
MUN AREA TRAFFIC STUDY FINAL STEERING COMMITTEE REPORT

**PREPARED FOR:
CITY OF ST. JOHN'S**

PREPARED BY:
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City of St. John's				CLIENT

Executive Summary

Background

The Memorial University Area Traffic Study was commissioned in 2014, by the City of St. John's, Memorial University of Newfoundland and the Provincial Department of Community Services with a purpose to examine the longer term transportation infrastructure needs in and around the University area. Over the past 5 years, the University and the Health Sciences Centre Complex have seen significant growth in infrastructure including a 150,000ft² expansion to the Faculty of Medicine, a new 820 space parking garage, and two new residences on campus that accommodate the housing needs for some 500 students. Growth in infrastructure is an on-going concern in the study area. The new Core Sciences Facility is an example of a large project that is presently under construction and that will contribute to traffic pressures in the area.

Past traffic impact studies conducted in the study area have indicated that that many of the intersections along the Prince Philip Drive Corridor operate at very poor levels of service with little or no residual capacity remaining, an indication that clearly illustrates the need to take a broader longer term look at the transportation infrastructure needs of the area.

Hatch Mott Macdonald (now Hatch) was originally retained by the City of St. John's in 2014 to complete this traffic impact study; Harbourside Transportation Consultants (HTC) was subsequently retained by Hatch as sub-contractor to complete the project. Other sub-consultants involved in the various aspects of this project included Brook McIlroy and Brian Taylor who handled the Transit and TDM components of this project.

Study Area

The study area for this project includes the segment of Allandale Road extending from the Outer Ring Road to Elizabeth Avenue, the segment of Prince Philip Drive extending from the east entrance to the Confederation Building west to Thorburn Road. The study area also includes the section of Elizabeth Avenue extending from Allandale Road west to Freshwater Road. The study area is identified in Figure 1.

Study Methodology

The methodology for the MUN Area Traffic Study followed fairly standard procedures for this type of study. The main workflow tasks included:

- Project Initiation and Information Gathering
- Stakeholder and Public Engagement
- Traffic Operations Analysis
- Assessment of Network Improvements
- Public Transit
- Transportation Demand Management and Parking
- Pedestrian Safety
- Review of Campus Specific Issues

- Draft Report Documentation and Public Engagement
- Final Report Documentation

The main goal is to develop a future vision of the transportation network within the study area that will accommodate projected growth to the year 2025.

Public Consultation

Key stakeholder and public engagement consultations were recognized as vital components to the study in understanding existing conditions on the MUN area. A total of 9 stakeholder groups and organizations were identified and solicited for feedback on various aspects of this project.

A website was activated for this project with an interactive mapping feature which allowed participants to pinpoint areas of concern throughout the study area. There were nearly 200 comments received within the first three weeks of the website launch. The input gathered from the web map was used to better understand the existing conditions from the perspective of the daily users, to identify alternative solutions, as well as to assist in the preliminary evaluation of alternative solutions.

A project on-line survey was also used to obtain specific information on key topics for this project. In total, 414 responses were received to the 11-question project survey which remained online on the project website for a period of four weeks.

There were also two public information sessions held on campus in June of 2014 to explain the purpose of the project and to obtain feedback from those in attendance.

Summaries of the consultation components of this project are noted in the Introduction section of the report.

Traffic Analysis

The traffic analysis for this study was completed by the study team using a number of different software packages. The Synchro/SimTraffic (Version 9) software package was used as the main evaluation tool for the signalized and unsignalized level of service analysis completed for this report. The study team also used the ARCADY/Junctions 8 software to analyze the level of service for the suggested roundabout locations. VISUM, which is a macroscopic transportation planning modelling software package, was also used in the high level traffic analysis.

HTC completed two levels of traffic analysis for this study. The first will be referred to as the *detailed traffic analysis*. This analysis involved a sub-area of 6 study intersections and used existing traffic volumes that were both factored and adjusted by an agreed amount to reflect the anticipated growth in the study area. The redistribution of traffic patterns expected to occur with the completion of the Team Gushue Highway was considered, however, the effects in the model were small and to remain conservative – no adjustments were made to the model. The traffic volumes were prepared by Hatch Mott MacDonald, approved by the

City of St. John's and provided to HTC to complete the detailed traffic analysis. The detailed analysis results would be used to plan capital improvements that are required at the key intersections within the study area within the next 5 years.

The second analysis, which is referenced as the *high level traffic analysis*, relied on the traffic volumes obtained from the City's 2025 VISUM models. The results from this analysis are used to highlight, conceptually, the improvements that may be required at some point in the future within the Study Area to accommodate the future growth and projected traffic volumes. These improvements would be used for planning purposes but would be reaffirmed in a more comprehensive Transportation Planning exercise that is planned by the City of St. John's as they update their Transportation Plan in the near future.

Detailed Traffic Analysis

The detailed traffic analysis involved a sub-area analysis of 6 study intersections using existing traffic volumes that were both factored and adjusted by an agreed amount to reflect anticipated growth in the study area to the year 2025.

The scope of work for the detailed traffic analysis included:

Task 1 - A level of service analysis for the following conditions at each of the 6 intersections included within the sub-analysis work.

- Scenario 0 – Existing conditions.
- Scenario 1 – Conditions expected to be present in 2025 based on volumes that have been factored and adjusted to reflect the normal background traffic growth, the redistribution of traffic patterns associated with the Team Gushue Highway and the new Core Sciences Facility development.
- Scenario 2 – Same traffic volumes as Scenario 2 with improvements made to the study network.

Task 2 - Production of conceptual drawings and cost estimates for the improvements that are identified in the analysis as being required.

The study area for this detailed analysis includes six intersections – three on Prince Philip Drive and three on Elizabeth Avenue, near Memorial University. The six intersections that were analyzed, complete with the month and year counted, include:

- Prince Philip Drive/Columbus Drive & Thorburn Road – March 2013
- Prince Philip Drive & Clinch Crescent/Westerland Road – October 2013
- Prince Philip Drive & Allandale Road – April 2013
- Elizabeth Avenue & Allandale Road/Bonaventure Avenue – March 2012
- Elizabeth Avenue & Westerland Road – May 2013
- Elizabeth Avenue & Freshwater Road – April 2013

Findings/Recommendations – Detailed Traffic Analysis

Prince Philip Drive/Columbus Drive & Thorburn Road

The intersection of Prince Philip Drive and Thorburn Road is one of the largest, most complex intersections that the City of St. John's controls. This intersection already has three through lanes in both the north and southbound directions and a dual left turning lane on Thorburn Road. The results of our analysis indicates that little or nothing can be done with the present method of traffic control at this intersection in terms of signal timing, phasing, cycle length changes or with auxiliary lane additions that will provide an acceptable level of service at this intersection for 2025. Our analysis, using a multi-lane roundabout as the method of traffic control, yielded acceptable results in terms of the LOS during both analysis periods.

Accordingly our recommendation, is to reconfigure the intersection to a multi-lane roundabout as shown in Figure 7.

Prince Philip Drive & Clinch Crescent/Westerland Road

The intersection of Prince Philip Drive and Clinch Crescent/Westerland Road is also a major intersection for the City of St. John's. It provides a secondary access to the Health Sciences complex from Prince Philip Drive and provides both vehicular and pedestrian connections to both sides of campus. The results of our analysis, indicate that little or nothing can be done with the present method of traffic control at this intersection in terms of signal timing, phasing, cycle length changes or with auxiliary lane additions that will provide an acceptable level of service at this intersection for 2025. Our analysis, using a multi-lane roundabout as the method of traffic control, yielded acceptable results in terms of the LOS during both analysis periods. Our recommendation is to reconfigure this intersection to a multi-lane roundabout.

This design does not match with the long term concept plan developed for this area of the study. In the long term concept plan, this intersection was configured as a 3-way roundabout with Westerland Road being closed to through traffic. This is being done to address the public input HTC had received and concerns in relation to pedestrian safety.

Prince Philip Drive & Allandale Road

The intersection of Prince Philip Drive and Allandale is a large, relatively complicated signalized intersection with heavy traffic flows on most approaches to the intersection. This intersection has experienced a high number of collisions – 98 collisions over a 3 year period (2009 – 2011). The results of the analysis indicate that little or nothing can be done with the present method of traffic control at this intersection in terms of signal timing, phasing, and cycle length changes or with auxiliary lane additions that will provide an acceptable level of service at this intersection for 2025. Our analysis, using a multi-lane roundabout as the method of traffic control, yielded acceptable results in terms of the LOS during both analysis periods. HTC included a right turn by-pass lane on the northwest side of the roundabout to accommodate the heavy right turn volumes at this location. This by-pass lane may not

be required based on the long term concept plan that includes the Clinch Crescent to Mt. Scio Road connection.

Elizabeth Avenue & Allandale Road/Bonaventure Avenue

The intersection of Elizabeth Avenue and Allandale is a busy signalized intersection located at the eastern boundary of the study area. The results of our analysis indicate that the traffic volumes projected or forecasted to be present at this intersection can function under a signalized intersection control configuration. Some timing changes and some geometric lane improvements will be necessary, as detailed in Section 2.2.9.

Elizabeth Avenue & Westerland Road

The Elizabeth Avenue intersection with Westerland Road is one of the smaller intersections included within this sub-area analysis. The analysis of the 2025 peak hour volumes indicates that an acceptable LOS can be achieved with a minor geometric improvements (the addition of an auxiliary right turn lane in the westbound direction) and some timing changes to the controller.

This design does not match the long term concept plan that was developed for the Elizabeth Avenue area of the study. Under that concept plan this intersection was removed totally from the network in this area.

Elizabeth Avenue & Freshwater Road

The analysis work completed by HTC at the intersection of Elizabeth Avenue Road and Freshwater Road shows that this intersection functions well during the 2025 analysis period.

It should be noted that traffic currently spills back during both peak periods from the Oxen Pond intersection with Freshwater and affects the operation at Freshwater Road and Elizabeth Avenue. So, while the sub-area analysis shows a good level of service, things are likely to be much worse in 2025 because of the operational problems at the Freshwater Road intersection with Oxen Pond Road. Further review of the Oxen Pond Road/Freshwater Road intersection will be required to resolve this problem.

The results of the detailed traffic analysis clearly indicate that the three intersections along Prince Philip Drive will be over capacity by the year 2025 in both analysis periods. The recommendations for these intersections are largely the same as those identified as being required in the high level analysis.

It should be noted that while only minor improvements are suggested along Elizabeth Avenue in the detailed analysis, single lane volumes of 650-850 vehicles per hour do not leave much spare capacity for unanticipated or expected growth in volumes. Much of the public feedback on this project indicates that pedestrian safety is a major concern along Westerland Road and hence the comments and concepts that are developed in Section 4.2 of report apply. In the long term, the segment of Westerland Road from Prince Philip Drive to Elizabeth Avenue should be removed from service altogether.

HTC heard during the public consultation process that many people, including the administration of the campus, did not want to see any additional widening of Elizabeth Avenue. This was a significant influencing factor in the rationale to provide a roundabout corridor along Elizabeth Avenue in the long term. This configuration will handle the traffic flows without any widening. A raised median in the centre of Elizabeth Avenue and an active transportation (AT) trail along the north side of the road is recommended as well. Maintaining a conventional corridor of traffic signals will not facilitate that vision.

Estimated Costs – Detailed Traffic Analysis

The estimates of the improvements associated with the detailed analysis are noted below Table A. HTC has also provided a priority plan for these different projects. It is recommended that the City of St. John's proceed to the preliminary design stage to obtain more accurate costing for budgetary purposes. The total cost of the improvements associated with the detailed analysis is \$4.95 million dollars.

Table A: Detailed Traffic Analysis – Estimated Improvement Costs

Detailed Analysis		
Priority		
1	Prince Philip Drive & Allandale Road	\$ 1,600,000
2	Prince Philip Drive & Clinch Crescent/Westerland Road	\$ 1,200,000
3	Prince Philip Drive/Columbus Drive & Thorburn Road	\$ 1,800,000
4	Elizabeth Avenue & Allandale Road/Bonaventure Avenue	\$ 200,000
4	Elizabeth Avenue & Westerland Road	\$ 150,000
Total Cost of Detailed Analysis		\$ 4,950,000

High Level Traffic Analysis

The high level traffic analysis completed by HTC for this project involved a number of different VISUM modelling scenarios for both the AM and PM peak hour analysis periods. They include:

- Scenario 1 - 2025 projection of normal growth within the study area.
- Scenario 2 - 2025 projection of normal growth with road network improvements.
- Scenario 3 - 2025 projection of normal growth with road network improvements and new development.
- Scenario 4 - 2025 projection of normal growth with road network improvements and new development. This scenario includes the widening of Elizabeth Avenue and the proposed link from Allandale Road to Clinch Crescent.

HTC also added a scenario, 4B, which was evaluated to consider roundabouts as an alternative to signal controls at poorly performing signalized intersections throughout the study area road network.

Findings / Recommendations – High Level Traffic Analysis

Modelling Scenario 1 is a year 2025 projection of the traffic volumes expected to be present on the study area road network under existing intersection timing/phasing and lane configurations in both the AM and PM peak periods of day. During the PM peak hour, under the volumes for the Scenario 1, most of the intersections in the study area suffer from poor levels of service and congestion (refer to section 2.2.4). Even with minor improvements to signal timings/phasing and lane configurations where appropriate, as modelled under Scenario 2, there is little improvement in levels of service and congestion throughout the study area road network. LOS conditions under Scenario 3, the campus study area growth scenario, are slightly better because of improvements put in place at the Elizabeth Avenue intersection with Freshwater Road, but overall, many intersections throughout the study area still suffer from poor levels of service and congestion and more predominately so during the PM peak hour. Under Scenario 4, Option A, traffic volumes are again projected to the year 2025, growth is considered, and several significant changes are made to the MUN area road network, including the addition of a new link from the intersection of Mt. Scio Road/Allandale Road to Clinch Crescent and the widening of Elizabeth Avenue to two through lanes in each direction from Allandale Road to Freshwater Road and Stamp's Lane. The results of the LOS analysis for Scenario 4, Option A in the PM peak hour indicate some improvements in the LOS for some study area intersections when compared to the LOS results for Scenario 3. Six of the study area's 20 intersections show an improvement.

The new roadway connecting the intersection of Mt. Scio Road and Allandale Road to Clinch Crescent is expected to draw an average daily traffic volume of 18,500 vpd. This new roadway, in combination with the additional lanes on Elizabeth Avenue, reduce the overall traffic volumes on segments of Prince Philip Drive and Allandale Road, by approximately 650 vehicles, but the relief, while significant and needed, is not sufficient itself to re-establish acceptable levels of service at the vast majority of intersections throughout the study area.

With signal systems optimized, the options available to gain additional capacity at many of the study areas signalized intersections and improve the level of service results to within acceptable norms are limited. Traffic volumes either have to be reduced (i.e. more emphasis placed on transit/active transportation and other TDM measures), streets have to be widened to provide additional lanes, or there has to be a departure from the traditional method of traffic control (i.e. traffic signals) that are presently used at many of the study area intersections.

Scenario 4, Option B is the roundabouts scenario for the study area. The study team replaced the traffic signals at 14 intersections throughout the study area with roundabout control and in doing so were able to re-establish acceptable levels of service at the vast majority of the study area intersections without the need to widen any existing streets in the study including Elizabeth Avenue.

Summaries of the overall intersection LOS results from both Synchro/SimTraffic and ARCADY for both the AM and PM peak hour analysis periods for Scenarios 1, 2, 3, 4, Option A and Scenario 4, Option B are shown in Table 12 and Table 13.

Estimated Costs – High Level Traffic Analysis

Harbourside Transportation Consultants has provided Class 5 cost estimates for the projects that had been envisioned under the primary analysis for this study. These estimates do not reflect costs of any land acquisition that may be required to facilitate the same.

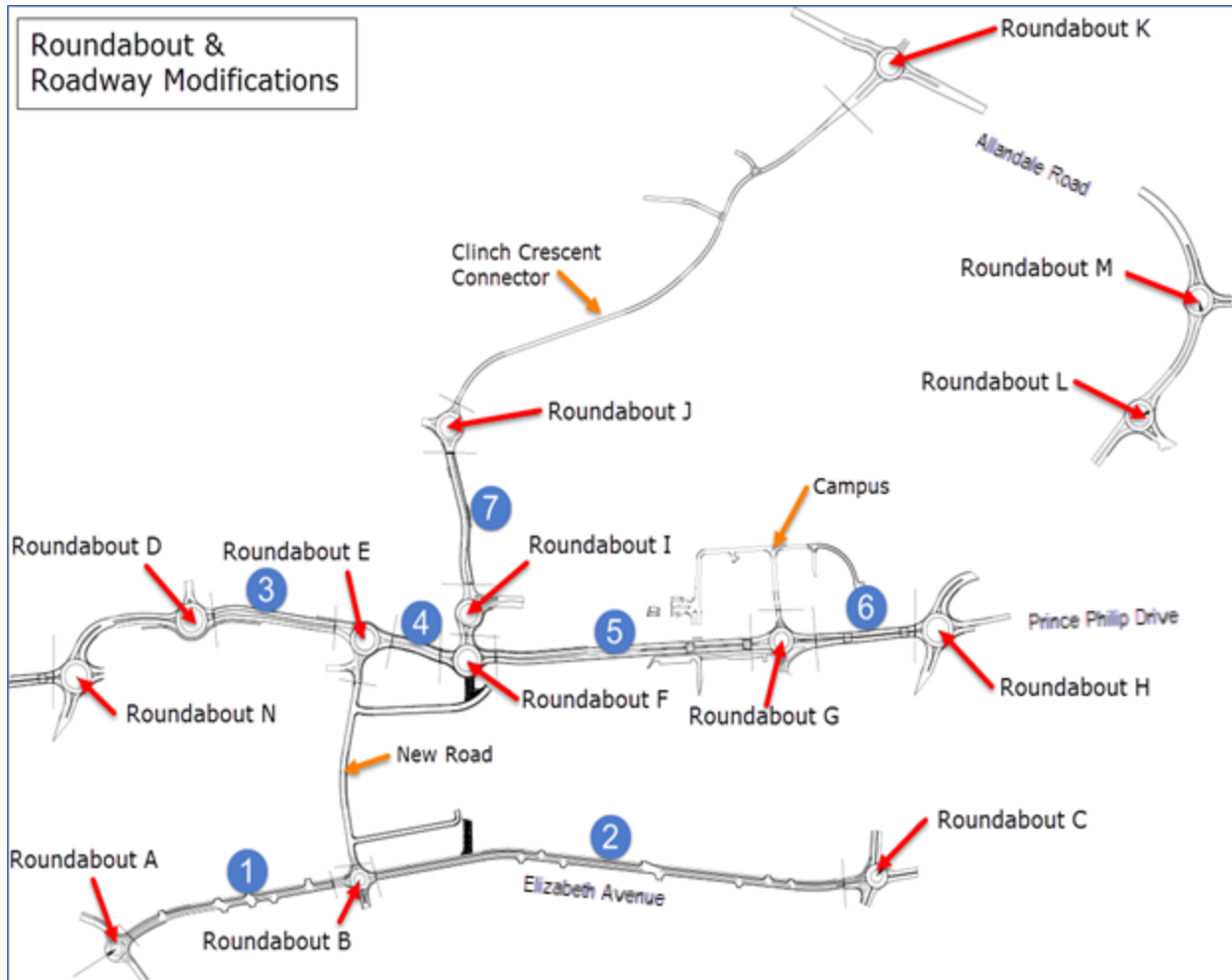


Figure A: Roundabout & Roadway Modifications

A priority plan for the primary analysis improvements was not established by HTC. It was assumed this would be provided when the work associated City's Transportation Plan update gets underway in near future.

The total estimated cost of the improvements that have been suggested by HTC under the detailed traffic analysis work completed for this project is \$21.7 million dollars. Again, this cost does not reflect land acquisition nor does it reflect the cost of the storm sewer upgrading that will be required along the Elizabeth Avenue corridor.

Table B: High Level Analysis Cost

Road Network Modifications		
New Roadways		
New Clinch Crescent Connector	\$	3,000,000
Prince Philip Drive & Elizabeth Avenue Corridor (New Road - Roundabout B to Roundabout E)	\$	1,000,000
Total New Roadway Cost	\$	4,000,000
Road Network Improvements		
1 Freshwater Road/Elizabeth Avenue to Elizabeth Avenue/New Road	\$	600,000
2 Elizabeth Avenue/New Road to Elizabeth Avenue/Allandale Road/Bonaventure Avenue	\$	1,000,000
3 Prince Philip Drive/Clinch Crescent (West) to Prince Philip Drive/New Road	\$	500,000
4 Prince Philip Drive/New Road to Prince Philip Drive & Clinch Crescent (East)	\$	300,000
5 Prince Philip Drive & Clinch Crescent (East) to Prince Philip Drive & New Campus Road	\$	500,000
6 Prince Philip Drive & New Campus Road to Prince Philip Drive & Allandale Road	\$	600,000
7 Clinch Crescent & Arctic Avenue to Clinch Crescent & New Clinch Crescent Connector	\$	300,000
Campus Road	\$	250,000
Total Road Network Improvements Cost	\$	4,050,000
Roundabouts		
A Freshwater Road & Elizabeth Avenue	\$	750,000
B Elizabeth Avenue & New Road	\$	600,000
C Elizabeth Avenue & Allandale Road/Bonaventure Avenue	\$	1,000,000
D Prince Philip Drive & Clinch Crescent (West)	\$	900,000
E Prince Philip Drive & New Road	\$	900,000
F Prince Philip Drive & Clinch Crescent (East) ¹	\$	900,000
G Prince Philip Drive & New Campus Road	\$	1,100,000
H Prince Philip Drive & Allandale Road ¹	\$	1,500,000
I Clinch Crescent & Arctic Avenue	\$	750,000
J Clinch Crescent & New Clinch Crescent Connector	\$	750,000
K Allandale Road & Mt. Scio Road	\$	1,200,000
L Allandale Road & Confederation Building Entrance	\$	750,000
M Allandale Road & Higgins Line	\$	750,000
N Prince Philip Drive/Columbus Drive & Thorburn Road ¹	\$	1,800,000
Total Roundabout Cost	\$	13,650,000
Total Cost for High Level Analysis		\$ 21,700,000

¹ Please note that the configurations for Roundabouts F, H & N are different between the detailed analysis and high-level analysis. As a result, the costs between Table A and Table B for these roundabouts are different.

Long Term Network Improvements

Widening of Elizabeth Avenue

The widening of Elizabeth Avenue from Bonaventure Avenue to Freshwater Road has been an on and off again topic of discussion many years with the City of St. John's. In 1998, this project was discussed in the City's Transportation Plan and contemplated as an improvement that could reduce the traffic pressures on Prince Philip Drive by providing additional capacity on a parallel route. The thought at that time was to widen Elizabeth Avenue to five lanes to provide that capacity.

Elizabeth Avenue is a critical connection and access route for students, faculty and the staff at MUN. It serves as an access area for vehicles, pedestrians and cyclists. There is a need to continue and improve upon this access to the south side of campus, but solutions must be sensitive to local residents and side street accesses as well as pedestrian safety. The ultimate solution should provide additional vehicle capacity at the intersections while providing an environment which promotes lower speeds, pedestrian safety and side street/driveway access.

The public feedback HTC has received on this issue, has indicated that there was no desire to create another high speed, high capacity facility like Prince Philip Drive. There is, however, a need to create additional vehicle capacity to share the traffic load with Prince Philip Drive. Without it, Prince Philip Drive traffic will continue to grow to levels that will exceed the capacity of the intersections.

An alternative concept plan for Elizabeth Avenue was developed by HTC that will increase the capacity of the street and its intersections, while also minimizing capital improvement costs and disturbance to the local neighbourhood. This concept involves the introduction of a roundabout corridor, complete with a non-traversable median and AT trail provisions.

The introduction of roundabouts at key intersection locations, medians and a narrower corridor will enable the City to create a greener, more aesthetically-pleasing streetscape which can easily accommodate all users: vehicles, pedestrians, cyclists and others.

Sketches SSK-12 to SSK-14 illustrate the proposed long term changes HTC is recommending along Elizabeth, between Freshwater and Bonaventure Avenue including a typical road cross-section concept for Elizabeth Avenue. The overall plan can be seen on drawing SSK -1. All drawings can be found in Appendix C.

Proposed Roadway connection - Allandale Road to Clinch Crescent

The proposed road network connection from the Mt. Scio Road intersection with Allandale Road to Clinch Crescent has also been an on and off again topic of discussion for as far back as when the original planning was completed for the Outer Ring Road, and while this link may have generated some discussion at various times, it has never formed part of the original planning package for the construction of the Outer Ring Road.

The comparison of the VISUM model analysis completed by HTC for Scenarios 3 and 4A indicate that the proposed roadway from the intersection of Mt. Scio Road and Allandale Road to Clinch Crescent will handle fairly significant volumes during both the AM (1,370 vph) and PM (2,370 vph) peak hour periods. The proposed route is attractive for motorists in the study area and will help reduce the traffic volumes on Prince Philip Drive and Allandale Road to more manageable levels. The roadway does provide a much more direct route from the Outer Ring Road to the University and the Health Sciences Complex, both of which are major traffic generators. It also provides an alternative means of access to the Health Sciences complex that is not reliant on Prince Philip Drive.

The proposed roadway from the intersection of Mt. Scio Road and Allandale Road to Clinch Crescent may be needed in the long term. The roadway should be built to a two lane standard with roundabouts used as the method of traffic control at intersections. Flaring to two lanes may be required on the entrance to the roundabouts. The City of St. John's should consider establishing a 35m right of way width to allow for future expansion of the roadway should that become required.

Operational Network Improvements

Prince Philip Drive/Morrissey Road/Irwin's Road and Livyer's Loop

The Prince Philip Drive intersection with Morrissey Road has been a source of complaints for both pedestrians and motorists for many years. The geometric alignment and configuration of this intersection is not conventional in terms of what motorists expect from a four way signalized intersection. The east intersection of Irwin's Road and Livyer's Loop has also been problematic for quite some time. The poor alignment and merge onto Prince Philip Drive do not meet any TAC geometric design guideline standards. To deal with these problems, HTC is recommending that a reconfiguration of the road network in this area. The reconfiguration involves closing the Morrissey Road intersection with Prince Philip Drive. The segment of Morrissey Road between Artic Avenue and Prince Philip Drive would be removed and the medians on Prince Philip Drive closed and fenced accordingly to prevent pedestrian movements across Prince Philip Drive at this location. Traffic on Arctic Avenue would be re-routed left onto Morrissey Road and eventually to a new roadway extending from Morrissey Road to the east intersection of Livyer's Loop with Prince Philip Drive. A roundabout would be installed at this intersection. The Livyer's Loop approach to the roundabout would be restricted to a right turn by-pass lane. This, of course, would be optional and is being suggested for the sole purpose of controlling the amount of short cutting traffic moving from Elizabeth Avenue to Arctic Avenue and points west on campus. The segment of Irwin's Road along the frontage of the Main Dining Hall would be turned into a limited access cul-de-sac, used mainly for deliveries, etc.

The existing pedestrian tunnel near St. John's College has recently been upgraded to provide a usable grade separated link in this area of campus. A new multi-use underpass on the Morrissey to Livyer's alignment should be investigated as part of this closure of this intersection. This underpass may also be able to serve smaller maintenance vehicles. The one way restriction on the segment of Livyer's Loop from Irwin's Road to the access to the parking lot for the Science Building should remain in place as a permanent feature.

Westerland Road/Pedestrian Concerns

One of the more prominent and recurring themes that came up during the public consultation process (the interactive website) and through the stakeholder consultation process, was the pedestrian safety issue on Westerland Road. Westerland Road is the only direct connection between Elizabeth Avenue and Prince Phillip Drive that exists west of Allandale Road, and the only such connection which runs through the MUN campus. Due to the nature of its connectivity, Westerland Road is subject to relatively heavy traffic volumes as an alternate path to and from the MUN campus and the Health Sciences Center. Besides the vehicular traffic on Westerland Road, it is also the site of a large volume of pedestrian traffic, including the two of the busiest pedestrian crossings within the study area.

There has been a long-standing concern with the conflicts introduced between the heavy vehicle traffic and the heavy pedestrian traffic on Westerland Road. This has created a number of accidents and near-misses through the years. The University has undertaken a pedestrian crossing study in the recent past and one of the recommendations included a set of improvements intended to improve pedestrian safety on Westerland Road. These recommendations included high visibility flashing beacons to increase crosswalk visibility and roadside bulb-outs intended to reduce vehicle speeds and to minimize crossing distances. These improvement measures have recently been installed and the University, by all accounts, is pleased with the resulting road section. The improvements are getting favourable feedback and reaction from the students, faculty and other users.

While these improvements are appearing to have a positive impact, there is concern that the positive impacts may be a function of drivers reacting to a change in conditions and that the driver behaviour may migrate towards its previous conditions (high volumes, high speeds) after drivers become familiar with the new conditions. It is recommended that the crossings be monitored over time to ensure the new beacon system remains effective.

In the long term, and in keeping with the goals of the Campus Master Plan (Brook McIlroy), it is HTC's recommendation that the vehicle/pedestrian conflicts be completely eliminated. This could be achieved by relocating Westerland Road to the west, effectively removing the road from the interior of campus and building it on the periphery of the campus, to the west of any on-campus parking. The proposed layout is illustrated in Figure 38 and on drawing sketch SSK-14 in Appendix C.

Public Transit

As part of the Public Transit review for this project a number of key areas were examined in some detail by the sub-consultant dealing with Transit and TDM issues on this project, Brian Taylor. From a transit perspective, these areas included a public transit operational review, a fare strategy review, a review of transit planning and a service review. The recommendations stemming from each area review are noted below.

Public Transit Operational Review

- Metrobus to develop a comprehensive printed route map and schedule booklet showing all bus routes and scheduling information such as major transfer points, terminals and major destinations as well as bicycle routes and walking paths connecting to transit service.
- Metrobus to install printed route map and schedule displays at major transit destinations, transit terminals and bus shelters and in the Health Sciences Center, Memorial University and the Confederation Building.
- Metrobus to investigate the installation of interactive electronic screen displays in major transit points, malls and transit terminals displaying transit route and real-time transit information and transit trip planning capability.
- Metrobus to develop a transit information booklet for inclusion the university student orientation package.

Fare Strategies

- M-Card has become the method of choice for most Metrobus customers. Effort should be made to reduce the time lag in loading and uploading of rides and passes on M-Cards and expand sales outlets.
- Metrobus to complete the study of a U-Pass program for Memorial University students and consider expansion of the program to other educational institutions (refer to Appendix E).
- Metrobus to investigate the implementation of an employer-provided bus pass program with major employers, including the faculty and staff at Memorial University, the Health Sciences Center and the Provincial Departments located in the Confederation Building and the City of St. John's. The combination of a U-Pass program for Memorial University students and an EcoPass program for employees at the university, Health Services Center and Confederation Building would significantly increase ridership and fund service improvements on transit routes serving these institutions.
- Metrobus to revisit the timed transfer policy. Many transit systems have adopted a timed transfer policy. Research should be carried out on other transit systems regarding policies to reduce abuse of the policy. It is recommended to reduce the time allowed for a valid transfer from 120 minutes to 90 minutes after the last time point on a route.

Transit Planning

- The St. John's Transit Commission continue to engage the Province and neighbouring municipalities in discussions to develop a regional transit system.
- Metrobus staff work with City planning staff to promote transit-oriented design in future development plans.
- Metrobus staff work with the City of St. John's to install transit priority signals and queue-jump lanes at key intersections.
- Metrobus work with Memorial University to improve the Arctic Avenue terminal.
- Metrobus work with City staff to install transit priority signals along Prince Phillip Drive.

- Metrobus identify a suitable location for a new transit terminal to serve the Health Sciences Center and Memorial University. The corner lot at Clinch Crescent and Prince Phillip Drive should be considered as a possible location.
- Metrobus work with the Avalon Mall to improve transit facilities.
- Metrobus develop a bus shelter program to increase the number of bus shelters including criteria for locating shelters and guidelines to determine the amenities that should be included at each location.
- Metrobus develop a park-and-ride program to identify possible locations for park-and-ride sites and transit service to the study area.

Service Review

- Routes 24 and 26 to provide express service with one (1) morning trip only. Due to fleet availability constraints, no evening return express trip is available. Staff should look at realigning other service to allow a return express trip on Routes 24 and 26.
- Metrobus to conduct regular passenger counts and surveys to ensure transit routes are meeting ridership goals and performance.
- There is a high level of service along Prince Phillip Drive to the Health Sciences Center and Memorial University. Investigate if some service could be re-routed along Elizabeth Avenue and up Westerland Road to these institutions.
- Metrobus to investigate the implementation of an express bus network connecting major transit terminals and park and ride locations to major destinations.
- Metrobus to begin planning of accessible transit service on conventional transit routes considering transit routes that serve the Health Sciences Center and Memorial University as a priority.
- Metrobus to evaluate the response to the service with possible expansion of neighbourhood bussing to serve communities popular for off-campus student housing such as the Kenmount Terrace and Crosby Road areas.
- Metrobus to consider extending Friday and Saturday evening service by providing a late night shuttle between the terminal at City Hall/Mile One and the University. This service could be delivered using the smaller Community Transit vehicle.
- Metrobus to develop policies and procedures for providing bicycle travel on transit.
- Plan the installation of bicycle racks at transit terminals and major transit destinations.
- Work closely with the local cycling community to promote transit and cycling as a travel options.
- Metrobus investigate the introduction of a "Guaranteed Ride Home" program for Metrobus customers.
- Metrobus consider the introduction of stop announcements at major transit stops and destinations.

Transportation Demand Management (TDM)

Transportation Demand Management (TDM) involves the use of various policies, programs, services and products to influence the manner in which people travel. The idea of TDM is to motivate people to travel using different modes of transportation including walking, cycling, transit and ridesharing. For individuals that take advantage of TDM programs and services, they have greater choices and convenience, they save both time and money, and they reap the benefits of a healthier more sustainable lifestyle.

By properly managing the demand for travel, municipalities can, and have in some instances, reduce the need for new or widened roads, reduce the environmental and social costs of car use, and have increased their return on the investments they have made in walking, cycling, transit and ridesharing throughout the communities they manage.

The project team has examined and made recommendations on a number of different strategies that could be employed to more effectively promote and enhance Transportation Demand Management in relation to public transit, parking, cycling, walking and active transportation. These strategies include:

- Strategy 1: Partnerships to promote sustainable transportation and awareness of the benefits of public transportation.
- Strategy 2: Improve transit facilities to improve bus access and customer amenities using transit-friendly design guidelines.
- Strategy 3: Partnerships to promote active transportation initiatives.
- Strategy 4: Develop parking policies that encourage greater transit use.
- Strategy 5: Investigate the use of transit priority measures to reduce transit travel times and improve schedule adherence and on-time performance.
- Strategy 6: Use Intelligent Transportation Systems to improve transit service.
- Strategy 7: Establish a U-Pass program for full-time Memorial University students and an EcoPass program for Memorial University faculty and employees and employees at the Health Sciences Center and Confederation Building.
- Strategy 8: Develop a "suite" of service delivery options for public transit.
- Strategy 9: Adding value to the transit experience
- Strategy 10: Develop park-and-ride sites strategically located at the periphery of the urban core with express bus service into the study area.

Crosswalks and Pedestrian Safety

As part of the Crosswalk and Pedestrian Safety component of the project, the study team reviewed a total of 22 pedestrian crossing locations with the MUN campus study area. Eight of these crossings are located on streets with significant traffic volumes and speeds. These were assessed using the TAC Pedestrian Crossing Control Guide to determine whether or not appropriate control measures are in presently in place. Several locations required some upgrading to meet the TAC standards. The remaining 14 pedestrian crossings were located within the internal campus road network and were evaluated for the presence of signage, pavement markings, lighting, sight distance obstructions etc. Summaries of the assessments results are contained in Section 7 of the report.

HTC recommends the following improvements be made at all crosswalks throughout the MUN campus, not just the 22 that were assessed:

- Re-painting the zebra crosswalk markings (inlaid thermoplastic crosswalks)
- WC-2 signs should be placed on each approach to pedestrian crossings
- Removal of red and/or amber flashing beacons
- All signage should be inspected for retro reflectivity

In addition to the crosswalk assessments, HTC is also recommending a new pedestrian tunnel be installed across Prince Philip Drive at the Morrissey Drive intersection and that new overhead pedestrian walkways be installed connecting the Education Building to the New Core Sciences Facility to the parking garage and finally to the Health Sciences Centre. Concept plans of the proposed connections and of the tunnel location are noted in Figure 39 and Figure 40.

Campus Specific Issues

As part of the Campus Specific Issues section of the MUN Area Traffic Study, Brook McIlroy, the authors of the original Campus Master Plan (CMP), reviewed the transportation recommendations from the CMP, discussing the recommendations that have been implemented, as well as those that remain to be addressed.

As part of this section of the report, Brook McIlroy has examined key improvements that are being proposed as part of the MUN Area Traffic Study and provided commentary related to the compatibility of these improvements to the overall CMP. The key improvements included the Elizabeth Avenue upgrading, the improvements suggested in the area of Prince Philip Drive/Morrissey Road and on Irwin's Road and Livyer's Loop, the Westerland Road relocation plan and the cost of parking on Campus.

The findings indicated that overall there is a strong compatibility between the Campus Master Plan and the MUN Area Traffic Study and that the adoption of the Traffic Study recommendations will advance the goals and objectives of the CMP.

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1 Introduction

1.1 Background

The City of St. John's, Memorial University and Health and Community Services have partnered together to undertake the Memorial University Area Traffic Study to examine the longer term transportation infrastructure needs in and around the University area. Over the past five years, Memorial University and the Health Sciences Complex have seen significant growth in infrastructure including a 152,000 ft² expansion to the Faculty of Medicine, the construction of an 820 space parking garage, and the construction of two new residences that will accommodate 500 students. The capital cost of construction is in the area of \$128 million. In the next five years, plans are in the works for the construction of a new Core Science Facility having an estimate global project value of \$325 million.

The current and planned expansions to Memorial University and the Health Sciences Complex have, and will continue to, generate additional traffic to this area of the City of St. John's. This area is also a major employment node, employing 14,500 people on both a full and part time basis between the University, Health Sciences Complex, and the Confederation Building. There are approximately 18,000 full and part time graduate and undergraduate students registered on the St. John's Campus. The transportation implications associated with this growth, the employment characteristics of this area, and the number of students registered to attend classes on the St. John's campus are significant. The pressures exerted on the area's roadways including Prince Philip Drive, Allandale Road and Elizabeth Avenue are evident during both peak and non-peak traffic periods of the day. Congestion along Prince Philip Drive, Allandale Road and Elizabeth Avenue are daily occurrences that not only cost motorists things associated with travel delays such as increased fuel consumption and vehicle operating expenses, but that also contribute to losses in productivity and higher greenhouse gas emissions. There is also a serious concern about the ability of maintaining good access for emergency vehicles to the Health Sciences Complex at all times of the day.

The City's 1998 Transportation Plan, which was completed by SGE, recommended a number of significant transportation related infrastructure improvements to accommodate the projected growth throughout the City of St. John's over the study's horizon year time frame. These projects included:

- Construction of the Outer Ring Road.
- Completion of the Team Gushue Highway.
- Completion of the East End Arterial.
- Movement of trucks between the East End of the City and the Downtown.
- Widening of Elizabeth Avenue from Allandale Road to Freshwater Road.

The Outer Ring Road is constructed and fully operational, with some segments handling in excess of 30,000 vehicles per day. The Team Gushue Highway (south of Kenmount Road) is presently under construction and is scheduled to open in the fall of 2017. The only project that has not already been fully considered by the City of St. John's is the widening of Elizabeth Avenue from Allandale Road to Freshwater Road. The purpose of this project, as it was contemplated in the 1998 Transportation Plan, was to provide additional capacity in an east/west direction that would relieve some of the pressures on the Columbus Drive/Prince Philip Drive corridor.

The traffic study completed by Hatch Mott MacDonald in 2010 for the proposed parking garage and parking lot expansion at Memorial University did take into consideration some of the anticipated growth in the study area. However, the mandate of this work was to determine the traffic impacts associated with the new garage and parking lot expansion and to suggest ways, in the short term, to mitigate the associated impacts. These improvements, which have not yet been completed, included a number of short term solutions at many of the intersections along Prince Philip Drive. The solutions included the addition of and lengthening of a number of auxiliary left and right turning lanes. While this study did not look at any of the longer term transportation needs of this area, it did highlight the fact that many of the intersections along the Prince Philip Drive Corridor were operating at very poor levels of service with little or no residual capacity remaining. That study clearly illustrated the need to take a broader longer term look at the transportation infrastructure needs of the area which is the overall purpose and mandate of the Memorial University Area Traffic Study.

1.2 Study Area

The study area for this project is shown in Figure 1. It includes the segment of Allandale Road extending from the Outer Ring Road to Elizabeth Avenue, the segment of Prince Philip Drive extending from the east entrance to the Confederation Building west to Thorburn Road. The study area also includes the section of Elizabeth Avenue extending from Allandale Road west to Freshwater Road.

Two different traffic analyses were completed for this project which included a detailed and a high level traffic analysis. The first 6 intersections, listed below, were included in the detailed traffic analysis and all 20 intersections were included in the high level traffic analysis. A complete listing of the intersections and roadways included within the study area for this project are noted below.

Intersections

1. Allandale Road @ Prince Philip Drive
2. Prince Philip Drive @ Westerland Road
3. Prince Philip Drive @ Thorburn Road
4. Elizabeth Avenue @ Allandale
5. Elizabeth Avenue @ Westerland Road
6. Freshwater Road @ Elizabeth Avenue
7. Outer Ring Road @ Allandale Road
(2 intersections)
8. Allandale Road @ Mt. Scio Road
9. Allandale Road @ Higgins Line
10. Allandale Road @ West Entrance to
Confederation Building
11. Clinch Crescent @ Arctic Avenue
12. Prince Philip Drive @ East Entrance to
Confederation Building
13. Prince Philip Drive @ Morrissey Road
14. Prince Philip Drive @ Clinch Crescent
15. Prince Philip Drive @ Wicklow Street
16. Freshwater Road @ Thorburn Road
17. Freshwater Road @ Stamp's Lane
18. Elizabeth Avenue @ Paton Street
19. Elizabeth Avenue @ Anderson Avenue

Roadways

20. Outer Ring Road (Relevant Segment)
21. Allandale Road
22. Prince Philip Drive
23. Freshwater Road
24. Clinch Crescent
25. Westerland Road
26. Arctic Avenue
27. Russell Road
28. Phalen Road

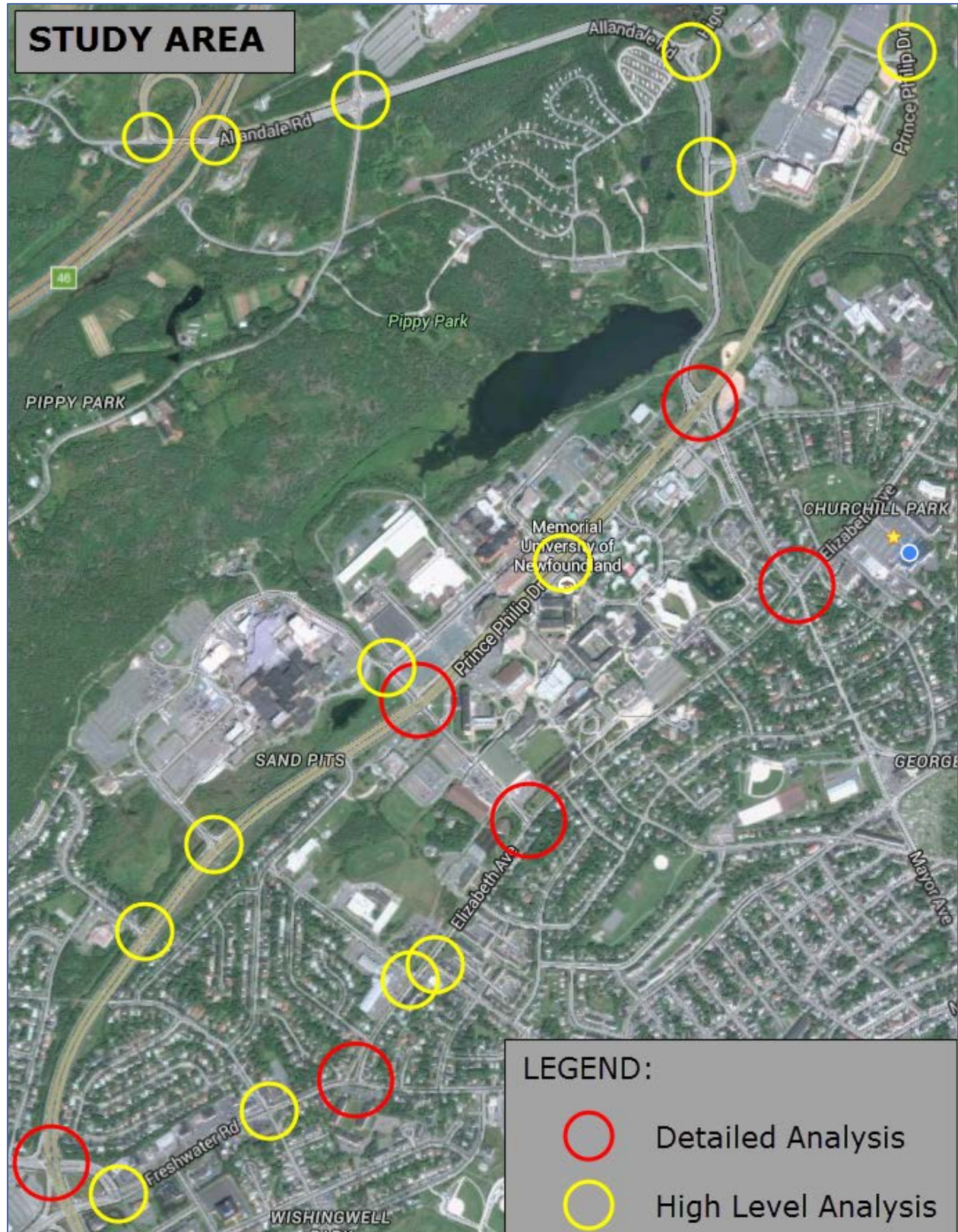


Figure 1: Key Intersections and Roadways

1.3 Data Collection

Existing traffic volumes for the 2014 base year were based on data provided by the City of St. John's and traffic counts conducted by Harbourside Transportation Consultants (HTC). The City of St. John's provided the following four-hour intersection counts:

- Allandale Road @ Mt. Scio Road – December 2012
- Allandale Road @ Higgins Line – December 2012
- Allandale Road @ West Entrance to Confederation Building – March 2013
- Allandale Road @ Prince Philip Drive – April 2013
- Prince Philip Drive @ East Entrance to Confederation Building – September 2013
- Prince Philip Drive @ Morrissey Road – March 2013
- Prince Philip Drive @ Westerland Road – October 2013
- Prince Philip Drive @ Clinch Crescent – November 2012
- Prince Philip Drive @ Wicklow Street – November 2012
- Prince Philip Drive @ Thorburn Road – March 2013
- Freshwater Road @ Thorburn Road – October 2012
- Freshwater Road @ Elizabeth Avenue – April 2013
- Elizabeth Avenue @ Paton Street – March 2013
- Elizabeth Avenue @ Anderson Avenue – March 2013
- Elizabeth Avenue @ Westerland Road – May 2013
- Elizabeth Avenue @ Allandale – March 2012

HTC conducted four-hour intersection counts (7:00–9:00AM, 4:00–6:00PM) at the following intersections:

- Clinch Crescent @ Arctic Avenue – February 2014
- Outer Ring Road @ Allandale Road – February 2014
- Freshwater Road @ Stamp's Lane – February 2014

The 2013 and 2014 traffic count data is included in Appendix A.

In addition to the traffic counts conducted for the traffic analysis, HTC also gathered traffic and pedestrian data at 8 different locations within the study that are prominent pedestrian crossings. These counts were conducted in March of 2014. Copies of the counts are included in Appendix A.

1.4 Study Methodology

The methodology for the MUN Area Traffic Study was developed based on the requirements detailed in Section 4.0 of the terms of reference for the study. The main goal is to develop a future vision of the transportation network within the study area that will accommodate the projected growth in the year 2025. The main workflow streams included:

1. Project Initiation and Information Gathering
2. Stakeholder and Public Engagement
3. Traffic Operations Analysis
4. Transportation Demand Management/Assessment of Non-Auto Modes
5. Review of Campus Specific Issues
6. Draft Report Documentation and Public Engagement
7. Final Report Documentation

Our technical traffic operational analysis conducted as part of this traffic impact study followed the procedures identified by the Institute of Transportation Engineers (ITE) for the preparation of traffic impact studies. Figure 2 provides a conceptual summary of this approach.

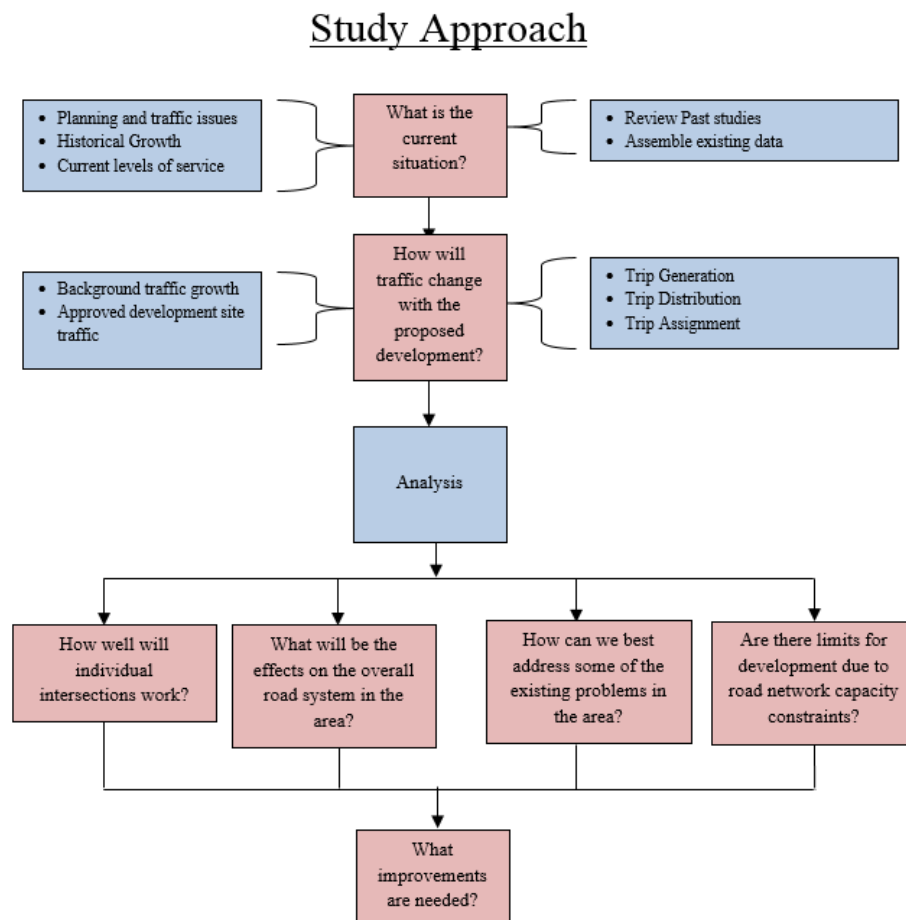


Figure 2: Traffic Analysis - Study Approach

1.5 Intersection Performance Measures

Intersection measures of performance were reviewed and compared for different network and traffic volume scenarios during the analysis that was completed for this study. The analysis used industry standard techniques.

The main evaluation tool used in the analysis for this report was the *Synchro/SimTraffic* software which analyzes typical measures of performance based on the methodology of the Highway Capacity Manual (Transportation Research Board, 2000). The *SimTraffic* micro-simulation traffic software was also used in the course of the analysis to illustrate and identify interactions between individual driver types and the effects of adjacent or closely spaced intersections. The ARCADY/Junctions 8 software was used to analyze roundabout options. ARCADY uses the TRL/Kimber empirical method to assess roundabouts.

Three primary measures of performance are typically used to evaluate the performance of an intersection. These are outlined below:

Volume to Capacity Ratio (v/c) – Volume to capacity ratios relate the estimated traffic volumes (demand volume) to the theoretical maximum volume that could be accommodated (capacity volume/adjusted saturation flow rate). As the v/c ratio approaches 1.0, the movement has reduced ability to accommodate any additional volume of traffic. Generally, intersection control or road infrastructure movements can alleviate any reduced residual capacity

Level of Service (LOS) – LOS is a qualitative measure which describes operational conditions. It is based on service measures such as freedom to manoeuvre, travel time, speed, and traffic interruptions. LOS is expressed as a scale from 'A' to 'F,' where LOS A represents free flow conditions or very low delay (less than 10 seconds per vehicle at an intersection), and LOS F represents delay times that are unacceptable to motorists using the facility (greater than 50 seconds at a STOP sign control or greater than 80 seconds at traffic signals). Generally speaking, a minimum LOS D is considered acceptable; however, the desirable design level of service is generally accepted as being LOS D or better.

Tables in the remainder of this report use the following colour code to identify the six levels of service:

Level of Service Rating	Percentile Delay (seconds / vehicle)	
	<i>Signalized Intersection</i>	<i>Stop-controlled Intersection</i>
A	≤ 10.0	≤ 10.0
B	> 10.0 and ≤ 20.0	> 10.0 and ≤ 15.0
C	> 20.0 and ≤ 35.0	> 15.0 and ≤ 25.0
D	> 35.0 and ≤ 55.0	> 25.0 and ≤ 35.0
E	> 55.0 and ≤ 80.0	> 35.0 and ≤ 50.0
F	> 80.0	> 50.0

Queue Capacity – Queue capacity at intersections is critical to the performance of the network. As part of the analysis process, queue lengths were examined and recommendations were made to ensure that sufficient vehicle storage is available to maintain efficient traffic flow.

The analysis results tables display the LOS, volume to capacity ratio, delay per vehicle, and queue length results for turning movements of each approach to the intersection as calculated by Synchro. The average delay per vehicle simulated in SimTraffic, the equivalent LOS based on these delays, and the 95th percentile queue lengths are also summarized. The traffic volume figures also show the intersection LOS.

The analysis results tables of this report display overall intersection delay and LOS as calculated by Synchro and the overall intersection average delay per vehicle simulated in SimTraffic with the equivalent LOS based on these delays.

1.6 Initial Public Consultation & Findings

1.6.1 Stakeholder and Public Engagement

Stakeholder and public engagement was recognized as a vital component of this study in understanding the existing conditions of the MUN Area traffic network. The use of various tools to solicit feedback and input from the public provided valuable insight in identifying issues and concerns of the daily transportation users of the University and surrounding area.

As part of the initial consultation process, HTC identified key stakeholders and agencies in order to gain their knowledge and input of current problems, possible future developments and potential improvements. Information was gathered through stakeholder interviews and email correspondence. Key stakeholders identified by the project steering committee included the following:

- Newfoundland Department of Transportation and Works
- Eastern Health
- MUN – Facilities Management Division
- Metro Bus
- MUN Students Union (Graduate and Undergraduate)
- C.A. Pippy Park Commissions
- Bicycle Newfoundland
- Provincial Department for Advanced Education and Skills
- Health and Community Services

1.6.1.1 Stakeholder Response Summary

Below summarizes the responses received by email or through a personal interview:

- *Newfoundland Department of Transportation and Works*

The Newfoundland Department of Transportation and Works is represented on the project steering committee by Mr. John Morrissey, P.Eng. – Manager of Highway Design and Traffic Engineering. Mr. Morrissey indicated that he would be providing comments on the study on an ongoing basis as part of the project steering committee. He did want to note for the project team that contrary to Section 4.07 of the terms of reference “Long Term Network Improvements” that he could not find any record of the suggested new roadway link extending from the Mount Scio Road intersection with Allandale Road to Clinch Crescent in the original plan for the Outer Ring Road or documentation indicating that it had been intentionally removed from the planning process at that time.

- *Eastern Health and Health and Community Services*

Eastern Health and Health and Community Services (HCS) provided one combined response from Mr. Joe Dunford, M.Eng, P.Eng., Regional Director – Infrastructure Support for input into the overall study. Eastern Health and HCS have concerns with respect to the following:

General Traffic concerns and Pedestrian Safety

- Congestion at the main entrance to the Health Sciences Complex (HSC) especially in the area of the main ticket booth/ parking lot entrance.
- The ability to maintain emergency access to the HSC during the 100 year storm event.
- Congestion during the PM peak hour at the Prince Philip Drive intersection with Clinch Crescent.
- Code Requirements for Fire Truck Routing and emergency exits.
- Speeding issues on Clinch Crescent. Suggestion for installation of feedback signage.
- Ambulance access on the North Mosdell entrance.
- The pedestrian crossing on the east side of the Janeway going to the walking trail is a concern.
- The pedestrian crossing from the parking garage is an issue due to its location.

Transit and TDM

- Consideration of a stop being placed close to the Hostel entrance.
- The cost of parking should be considered.
- Cycling should be promoted.
- Electric Cars... provision and promotion of the same.

- *MUN – Facilities Management Division*

The Facilities Management Division of MUN was represented by Mr. Darrell Miles, P.Eng – Director, Operations and Maintenance. The following general concerns and issues were noted in an interview with Mr. Miles on April 1st, 2014.

General Traffic Concerns

- Traffic congestion is a real concern on Westerland Road. It was noted that the roadway blocks occasionally for periods of in excess of 20 minutes during peak traffic periods. Drivers often get frustrated and pass on the inside. Speeds increase at night.
- Russell Road, Phelan Road and Livyer's Loop are often used by motorists as an effective short cut route to the Health Sciences Complex. The University presently has temporary restrictions in place prohibiting NB traffic on a small section of Livyer's Loop. This has effectively reduced the amount of through traffic being experienced in the area.
- There are approximately 2,000 students that leave residences in the morning to attend classes on campus. Limiting the amount of through traffic in this area is an important safety issue in this regard.
- The Livyer's Loop alignment with Morrissey Road and Prince Philip Drive is extremely poor which results in an overlap in vehicle turning paths. The poor geometrics often distracts drivers from paying attention to the pedestrians at this intersection. A grade separated intersection at this location may be an option worth investigating.
- The alignment of Russell Road and Phelan Road is another concern. It was suggested that it may be more appropriate to realign Russell Road and Phelan Road with Rodney Street which would avoid traffic travelling through what are in essence at the present time parking areas.
- Artic Avenue is used as a shortcut route to access the HSC. There are a number of well used pedestrian crossings along this route and speeds are high. The crossing at Kerwin Place and Artic Avenue was specifically noted.
- The pedestrian crossing by the bridge on Clinch Crescent is also a concern.
- The Education building is a major drop off and pick up point on campus. This activity often causes backups and operational problems on Westerland Road.
- Any widening of Elizabeth Avenue has to be designed properly reflecting the pedestrian patterns and activities in the area.

Parking and Transit

- At the present time, the cost of a student parking pass on campus is very low relative to demand of student vs. faculty/staff.
- The collective agreements of MUNFA and CUPE prevent any substantial increase in the cost of a parking permit. The cost can only be increased yearly by the consumer price index.
- MUN sees the advantage from a TDM perspective to increasing these fees. The University's position is to try and recover costs on all new parking infrastructure put in place.
- The UPass concept is an important TDM measure. It will not gain the acceptance needed to pass a student referendum unless the problems associated with the limited areas presently serviced is resolved.

- *Metrobus*

Metrobus is represented by Judy Powell, the General Manager. The project team received both written and verbal feedback from Mrs. Powell on the MUN Area traffic study. The main area of concern relates to the University Centre and the difficulty Metrobus has in front of this facility with conflicts due to parked cars and pedestrians which result in delays and safety concerns. The layby area in front of the University Centre barely provides space for 2-3 buses to dwell at a time and is often congested with motorists dropping off or picking up students. Metrobus indicated that the road network in the area of the University Centre is just not conducive to transit operations. Concern was also expressed with traffic operations on Westerland Road which also results in delays in service due to heavy vehicle and pedestrian traffic in the area.

Metrobus expressed concern that facilities for transit are inadequate at the present time. If a U-Pass program were introduced in the future a well-designed transit terminal would be required in the area of the University Centre. Consideration would also have to be given to the street network and to other operational improvements such as transit priority to ensure the efficient and safe operation of transit on campus.

- *MUN Students Union (Undergraduate)*

The MUN Undergraduate Students Union was interviewed by the study team to obtain feedback on the MUN Area traffic study. The student's representatives included Candice Simms and Ashley Holloway. The following comments and feedback were obtained during the interview process with the study team.

General Traffic Concerns

- The main area of concern for the Students Union was the traffic congestion on campus during peak traffic periods.
- They indicated approximately 50% of students attending Memorial presently live in areas not serviced by transit and as a result they would not support any suggestion of a universal transit pass (UPass). They also indicated that transit frequency and timing on campus is poor. They like the idea of a "park and ride" that would likely benefit a wider audience than just students.
- The intersection of Artic Avenue and Clinch Crescent is a concern. The students indicated that this intersection performs poorly during peak traffic periods. They indicated that at the very least the intersection of Artic Avenue and Clinch Crescent should be considered as a candidate for traffic signal controls.
- The speed of traffic is an issue and pedestrian safety is a concern specifically at the crossing of Kerwins Place and Artic Avenue.
- The students liked the idea of ride sharing and carpooling.
- It was indicated there needs to be more cycling education and that motorists don't know how to react to cyclists when they encounter them. They talked the need for good cycling facilities on campus such as covered bike parks, a bike share program, and bike lockers.

- The students seems to be fine with the suggestions being made in terms of improvements along Elizabeth Avenue; the AT trail in particular.
 - The students were not concerned about the new link being suggested by the study team that would connect Clinch Crescent to the intersection of Allandale Road and Mt. Scio Road.
- *C.A. Pippy Park Commission*
The C. A. Pippy Park Commission is represented by Mr. Rick Mercer and while the project team never received a formal response to our requests for input into the study project team did have a verbal conversation with Mr. Mercer on the overall scope of the project in which it was indicated that the C. A. Pippy Park Commission would be opposed to the construction of a new roadway link extending from Clinch Crescent to the intersection of Allandale Road and Mt. Scio Road.

Despite numerous attempts made by the study team, no feedback on the MUN Area traffic study was received from Bicycle Newfoundland and Labrador (BNL), the Provincial Department for Advanced Education and Skills, or the Graduate Students Union (GSU). Copies of any written responses received from the identified stakeholders are contained in Appendix D.

1.6.2 Project Website

A project website was created to serve as the primary source of online information for the project providing relevant background information, project material and public notification. One of the most critical features of the project website was the interactive map, which allows the user to indicate areas of concern and provide comments detailing the issue. Figure 3 below is a screenshot of the interactive map.

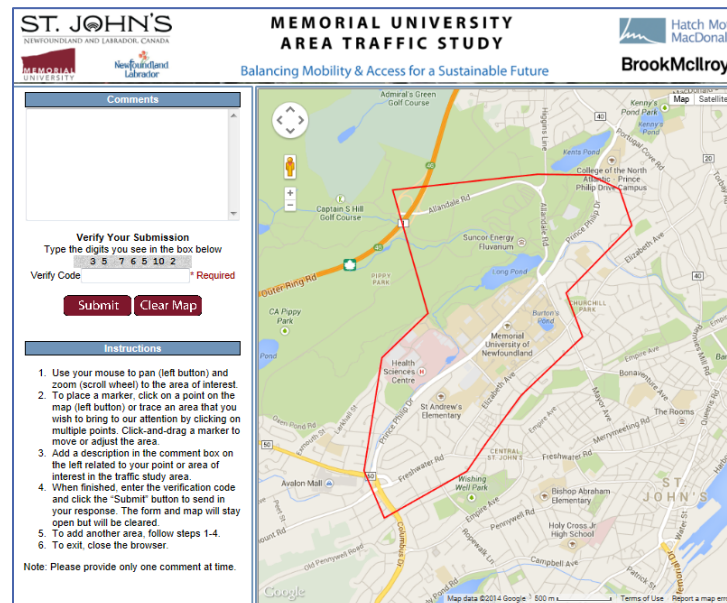


Figure 3: Screenshot of Interactive Web Map

There were nearly 200 comments within the first three weeks of the website launch. The input gathered from the web map was used to better understand the existing conditions from the perspective of the daily users, to identify alternative solutions, as well as to assist in the preliminary evaluation of alternative solutions. Figure 4 illustrates some common themes from comments received. A complete list of comments is contained in Appendix D.



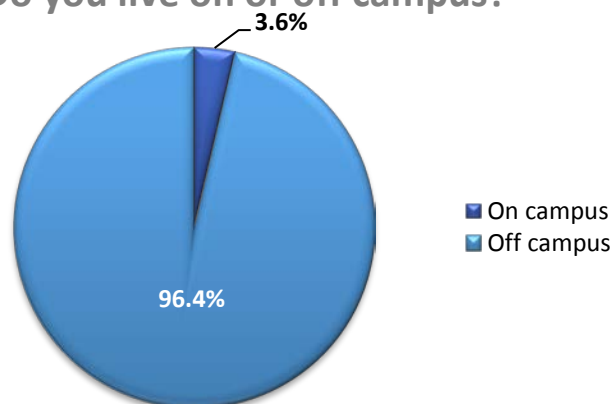
Figure 4: Common Themes from the Interactive Web Map

1.6.3 Project Survey

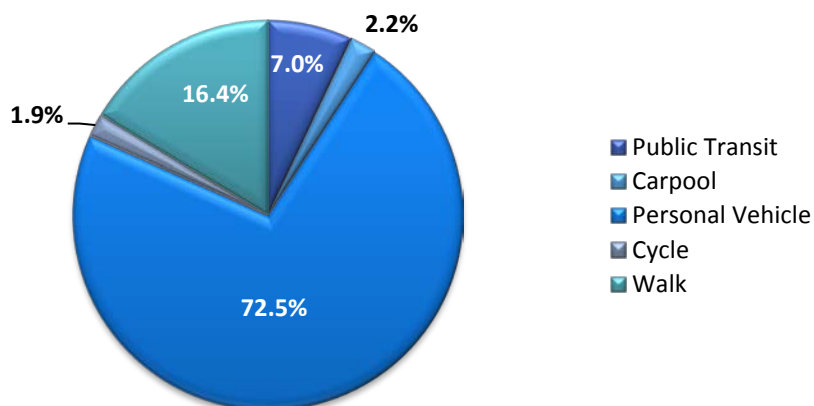
A brief online survey was launched on June 3, 2014 using SurveyMonkey to solicit feedback from members of the public. The survey was available on the project website for a four week period and included 11 multiple choice questions. In addition, the City and the University's Twitter and Facebook accounts were used to notify the public of the survey.

There were a total of 414 responses to the project survey. Nearly all (96.4%) of the survey respondents were identified to reside off campus with the greater majority (72.5%) using personal vehicle to travel to and from the campus. 64.5% identified public transit services to and from the University to be inadequate. Frequent services, extended routes and reduced travel times were among the top three incentives to encourage the use of public transit. The following summarizes the results of the survey. Detailed analysis results are contained in Appendix D.

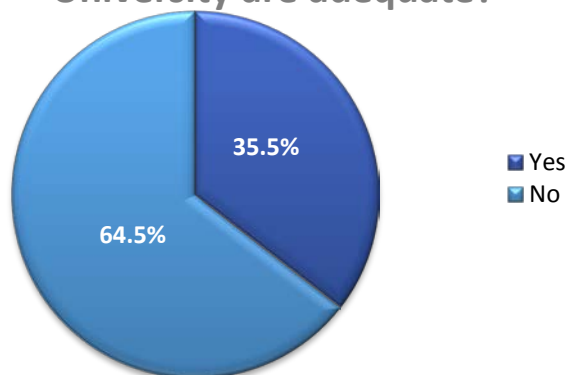
Do you live on or off campus?

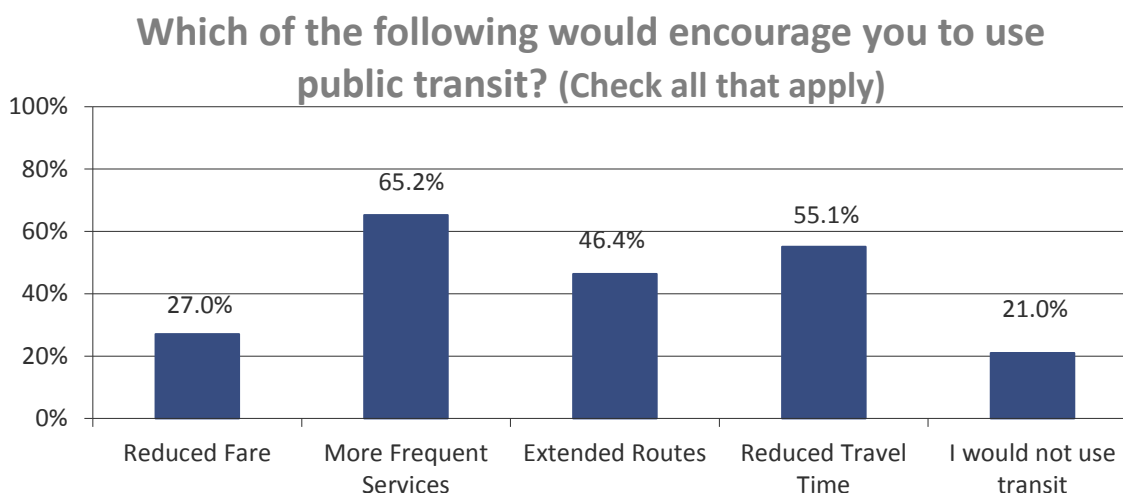


How do you usually travel to/from the University?



Do you think public transit services to/from the University are adequate?





1.6.4 Public Information Session #1

The notice of the first Public Information Session was issued by the City on June 5, 2014 through the City of St. John's website. A media release document can be found in Appendix D. In addition, both the City and the University used social media to communicate with the public about the details of the Public Information Session.

Two sessions of the first Public Information Session were held on Thursday June 12, 2014 at the Gushue Hall on MUN campus: an afternoon session from 2:00pm to 4:00pm and an evening session from 7:00pm to 9:00pm. There were four representatives from the consultant project team, in addition to one representative from both the City and the University. There were four people in attendance at the afternoon session and two people at the evening session. A City Councilor was also present during the evening session. News reporters from the Canadian Broadcasting Corporation (CBC) conducted interviews with the public and the consultant team during the afternoon session. A new article on the study can be found in Appendix D.

The purpose of the sessions was to introduce the study to the public and present the existing condition information gathered to date. The public was encouraged to provide their feedback and ask questions on the information presented. The sessions included display boards of the study area, existing traffic conditions and large maps of the University Campus and surrounding transportation network for the public to mark-up. A brief Power Point presentation on the study was also given to the public. Attendees were encouraged to sign-in, review the information presented, complete a comment sheet and provide input during the workshop. The Power Point presentation was made available for public viewing on the project website following the Public Information Session.

2 Traffic Analysis

The traffic analysis for this study was completed by the study team using a number of different software packages. The Synchro/ SimTraffic (Version 9) software package was used as the main evaluation tool for the signalized and unsignalized level of service analysis completed for this report. Synchro was used to analyze network intersections and their LOS measures of performance based on the methodology of the Highway Capacity Manual (Transportation Research Board, 2000). SimTraffic, the micro-simulation component of the software package, was also used in the course of the analysis to check delay, illustrate and identify interactions between upstream, adjacent and/or closely spaced intersections. The study team also used the ARCADY/Junctions 8 software to analyze the level of service for the suggested roundabout locations. The analysis reflects components of the geometric design such as entry width, flare lengths, entry radius and inscribed circle diameter. VISUM which is a macroscopic transportation planning modelling software package was used to inform future intersection and link traffic volumes under different network conditions for the high level traffic analysis.

HTC completed two levels of traffic analysis for this study. The first, which will be referred to as the detailed traffic analysis, involved a sub-area of 6 study area intersections and used existing traffic volumes that were both factored and adjusted by an agreed amount to reflect the anticipated growth in the study area. The redistribution of traffic patterns expected to occur with the completion of the Team Gushue Highway were considered, however were found to be small and to remain conservative, no adjustments were made for this analysis. The traffic volumes were prepared by Hatch Mott MacDonald, approved by the City of St. John's and provided to HTC to complete the detailed traffic analysis. The detailed analysis results would be used to plan capital improvements that are required at the key intersections within the study area within the next 5 years.

The second analysis, which is referenced as the high level traffic analysis, relied on the traffic volumes obtained from the City's 2025 VISUM models. It was agreed that the results from this analysis would be used to highlight, conceptually, the improvements that may be required at some point in the future within the Study Area to accommodate the future growth and projected traffic volumes. These improvements would be used for planning purposes but would be reaffirmed in a more comprehensive Transportation Planning exercise that is planned by the City of St. John's as they update their Transportation Plan in the near future.

2.1 Scenario 0 - Existing Traffic Analysis

Scenario 0 is the analysis of the existing conditions at the 6 intersections for the detailed traffic analysis which includes the existing lane configuration, existing traffic volumes and existing signal timing plans. The 6 intersections selected for the detailed traffic analysis were:

- Prince Philip Drive @ Thorburn Road
- Prince Philip Drive @ Westerland Road
- Prince Philip Drive @ Allandale Road
- Elizabeth Avenue @ Allandale
- Elizabeth Avenue @ Westerland Road
- Elizabeth Avenue @ Freshwater Road

Traffic volumes that were used in Scenario 0 analysis at the 6 study area intersections are shown below in Figure 5.

				Prince Philip Drive			
				↑			
				1861 (1236)			
				↓			
				1861 (1236)			
				↑			
				69 (124)			
				210 (357)			
				279 (481)			
				↑			
				401 1234 306			
				(333) (674) (279)			
				↑			
				1941			
				(1286)			
				↑			
				1861			
				(1236)			
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				1861			
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				69 (124)			
				210 (357)			
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				401 1234 306			
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				(1236)			
				↑			
				69 (124)			
				210 (357)			
				279 (481)			
				↑			
				401 1234 306			

<div>Existing Traffic Volumes ## (##) = AM (PM)</div>				(778) 628 ↓	Allandale Road	↑ 785 (878)				
				(121) (499) (158)		↑ 236 (298)				
←	517	(568)		116 365 147	Bonaventure Avenue	← 374 (420)	←	719	(884)	
Elizabeth Avenue				↓		↓ 109 (166)				
				(134) 106	↑	↑	↑			
(598)	434	→		(385) 270	→	27 443 82	(639)	499	→	
				(79) 58	↓	(27) (446) (96)				
				(744) 532 ↓	Westerland Road	↑ 552 (569)				
						↑ 545 (324)				
				(212) (184)	↑	↑ 234 (180)				
←	439	(720)		148 136	←	← 291 (508)	←	525	(688)	
				↓	Elizabeth Avenue					
				↑						
(553)	662	→		(144) 311	→	(593)	487	→		
				(409) 351	→					
				(319) 221 ↓	Elizabeth Avenue	↑ 491 (408)				
				(319)		↑ 93 (69)				
←	555	(745)		221	←	← 334 (426)	←	427	(495)	
				↓	Freshwater Road					
				↑						
(688)	689	→		(339) 398	→	(349)	291	→		
				(349) 291	→					

Figure 5: Scenario 0 – Existing Traffic Volumes AM (PM)

HTC used Synchro/SimTraffic (v9) to analyze the existing conditions at the 6 intersections. Table 1 and Table 2 shown below, reflects the AM and PM peak hour results of that analysis. It provides the level of service (LOS), delay per vehicle, volume to capacity (v/c) ratio and the queue length of each approach movement to the intersection. The detailed Synchro/SimTraffic results can be found in Appendix F.

Table 1: Scenario 0 – Existing Traffic Volumes – AM Peak Hour – Synchro/SimTraffic Analysis Results

Intersection		Scenario 0 - Existing - AM Peak Hour						
		Synchro			SimTraffic			
Street	Movement	Delay/ Veh (s)	LOS	V/C	Queue (m) 95th%ile	Delay/ Veh (s)	Equivalent LOS	Queue (m) 95th%ile
Columbus Drive/Prince Philip Drive & Thorburn Road		35.6	D			27.2	C	
Columbus Drive/Prince Philip Drive	Eastbound Left - Turn	52.3	D	0.94	123.4	33.8	C	91.8
	Eastbound Through	39.6	D	0.89	191.4	28.6	C	116.6
	Eastbound Right - Turn	6.4	A	0.39	26.8	6.2	A	31.5
	Westbound Left - Turn	12.5	B	0.33	5.1	35.9	D	20.6
	Westbound Through	29.9	C	0.59	54.5	16.4	B	48.1
	Westbound Right - Turn	15.8	B	0.44	29.6	5.3	A	-
Thorburn Road	Northbound Through	56.7	E	0.79	44.5	52.1	D	54.9
	Northbound Right - Turn					29.9	C	45.1
	Southbound Left - Turn	59.8	E	0.89	91.0	51.0	D	87.3
	Southbound Through	15.7	B	0.48	46.3	26.4	C	52.5
	Southbound Right - Turn					15.6	B	64.0
Prince Philip Drive & Clinch Crescent/Westerland Road		63.3	E			57.3	E	
Prince Philip Drive	Eastbound Left - Turn	64.8	E	0.93	78.3	45.2	D	87.4
	Eastbound Through	29.3	C	0.70	79.3	29.1	C	109.8
	Eastbound Right - Turn	5.8	A	0.59	20.2	20.5	C	90.7
	Westbound Left - Turn	40.6	D	0.85	45.3	125.7	F	116.9
	Westbound Through	132.2	F	1.21	166.5	90.7	F	461.5
	Westbound Right - Turn					151.0	F	465.1
Clinch Crescent/Westerland Road	Northbound Left - Turn	26.8	C	0.41	34.4	39.4	D	68.5
	Northbound Through	60.3	E	0.90	116.6	45.7	D	146.5
	Northbound Right - Turn	3.8	A	0.29	4.1	23.0	C	56.6
	Southbound Left - Turn	28.6	C	0.46	21.2	35.0	C	28.6
	Southbound Through	31.7	C	0.21	28.8	33.7	C	32.4
	Southbound Right - Turn	0.6	A	0.15	0.0	10.8	B	20.6
Prince Philip Drive & Allandale Road		41.0	D			33.5	C	
Prince Philip Drive	Eastbound Left - Turn	53.6	D	0.92	118.0	25.2	C	83.8
	Eastbound Through	42.2	D	0.50	92.0	33.1	C	78.3
	Eastbound Right - Turn	19.6	B	0.21	28.0	7.2	A	4.5
	Westbound Left - Turn	22.8	C	0.47	28.4	41.8	D	78.6
	Westbound Through	56.4	E	0.89	118.0	69.6	E	138.4
	Westbound Right - Turn					35.0	C	130.9
Allandale Road	Northbound Left - Turn	98.5	F	0.95	90.7	74.4	E	71.8
	Northbound Through	26.6	C	0.42	69.5	22.1	C	85.1
	Northbound Right - Turn	4.2	A	0.22	12.2	7.7	A	-
	Southbound Left - Turn	35.8	D	0.05	6.8	39.9	D	19.3
	Southbound Through	46.7	D	0.71	73.6	40.8	D	70.1
	Southbound Right - Turn	24.9	C	0.74	111.9	9.5	A	121.9
Bonaventure Avenue/Allandale Road & Elizabeth Avenue		37.9	D			37.1	D	
Elizabeth Avenue	Eastbound Left - Turn	21.8	C	0.44	24.7	25.5	C	44.1
	Eastbound Through					22.4	C	76.3
	Eastbound Right - Turn	30.8	C	0.55	89.4	10.3	B	
	Westbound Left - Turn	20.6	C	0.40	24.9	23.4	C	52.0
	Westbound Through	34.9	C	0.66	104.4	26.4	C	94.8
	Westbound Right - Turn	4.2	A	0.37	8.7	3.6	A	12.9
Bonaventure Avenue/Allandale Road	Northbound Left - Turn	33.0	C	0.12	12.9	94.8	F	40.1
	Northbound Through	71.0	E	0.95	175.1	85.5	F	264.3
	Northbound Right - Turn	2.2	A	0.17	3.9	58.0	E	44.8
	Southbound Left - Turn	116.4	F	1.05	70.1	56.3	E	48.9
	Southbound Through	31.8	C	0.57	103.9	29.4	C	124.7
	Southbound Right - Turn	4.6	A	0.19	11.6	12.8	B	79.7
Elizabeth Avenue & Westerland Road		18.7	B			12.8	B	
Elizabeth Avenue	Eastbound Left - Turn	25.1	C	0.83	38.6	19.3	B	42.1
	Eastbound Through	6.4	A	0.37	37.9	8.7	A	81.4
	Westbound Through					19.9	B	
	Westbound Right - Turn	20.1	C	0.66	108.8	16.0	B	111.4
Westerland Road	Southbound Left - Turn	43.3	D	0.60	40.9	34.4	C	38.4
	Southbound Right - Turn	9.4	A	0.45	14.7	3.5	A	7.4
Elizabeth Avenue & Freshwater Road		6.1	A			4.4	A	
Freshwater Road	Westbound Right - Turn	17.3	C	0.45	17.4	7.7	A	30.9
Elizabeth Avenue	Northbound Through	0.0	-	0.31	0.0	1.8	A	9.8
	Northbound Right - Turn					1.2	A	
	Southbound Left - Turn	12.1	B	0.46	19.0	8.2	A	32.5
	Southbound Through	0.0	-	0.19	0.0	3.6	A	34.0

Table 2: Scenario 0 – Existing Traffic Volumes – PM Peak Hour – Synchro/SimTraffic Analysis Results

Intersection		Scenario 0 - Existing - PM Peak Hour						
		Synchro			SimTraffic			
Street	Movement	Delay/ Veh (s)	LOS	V/C	Queue (m) 95th%ile	Delay/ Veh (s)	Equivalent LOS	Queue (m) 95th%ile
Columbus Drive/Prince Philip Drive & Thorburn Road		39.3	D			30.8	C	
Columbus Drive/Prince Philip Drive	Eastbound Left - Turn	66.0	E	0.95	112.6	35.7	D	76.5
	Eastbound Through	25.4	C	0.47	76.0	20.6	C	60.6
	Eastbound Right - Turn	3.7	A	0.34	16.1	4.9	A	25.0
	Westbound Left - Turn	17.0	B	0.18	8.5	20.7	C	19.1
	Westbound Through	45.5	D	0.84	96.6	39.4	D	90.7
	Westbound Right - Turn	23.3	C	0.76	56.8	7.2	A	63.9
Thorburn Road	Northbound Through	75.6	E	0.97	91.5	59.9	E	80.0
	Northbound Right - Turn					34.0	C	74.3
	Southbound Left - Turn	63.9	E	0.88	78.5	54.4	D	75.1
	Southbound Through	17.8	B	0.58	60.4	26.7	C	53.3
	Southbound Right - Turn					21.6	C	87.8
Prince Philip Drive & Clinch Crescent/Westerland Road		55.1	E			54.7	D	
Prince Philip Drive	Eastbound Left - Turn	33.7	C	0.65	23.7	44.1	D	83.0
	Eastbound Through	47.5	D	0.93	157.6	42.6	D	153.3
	Eastbound Right - Turn	16.1	B	0.66	35.8	21.5	C	94.8
	Westbound Left - Turn	37.5	D	0.74	23.6	51.0	D	101.7
	Westbound Through	84.9	F	1.08	172.4	53.4	D	172.0
	Westbound Right - Turn					65.3	E	176.7
Clinch Crescent/Westerland Road	Northbound Left - Turn	67.7	E	0.93	83.9	131.2	F	75.4
	Northbound Through	31.2	C	0.24	36.2	69.2	E	246.8
	Northbound Right - Turn	9.9	A	0.46	22.6	59.8	E	43.2
	Southbound Left - Turn	38.2	D	0.74	61.7	51.6	D	84.1
	Southbound Through	39.3	D	0.61	73.6	43.1	D	137.7
	Southbound Right - Turn	76.6	E	1.03	100.3	72.8	E	102.5
Prince Philip Drive & Allandale Road		52.5	D			94.0	F	
Prince Philip Drive	Eastbound Left - Turn	74.1	E	1.06	166.4	38.9	D	145.4
	Eastbound Through	36.3	D	0.78	144.4	30.8	C	117.9
	Eastbound Right - Turn	10.7	B	0.29	24.5	8.7	A	32.1
	Westbound Left - Turn	65.0	E	0.87	51.1	308.1	F	91.7
	Westbound Through	104.2	F	1.09	126.7	363.0	F	485.2
	Westbound Right - Turn					331.1	F	473.5
Allandale Road	Northbound Left - Turn	77.0	E	0.86	82.3	110.0	F	88.0
	Northbound Through	49.0	D	0.86	167.4	71.8	E	290.4
	Northbound Right - Turn	7.0	A	0.32	19.7	9.7	A	126.9
	Southbound Left - Turn	46.5	D	0.17	8.6	68.7	E	21.4
	Southbound Through	71.1	E	0.92	77.6	54.5	D	78.5
	Southbound Right - Turn	14.9	B	0.45	49.5	4.2	A	39.2
Bonaventure Avenue/Allandale Road & Elizabeth Avenue		35.2	D			33.4	C	
Elizabeth Avenue	Eastbound Left - Turn	27.4	C	0.50	29.8	51.6	D	64.4
	Eastbound Through	47.2	D	0.82	148.8	30.7	C	109.6
	Eastbound Right - Turn	31.6	C	0.66	38.3	14.8	B	
	Westbound Left - Turn	36.3	D	0.68	116.8	52.0	D	63.6
	Westbound Through	4.6	A	0.41	17.9	25.9	C	116.7
	Westbound Right - Turn					4.4	A	34.8
Bonaventure Avenue/Allandale Road	Northbound Left - Turn	29.6	C	0.16	12.2	59.3	E	36.0
	Northbound Through	58.3	E	0.91	154.6	49.9	D	171.8
	Northbound Right - Turn	2.4	A	0.19	5.2	27.7	C	45.7
	Southbound Left - Turn	59.9	E	0.87	56.7	52.6	D	49.7
	Southbound Through	30.1	C	0.69	127.5	34.5	C	183.9
	Southbound Right - Turn	3.8	A	0.18	10.3	12.9	B	109.0
Elizabeth Avenue & Westerland Road		21.5	C			14.5	B	
Elizabeth Avenue	Eastbound Left - Turn	11.5	B	0.49	17.1	17.8	B	33.1
	Eastbound Through	6.9	A	0.35	43.8	6.2	A	41.5
	Westbound Through	28.4	C	0.83	189.9	20.9	C	128.8
	Westbound Right - Turn					16.7	B	
Westerland Road	Southbound Left - Turn	47.6	D	0.71	54.4	37.0	D	52.6
	Southbound Right - Turn	8.8	A	0.52	17.7	5.3	A	20.9
Elizabeth Avenue & Freshwater Road		7.4	A			4.2	A	
Freshwater Road	Westbound Right - Turn	23.0	C	0.65	36.1	10.2	B	42.4
Elizabeth Avenue	Northbound Through	0.0	-	0.32	0.0	1.8	A	5.2
	Northbound Right - Turn					0.9	A	
	Southbound Left - Turn	10.6	B	0.37	12.8	7.4	A	28.8
	Southbound Through	0.0	-	0.22	0.0	3.0	A	22.4

2.1.1 Discussion of the Results – Scenario 0

The Scenario 0 Level of Service results noted above, perform fairly well during both the AM and PM peak hour periods. The detailed descriptions of each intersection are below.

Columbus Drive/Prince Philip Drive & Thorburn Road

As indicated in the results above, both the AM and PM peak hours have an overall intersection LOS D and are acceptable, however the northbound approach movement and the southbound left-turn approach are operating at LOS E. Also, in the PM peak hour the eastbound left-turn movement operates at LOS E and is nearing capacity.

The SimTraffic analysis indicates the intersection is operating at an overall LOS C in both the AM and PM peak hours with the northbound through movement operating at LOS E.

Prince Philip Drive & Clinch Crescent/Westerland Road

As indicated in the results above, both the AM and PM peak hours have an overall intersection LOS E and are nearing capacity. During the AM peak hour the eastbound left-turn movement and the northbound through movement operate at LOS E and the westbound through and right-turn movements operate at LOS F. During the PM peak hour the northbound left-turn movement and the southbound right-turn movement operate at LOS E and the westbound through and right-turn movements operate at LOS F.

The SimTraffic analysis indicates the intersection is operating at an overall LOS E in the AM peak hour with the westbound approach operating at LOS F. The SimTraffic analysis indicates the intersection is operating at an overall LOS D in the PM peak hour with the westbound right-turn, southbound right-turn and northbound through/right-turn approach operating at LOS E and northbound left-turn operating at LOS F.

Prince Philip Drive & Allandale Road

As indicated in the results above, both the AM and PM peak hours have an overall intersection LOS D. During the AM peak hour the westbound through and right-turn movement operate at LOS E and the northbound left-turn movement operate at LOS F. During the PM peak hour the eastbound left-turn, westbound left-turn, northbound left-turn and southbound through movements operate at LOS E and the westbound through and right-turn movements operate at LOS F.

The SimTraffic analysis indicates the intersection is operating at an overall LOS C in the AM peak hour with the westbound through and northbound left-turn movement operating at LOS E. The SimTraffic analysis indicates the intersection is operating at an overall LOS F in the PM peak hour with the westbound approach and northbound left-turn movement operating at LOS F and northbound through and southbound left-turn movements operating at LOS E.

Bonaventure Avenue/Allandale Road & Elizabeth Avenue

As indicated in the results above, both the AM and PM peak hours have an overall intersection LOS D. During the AM peak hour the northbound through movement operates at LOS E and southbound left-turn movement operates at LOS F with all other approaches operating at LOS D or higher. During the PM peak hour, the northbound through and southbound left-turn movements operate at LOS E with all other movements operating at LOS D or higher.

The SimTraffic analysis indicates the intersection is operating at an overall LOS D in the AM peak hour with the northbound right-turn and the southbound left-turn movements operating at LOS E and northbound left-turn and through movements operating at LOS F. The SimTraffic analysis indicates the intersection is operating at an overall LOS C in the PM peak hour with the northbound left-turn movement operating at LOS E.

Elizabeth Avenue & Westerland Road

As indicated in the results above, both the AM and PM peak hours have all movements operating at LOS D or higher, which is considered acceptable.

Elizabeth Avenue & Freshwater Road

As indicated in the results above, both the AM and PM peak hours have all movements operating at LOS C or higher, which is considered acceptable. It has been noted however, that during peak times the intersection of Oxen Pond Road/Freshwater Road spills back into the intersection of Elizabeth Avenue/Freshwater Road. This spill back impacts the operations at the Elizabeth Avenue/Freshwater Road intersection; further study should be completed to develop a solution for the same.

2.2 Detailed Traffic Analysis

A detailed analysis was conducted for 6 study area intersections. This analysis used traffic volumes that factored existing counts up by an agreed amount to reflect anticipated growth. Redistribution of traffic patterns expected to occur with the completion of the Team Gushue Highway was evaluated but no modifications were made to reflect a conservative approach. The new development site traffic was also added to the volumes. These volumes were prepared by Hatch Mott MacDonald, approved by the City of St. John's and provided to HTC to complete the detailed analysis.

The traffic analysis for this detailed traffic analysis was completed using the Synchro/SimTraffic (Version 9) software package and the ARCADY/Junctions 8 software. The Synchro/SimTraffic software was used as the main evaluation tool for the signalized and unsignalized intersections level of service analysis completed for this report. The ARCADY/Junctions 8 software was used to analyze the level of service for the suggested locations for roundabouts. An explanation of the intersection performance measures has been previously provided in Section 1.5 of the report.

2.2.1 Detailed Analysis Scenarios

Two different network scenarios were completed for this detailed traffic analysis for both the AM and PM peak hours at the 6 identified intersections noted in Figure 1. These scenarios included:

- **Scenario 1** – Conditions expected to be present in 2025 based on the existing traffic volumes with a factor of 0.8% per year to reflect the normal background traffic growth and the new Core Science Facility development.
- **Scenario 2** – Same traffic volumes as Scenario 2 with improvements to the study network.

2.2.2 Development added to the Network

The study team interviewed both Darrell Miles with MUN Facilities Management, and Mr. Joe Dunford with Eastern Health to get a sense of the anticipated capital works plans for both Eastern Health and the University over the next 10 years (2015-2025).

From the information gathered during these interviews, it would appear as though the only significant development expected over the next 10 years in the study area will be the Core Science Facility which is expected to start construction in September of 2015. The proposed development trip generation rates are shown below in Table 3.

Table 3: Trip Generation Rates - Core Science Facility

VISUM Zone	Use	Number	Unit	1000 sq ft GFA * Coverage	ITE Code	AM Peak Trip Gen	AM Peak Total In	AM Peak Total Out	PM Peak Trip Gen	PM Peak Total In	PM Peak Total Out
PROPOSED DEVELOPMENT (2015 - 2025)											
Zone 229	Core Science Facility	300,000	sq. ft	300	540	897	664	233	762	442	320
Zone 229	Core Science Facility	500	students		550	105	84	21	105	32	74
Proposed Development Total						1002	748	254	867	473	394

The table above captures the two elements of the Core Science Facility. This facility has approximately 480,000 gross square feet of space, both office and student oriented functions.

After completion of this analysis, the construction of a new Animal Rescue Centre was identified. This is expected to be completed in 2018 and will be approximately 35,000 gross square feet. Trips to this centre are not expected to significantly impact the conclusions of this report.

2.2.3 Scenario 1 – 2025 Traffic Volumes

Scenario 1 is an analysis of the future conditions at the 6 intersections which includes the existing lane configuration, future traffic volumes and an optimized signal timing plan at this intersection. The traffic volumes that were used in the Scenario 1 analysis to reflect normal background traffic growth to the year 2025 (0.8% per year) and the new Core Science Facility development. The future traffic volumes at the 6 selected intersections are shown in Figure 6.

					Prince Philip Drive				
					↑				
					2189				
					(1381)				
					↑				
					79 (136)				
					← 229 (390)				
					← 308 (526)				
← 908 (1379)									
Thorburn Road									
					← 438 (364)				
					↑ 1453 (761)				
					↗ 334 (305)				
					↑				
					2225				
					(1430)				

<div> <div>Future Traffic Volumes ## (##) = AM (PM)</div> <div> <div>← 567 (621)</div> <div>→ 474 (652)</div> </div> </div>				<div> <div>(850) 686 ↓</div> <div> <div>← 128 (133)</div> <div>→ 398 (545)</div> </div> </div>		<div> <div>← 160 (172)</div> <div>→ 295 (420)</div> </div>		<div> <div>← 788 (966)</div> <div>→ 545 (697)</div> </div>	
<div> <div>Future Traffic Volumes ## (##) = AM (PM)</div> <div> <div>← 480 (788)</div> <div>→ 791 (620)</div> </div> </div>				<div> <div>(435) 310 ↓</div> <div> <div>← 162 (233)</div> <div>→ 148 (202)</div> </div> </div>		<div> <div>← 608 (761)</div> <div>→ 531 (648)</div> </div>		<div> <div>← 608 (761)</div> <div>→ 531 (648)</div> </div>	
<div> <div>Future Traffic Volumes ## (##) = AM (PM)</div> <div> <div>← 606 (813)</div> <div>→ 790 (758)</div> </div> </div>				<div> <div>(348) 241 ↓</div> <div> <div>← 241 (348)</div> <div>→ 318 (381)</div> </div> </div>		<div> <div>← 467 (540)</div> <div>→ 318 (381)</div> </div>		<div> <div>← 467 (540)</div> <div>→ 318 (381)</div> </div>	

Figure 6: Scenario 1 – Traffic Volumes AM (PM)

HTC used Synchro/SimTraffic (v9) to analyze the Scenario 1 conditions at the 6 intersections. Table 4 and Table 5 shown below, reflects the AM and PM peak hour results of that analysis. It provides the level of service (LOS), delay per vehicle, volume to capacity (v/c) ratio and the queue length of each approach movement to the intersection. The detailed Synchro/SimTraffic results can be found in Appendix F.

Table 4: Scenario 1 – Traffic Volumes – AM Peak Hour – Synchro/SimTraffic Analysis Results

Intersection		Scenario 1 - Future 2025 - AM Peak Hour						
		Synchro			SimTraffic			
Street	Movement	Delay/ Veh (s)	LOS	V/C	Queue (m) 95th%ile	Delay/ Veh (s)	Equivalent LOS	Queue (m) 95th%ile
Columbus Drive/Prince Philip Drive & Thorburn Road		104.6	F			201.2	F	
Columbus Drive/Prince Philip Drive	Eastbound Left - Turn	232.6	F	1.43	177.6	377.8	F	264.8
	Eastbound Through	144.5	F	1.23	278.1	185.0	F	461.3
	Eastbound Right - Turn	14.3	B	0.50	51.7	36.6	D	580.5
	Westbound Left - Turn	22.5	C	0.33	1.5	32.5	C	19.2
	Westbound Through	15.1	B	0.61	24.3	22.3	C	35.8
	Westbound Right - Turn	2.0	A	0.45	4.5	5.0	A	-
Thorburn Road	Northbound Through	34.5	C	0.45	42.0	35.3	D	49.3
	Northbound Right - Turn					22.7	C	39.0
	Southbound Left - Turn	269.7	F	1.50	141.8	697.5	F	497.3
	Southbound Through	13.7	B	0.46	47.2	218.6	F	498.6
	Southbound Right - Turn					207.5	F	128.3
Prince Philip Drive & Clinch Crescent/Westerland Road		129.9	F			137.6	F	
Prince Philip Drive	Eastbound Left - Turn	356.6	F	1.73	96.9	246.7	F	77.5
	Eastbound Through	22.2	C	0.85	61.3	57.0	E	275.2
	Eastbound Right - Turn	6.1	A	0.66	10.1	36.4	D	67.8
	Westbound Left - Turn	35.2	D	0.83	32.1	175.8	F	124.2
	Westbound Through	204.4	F	1.38	195.4	152.5	F	589.5
	Westbound Right - Turn					238.7	F	587.4
Clinch Crescent/Westerland Road	Northbound Left - Turn	30.4	C	0.44	35.2	200.0	F	80.5
	Northbound Through	178.6	F	1.29	214.6	204.1	F	392.3
	Northbound Right - Turn	12.5	B	0.32	6.5	174.9	F	60.2
	Southbound Left - Turn	29.7	C	0.45	24.4	34.2	C	30.7
	Southbound Through	36.7	D	0.25	34.1	34.0	C	33.4
	Southbound Right - Turn	0.8	A	0.18	0.0	10.1	B	20.4
Prince Philip Drive & Allandale Road		49.9	D			95.3	F	
Prince Philip Drive	Eastbound Left - Turn	108.2	F	1.11	116.6	37.6	D	65.4
	Eastbound Through	10.5	B	0.56	40.2	12.2	B	27.9
	Eastbound Right - Turn	1.2	A	0.24	1.0	5.5	A	-
	Westbound Left - Turn	23.9	C	0.52	31.4	238.9	F	91.0
	Westbound Through	70.2	E	0.99	140.2	270.9	F	531.2
	Westbound Right - Turn					265.1	F	525.6
Allandale Road	Northbound Left - Turn	85.3	F	1.03	92.9	187.4	F	86.2
	Northbound Through	18.2	B	0.44	61.2	68.3	E	416.2
	Northbound Right - Turn	2.5	A	0.24	6.5	13.9	B	281.3
	Southbound Left - Turn	38.6	D	0.07	7.6	54.4	D	29.5
	Southbound Through	62.2	E	0.90	93.7	51.4	D	90.5
	Southbound Right - Turn	48.5	D	0.97	181.0	25.5	C	129.9
Bonaventure Avenue/Allandale Road & Elizabeth Avenue		40.3	D			43.3	D	
Elizabeth Avenue	Eastbound Left - Turn	45.7	D	0.74	35.7	39.2	D	49.4
	Eastbound Through	32.5	C	0.74	61.4	30.4	C	90.2
	Eastbound Right - Turn					11.8	B	
	Westbound Left - Turn	32.0	C	0.61	28.5	35.4	D	64.9
	Westbound Through	54.1	D	0.88	122.2	38.9	D	138.2
	Westbound Right - Turn	10.0	B	0.49	22.0	5.4	A	39.4
Bonaventure Avenue/Allandale Road	Northbound Left - Turn	26.7	C	0.12	12.5	99.9	F	43.3
	Northbound Through	65.7	E	0.96	188.4	100.4	F	320.3
	Northbound Right - Turn	1.8	A	0.16	3.7	75.8	E	45.3
	Southbound Left - Turn	122.4	F	1.07	50.4	47.4	D	43.1
	Southbound Through	12.1	B	0.54	29.8	15.7	B	52.8
	Southbound Right - Turn	0.7	A	0.18	0.3	7.5	A	14.6
Elizabeth Avenue & Westerland Road		39.9	D			69.6	E	
Elizabeth Avenue	Eastbound Left - Turn	57.3	E	0.94	126.1	136.4	F	40.9
	Eastbound Through	6.0	A	0.37	40.4	103.4	F	406.7
	Westbound Through	57.2	E	0.94	191.3	63.2	E	229.4
	Westbound Right - Turn					58.1	E	
Westerland Road	Southbound Left - Turn	48.1	D	0.71	51.0	44.5	D	38.2
	Southbound Right - Turn	10.3	B	0.50	16.0	3.7	A	5.4
Elizabeth Avenue & Freshwater Road		7.3	A			5.7	A	
Freshwater Road	Westbound Right - Turn	19.8	C	0.52	22.2	8.4	A	33.5
Elizabeth Avenue	Northbound Through	0.0	-	0.34	0.0	1.8	A	10.8
	Northbound Right - Turn					1.2	A	
	Southbound Left - Turn	14.3	B	0.58	28.7	11.0	B	35.2
	Southbound Through	0.0	-	0.21	0.0	5.5	A	72.3

Table 5: Scenario 1 – Traffic Volumes – PM Peak Hour – Synchro/SimTraffic Analysis Results

Intersection		Scenario 1 - Future 2025 - PM Peak Hour						
		Synchro			SimTraffic			
Street	Movement	Delay/ Veh (s)	LOS	V/C	Queue (m) 95th%ile	Delay/ Veh (s)	Equivalent LOS	Queue (m) 95th%ile
Columbus Drive/Prince Philip Drive & Thorburn Road		51.6	D			98.4	F	
Columbus Drive/Prince Philip Drive	Eastbound Left - Turn	134.7	F	1.17	139.6	90.8	F	184.6
	Eastbound Through	32.1	C	0.61	96.2	28.5	C	122.2
	Eastbound Right - Turn	4.5	A	0.40	18.1	6.1	A	27.9
	Westbound Left - Turn	16.1	B	0.25	7.9	43.5	D	98.6
	Westbound Through	57.6	E	1.03	91.5	93.2	F	211.0
	Westbound Right - Turn	28.5	C	0.94	61.9	24.9	C	135.0
Thorburn Road	Northbound Through	41.7	D	0.71	75.4	39.0	D	73.9
	Northbound Right - Turn					22.3	C	65.4
	Southbound Left - Turn	133.4	F	1.15	102.1	466.7	F	581.1
	Southbound Through					79.8	E	617.3
	Southbound Right - Turn	17.4	B	0.57	67.5	83.3	F	137.6
Prince Philip Drive & Clinch Crescent/Westerland Road		67.0	E			96.5	F	
Prince Philip Drive	Eastbound Left - Turn	114.2	F	1.10	59.0	157.1	F	97.9
	Eastbound Through	41.1	D	0.99	117.7	45.3	D	180.8
	Eastbound Right - Turn	11.8	B	0.69	32.1	23.2	C	90.4
	Westbound Left - Turn	47.1	D	0.81	31.0	136.1	F	119.2
	Westbound Through					139.0	F	458.0
	Westbound Right - Turn	83.9	F	1.10	196.7	163.3	F	461.7
Clinch Crescent/Westerland Road	Northbound Left - Turn	132.1	F	1.15	101.2	176.8	F	73.1
	Northbound Through	41.1	D	0.44	46.9	111.9	F	310.9
	Northbound Right - Turn	11.6	B	0.56	15.0	104.7	F	52.9
	Southbound Left - Turn	40.0	D	0.80	69.2	50.2	D	86.8
	Southbound Through	43.3	D	0.69	82.6	48.6	D	128.6
	Southbound Right - Turn	139.3	F	1.21	129.9	96.0	F	92.4
Prince Philip Drive & Allandale Road		66.7	E			100.4	F	
Prince Philip Drive	Eastbound Left - Turn	142.7	F	1.23	184.5	105.5	F	232.8
	Eastbound Through	19.7	B	0.79	135.8	26.6	C	277.9
	Eastbound Right - Turn	0.7	A	0.30	0.0	9.3	A	-
	Westbound Left - Turn	53.3	D	0.80	54.8	75.0	E	86.1
	Westbound Through					96.9	F	211.8
	Westbound Right - Turn	50.6	D	0.87	115.8	70.7	E	202.3
Allandale Road	Northbound Left - Turn	180.8	F	1.27	93.6	430.1	F	84.1
	Northbound Through	100.1	F	1.12	184.1	300.0	F	500.8
	Northbound Right - Turn	6.8	A	0.39	18.3	67.8	E	594.6
	Southbound Left - Turn	55.3	E	0.27	9.9	148.7	F	35.5
	Southbound Through	149.2	F	1.19	95.5	124.5	F	121.6
	Southbound Right - Turn	20.1	C	0.56	66.8	6.1	A	82.9
Bonaventure Avenue/Allandale Road & Elizabeth Avenue		41.3	D			95.5	F	
Elizabeth Avenue	Eastbound Left - Turn	30.4	C	0.59	37.3	156.1	F	75.5
	Eastbound Through					148.3	F	
	Eastbound Right - Turn	55.0	E	0.88	128.7	123.1	F	464.4
	Westbound Left - Turn	54.2	D	0.85	57.8	57.2	E	70.7
	Westbound Through	45.3	D	0.80	143.1	47.3	D	186.3
	Westbound Right - Turn	8.0	A	0.48	30.5	26.5	C	131.6
Bonaventure Avenue/Allandale Road	Northbound Left - Turn	31.8	C	0.20	13.3	251.0	F	52.3
	Northbound Through	70.8	E	0.98	183.4	256.1	F	374.4
	Northbound Right - Turn	3.0	A	0.20	7.3	212.0	F	52.6
	Southbound Left - Turn	96.8	F	1.02	37.9	46.2	D	48.1
	Southbound Through	17.2	B	0.75	37.8	31.5	C	145.0
	Southbound Right - Turn	0.3	A	0.19	0.1	9.2	A	75.3
Elizabeth Avenue & Westerland Road		17.2	B			15.7	B	
Elizabeth Avenue	Eastbound Left - Turn	15.1	B	0.61	21.9	22.7	C	38.2
	Eastbound Through	6.3	A	0.36	46.6	7.0	A	59.9
	Westbound Through					19.4	B	
	Westbound Right - Turn	14.9	B	0.80	65.8	15.2	B	104.0
Westerland Road	Southbound Left - Turn	60.3	E	0.85	80.5	47.8	D	65.1
	Southbound Right - Turn	8.2	A	0.57	10.2	5.5	A	33.8
Elizabeth Avenue & Freshwater Road		9.2	A			4.8	A	
Freshwater Road	Westbound Right - Turn	30.2	D	0.76	50.1	11.4	B	44.5
Elizabeth Avenue	Northbound Through					2.1	A	
	Northbound Right - Turn	0.0	-	0.35	0.0	1.2	A	7.3
	Southbound Left - Turn	11.4	B	0.42	16.3	9.1	A	31.9
	Southbound Through	0.0	-	0.24	0.0	3.6	A	34.9

2.2.4 Discussion of the Results – Scenario 1

The Scenario 1 LOS results noted above show that some of the study intersections perform with movements operating at LOS E or F and are nearing capacity. The detailed descriptions of each intersection are below.

Columbus Drive/Prince Philip Drive & Thorburn Road

As indicated in the results above, the AM peak hour has an overall intersection LOS F and is over capacity. The eastbound left-turn and through movement and the southbound left-turn movement operate at LOS F and are over capacity. The SimTraffic analysis indicates the intersection is operating at an overall LOS F and the southbound approach operates at LOS F.

In the PM peak hour the eastbound left-turn movement and the southbound left-turn movement operates at LOS F and is over capacity. The PM peak hour an overall intersection LOS D. The SimTraffic analysis indicates the intersection is operating at an overall LOS F with the westbound through movement and southbound right-turn operating at LOS F.

Prince Philip Drive & Clinch Crescent/Westerland Road

As indicated in the results above, the AM peak hour has an overall intersection LOS F and is over capacity. The eastbound left-turn movement, westbound through and right-turn movement and the northbound through movement operate at LOS F and are over capacity. The SimTraffic analysis indicates the intersection is operating at an overall LOS F and multiple movements operating at LOS F.

In the PM peak hour, the eastbound left-turn movement, the westbound through and right-turn movements, the northbound left-turn movement and the southbound right-turn movement operates at LOS F and are over capacity. Similar to the AM peak hour, the SimTraffic analysis in the PM peak hour indicates the intersection is operating at an overall LOS F with multiple movements operating at LOS F.

Prince Philip Drive & Allandale Road

As indicated in the results above, the AM peak hour has an overall intersection LOS D and the eastbound left-turn and northbound left-turn movements operate at LOS F. The westbound through and right-turn movement and the southbound through movement operate at LOS E. The SimTraffic analysis indicates the intersection is operating at an overall LOS F and westbound approach and northbound left-turn movement operating at LOS F and northbound through movement operates at LOS E.

In the PM peak hour, the eastbound left-turn movement, the northbound left-turn and through movements and southbound through movement operates at LOS F and are over capacity. The southbound left-turn movement operates at LOS E. The SimTraffic analysis in the PM peak hour indicates the intersection is operating at an overall LOS F with multiple movements operating at LOS E or F.

Bonaventure Avenue/Allandale Road & Elizabeth Avenue

As indicated in the results above, the AM peak hour has an overall intersection LOS D and the northbound through movement operates at LOS E and the southbound left-turn movement operates at LOS F. The SimTraffic analysis indicates the intersection is operating at an overall LOS D and northbound

left-turn and through movements operating at LOS F and northbound right-turn movement operates at LOS E.

In the PM peak hour, the eastbound through and right-turn movements and the northbound through movements operates at LOS E. The southbound left-turn movement operates at LOS F. The SimTraffic analysis in the PM peak hour indicates the intersection is operating at an overall LOS F with multiple movements operating at LOS E or F.

Elizabeth Avenue & Westerland Road

As indicated in the results above, the AM peak hour has an overall intersection LOS D and the eastbound left-turn movement and the westbound through/right-turn movement operates at LOS E. The SimTraffic analysis indicates the intersection is operating at an overall LOS E and the eastbound approach operates at LOS F and the westbound approach operates at LOS E.

In the PM peak hour, the southbound left-turn movement operates at LOS E and all other approaches operate at LOS D or higher. The SimTraffic analysis in the PM peak hour indicates that all approaches operate at LOS D or higher.

Elizabeth Avenue & Freshwater Road

As indicated in the results above, in both the AM and PM peak hours, all approaches at the intersection operates at LOS D or higher, which is considered acceptable. It should be mentioned that traffic currently spills back during both peak periods from the Oxen Pond Intersection with Freshwater and affects the operation at Freshwater Road and Elizabeth Avenue. So, while the detailed analysis shows a good level of service, things are likely to be much worse because of the operational problems at the Freshwater Road intersection with Oxen Pond Road. Further study of Oxen Pond Road/Freshwater Road intersection should be completed to identify and remediate the operational issues.

2.2.5 Improvement Options

HTC modified five of the six intersections to either include a multi-lane roundabout or modifications to the intersection. Three intersections were analyzed as multi-lane roundabouts, which include the intersections along Prince Philip Drive at Thorburn Road, Westerland Road and Allandale Road. Two intersections along Elizabeth Avenue were modified to include a longer storage lane and a channelized right-turn. Each intersection is described below of the options that were used to improve the intersections.

Columbus Drive/Prince Philip Drive & Thorburn Road

HTC modified the intersection of Prince Philip Drive/Columbus Drive and Thorburn Road in an effort to improve the LOS on individual intersection approaches. HTC added a dual left-turn lane on the Columbus Drive approach to the intersection. HTC also optimized the splits and the cycle length for the intersection, in both the AM and PM peak hour models. None of these improvements were able to deal effectively with the LOS issues. This intersection is clearly over capacity under the 2025 traffic volumes in both the AM and PM peak hours. Simple timing, phasing and cycle length adjustments are not viable options to deal with the LOS problems being experienced at this intersection.

Accordingly, HTC decided to examine the use of a multi-lane roundabout as the method of traffic control at this intersection.

Prince Philip Drive & Clinch Crescent/Westerland Road

HTC modified the intersection of Prince Philip Drive and Clinch Crescent/Westerland Road to improve the LOS on individual approaches of the intersection. HTC increased the cycle length to 120 seconds and also added a dual left-turn lane from Prince Philip Drive onto Clinch Crescent with the additional receiving lane dropping at Arctic Avenue. After optimizing the splits for the intersection, all approaches affected remained at LOS E or F. None of the improvements were able to deal effectively with the LOS issues. This intersection, again, is clearly over capacity under the 2025 traffic volumes in both the AM and PM peak hours. Simple timing, phasing, and cycle length changes and minor geometric adjustments are not viable options to deal with the LOS problems being experienced at this intersection. Accordingly, HTC turned to different means of traffic control – a multi-lane roundabout. This configuration was used in our analysis to determine if the level of service would improve in Scenario 2.

Prince Philip Drive & Allandale Road

HTC modified the intersection of Prince Philip Drive and Allandale Road to try and improve the LOS on individual approaches to the intersection. HTC increased the cycle length to 120 seconds and also added a dual left-turn lane from Prince Philip Drive onto Allandale Road and a dual left-turn from Allandale Road onto Prince Philip Drive. After optimizing the splits for the intersection, in both the AM and PM peak hours, the level of service at the multiple approaches still operate at LOS E. Therefore, increasing the cycle length and adding the dual left-turns lane did improve the level of service, but those approaches remain at LOS E and have no residual capacity. Accordingly, HTC turned to different means of traffic control for this intersection – a multi-lane roundabout. This configuration was used in our analysis to determine if the level of service would improve in Scenario 2.

Bonaventure Avenue/Allandale Road & Elizabeth Avenue

HTC modified the intersection of Elizabeth Avenue and Allandale Road/Bonaventure Avenue to improve the LOS at individual approaches. HTC added an additional through lane on the northbound approach and combined it with the existing right-turn lane on Bonaventure Avenue. HTC also extended the southbound left-turn storage lane on Allandale Road to 100m. After optimizing the splits for the intersection, in both the AM and PM peak hours, the level of service at the intersection operates with all movements at LOS D or higher. Therefore, HTC proceeded with these improvements and the intersection was analyzed in Synchro/SimTraffic to determine if the level of service would improve; Scenario 2.

Elizabeth Avenue & Westerland Road

HTC modified the intersection of Elizabeth Avenue and Westerland Road to improve the LOS at individual approaches. HTC added a channelized right-turn with a storage lane of 50m on the westbound approach on Elizabeth Avenue. After optimizing the splits for the intersection, in both the AM and PM peak hours, the level of service at the intersection operates with all movements at LOS D or higher, except for the southbound left-turn movement. Therefore, this improvement was analyzed in Synchro/SimTraffic to determine if the level of service would improve, Scenario 2.

Elizabeth Avenue & Freshwater Road

Due to the intersection operating at acceptable LOS in the future scenario, improvements were not considered for this intersection.

2.2.6 Advantages of Roundabouts

There are many advantages to using roundabouts and the most relevant to this project are listed below:

Vehicle Safety:

- When vehicles are using a roundabout there are only 8 potential conflict points compared to 32 potential conflict points in a signalized intersection.
- The driver of the vehicle only needs to look left when entering the intersection.
- The geometrics of a roundabout require the motorists to slow to a speed of 30-40 km/hr when entering and exiting the roundabout.
- Roundabouts are used as a traffic calming option.
- Accidents at roundabout tend to be less frequent and less severe than that of signalized intersections.

Pedestrian & Bicycle Safety:

- When a pedestrian crosses the approach leg to the roundabout, they are faced only with one direction of traffic and a single crossing at a time, of only one or two lanes of traffic.
- Between crossings, pedestrians will be accommodated on refuge islands or sidewalk before making their next crossing.
- Approaching drivers are forced to slow as they approach the roundabout, which enables them to be able to react and stop quickly to yield to pedestrians.
- Bicyclists have an option of travelling through the roundabout or proceeding to the crosswalk.

Traffic Operations:

- When vehicles enter the roundabout, they are approaching and yielding to the traffic on the inner circle.
- When a gap is available, the motorist may proceed in a counter-clockwise manner and exit on the appropriate leg.
- Without an automated signal control, drivers are able to judge for gaps and enter the intersection, rather than being forced to wait for a green light. This optimizes the overall intersection efficiency and reduces delay when compared a signalized or a stop-controlled intersection.
- Strategically placed roundabouts can be used as part on an overall access management plan to reduce the conflicts on a roadway created by left turning traffic.

Community and Environment Impacts:

- The central island areas of a roundabout can be landscaped or enhanced to become signature gateways.
- Vehicles tend to be able to proceed through a roundabout with less delay, resulting in a reduction in the amount of emissions and fuel consumed.

Overall, roundabouts are a safer more efficient method of traffic control that significantly reduce the delay traditionally experienced by signalized intersections.

2.2.7 Scenario 2 – 2025 Traffic Volumes with Improvements

Scenario 2 is an analysis of the future conditions at the six intersections with the same future traffic volumes as Scenario 1 (Figure 6). This scenario also includes the improvements completed at each intersection either using ARCADY/Junctions 8 software to analyze the intersection as a multi-lane roundabout or Synchro/SimTraffic to analyze the signalized intersection. The ARCADY/Junctions 8 analysis reflects components of the geometric design such as entry width, flare lengths, entry radius and inscribed circle diameter. The results of the analysis are shown in Table 6 below and can be found in Appendix G.

Table 6: Scenario 2 – Future Traffic Volumes with Improvements – Arcady Analysis Results

	AM						PM					
	Queue (PCE)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS	Queue (PCE)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
Prince Philip-Columbus-Thorburn - 2025												
Thorburn Road	3.01	7.46	0.75	A	10.45	B	9.58	26.20	0.92	D	10.67	B
Columbus Drive	8.57	15.57	0.90	C			0.98	2.87	0.50	A		
Connection to Freshwater	0.94	10.17	0.49	B			0.75	4.67	0.43	A		
Prince Philip	0.68	3.01	0.41	A			3.23	7.91	0.77	A		

	AM						PM					
	Queue (PCE)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS	Queue (PCE)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
Prince Philip-Clinch-Westerland - 2025												
Prince Philip (Westside)	19.61	34.49	0.97	D	21.58	C	7.78	16.57	0.89	C	11.13	B
Westerland	1.58	6.71	0.62	A			1.03	5.44	0.51	A		
Prince Philip (Eastside)	5.65	14.88	0.86	B			2.72	6.57	0.73	A		
Clinch Cres	0.23	2.79	0.18	A			3.51	12.17	0.78	B		

	AM						PM					
	Queue (PCE)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS	Queue (PCE)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
Prince Philip-Allandale - 2025												
Prince Philip (Westside)	1.84	5.14	0.65	A	4.30	A	17.18	28.94	0.96	D	24.57	C
Allandale (Southside)	0.91	3.96	0.48	A			8.98	31.14	0.92	D		
Prince Philip (Eastside)	1.42	4.89	0.59	A			1.76	6.69	0.64	A		
Allandale (Northside)	0.55	3.47	0.36	A			0.00	0.00	0.00	A		

As shown above in Table 6, all three intersections in both the AM and PM peak hours have an overall intersection LOS D or higher, which is considered acceptable. Please note that the queue lengths are measured as PCE (passenger car equivalent), with one vehicle assumed to be 7.0m long.

For the Synchro analysis of the intersection at Elizabeth Avenue/Allandale Road and Elizabeth Avenue/Westerland Road, in both the AM and PM peak hours, show that all movements are operating at LOS D or higher, which is acceptable. The only exception is in the AM peak hour, at Elizabeth Avenue/Westerland Road the southbound left-turn movement operating at LOS E.

The SimTraffic analysis indicates that in the AM peak hour both intersections operate at LOS D or better, which is considered acceptable. In the PM peak hour, the eastbound approach and the northbound left-turn movement operates at LOS E.

Table 7: Scenario 2 – Future Traffic Volumes with Improvements – AM Peak Hour – Synchro/SimTraffic Analysis Results

Scenario 2 - Future 2025 w Improvements - AM Peak Hour								
Intersection		Synchro				SimTraffic		
Street	Movement	Delay/ Veh (s)	LOS	V/C	Queue (m) 95th% ile	Delay/ Veh (s)	Equivalent LOS	Queue (m) 95th% ile
Bonaventure Avenue/Allandale Road & Elizabeth Avenue		33.9	C			27.7	C	
Elizabeth Avenue	Eastbound Left - Turn	24.9	C	0.55	25.7	29.2	C	52.6
	Eastbound Through	34.0	C	0.65	98.2	26.1	C	96.0
	Eastbound Right - Turn					13.3	B	
	Westbound Left - Turn	21.8	C	0.48	25.9	27.8	C	52.9
	Westbound Through	40.2	D	0.77	115.1	30.2	C	115.6
	Westbound Right - Turn	4.4	A	0.42	8.6	3.6	A	7.4
Bonaventure Avenue/Allandale Road	Northbound Left - Turn	36.8	D	0.17	14.7	45.2	D	33.5
	Northbound Through	54.5	D	0.88	103.2	41.9	D	79.4
	Northbound Right - Turn					28.2	C	74.0
	Southbound Left - Turn	39.4	D	0.71	44.7	37.9	D	64.0
	Southbound Through	30.8	C	0.62	105.0	26.9	C	104.6
	Southbound Right - Turn	4.2	A	0.20	11.5	7.0	A	20.2
Elizabeth Avenue & Westerland Road		16.9	B			14.7	B	
Elizabeth Avenue	Eastbound Left - Turn	11.1	B	0.69	54.6	13.2	B	43.3
	Eastbound Through	6.4	A	0.37	48.5	9.0	A	74.5
	Westbound Through	30.0	C	0.44	107.2	17.5	B	82.5
	Westbound Right - Turn	7.5	A	0.38	33.5	9.7	A	59.7
Westerland Road	Southbound Left - Turn	62.4	E	0.68	56.1	49.5	D	53.9
	Southbound Right - Turn	10.6	B	0.49	17.2	3.6	A	10.5

Table 8: Scenario 2 – Future Traffic Volumes with Improvements – PM Peak Hour – Synchro/SimTraffic Analysis Results

Scenario 2 - Future 2025 w Improvements - PM Peak Hour								
Intersection		Synchro				SimTraffic		
Street	Movement	Delay/ Veh (s)	LOS	V/C	Queue (m) 95th% ile	Delay/ Veh (s)	Equivalent LOS	Queue (m) 95th% ile
Bonaventure Avenue/Allandale Road & Elizabeth Avenue		36.5	D			42.9	D	
Elizabeth Avenue	Eastbound Left - Turn	19.9	B	0.46	28.7	74.5	E	74.4
	Eastbound Through	38.8	D	0.77	140.9	79.3	E	308.6
	Eastbound Right - Turn					62.2	E	
	Westbound Left - Turn	26.6	C	0.64	35.7	37.7	D	69.2
	Westbound Through	35.8	D	0.69	126.7	32.2	C	128.4
	Westbound Right - Turn	4.3	A	0.42	17.9	4.1	A	21.5
Bonaventure Avenue/Allandale Road	Northbound Left - Turn	45.6	D	0.32	15.5	73.3	E	39.8
	Northbound Through	54.3	D	0.88	98.5	42.7	D	80.3
	Northbound Right - Turn					27.1	C	74.1
	Southbound Left - Turn	48.1	D	0.79	57.5	47.0	D	101.0
	Southbound Through	44.8	D	0.86	171.5	44.3	D	175.5
	Southbound Right - Turn	4.4	A	0.21	11.9	15.4	B	60.7
Elizabeth Avenue & Westerland Road		18.4	B			14.6	B	
Elizabeth Avenue	Eastbound Left - Turn	9.4	A	0.42	24.2	15.4	B	36.0
	Eastbound Through	8.4	A	0.38	66.6	8.1	A	61.3
	Westbound Through	23.9	C	0.62	168.1	14.4	B	117.3
	Westbound Right - Turn	7.2	A	0.25	43.8	9.2	A	46.0
Westerland Road	Southbound Left - Turn	53.9	D	0.71	64.7	44.6	D	65.3
	Southbound Right - Turn	8.3	A	0.53	18.2	4.2	A	25.5

2.2.8 Estimated Costs – Detailed Analysis

The estimate cost of the conceptual improvements associated with the detailed analysis are noted below in Table 9. HTC has also provided a priority plan for these different projects. It is recommended that the City of St. John's proceed to the preliminary design stage to obtain more accurate costing for budgetary purposes. The total cost of the improvements associated with the detailed analysis is \$4.95 million dollars.

Table 9: Detailed Analysis Cost

Detailed Analysis	
Priority	
1 Prince Philip Drive & Allandale Road	\$ 1,600,000
2 Prince Philip Drive & Clinch Crescent/Westerland Road	\$ 1,200,000
3 Prince Philip Drive/Columbus Drive & Thorburn Road	\$ 1,800,000
4 Elizabeth Avenue & Allandale Road/Bonaventure Avenue	\$ 200,000
4 Elizabeth Avenue & Westerland Road	\$ 150,000
Total Cost of Detailed Analysis	\$ 4,950,000

2.2.9 Findings/Recommendations – Detailed Analysis

The traffic volumes that were used in the Scenario 1/Scenario 2 analyses reflect normal background traffic growth to the year 2025 (0.8% per year), and the traffic volumes associated with the new Core Science Facility development. HTC used the Synchro/SimTraffic software and Arcady/Junctions software packages to complete our LOS analysis work.

There were six intersections included within the detailed analysis work. These intersections included:

- Prince Philip Drive/Columbus Drive & Thorburn Road
- Prince Philip Drive & Clinch Crescent/Westerland Road
- Prince Philip Drive & Allandale Road
- Elizabeth Avenue & Allandale Road/Bonaventure Avenue
- Elizabeth Avenue & Westerland Road
- Elizabeth Avenue & Freshwater Road

Prince Philip Drive/Columbus Drive & Thorburn Road

The intersection of Prince Philip Drive and Thorburn Road is one the largest most complex intersections that the City of St. John's controls. This intersection already has three through lanes in both the north and southbound directions and a dual left turning lane on Thorburn Road. The results of our analysis indicates that little or nothing can be done with the present method of traffic control at this intersection in terms of signal timing, phasing, cycle length changes or with auxiliary lane additions that will provide an acceptable level of service at this intersection in either of the analysis periods for 2025. Our analysis using a multi-lane roundabout as the method of traffic control yielded acceptable results in terms of the LOS during both analysis periods.

Accordingly, our recommendation is to reconfigure the intersection to a multi-lane roundabout as shown in Figure 7. The estimated cost of upgrading this intersection is estimated at \$1.8 million dollars.

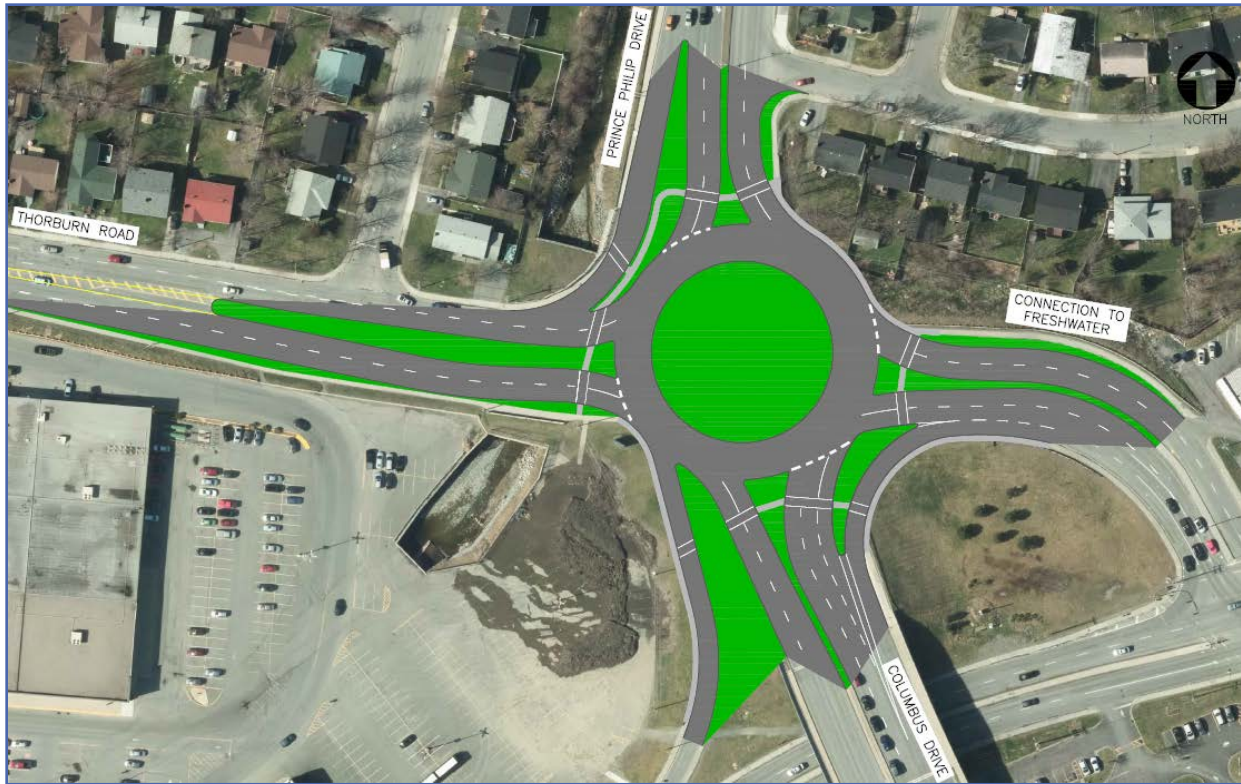


Figure 7: Prince Philip Drive/Columbus Drive & Thorburn Road proposed multi-lane roundabout

Please note that HTC has prepared this conceptual design bearing in mind the location of the structures for O’Leary’s Avenue Brook and the abutment of the Columbus Drive overpass.

Prince Philip Drive & Clinch Crescent/Westerland Road

The intersection of Prince Philip Drive and Clinch Crescent/Westerland Road is also a major intersection for the City of St. John’s. It provides a secondary access to the Health Sciences complex from Prince Philip Drive and provides both vehicular and pedestrian connections to both sides of campus. The result of our analysis, again, indicate that little or nothing can be done with the present method of traffic control at this intersection in terms of signal timing, phasing, cycle length changes or with auxiliary lane additions that will provide an acceptable level of service at this intersection in either of the analysis periods for 2025. Our analysis using a multi-lane roundabout as the method of traffic control yielded acceptable results in terms of the LOS during both analysis periods.

Our recommendation is to reconfigure this intersection to a multi-lane roundabout. The estimated cost based on the conceptual layout in Figure 8 to construct a multi-lane roundabout at this location would be \$ 1.2M.

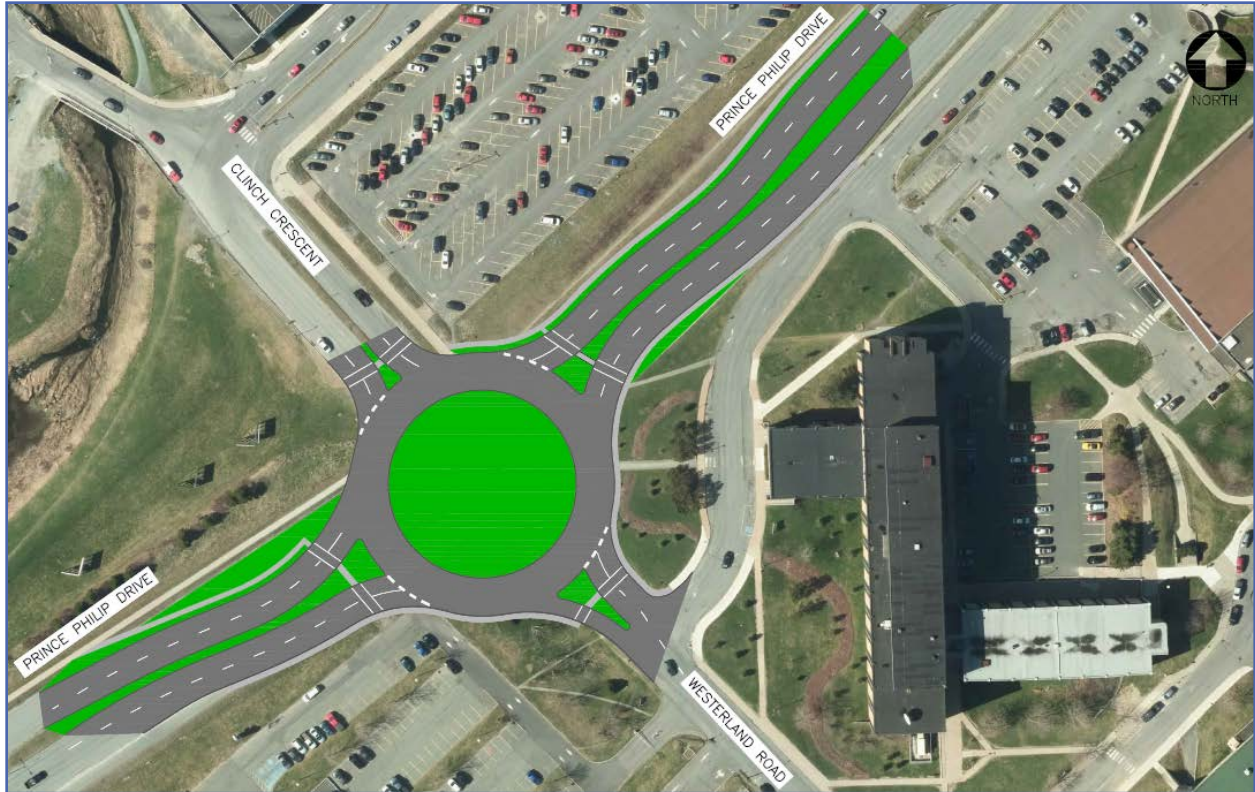


Figure 8: Prince Philip Drive & Clinch Crescent/Westerland Road proposed multi-lane roundabout

This conceptual design does not match with the long term conceptual plan developed for this intersection. This intersection was configured as a 3-legged roundabout with Westerland Road being closed to through traffic. Also, the location of the proposed 4-legged roundabout is aligned with the existing roadways, whereas the 3-legged roundabout was pushed towards Westerland Road to accommodate the proposed roundabout at Clinch Crescent/Arctic Avenue. The detailed design of this proposed roundabout should allow for a potential reconfiguration in the future to reflect the suggested closure of Westerland Road.

Prince Philip Drive & Allandale Road

The intersection of Prince Philip Drive and Allandale is again a very large, somewhat complicated signalized intersection with heavy traffic flows on most approaches of the intersection. This intersection also has a high collision rate – 98 traffic collisions over a 3 year period (2009-2011). The results of our analysis, again, indicates that little or nothing can be done with the present method of traffic control at this intersection in terms of signal timing, phasing, cycle length changes or with auxiliary lane additions that will provide an acceptable level of service at this intersection in either of the analysis periods for 2025. Our analysis using a multi-lane roundabout as the method of traffic control yielded acceptable results in terms of the LOS during both analysis periods.

Based on the conceptual plan shown in Figure 9, HTC are estimating the cost to build this multi-lane roundabout at \$1.6M. Please note that the southbound right-turn by-pass lane is not required in the high level analysis.



Figure 9: Prince Philip Drive & Allandale Road proposed multi-lane roundabout

Elizabeth Avenue & Allandale Road/Bonaventure Avenue

The intersection of Elizabeth Avenue and Allandale is also a busy signalized intersection located at the eastern boundary of the study area. The results of our analysis indicate that the traffic volumes projected or forecasted to be present at this intersection can work under a signalized intersection control configuration. Some timing changes and some geometric lane improvements will be necessary, which includes lengthening the southbound left-turn storage lane and changing the northbound right-turn lane into a shared through/right-turn lane.

Based on this conceptual plan shown in Figure 10, HTC are estimating the cost of the proposed geometric changes to this intersection will be approximately \$200,000.

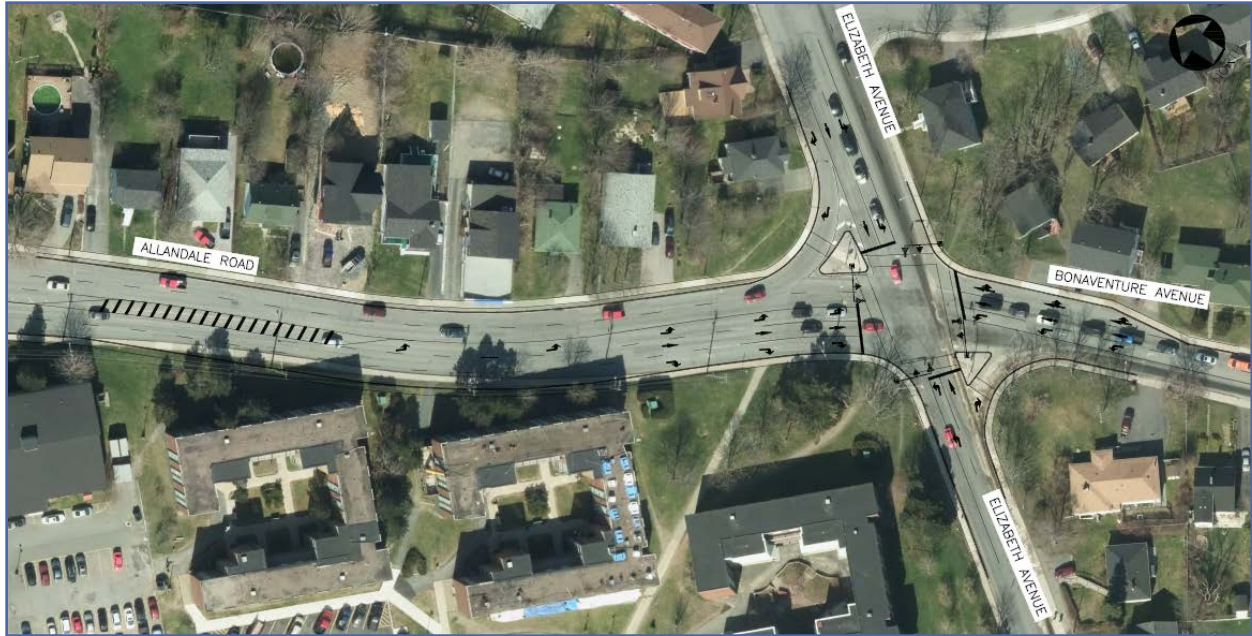


Figure 10: Elizabeth Avenue & Allandale Road/Bonaventure Avenue proposed improvements

Elizabeth Avenue & Westerland Road

The Elizabeth Avenue intersection with Westerland Road is one of the smaller intersections included within this detailed analysis. Our analysis of the 2025 peak hour volumes indicates that an acceptable LOS can be achieved with a minor geometric improvements (the addition of an auxiliary right turn lane in the westbound direction) and some timing changes to the controller. The estimated cost based on the conceptual design shown in Figure 11 is estimated at \$150,000.

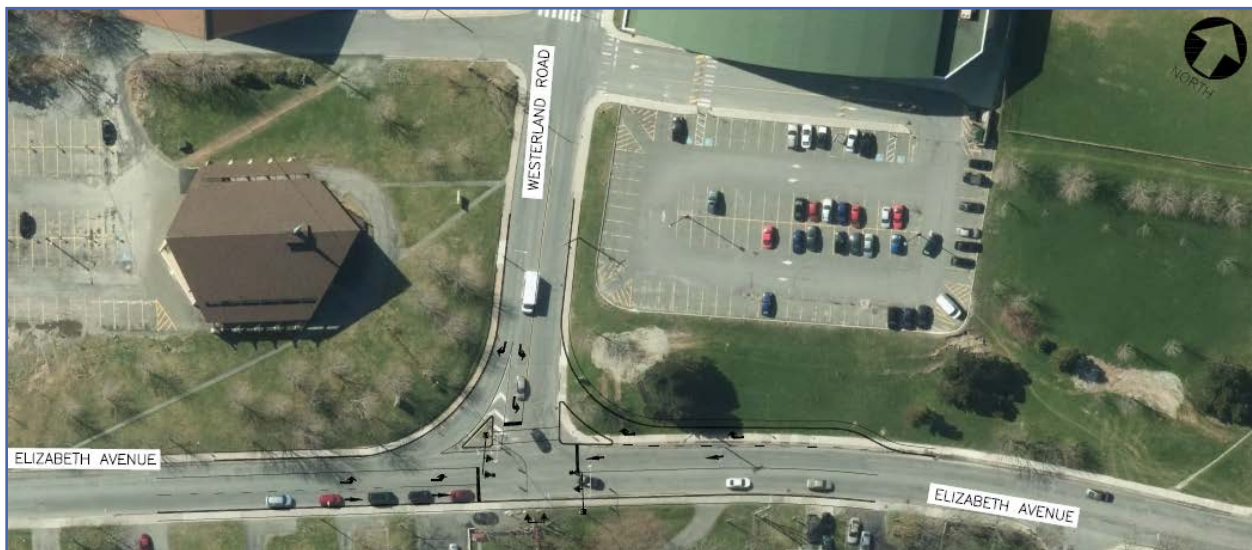


Figure 11: Elizabeth Avenue & Westerland Road proposed improvements

This design should be considered for the short term fix. It does not match with the long term concept plan developed for this area of the study in section 2.3.8 of the report. The long term goal involves removing this intersection totally from the road network.

Elizabeth Avenue & Freshwater Road

The analysis work completed by HTC at the intersection of Elizabeth Avenue Road and Freshwater Road shows that this intersection functions well during both analysis periods of 2025.

It should be mentioned that traffic currently spills back during both peak periods from the Oxen Pond Intersection with Freshwater and affects the operation at Freshwater Road and Elizabeth Avenue. So, while the detailed analysis shows a good level of service, things are likely to be much worse because of the operational problems at the Freshwater Road intersection with Oxen Pond Road. A further study of Oxen Pond Road/Freshwater Road intersection should be completed to identify and remediate the operational issues.

The results of this detailed analysis clearly indicate that the three intersections along Prince Philip Drive will be over capacity by the year 2025 in both analysis periods. The recommendations are largely the same as those identified as being required in the long term analysis. All concept improvement drawings can be found in Appendix H.

Should be noted that while only minor improvements are suggested along Elizabeth Avenue at the detailed analysis area intersections, the volumes are not significantly different than those used in the high level analysis. Single lane volumes of 650-850 vehicles per hour, do not leave much spare capacity for unanticipated or expected growth in volumes. Much of the public feedback HTC has taken in from this project, indicates that pedestrian safety is a major concern along Westerland Road and hence the comments and concepts that were developed in section 3.1 of report still apply. HTC remain of the opinion that in the long term the segment of Westerland Road from Prince Philip Drive to Elizabeth Avenue should be removed from service altogether.

HTC also heard during the public consultation process that that many people, including the administration of the campus, did not want to see any widening of Elizabeth Avenue. This was a significant influencing factor in our rationale to provide a roundabout corridor along Elizabeth Avenue in the long term. The traffic flow can be handled without any widening. HTC provided a raised median in the centre of Elizabeth Avenue and an AT trail along the north side of the road. In HTC's opinion, maintaining a conventional corridor of signals will not facilitate that vision.

2.3 High Level Traffic Analysis

A high level traffic analysis was conducted for the entire study areas, which included 20 unsignalized and signalized intersections. This analysis used the VISUM models to obtain the approach movement traffic volumes at all intersections included within the study area for both the AM and PM peak hours.

The traffic analysis for the high level traffic analysis was completed using the Synchro/SimTraffic (Version 9) software package and the ARCADY/Junctions 8 software. The Synchro/SimTraffic software was used as the main evaluation tool for the signalized and unsignalized intersections level of service analysis completed for this report. The ARCADY/Junctions 8 software was used to analyze the level of service for the suggested locations for roundabouts. An explanation of the intersection performance measures has been previously provided in Section 1.5 of the report.

2.3.1 Traffic Analysis - VISUM Model

As indicated previously, VISUM is a macroscopic transportation planning modelling software package that is used to model transportation networks and travel demand to forecast traffic flows under a different network conditions. In 2011, the City of St. John's developed a number of regional VISUM transportation planning models including models for the AM and PM peaks hours for traffic conditions present in 2010, 2015 and 2025. For the purposes of completing this study, the study team used an updated version of the 2025 model to complete the required analysis which includes commercial, industrial and residential development that is likely to occur in the St. John's Metro area by the year 2025. It also includes new road infrastructure such as the Team Gushue Highway that are expected to be completed by that time frame. The 2025 VISUM model used for the purposes of this analysis included the main developments in the following areas of the St. John's Metropolitan Area:

- Southlands (assumption made full build-out by 2025)
- Glencrest Development – Portions of the development (assumptions made for 1/3 of the full build out values in year 2025)
- St. John's Land Use Development Plan – lands above the 190m Contour (assumptions made for 1/3 of the full build out values in year 2025)
- Paradise Zones (2025 growth scenario used from the Paradise Improvement Plan)

Model Calibration in the Immediate Study Area

For the purposes of this study, HTC's modelling staff had a detailed look at the zones in the immediate area of the University to ensure they were coded correctly in the original model production and to ensure they were indeed functioning and generating traffic properly. Traffic analysis zones (TAZ's) 227, 228, 230, 231 and 402 were examined and adjusted accordingly to reflect the existing uses in each of these zones. For the above noted TAZ's, the ITE trip generation rates were used instead of the standard VISUM model zone inputs. Factors were then applied to the trip generation rates to balance them with existing volumes at key entrance and exit locations within the network. Reference Appendix B for details in this regard. The detailed spreadsheet of the ITE trip generation rates calculated for the campus area traffic analysis zones is contained in Appendix B.

The ITE trip generation rates were used over the standard travel demand model's default inputs for just the project zones rather than all zones of the model. To use ITE trip rates within the VISUM model, an additional modeling step has to be inserted before traffic assignment but after trip distribution and mode split. HTC adjusted the model produced origin-destination matrices using the Furness method so that the total number of trips in and out of the project zones matches the control total calculated from ITE trip

generation. This step changes the magnitude of the matrices but is able to retain the model predicted trip distribution pattern. (i.e., 20% going north, 50% going south, etc.). The ITE-modified origin-destination matrices are then assigned onto the transportation network to get the link and turning movement volumes. This approach has several advantages over other traffic impact assessment method including:

- The ability to retain the trip distribution pattern as predicted by the model. Manual distribution tends to over-simplify the reality.
- The ITE trip rates, are more suitable for traffic operations/capacity analysis at the link/turning movement level.
- The ability to use more advanced traffic assignment methods (stochastic assignment) to capture a wider range of route choice options.

2.3.2 High Level Analysis Scenarios

Section 4.05 of the terms of reference for this project specified that the study team was to examine a total of 5 different network conditions scenarios. These scenarios included:

- Existing conditions.
- A year 2015 projection of normal growth with no development in the study area.
- A year 2015 projection of normal growth with the anticipated level of development during that time frame in the study area. This would be without any network improvements including auxiliary lane additions or improvements and traffic signal timing and or phasing changes.
- A year 2015 year projection of normal growth with the anticipated level of development in the study area during that time frame with network improvements such as auxiliary lane additions or improvements and traffic signal timing and or phasing changes in place.
- A year 2025 projection of normal growth with the anticipated level of development in the study area including the improvements noted in the previous condition but also including the widening of Elizabeth Avenue and a proposed link from the Allandale Road Interchange with the Outer Ring Road and Clinch Crescent.

Upon closer examination of the scenarios referenced in the study's terms of reference, the study team recommended that the original scenarios be replaced by the scenarios noted below. In essence, all the 2015 VISUM modelling scenarios were replaced by similar 2025 VISUM modelling scenarios. These modelling scenario changes were approved by the project steering committee.

In total there were five different modelling scenarios used in the course of completing the analysis for this study. These scenarios included:

- Scenario 0: Existing conditions (Shown in Section 2.1).
- Scenario 1: 2025 Projection of normal growth with no new development in the study area.
- Scenario 2: 2025 Projection of normal growth with no new development in the study area with improvements to the road network such as auxiliary lanes, and/or intersection signal timing/phasing improvements.

- Scenario 3: 2025 Projection of normal growth with new development in the study area with improvements to the road network such as auxiliary lanes, and/or intersection signal timing/phasing improvements.
- Scenario 4: 2025 Projection of normal growth with new development in the study area with improvements to the road network (such as auxiliary lanes, signal timing improvements or phasing). This scenario also includes the widening of Elizabeth Avenue and a proposed link from the Allandale Road Interchange with the Outer Ring Road and Clinch Crescent.

A long term analysis was completed for the study area network based on traffic volumes derived from the VISUM model outputs.

2.3.3 Scenario (S1) - 2025 Normal Growth with No Development

The Scenario (S1) model is based on normal growth that is projected to occur regionally to the year 2025. It includes planned growth in the region but does not include any of the planned development in the MUN area. The VISUM models were used to obtain the approach movement traffic volumes at all intersections included within the study area for both the AM and PM peak hours. These traffic volumes were then analyzed/modelled using the Synchro and SimTraffic software.

Discussion of the Results

The LOS results during both the AM and PM peak hour periods at all intersections with the study area for Scenario S1 are discussed below. For the most part, many of the intersections within the study area have one or more movements are that are performing poorly and predominantly so, in the PM peak hour. The following 13 signalized and unsignalized intersections have an overall LOS of E or F in the PM peak hour:

- | | |
|--|---|
| • Columbus Drive/Prince Philip Drive & Thorburn Road | • Westerland Road & Elizabeth Avenue |
| • Prince Philip Drive & Clinch Crescent | • Anderson Avenue & Elizabeth Avenue |
| • Prince Philip Drive & Clinch Crescent/Westerland Road (AM & PM peak hours) | • Freshwater Road & Elizabeth Avenue |
| • Clinch Crescent & Arctic Avenue | • Freshwater Road & Stamps Lane/Oxen Pond Road (AM & PM peak hours) |
| • Prince Philip Drive & Allandale Road (AM & PM peak hours) | • Freshwater Road & Thorburn Road |
| • Bonaventure Avenue/Allandale Road & Elizabeth Avenue | • Outer Ring Road NB & Allandale Road (AM & PM peak hours) |
| | • Outer Ring Road SB & Allandale Road |

The traffic conditions under Scenario (S1) in the PM peak hour are poor with long delays and congestion present on one or more approaches at most intersections.

The main difference between Scenario (S0) and Scenario (S1) is the increase in the traffic volumes on the road network expected to occur over an 11 year timeframe: 2014-2025. These increases can be attributed

to normal yearly growth, and to new residential and commercial developments in the region. The existing road network configuration in the MUN Study area is expected to be over capacity by the year 2025. Improvements will be required.

2.3.4 Scenario (S2) - 2025 Traffic Volumes with No Development with Improvements

Scenario (S2) is very much similar to the (S1) scenario described previously. It includes the normal growth that is expected to occur on the road network to the year 2025, but also includes minor improvements in the analysis, such as additional auxiliary lanes and adjusted/optimized signal timings. The traffic volumes for the (S2) scenario were analyzed again using the Synchro and SimTraffic software.

Improvements to the Study Network

All of the signalized intersections within the study area required adjusted signal timings and offsets to better control the new volumes on the study area network. The new signal timings and offsets values were obtained from the optimization features of the Synchro/SimTraffic software. The only minor lane change made in the network was at the intersection of Mt. Scio Road and Allandale Road. Here the lane configuration was changed to provide separate left and through/right lane groups on the Mt. Scio Road approaches to the intersection. Figure 12 shows the improvements in red.

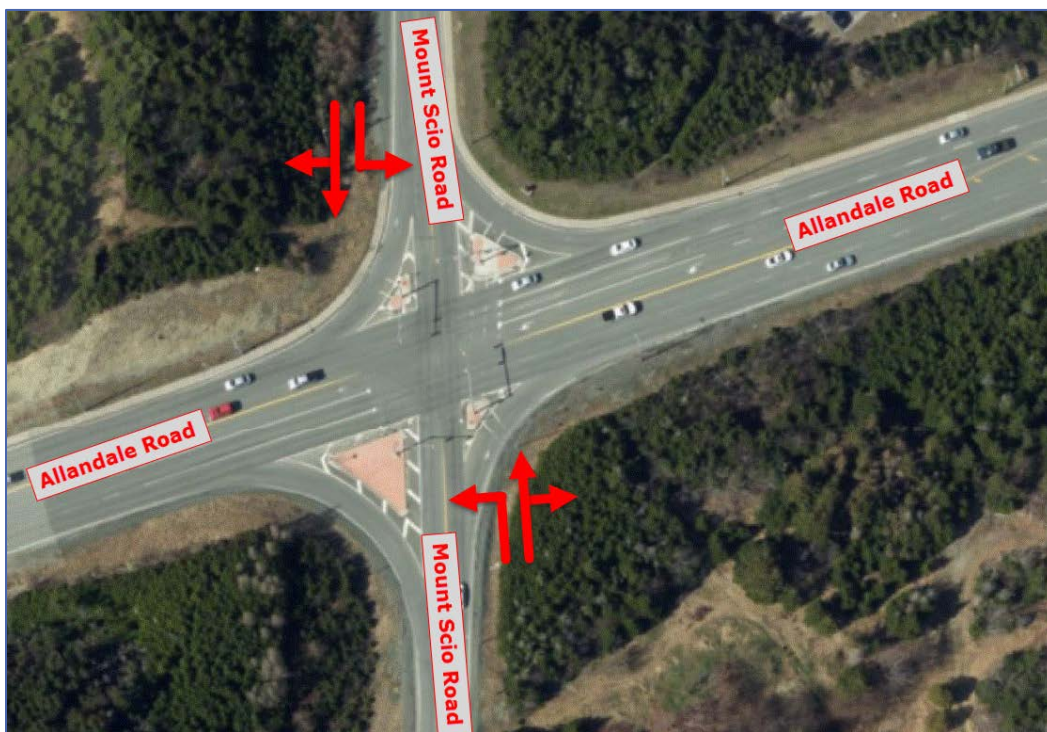


Figure 12: Reconfigured Intersection – Mt. Scio @ Allandale Road

Discussion of the Results

The LOS results during both the AM and PM peak hour periods at all intersections within the study area for Scenario (S2) are described below. As seen previously in the Scenario (S1) results, many of the intersections within the study area have one or more movements that are performing poorly and predominantly so,

in the PM peak hour. The following 12 signalized intersections and/or unsignalized intersections have an overall LOS of E or F in the PM peak hour.

- Columbus Drive/Prince Philip Drive & Thorburn Road
- Prince Philip Drive & Clinch Crescent
- Prince Philip Drive & Clinch Crescent/Westerland Road (AM & PM peak hours)
- Clinch Crescent & Arctic Avenue
- Prince Philip Drive & Allandale Road
- Bonaventure Avenue/Allandale Road & Elizabeth Avenue
- Westerland Road & Elizabeth Avenue
- Anderson Avenue & Elizabeth Avenue
- Freshwater Road & Elizabeth Avenue
- Freshwater Road & Stamps Lane/Oxen Pond Road
- Outer Ring Road NB & Allandale Road (AM & PM peak hours)
- Outer Ring Road SB & Allandale Road

Even with signal timing changes and minor improvements to the road network the traffic conditions under Scenario (S2) the PM peak hour remain poor with long delays and congestion present at most intersections on one or more approaches. The poor performance of the study area intersections in scenario (S2) is an indication that additional roadway capacity is required in the study area to accommodate the projected 2025 traffic volumes. Additional roadway capacity can be gained by widening roads and adding additional through lanes or by changing the intersection control method from traffic signals to roundabouts which reduces delay.

Alternatively, transportation demand management tools may be employed to try and reduce the overall amount of traffic projected to be in the study. More people using transit to access the study area would be the obvious solution.

2.3.5 Scenario (S3) - 2025 Traffic Volumes with Development with Improvements

Scenario (S3) includes the normal growth expected on the road network to the year 2025, as well as the full build-out of the expected development on campus and in the immediate area expected to occur by that timeframe. The VISUM models were adjusted to reflect the anticipated development and the resulting volumes analysed with the Synchro and SimTraffic software.

Development added to the Network

The study team interviewed both Darrell Miles with MUN Facilities Management, and Mr. Joe Dunford with Eastern Health to get a sense of the anticipated capital works plans for both Eastern Health and the University over the next 10 years (2015-2025).

From the information gathered during these interviews, it would appear as though the only significant development expected over the next 10 years in the study area will be the Core Science Facility which is expected to start construction in September of 2015.

Table 10: Trip Generation Rates - Core Science Facility

VISUM Zone	Use	Number	Unit	1000 sq ft GFA * Coverage	ITE Code	AM Peak Trip Gen	AM Peak Total In	AM Peak Total Out	PM Peak Trip Gen	PM Peak Total In	PM Peak Total Out
PROPOSED DEVELOPMENT (2015 - 2025)											
Zone 229	Core Science Facility	300,000	sq. ft	300	540	897	664	233	762	442	320
Zone 229	Core Science Facility	500	students		550	105	84	21	105	32	74
Proposed Development Total						1002	748	254	867	473	394

To reflect this development, an additional TAZ was created in the VISUM model (Zone 229). The trip generation rates added to the 2025 VISUM model to reflect this development are noted in Table 10 above. Please note the shelled only portion of the Core Sciences Building is expected to be used by the Faculty of Engineering and Applied Sciences attracting approximately 500 new students and 64 new staff members. The multi-point assignments for traffic analysis Zone 229 connect to Arctic Avenue. More information can be found in Appendix B.

Improvements to the Study Network

All of the signalized intersections in the Synchro model for the (S3) scenario required adjustments to both the signal timing splits and offsets to more efficiently handle the new volumes on the study area network. Traffic signals were added at the intersection of Freshwater Road and Elizabeth Avenue. The Mt. Scio Road/Allandale Road intersection maintained the same configuration as was used in Scenario 2 – an exclusive left and through-right lane groups on both the northbound and southbound approaches as shown previously in Figure 12.

Discussion of the Results

The LOS results during both the AM and PM peak hour periods at all intersections with the study area for Scenario (S3) are described below. Again, many of the intersections within the study area have one or more movements are that are performing poorly and predominantly so, in the PM peak hour. The following 14 signalized intersections and unsignalized intersections have a LOS of E or F in the PM peak hour.

- Columbus Drive/Prince Philip Drive & Thorburn Road (AM & PM peak hours)
- Prince Philip Drive & Clinch Crescent
- Prince Philip Drive & Clinch Crescent/Westerland Road (AM & PM peak hours)
- Clinch Crescent & Arctic Avenue
- Prince Philip Drive & Allandale Road (AM & PM peak hours)
- Bonaventure Avenue/Allandale Road & Elizabeth Avenue
- Westerland Road & Elizabeth Avenue
- Anderson Avenue & Elizabeth Avenue
- Paton Street & Elizabeth Avenue
- Freshwater Road & Elizabeth Avenue (AM & PM peak hours)
- Freshwater Road & Stamps Lane/Oxen Pond Road
- Allandale Road & Mt. Scio Road
- Outer Ring Road NB & Allandale Road
- Outer Ring Road SB & Allandale Road

The traffic conditions throughout the study area under Scenario (S3) in the PM peak hour are poor with long delays and congestion prevalent on one or more approaches at most intersections. The spillback queues from several of the larger signalized intersections within the study network are fairly extensive and

result in operational problems and poor levels of service for some adjacent intersections. Overall, the road network conditions under the traffic volumes forecasted for Scenario (S3) are just slightly worse than conditions expected under the traffic volumes forecasted for Scenario (S2) in the PM peak hour. The SimTraffic results show what should be considered as misleading improvements in the LOS at certain key intersections within the road network including Prince Philip Drive at Wicklow and at Clinch Crescent. This is a result of heavy congestion at other intersections that block or interfere with the flow of traffic at these intersections.

Under Scenario (S3), the study area road network is over capacity. Additional roadway capacity is required in order to make any improvements in the overall performance of the intersections within the study area.

2.3.6 Scenario (S4) - 2025 Traffic Volumes with Development & Additional Roadways

Scenario (S4) includes the normal growth expected on the road network to the year 2025, as well as the full build-out of the development on campus and in the immediate area expected to occur by that timeframe. This model also reflects a number of different network configurations. The first network configuration, Option A, includes a new roadway link extending from Clinch Crescent to Mt. Scio Road. It also includes the widening of Elizabeth Avenue to 4 lanes from Allandale Road to Freshwater Road and Stamps Lane. The second network configuration, Option B, also includes a new roadway link extending from Clinch Crescent to Mt. Scio Road but with this option many of the signalized intersections that are suffering from capacity issues have been replaced with new roundabouts, 14 locations in total.

2.3.6.1 Option A – New Roadway & Widening of Elizabeth Avenue

For Scenario (S4) Option A, the traffic volumes were forecasted by the VISUM models and analysed using the Synchro and SimTraffic models.

Improvements to the Study Network

The improvements that were included in Scenario 4 – Option A, include new signalized intersections and dual left and right turn auxiliary lanes. The signal timings and offsets were optimized for all signalized intersections in the study area road network. The improvements have been made to the study network which are noted below.

Signalized Intersections:

- Freshwater Road/Elizabeth Avenue
- Clinch Crescent/Arctic Avenue
- Clinch Crescent/New Connection
- Mt. Scio Road/New Connection

Dual Left or Right Turns:

- Mt. Scio Road/Allandale Road (NB Dual Left)
- Freshwater Road/Elizabeth Avenue (SB Dual Left & WB Dual Right)
- Clinch Crescent/Prince Philip Drive (SB Dual Right)

Auxiliary and Additional Through Lanes:

- Mt. Scio Road/Allandale Road (EB right-turn & SB right-turn & WB right-turn & NB right-turn)
- Allandale Road/Prince Philip Drive (EB right-turn)
- Freshwater Road/Elizabeth Avenue (NB right-turn)
- Clinch Crescent/Arctic Avenue (NB right-turn & SB left-turn)
- Elizabeth Avenue/Allandale Road/Bonaventure Avenue (EB right-turn)
- Freshwater Road/Thorburn Road (WB right-turn extended)
- Elizabeth Avenue (additional through lane added in EB and WB directions from Allandale Road to Freshwater Road)
- Freshwater Road (additional through lane added in NB and SB directions from Elizabeth Avenue to Stamp's Lane)

Discussion of the Results

The LOS results during both the AM and PM peak hour periods at all intersections within the study area for Scenario (S4) – Option A are shown below. While the changes that were made to the network configuration under Scenario (S4) result in some improvement in the overall performance of the network, there are still many intersections with movements that are performing poorly in both the AM and PM Peak Hour. The following 10 signalized intersections and unsignalized intersections have an overall LOS of E or F in the PM peak hour:

- | | |
|--|--|
| • Columbus Drive/Prince Philip Drive & Thorburn Road | • Bonaventure Avenue/Allandale Road & Elizabeth Avenue |
| • Prince Philip Drive & Clinch Crescent/Westerland Road (AM & PM peak hours) | • Anderson Avenue & Elizabeth Avenue |
| • Clinch Crescent & Arctic Avenue (AM peak hour only) | • Freshwater Road & Elizabeth Avenue |
| • Prince Philip Drive & Allandale Road | • Freshwater Road & Stamps Lane/Oxen Pond Road |
| | • Outer Ring Road NB & Allandale Road (AM & PM peak hours) |
| | • Outer Ring Road SB & Allandale Road |

Most of the intersections in the study area are handling high traffic volumes under this scenario. The queuing and spillbacks that result from the same, in some cases, affect the adjacent/surrounding intersections resulting in a poor levels of service at those intersections as well.

The widening of Elizabeth Avenue from Allandale Road west to Freshwater Road and Stamp's Lane and the addition of a new roadway linking Clinch Crescent to Allandale Road were both significant improvements added to the study area road network under the Scenario (S4) Option A. The widening of Elizabeth Avenue to 4 lanes does attract more traffic from the study area network when compared to the volumes on two lane configuration used in Scenario (S3). While the widening does provide some relief in the study area network and some improvement in LOS, it does not provide the relief on Prince Philip Drive as had been expected in the City's Transportation Plan. Please refer to section 3 of the report for more discussion on the widening of Elizabeth Avenue.

The addition of a new roadway linking Clinch Crescent to Allandale Road under the Scenario (S4) Option A does result in a reduction in traffic volumes along the segment of Prince Philip Drive that extends from Westerland Road to Allandale Road and along Allandale Road from Prince Philip Drive to Mt. Scio Road. Section 3.2 of the report discusses this new roadway link in a more detail.

While the changes that were made to the study area road network under Scenario (S4) Option A are significant, and while the level of service improves at many of the intersections within the study area as a result of these changes, there remain many problems that are a result of simply too much traffic on the road network for the capacity that is available.

The capacity of many of the roadways within the study area is limited to a large degree by the number of through lanes present and by the traffic signals that provide right of way control at intersecting roadways. A roadway can typically handle 1,900 passenger cars per lane per hour of green time. When signals are introduced along the roadway, this capacity becomes limited by a number of different factors including the green to cycle length ratio (g/c). For a single lane roadway with normal lane widths, normal grades, no parking interference or bus maneuvers, and no truck traffic, the road capacity would be largely be a function of the g/c ratio. With a g/c ratio of 0.6, the roadway capacity available could be reduced to 1,140 passenger cars per hour.

Roundabouts are able to process the traffic at intersections with less delay to motorists than they would experience under a traditional traffic signal control. The study team has added an additional scenario into the analysis, Scenario (S4) Option B, which incorporates roundabout control at many of the study area intersections. The intent was that the roundabout control would reduce delay and improve the LOS throughout the study area.

2.3.6.2 Option B – Additional Roadway and Roundabouts

For Scenario (S4) Option B the traffic volumes were again forecasted by the VISUM models and analysed using a combination of Synchro/SimTraffic and the ARCADY/Junctions 8 software to determine the level of service for the signalized and unsignalized intersections and roundabout locations throughout the study area.

Improvements to the Study Network

The improvements that were added to the road network in Scenario (S4) Option B, primarily include new roundabouts at many of the intersections within the study area. There are 14 locations in total. An additional improvement was required at Morrissey Road and Prince Philip Drive, which was a dual left turning lane in the southbound direction. It should also be noted that Elizabeth Avenue in this scenario remains as a two lane roadway. Also, this scenario did not analyse the following roundabouts, shown in Figure 13, roundabout B, E or G.

Location of Roundabouts added to the study area:

- Allandale Road @ Mt. Scio Road
- Allandale Road @ Higgins Line
- Allandale Road @ Confederation Building Lot
- Allandale Road @ Prince Philip Drive
- Prince Philip Drive @ New Campus Road
- Allandale Road/Bonaventure Avenue @ Elizabeth Avenue
- Westerland Road @ Elizabeth Avenue
- Clinch Crescent/Westerland Road @ Prince Philip Drive
- Clinch Crescent @ Prince Philip Drive
- Clinch Crescent @ Arctic Avenue
- Clinch Crescent @ New Connection
- Mt. Scio Road @ New Connection
- Thorburn Road @ Prince Philip Drive/Columbus Drive
- Freshwater Road @ Elizabeth Avenue

Concept plans for each of the suggested roundabout locations have been included in Appendix C.

Discussion of the Results

The LOS results for Scenario (S4) Option B were obtained using both the Synchro/SimTraffic and ARCADY software. The results of the analysis completed for Scenario (S4) Option B are considerably better than the results of any of the previous options analyzed. The introduction of the 14 roundabouts at various locations throughout the study area, reduces the delay and restores the LOS at the majority of the larger intersections to more acceptable levels. There remain a few intersections with movements operating at LOS E and F. These are noted below.

Thorburn Road & Columbus Drive/Prince Philip Drive

This intersection was modelled as a multi-lane roundabout with two and three lane approaches. The traffic volumes at this intersection are extremely high with volumes greater than 1,000 vehicles at all approaches. Even with three lane approaches, the LOS for this intersection remains poor. Further investigation and design work is required for this intersection, to determine the best solution.

Anderson Avenue/Elizabeth Avenue & Paton Street/Elizabeth Avenue

Both Anderson Avenue and Paton Street are stop-controlled intersections along Elizabeth Avenue. Both roadways have a single lane stop controlled approach to Elizabeth Avenue that accommodates both the left and right turning movements in one shared lane. All turning movements have a LOS F. If a raised median is placed in Elizabeth Avenue to eliminate the left turning movements, the LOS will improve at both intersections. The planned roundabouts on Elizabeth Avenue will facilitate the left turning movements.

Freshwater Road & Stamps Lane/Oxen Pond Road

This intersection has both commercial buildings and/or homes on all four quadrants which limits the options to improve this intersection. Significant property acquisition would be needed to facilitate improvements to this intersection to achieve acceptable levels of service. Further investigation is required at this intersection to determine the best solution.

2.3.7 Estimated Costs – High Level Analysis

Harbourside Transportation Consultants has provided Class 5 cost estimates for the projects that had been envisioned under the high level analysis for this study. These estimates do not reflect costs of any land acquisition that may be required to facilitate the same. A priority plan for the high level analysis improvements was not established by HTC. It was assumed this would be provided when the work associated City's Transportation Plan update gets underway in near future.

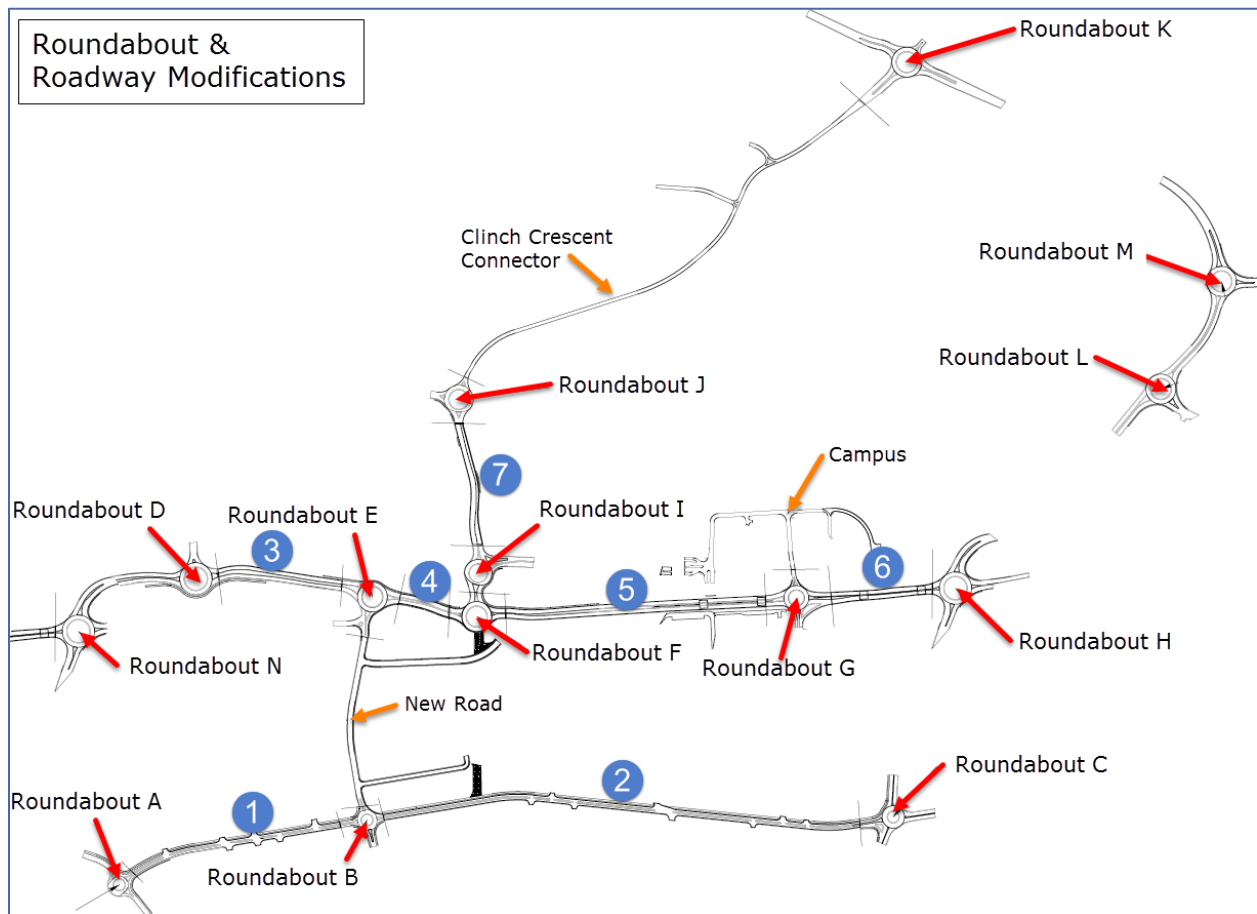


Figure 13: Roundabout & Roadway Modifications

The total estimated cost of the improvements that have been suggested by HTC under the high level analysis work completed for this project is \$21.7 million dollars and is shown below in Table 11. Again this cost does not reflect land acquisition nor does it reflect the cost of the storm sewer upgrading that will be required along the Elizabeth Avenue corridor which will be significant in of itself.

Table 11: High Level Analysis Cost

Road Network Modifications		
New Roadways		
New Clinch Crescent Connector	\$	3,000,000
Prince Philip Drive & Elizabeth Avenue Corridor (New Road - Roundabout B to Roundabout E)	\$	1,000,000
Total New Roadway Cost	\$	4,000,000
Road Network Improvements		
1 Freshwater Road/Elizabeth Avenue to Elizabeth Avenue/New Road	\$	600,000
2 Elizabeth Avenue/New Road to Elizabeth Avenue/Allandale Road/Bonaventure Avenue	\$	1,000,000
3 Prince Philip Drive/Clinch Crescent (West) to Prince Philip Drive/New Road	\$	500,000
4 Prince Philip Drive/New Road to Prince Philip Drive & Clinch Crescent (East)	\$	300,000
5 Prince Philip Drive & Clinch Crescent (East) to Prince Philip Drive & New Campus Road	\$	500,000
6 Prince Philip Drive & New Campus Road to Prince Philip Drive & Allandale Road	\$	600,000
7 Clinch Crescent & Arctic Avenue to Clinch Crescent & New Clinch Crescent Connector	\$	300,000
Campus Road	\$	250,000
Total Road Network Improvements Cost	\$	4,050,000
Roundabouts		
A Freshwater Road & Elizabeth Avenue	\$	750,000
B Elizabeth Avenue & New Road	\$	600,000
C Elizabeth Avenue & Allandale Road/Bonaventure Avenue	\$	1,000,000
D Prince Philip Drive & Clinch Crescent (West)	\$	900,000
E Prince Philip Drive & New Road	\$	900,000
F Prince Philip Drive & Clinch Crescent (East) ¹	\$	900,000
G Prince Philip Drive & New Campus Road	\$	1,100,000
H Prince Philip Drive & Allandale Road ¹	\$	1,500,000
I Clinch Crescent & Arctic Avenue	\$	750,000
J Clinch Crescent & New Clinch Crescent Connector	\$	750,000
K Allandale Road & Mt. Scio Road	\$	1,200,000
L Allandale Road & Confederation Building Entrance	\$	750,000
M Allandale Road & Higgins Line	\$	750,000
N Prince Philip Drive/Columbus Drive & Thorburn Road ¹	\$	1,800,000
Total Roundabout Cost	\$	13,650,000
Total Cost for High Level Analysis		\$ 21,700,000

¹ Please note that the configurations for Roundabouts F, H & N are different between the detailed analysis and high-level analysis. As a result, the costs between Table A and Table B for these roundabouts are different.

2.3.8 Findings and Recommendations – High Level Analysis

Modelling Scenarios for the High level traffic analysis, use VISUM model output volumes on the study area road network under existing intersection timing/phasing and lane configurations in both the AM and PM peak periods of day.

The new roadway connecting the intersection of Mt. Scio Road and Allandale Road to Clinch Crescent is expected to draw an average daily traffic volume of 18,500 vpd. This new roadway in combination with the additional lanes on Elizabeth Avenue reduce the overall traffic volumes on segments of Prince Philip Drive and Allandale Road, but the relief, while significant and needed, is not sufficient enough itself to re-establish acceptable levels of service at the vast majority of intersections throughout the study area. This connection should be considered as a long term improvement and a right-of-way should be reserved of 35m.

Scenario (S4) Option B is the roundabouts scenario for the study area. The study team replaced the traffic signals at 14 intersections throughout the study area with roundabout control and in doing so were able to re-establish acceptable levels of service at the vast majority of the study area intersections without the need to widen any existing streets in the study including Elizabeth Avenue.

Summaries of the overall intersection LOS results from both Synchro/SimTraffic and ARCADY for both the AM and PM peak hour analysis periods for Scenarios S1, S2, S3, S4, Option A and S4, Option B are shown in Table 12 and Table 13 that follow. All concept drawings can be found in Appendix C.

Table 12: All Scenarios - AM Peak Hour ARCADY & Synchro Analysis Results

Intersection		AM Peak Hour - S1				AM Peak Hour - S2				AM Peak Hour - S3				AM Peak Hour - S4-A				AM Peak Hour - S4-B			
		Synchro		SimTraffic		Synchro		SimTraffic		Synchro		SimTraffic		Synchro		SimTraffic		Synchro		ARCADY	
		Delay/Veh (s)	LOS	Delay/Veh (s)	LOS	Delay/Veh (s)	LOS	Delay/Veh (s)	LOS	Delay/Veh (s)	LOS	Delay/Veh (s)	LOS	Delay/Veh (s)	LOS	Delay/Veh (s)	LOS	Delay/Veh (s)	LOS	Delay/Veh (s)	LOS
Street	Movement																				
Columbus Drive/ Prince Philip Drive & Thorburn Road		50.1	D	71.1	E	49.6	D	80.8	F	59.6	E	188.6	F	44.7	D	132.7	F			3.5	A
Prince Philip Drive & Wicklow Street		11.7	B	36.4	D	6.9	A	13.9	B	8.5	A	69.3	E	9.5	A	59.6	E	9.5	A		
Prince Philip Drive & Clinch Crescent		22.4	C	55.3	E	16.9	B	31.5	C	17.5	B	95.8	F	17.8	B	84.3	F			2.5	A
Prince Philip Drive & Clinch Crescent/ Westerland Road		141.5	F	191.6	F	109.2	F	190.2	F	204.4	F	255.5	F	152.2	F	189.3	F			3.1	A
Clinch Crescent & Arctic Avenue		5.1	A	13.5	B	5.1	A	13.0	B	14.8	B	57.9	F	67.7	E	13.0	B			4.1	A
Prince Philip Drive & Morrissey Drive		7.1	A	27.8	C	4.6	A	21.6	C	7.2	A	128.0	F	7.7	A	17.5	B	7.7	A		
Prince Philip Drive & Allandale Road		64.8	E	120.5	F	51.2	D	132.9	F	71.9	E	257.5	F	50.0	D	148.6	F			2.0	A
Prince Philip Drive & Confederation Building Lot		8.0	A	4.4	A	8.5	A	4.4	A	8.2	A	28.3	C	8.4	A	4.3	A			2.7	A
Bonaventure Avenue/ Allandale Road & Elizabeth Avenue		45.2	D	49.7	D	32.6	C	27.7	C	43.5	D	54.3	D	43.7	A	37.6	D			2.9	A
Elizabeth Avenue & Westerland Road		37.6	D	11.1	B	21.6	C	28.8	C	32.2	C	74.4	E	16.9	B	27.4	C			9.1	A
Elizabeth Avenue & Anderson Avenue		5.9	A	3.7	A	5.9	A	11.5	B	7.8	A	34.6	D	7.7	A	5.1	A	7.7	A		
Elizabeth Avenue & Paton Street		1.3	A	3.0	A	1.3	A	6.7	A	1.4	A	18.6	C	0.8	A	5.0	A	0.8	A		
Elizabeth Avenue & Freshwater Road		16.9	C	12.5	B	16.9	C	22.4	C	69.2	E	50.1	D	52.6	D	76.8	E			3.1	A
Freshwater Road & Stamps Lane/ Oxen Pond Road		95.6	F	85.6	F	32.2	C	39.1	D	51.1	D	5.0	A	30.4	C	112.2	F	30.4	C		
Freshwater Road & Thorburn Road		13.0	B	85.8	F	14.0	B	20.6	C	15.5	B	70.9	E	14.8	B	65.8	E	14.8	B		
Allandale Road & Confederation Building Lot		6.6	A	4.6	A	4.7	A	3.3	A	5.1	A	3.4	A	4.6	A	3.0	A			2.4	A
Allandale Road & Higgins Line		10.5	B	9.1	A	9.2	A	8.8	A	9.7	A	9.6	A	9.5	A	9.7	A			2.3	A
Allandale Road & Mt. Scio Road		19.5	B	15.7	B	17.4	B	14.6	B	17.7	B	15.0	B	19.7	B	17.6	B			3.7	A
Outer Ring Road NB & Allandale Road		100.7	F	7.7	A	100.7	F	6.5	A	124.7	A	10.7	B	169.2	F	4.8	A	169.2	F		
Outer Ring Road SB & Allandale Road		5.0	A	4.1	A	5.0	A	4.0	A	5.1	A	4.1	A	6.6	A	4.5	A	6.6	A		
New Connection & Clinch Crescent														5.6	A	6.2	A			3.0	A
Mt. Scio Road & New Connection														7.4	A	10.6	B			2.5	A

Table 13: All Scenarios - PM Peak Hour ARCADY & Synchro Analysis Results

Intersection		PM Peak Hour - S1				PM Peak Hour - S2				PM Peak Hour - S3				PM Peak Hour - S4-A				PM Peak Hour - S4-B			
		Synchro		SimTraffic		Synchro		SimTraffic		Synchro		SimTraffic		Synchro		SimTraffic		Synchro		ARCADY	
		Delay/Veh (s)	LOS	Delay/Veh (s)	LOS	Delay/Veh (s)	LOS	Delay/Veh (s)	LOS	Delay/Veh (s)	LOS	Delay/Veh (s)	LOS	Delay/Veh (s)	LOS	Delay/Veh (s)	LOS	Delay/Veh (s)	LOS	Delay/Veh (s)	LOS
Street	Movement																				
Columbus Drive/ Prince Philip Drive & Thorburn Road		216.3	F	146.0	F	160.9	F	124.8	F	162.6	F	96.7	F	174.9	F	116.7	F			305.4	F
Prince Philip Drive & Wicklow Street		40.3	D	69.4	E	32.0	C	89.7	F	46.2	D	17.9	B	36.0	D	22.7	C	36.0	D		
Prince Philip Drive & Clinch Crescent		100.5	F	80.3	F	88.3	F	108.7	F	97.9	F	14.1	B	27.2	C	14.7	B			5.9	A
Prince Philip Drive & Clinch Crescent/ Westerland Road		166.9	F	275.5	F	139.4	F	305.9	F	183.5	F	100.4	F	183.7	F	152.5	F			12.7	B
Clinch Crescent & Arctic Avenue		162.5	F	477.7	F	162.5	F	545.1	F	210.4	F	122.1	F	18.1	B	78.7	E			3.6	A
Prince Philip Drive & Morrissey Drive		23.9	C	85.2	F	22.3	C	117.4	F	25.2	C	175.9	F	27.7	C	62.2	E	27.7	C		
Prince Philip Drive & Allandale Road		279.6	F	379.0	F	267.3	F	385.6	F	241.5	F	314.2	F	146.1	F	293.0	F			6.1	A
Prince Philip Drive & Confederation Building Lot		41.1	D	137.1	F	31.3	C	96.2	F	32.9	C	87.3	F	32.8	C	75.3	E			5.9	A
Bonaventure Avenue/ Allandale Road & Elizabeth Avenue		303.6	F	442.7	F	247.2	F	423.5	F	251.4	F	225.0	F	201.3	F	120.4	F			11.2	B
Elizabeth Avenue & Westerland Road		84.4	F	720.9	F	59.6	E	732.2	F	72.3	E	337.7	F	19.9	B	42.0	D			14.8	B
Elizabeth Avenue & Anderson Avenue		1459.1	F	596.7	F	1459.1	F	569.2	F	1466.8	F	412.4	F	1179.7	F	39.2	E	1179.7	F		
Elizabeth Avenue & Paton Street		29.1	D	369.3	F	29.1	D	358.3	F	39.3	E	257.9	F	13.3	B	32.7	D	13.3	B		
Elizabeth Avenue & Freshwater Road		216.5	F	177.5	F	216.5	F	171.7	F	200.2	F	178.7	F	182.1	F	110.0	F			5.7	A
Freshwater Road & Stamps Lane/ Oxen Pond Road		308.2	F	173.3	F	334.3	F	154.6	F	369.1	F	157.9	F	207.8	F	168.3	F	207.8	F		
Freshwater Road & Thorburn Road		66.6	E	108.2	F	43.9	D	70.6	E	48.1	D	75.4	E	41.4	D	88.3	F	41.4	D		
Allandale Road & Confederation Building Lot		22.7	C	581.2	F	33.0	C	294.9	F	30.7	C	78.7	E	17.8	B	72.0	E			6.2	A
Allandale Road & Higgins Line		21.5	C	548.8	F	17.0	B	789.8	F	17.7	B	69.1	E	16.6	B	35.7	D			5.2	A
Allandale Road & Mt. Scio Road		46.7	D	313.4	F	47.6	D	134.3	F	76.6	E	37.8	D	44.5	D	29.9	C			6.5	A
Outer Ring Road NB & Allandale Road		116.7	F	138.3	F	116.7	F	36.4	E	112.8	F	20.9	C	134.1	F	5.8	A	134.1	F		
Outer Ring Road SB & Allandale Road		71.9	F	505.0	F	71.9	F	44.4	E	72.5	F	7.6	A	139.1	F	8.7	A	139.1	F		
New Connection & Clinch Crescent														8.6	A	40.4	D			5.9	A
Mt. Scio Road & New Connection														9.6	A	21.2	C			2.9	A

3 Long Term Network Improvements

3.1 Widening of Elizabeth Avenue

The 1998 St. John's Transportation Study (SGE) served to analyze the road network in St. John's and determine its shortcomings, both today and in the future. There were various problems identified, including Problem 4: Congestion on Inner Ring Road due to Growth in External Travel Demand. The "Inner Ring Road" was defined as the collection of Columbus Drive and Prince Philip Road. The study demonstrated that congestion would continue to build in this area if nothing was done. The study identified three potential solutions to relieve congestion on the Inner Ring Road:

- Widen Elizabeth Avenue (from Bonaventure Avenue to Freshwater Road)
- Improve interchange Realignment at Kenmount Road
- Widen Empire Avenue

The concept of widening Elizabeth Avenue suggested the road be widened to four lanes, plus turning lanes. It also suggested that the intersection of Elizabeth and Freshwater be modified to allow free flow from Freshwater to Elizabeth. The main purpose of this recommendation would be to divert University/Confederation Building traffic away from Prince Philip Drive. The study also noted that this increase in capacity on Elizabeth Avenue will result in a certain level of neighbourhood shortcutting through the adjacent residential streets. Traffic calming measures were suggested to mitigate this potential issue. In 2006, Kendall Engineering Limited was retained to assess the options that were available to widen Elizabeth Avenue, with cost estimate and phasing plans. One of this study's objective is to reaffirm whether or not the project is still required from a technical perspective.

3.1.1 Existing Conditions

Elizabeth Avenue is a currently operating as a two (2) lane cross section that parallels Prince Philip Drive with a posted speed limit of 50km/hr. There are multiple side streets and driveways that have access onto Elizabeth Avenue. Today, there are unsignalized side streets, such as Paton Street and Anderson Avenue, which have difficulty finding a gap to enter onto Elizabeth Avenue, either making a left or right turn. Due to the high volumes on the main street, there are very few gaps to allow other vehicles to enter onto Elizabeth Avenue during the peak hour periods.

The Elizabeth Avenue corridor is also a heavily travelled pedestrian area for the University. The region to the south of Elizabeth Avenue is a popular housing area for students and has parking lots for students and staff of MUN. Any improvement plan for Elizabeth Avenue must accommodate this mode of travel.

3.1.2 Future LOS

Level of Service (LOS) results in the 1998 study show that the existing conditions of the intersections of Elizabeth/Westerland and Elizabeth/Bonaventure operate at failing level of service (F). The analysis completed for Scenario 0 – Existing Conditions 2014, show both of the intersections operating with an overall LOS D or better in both the AM and PM peak hours.

To mitigate this, the recommended improvement option included widening the corridor to four lanes and the necessary turning lanes at the intersections. While this improvement was seen as a necessary measure to accommodate traffic growth in the area, the widening would result in a significant change to the network and the landscape in the area. Wider streets and the addition of auxiliary turning lanes would reduce the amount of green space in the area and the accommodation of additional traffic volumes would create more difficulty for local residents accessing their driveways from Elizabeth Avenue.

3.1.3 Technical Justification

Elizabeth Avenue is a critical connection and access route for student, faculty and staff at MUN. It serves as an access area for vehicles, pedestrians and cyclists. There is a need to continue and improve upon this access to the south side of campus, but to be sensitive to local residents and side street accesses. The ultimate solution can provide additional vehicle capacity at the intersections while providing an environment which promotes lower speeds, pedestrian safety and side street/driveway access.

The public feedback indicated that there was not a desire to create another high speed, high capacity facility like Prince Philip Drive. There is, however, a need to create additional vehicle capacity to share the traffic load with Prince Philip Drive. Without it, Prince Philip Drive traffic will continue to grow to levels that will exceed the capacity of the intersections.

Resurfacing of Elizabeth Avenue is required in the short term regardless of other improvements. Although, it is not within the next 10 years, the underground infrastructure on Elizabeth Avenue has also been identified for an upgrade.

3.1.4 Required Features

Elizabeth Avenue needs to serve a number of functions, including providing alternate access to the MUN campus, providing access to the local residential community and creating a safe, efficient route for pedestrians and cyclists. The intersections must operate safely and efficiently and the roadway should not create an environment which results in high vehicle speeds. Being on the edge of the campus, the road design should ideally create an atmosphere which has the feel of a university campus, but includes all of the required facilities to accommodate the various users. Roadway lighting should be included, along with clear way finding signage. If properly designed, this stretch of roadway can become a true asset in the roadway network within the study area.

3.1.5 Long Term Concept Plan

An alternative concept was developed in order to increase the capacity of the street and its intersections, while also minimizing improvement capital costs and disturbance to the local neighbourhoods. This concept included the introduction of a roundabout corridor, complete with a non-traversable median.

This concept is worth considering because it provides the ability for the corridor to accommodate greater levels of traffic without the need to widen the street. The reason for this is that the roundabout intersections can handle higher traffic volumes through “flaring”, or the creation of additional lanes at the intersection without the need for multiple through lanes or auxiliary turning lanes. Also, the roundabout intersections, as numerous studies show, result in a higher level of intersection safety over more traditional signalized or stop-controlled intersections. With the inclusion of a raised, non-traversable median along the entire corridor, left turning movements into driveways and streets will be eliminated in favour of safer right turn movements. Vehicles will simply make a U-turn at the roundabout intersections in order to access driveways. Finally, the ability to introduce roundabouts, medians and a narrower corridor will enable the City to create a greener, more aesthetically-pleasing streetscape which can easily accommodate all users – vehicles, pedestrians, cyclists and others.

Sketches SSK-12 to SSK-14 illustrate the proposed changes to Elizabeth, between Freshwater and Bonaventure, including a typical road cross-section concept for Elizabeth Avenue which can be found in Appendix C. This cross-section should be refined at the time of project implementation.

Traffic Calming may be required for Whiteway Street with the addition of a roundabout at the intersection of Elizabeth Avenue and Whiteway Street. A proactive traffic calming assessment of Whiteway Street should be conducted at the time that a modified intersection is considered, in accordance with the City of St. John’s Traffic Calming Policy.

Consideration needs to be given to the crosswalks and access points at Westerland Road, Newtown Road, Parking Lot 15B entry and Russell Road, as part of this upgrade project.

The redesigned Elizabeth Avenue also needs to consider how transit stops will be treated. This includes a possible minor transit station near the Arts and Administration Building.

3.2 Proposed Roadway connection - Allandale Road to Clinch Crescent

The proposed road network connection from the Mt. Scio Road intersection with Allandale Road to Clinch Crescent has been an on and off again topic of discussion for as far back as when the original planning was completed for the Outer Ring Road; and while this Pippy Park Link may have generated some discussion at various times it has never formed part of the original planning package for the construction of the Outer Ring Road.



Figure 14: Proposed Roadway Connection - Allandale Road to Clinch Crescent (Pippy Park Link)

More recently, in 2007, this roadway was reviewed as part of a MUN student Engineering project, the conclusions of which indicated that better access to the Health Sciences Complex could be achieved with the construction of a 4 lane roadway linking the Mt. Scio Road intersection with Allandale Road with Clinch Crescent. It was also noted that such a link would help to alleviate some of the traffic congestion experienced along Allandale Road at different peak periods of the day.

As part of this project, HTC was tasked to look at this roadway linkage again, and to determine first of all, whether or not the roadway is needed as a long term network improvement in the MUN study area and if so, to what standard it should be built.

The new roadway connecting the intersection of Mt. Scio Road and Allandale Road and Clinch Crescent is expected to draw an average daily traffic volume of 18,500 vpd. The PM peak hour volumes are the heaviest, with 1,450 vph in the NB direction and some 925 vph in the SB direction. HTC completed a comparison between Scenario 3 and 4B to determine the amount of traffic that would be reduced on Prince Philip Drive. Approximately a total of 650 vehicles would be reduced off of Prince Philip Drive.

3.2.1 Conclusion

Is the proposed roadway from the intersection of Mt. Scio Road and Allandale Road to Clinch Crescent needed?

The comparison of the VISUM analysis completed by HTC for Scenarios 3 and 4A indicate that the proposed roadway from the intersection of Mt. Scio Road and Allandale Road to Clinch Crescent will handle fairly significant volumes during both the AM and PM peak hour periods. The proposed route is attractive for motorists in the study area and will help reduce the traffic volumes on Prince Philip Drive and Allandale Road to more manageable levels. The roadway does provide a much more direct route from the Outer Ring Road to the University and the Health Sciences Complex; both of which are major traffic generators. It also provides an alternative means of access to Health Sciences complex that is not reliant on Prince Philip Drive. This roadway could be used as a construction detour for any upgrading required for Prince Philip Drive.

Short term recommendations alleviate expected traffic concerns along Prince Philip Drive to 2025. However, this link provides significant new capacity into the area. The roadway should be built to a two-lane RCU 80 standard, which includes a 3.5m travel lane, 0.5m paved shoulder, 1m gravel shoulder and 1m rounding, as per the City of St. John's standards. This cross section was used in the cost estimates provided. Roundabouts were used as the method of traffic control at the new intersections and were also included in the cost estimates. Flaring to two lanes may be required on the entrance to the roundabouts. A 35m right-of-way should be reserved to allow for future needs.

4 Operational Network Improvements

4.1 Prince Philip Drive/Morrissey Road/Irwin's Road and Livyer's Loop

The Prince Philip Drive intersection with Morrissey Road has been a source of complaints for both pedestrians and motorists for many years. The geometric alignment and configuration of this intersection is not typical in terms of what motorists expect from a four way signalized intersection. The Prince Philip Drive approaches are two lanes in both the east and west directions with an auxiliary left and right turning lane on the westbound approach only. Eastbound traffic on Prince Philip Drive is not permitted to turn either left onto Morrissey Road or right onto Irwin's Road. The posted speed limit on both of these approaches is 70 km/hr. The Morrissey Road approach to the intersection has two lanes exiting and two lane entering and a raised concrete median island. The Livyer's Loop approach consists of a single lane shared left thru right lane and one receiving lane. The Livyer's Loop approach is set back from the other approaches of the signalized intersection by Irwin's Road which runs parallel to Prince Philip Drive. The Irwin's Road approach to Livyer's Loop is stop controlled. The configuration of the intersection is noted below in Figure 15.



Figure 15: Intersection of Morrissey Road and Prince Philip Drive

The lane alignments for both Morrissey Road and Livyer's Loop are not ideal. They are somewhat staggered and this combined with the fact that the intersection is narrow for the north and southbound directions leads to conflicts in the turn paths of opposing vehicles. Motorists exiting Livyer's Loop can also be confused by the presence of Irwin's Road causing them to turn left prematurely into the opposing lanes on Prince Philip Drive.

The configuration of Irwin's Road and the east intersection with Livyer's Loop and Prince Philip Drive is also somewhat complicated and confusing for motorists. Traffic exiting Irwin's Road onto Prince Philip Drive and traffic exiting Livyer's Loop onto Prince Philip Drive may have some difficulties with right of way issues. The intersection does not meet the normal standards for intersection spacing.



Figure 16: East Intersection of Livyer's Loop/Irwin's Road and Prince Philip Drive

The configuration of Livyer's Loop and its connection to Morrissey Drive, Phelan Road, Burton's Pond Road and Russell Road has in the past lent itself to some shortcutting of traffic through campus coming from Elizabeth Avenue travelling to Artic Avenue and Clinch Crescent and the Health Sciences Complex.

This shortcutting of traffic, combined with the construction activities associated with the new residence buildings, lead the University to prohibit traffic from proceeding north on Livyer's Loop beyond the access to the Science Building parking lot access. The concern with the short cutting traffic, is the speeds they

travel at and potential for conflicts with the high volumes of pedestrian traffic that cross Livyer's Loop and Phelan's Road on a daily basis.

To resolve these problems, HTC is suggesting a reconfiguration of the road network in this area. The reconfiguration involves closing the Morrissey Road intersection with Prince Philip Drive. The segment of Morrissey Road between Artic Avenue and Prince Philip Drive would be removed and the medians on Prince Philip Drive closed and fenced accordingly to prevent pedestrian movements across Prince Philip Drive at this location. Traffic on Arctic Avenue would be re-routed left onto Morrissey Road and eventually to a new roadway extending from Morrissey Road to the east intersection of Livyer's Loop with Prince Philip Drive. A roundabout would be installed at this intersection. The Livyer's Loop approach to the roundabout would be restricted to a right turn by-pass lane. This of course would be optional and is being suggested for the sole purpose of controlling the amount of short cutting traffic moving from Elizabeth Avenue to Arctic Avenue and point's west on campus. The segment of Irwin's Road along the frontage of the Main Dining Hall would be turned into a limited access cul-de-sac; used mainly for deliveries, etc.

Under such a scenario, the segment of Morrissey Road from Prince Philip Drive to Artic Avenue would be closed. The median on Prince Philip Drive and the opening for Irwin's Road on Prince Philip Drive would also be closed and the traffic signals controlling this intersection would be decommissioned. The concept plan of the proposed road network re-configuration is shown below in Figure 17.



Figure 17: Proposed Road Network Reconfiguration - Morrissey Road and Livyer's Loop.

The existing pedestrian tunnel near St. John's College has recently been upgraded to provide a usable grade separated link in this area of campus. A new multi-use underpass on the Morrissey to Livyer's alignment should be investigated as part of this closure of this intersection. This underpass may also be able to serve smaller maintenance vehicles. The one way restriction on the segment of Livyer's Loop from Irwin's Road to the access to the parking lot for the Science Building should remain in place as a permanent feature.

Consideration should also be given to extending Phalen's Road to intersect the Rodney Street/Elizabeth Avenue intersection. This will result in the need to remove 208 Elizabeth Avenue, but it will also eliminate several vehicle movements that are essentially forced now to travel through parking lots and the associated pedestrian traffic.

4.2 Westerland Road/Pedestrian Concerns

One of the more predominant and reoccurring themes that has come up during the public consultation process (the interactive website) and through the stakeholder consultation process, is the pedestrian safety issue on Westerland Road. Westerland Road is the only direct connection between Elizabeth Avenue and Prince Phillip Drive that exists west of Allandale Road, and the only such connection which runs through the MUN campus. Due to the nature of its connectivity, Westerland Road is subject to relatively heavy traffic volumes as an alternate path to and from the MUN campus and the Health Sciences Center. The Westerland Road/Prince Phillip intersection is aligned opposite the Prince Phillip/Clinch Crescent to create a four-legged intersection. Clinch Crescent is the one of the main access points into MUN, close to the new parking facility, and a primary access into the Health Sciences Centre. Access points directly on Westerland Road serve as entries into the center of campus and into MUN parking facilities. Also located on Westerland Road is the MUN Aquarena and the CBC Building. All of these factors create a section of road which is busy, and can be subject to higher than desired vehicular speeds.

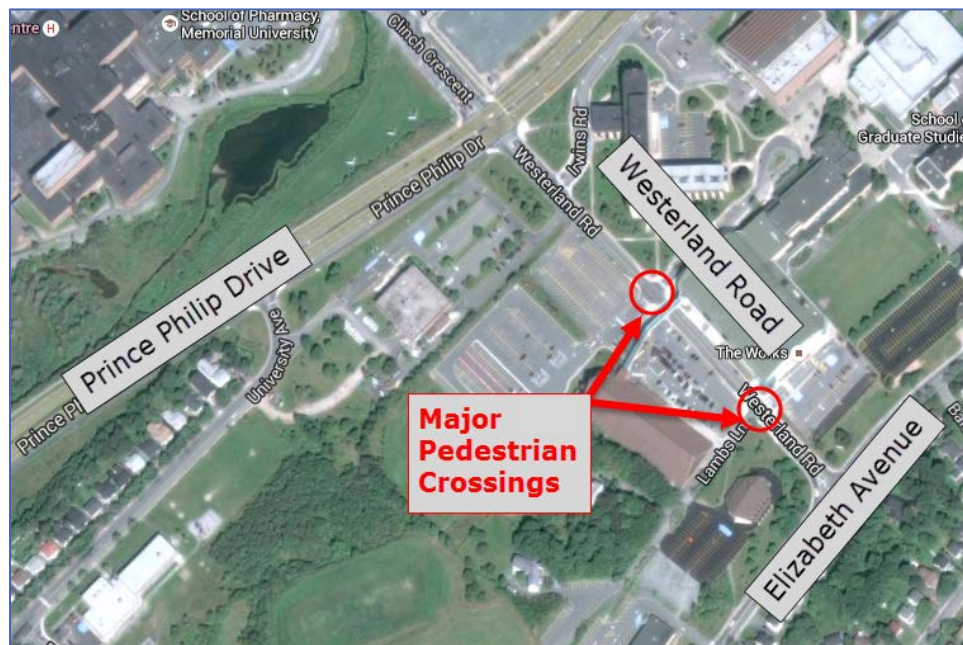


Figure 18: Westerland Road

Besides the vehicular traffic on Westerland Road, it is the site of a large volume of pedestrian traffic, including the two of the busiest pedestrian crossings within the study area. This is primarily due to the fact that there is exists a large parking lot immediately west of Westerland Road. During the morning, and at most times of the day, pedestrians are crossing Westerland Road, going to and from their vehicles. The MUN Campus Master Plan also indicates that a future parking structure could be built on the west side of Westerland Road to increase available parking on campus. In addition to the parking, there exists a

significant portion of the student population who live to the west of campus and require crossing Westerland Road to get home, either by foot or bicycle.

There has been a long-standing concern with the conflicts introduced between the heavy vehicle traffic and the heavy pedestrian traffic. This has created a number of accidents and near-misses through the years. The University has undertaken a pedestrian crossing study in the recent past and one of the sets of recommendations included a set of improvements intended to improve pedestrian safety on Westerland Road. These recommendations included high visibility flashing beacons to increase crosswalk visibility and roadside bulb-outs intended to reduce vehicle speeds and to minimize crossing distances. These improvement measures have recently been installed and the University, by all accounts, is pleased with the resulting road section. The improvements are getting favourable feedback and reaction from the students, faculty and other users.

While these improvements are appearing to have a positive impact, there is concern that the positive impacts may be a function of drivers reacting to a change in conditions and that the driver behaviour may migrate towards its previous conditions (high volumes, high speeds) after drivers become familiar with the new conditions. It is recommended that the crossings be monitored over time to ensure the new beacon system remains effective.

In the long term, and in keeping with the goals of the Campus Master Plan (Brook McIlroy), it would be recommended to completely remove a majority of this vehicle/pedestrian conflict. There does exist the possibility to relocate Westerland Road to the west, effectively removing the road from the interior of campus and building it on the periphery of the campus, to the west of any on-campus parking. There exists a significant amount of space on the west side of the existing parking, enough to accommodate a new, single lane, two-way roadway. This realigned Westerland Road would serve to provide nearly the same level of connectivity for vehicular traffic, with the exception that it would not align directly with Clinch Crescent. The driver would have to travel through an additional intersection to access Clinch Crescent.

The existing Westerland Road would be closed completely to through traffic and may only be used for local access, if necessary. Alternatively, Westerland Road could become a transit only corridor. This would create a pedestrian-friendly corridor within the confines of the now-abandoned roadway. Access to the existing parking lots would now come through the new road from the west and keep vehicle access to campus on the periphery. While there would still be some pedestrian crossings required, the crossings would be limited to pedestrians who walk to campus from an off-site location. Through proper design, it should be the goal to direct pedestrians to cross at the new intersections that would be created at Elizabeth Avenue and Prince Phillip Drive. The road's primary function would be to move vehicles and to gain access to the parking areas on the west end of campus. Additional access would be created from the new Westerland Road to connect to Irwin's Road. Also, the new road would be connected to the existing University Avenue, likely with a right-in/right-out intersection. The existing intersection of University Avenue and Prince Phillip Drive would be replaced by the intersection of new Westerland Road and Prince Phillip. The proposed layout is illustrated in Figure 19 below and on drawing sketch SSK-14 in Appendix C.



Figure 19: Westerland Road Re-Alignment Concept Plan

5 Public Transit

5.1 Public Transit Operational Review

5.1.1 Background

St. John's Transit Commission (Metrobus) provides transit service to the City of St. John's with a population of 130500 and contracted transit service to the City of Mount Pearl with a population of 25,000.

Metrobus operates 23 bus routes using 53 forty-foot diesel buses and employs 124 full-time and 20 part-time staff. Service is provided seven days a week operating from 6:00 am until 12:30 am weekdays, 7:30 am until 12:30 am Saturdays and 8:30 am until 10:30 pm on Sundays and Holidays.

Increasing transit ridership has been an on-going challenge for Metrobus. This was compounded by a three month long strike by unionized transit workers in 2010/11. Ridership for the last three years was 2.52 million in 2011, 3.07 million in 2012 and 3.01 million in 2013.

In 2011, Metrobus contracted Dillon Consulting to conduct a "Market Assessment and Strategic Directions Study" including a comprehensive review of its operations. Since the completion of this study, Metrobus has introduced a number of recommended improvements including extended hours of service, new transit routes, improvements to service frequency, introduction of Google Transit Trip planning and a significant investment in the bus fleet replacing older buses with accessible low floor vehicles.

In May, 2014, Metrobus moved into new state-of-the art transit facilities located at 25 Messenger Drive, St. John's. The new facilities will allow for future expansion of transit service.

Metrobus has retained consulting services to complete a detailed study of a Universal Pass (UPass) program for Memorial University students. This study was conducted during the MUN Traffic Study and included surveys of student travel patterns, student attitudes regarding existing transit service and a review of existing transit routes and services and recommendations for service levels and routing to meet students' needs.

5.1.2 Marketing and Promotional Advertising

Metrobus has been recognized for excellence in marketing receiving a number of national awards including three awards related to the implementation of the Air Miles loyalty program in 2012. These awards include two awards at the Air Miles Excellence Awards - one in the Community and Sustainability category and one in the New Sponsor Launch category, and an award for the development and implementation of marketing and communications initiatives by the Canadian Urban Transit Association in 2013.

Metrobus provides a number of customer conveniences to assist with their transit travel including Google Transit Trip Planner, interactive route map, text alerts on bus arrivals, printed route maps and schedules, electronic fare payment and the Air Miles loyalty program.

5.1.3 Google Transit Trip Planner

Google Transit Trip Planner is used by transit systems worldwide. Metrobus customers can go to the Metrobus website and log onto "plan a trip" and enter the departure location, destination and departure or arrival time. The system will show the bus routes available to make the trip and the length of time the trip will take and display the routing options on a map. This system makes planning transit travel easy and convenient.

5.1.4 Text Alerts

Interactive texting allows Metrobus customers to sign-up and receive service notices, view information regarding the balance and expiry on their M-Card and search bus route and schedule information.

5.1.5 Air Miles

Starting in May 2012, Metrobus was the first transit system in the world to join the Air Miles rewards program. Metrobus customers can earn Air Miles by registering for their M-Card and earn Air Miles reward miles when loading their card. This program is an added-value initiative that promotes the M-Card fare payment and rewards customers with Air Miles for using public transit.

5.1.6 Printed Bus Routes and Schedule Information

With many bus routes and time schedules, making transit information readily available and easy to understand especially for visitors and new or occasional users, requires providing the information in many formats. Metrobus has excellent transit information on their website.

Metrobus also provides printed schedules for each individual transit route including a map of the route. These schedules are available on all transit buses and at M-Card sales outlets.

Metrobus printed schedules and maps show the routing for the single bus route making planning transit trips difficult as they don't show multiple routes available to the same destination or connections to other transit routes. In addition, the route maps and street served are difficult to read.

Recommendations Operational Review:

- Metrobus to develop a comprehensive printed route map and schedule booklet showing all bus routes and scheduling information such as major transfer points, terminals and major destinations as well as bicycle routes and walking paths connecting to transit service.
- Metrobus to install printed route map and schedule displays at major transit destinations, transit terminals and bus shelters and in the Health Sciences Center, Memorial University and the Confederation Building.
- Metrobus to investigate the installation of interactive electronic screen displays in major transit points, malls and transit terminals displaying transit route and real-time transit information and transit trip planning capability.

- Metrobus to develop a transit information booklet for inclusion the university student orientation package.

5.2 Fare Strategies

5.2.1 M-Card

M-Card is an interactive smart card fare payment system. Customers can register for an M-Card and add rides or thirty (30) day passes. Customers can load and reload M-Cards on-line or at Metrobus sales outlets. M-Cards can be loaded using credit or debit cards.

M-Cards loaded on-line are uploaded by an on-board validator on the bus. When loading an M-Card on-line, there is a delay of up to 24 to 48 hours for the transaction to be completed and updated on the bus fleet. This requires customers to load the cards well in advance of using the M-Card or reloading the card before the remaining rides on the card are exhausted. In 2013, sixty-four (64) percent of rides were paid using M-Cards.

5.2.2 U-Pass Program

A U-Pass program for full-time university students increases ridership and allows the transit agency to improve service not only to the university but the transit network as a whole. Metrobus is in the process of studying a U-Pass program with Memorial University. Currently, Memorial University students can purchase semester passes at \$245 per semester. A more detailed discussion of the U-Pass program is included in Appendix E.

5.2.3 EcoPass Program

Partnering with major employers to provide employer-provided bus passes (often referred to as an "EcoPass" program) can increase transit use by commuters. Bus passes can be provided through payroll deductions and can be subsidized by the employer or the transit agency.

5.2.4 Transfer Policy

In January, 2014, following a recommendation in the "Metrobus Market Assessment and Strategic Directions Study" prepared by Dillon Consulting, Metrobus initiated a "timed transfer policy" whereby a bus transfer is valid for a specific period of time on any transit route, making the transfer a short term bus pass. Timed transfers reduce conflicts between bus drivers and passengers regarding the validity of transfers, allows passengers wishing to make short trips the opportunity to return on the same fare if they are returning within the allotted time of the transfer and allows passengers to make quick stops along their travel and not have to pay an additional fare to continue their trip. Metrobus transfers were valid for 120 minutes from the time of issue. Due to driver concerns regarding abuse and passing of valid transfers between people, the policy was reverted back to the previous policy where transfers are only valid on connecting buses travelling in a continuous trip.

Recommendations - Fare Strategies:

- M-Card has become the method of choice for most Metrobus customers. Effort should be made to reduce the time lag in loading and uploading of rides and passes on M-Cards and expand sales outlets.
- Metrobus to complete the study of a U-Pass program for Memorial University students and consider expansion of the program to other educational institutions (refer to Appendix E).
- Metrobus to investigate the implementation of an employer-provided bus pass program with major employers, including the faculty and staff at Memorial University, the Health Sciences Center and the Provincial Departments located in the Confederation Building and the City of St. John's. The combination of a U-Pass program for Memorial University students and an EcoPass program for employees at the university, Health Sciences Center and Confederation Building would significantly increase ridership and fund service improvements on transit routes serving these institutions.
- Metrobus to revisit the timed transfer policy. Many transit systems have adopted a timed transfer policy. Research should be carried out on other transit systems regarding policies to reduce abuse of the policy. It is recommended to reduce the time allowed for a valid transfer from 120 minutes to 90 minutes after the last time point on a route.

5.3 Transit Planning

5.3.1 Regional Transit

The "Metrobus Market Assessment and Strategic Directions Study" prepared by Dillon Consulting Ltd., and adopted by St. John's Transit Commission, recommended the commission work with surrounding municipalities to establish a regional transit system.

Transportation issues as a result of growth in the surrounding rural and suburban areas can best be addressed by a regional approach. Metrobus has recently invested in new transit facilities and has the infrastructure to provide for future growth in transit service to the surrounding areas including the City of Mount Pearl, Conception Bay South and Paradise.

5.3.2 Transit Oriented Design

Through "smart growth" initiatives like transit-oriented development and design, ensuring transit-supportive land uses and locating high density residential and employment densities near transit, creating convenient pedestrian and cycling connections, managing parking and creating attractive and functional transit terminals, the City will realize significant returns on its' transit investment.

Transit Oriented Design (TOD) places public transit at the centre of a community by providing high quality transit service within walking and cycling distance from high density development. This type of transit-friendly design can support local or community transit service with connections to main bus routes for travel to other areas.

5.3.3 Transit Priority Measures

Metrobus staff, in consultation with bus operators and supervisors, reviewed twenty-six (26) intersections in the City of St. John's and have identified a number of intersections where transit priority signals would improve transit travel times and on-time performance, particularly along the Prince Phillip Drive corridor. These include:

- Topsail Road @ Hamlyn
- Topsail Road @ Columbus Drive
- LeMerchant Road/Harvey Road @ Longs Hill
- LeMerchant Road @ Cookstown Road
- Columbus Drive @ Captain Whelan Drive
- Prince Phillip Drive @ Portugal Cove Road
- Prince Phillip Drive @ Clinch Crescent/Westland Road
- Prince Phillip Drive @ Thorburn Road
- Freshwater Road @ Thorburn Road
- Freshwater Road @ Crosbie Road

5.3.4 Transit Terminals

Transit terminals, particularly at the Artic Avenue entrance to Memorial University and the Avalon Mall, require improvements to bus accesses, passenger waiting areas and public amenities. The Artic Avenue terminal has many as five (5) buses in the terminal at one time. This, combined with automobile traffic and parking, makes the area over-crowded and unsuitable for expansion of service to the University. In the longer term, a suitable location for a new terminal serving both the Memorial University and the Health Sciences Center should be considered. Transit priority signals at the intersection of Clinch Crescent and Prince Phillip Drive and Morrissey Road and Prince Phillip Drive would assist transit vehicles entering and exiting the area. The Avalon Mall is a major transit terminal with a number of transit routes servicing the mall and a transfer point for passengers transferring between routes. A number of these routes serve the study area. This terminal requires upgrading with adequate bus access and passenger amenities.

Possible new transit station location, include, but are not limited to; Arctic Avenue, Prince Philip Drive, Irwin's Road, Pedagogue's Close or Westerland Road.

5.3.5 Transit Shelters

Transit shelters offer bus passengers shelter from inclement weather and include amenities that make waiting for the bus safer and more comfortable. Bus shelters should be installed where there is high transit use or near facilities such as seniors residences and schools. Amenities can include benches, lighting, heating, transit route and schedule information, newspaper boxes, recycling receptacles and be fully accessible. Metrobus currently has sixty-nine (69) bus shelters. Given the number of bus stops in the service area, Metrobus should consider doubling the number of bus shelters throughout the service area.

5.3.6 Park and Ride

Park and Ride facilities located at the periphery of the metropolitan area can extend the availability of transit well beyond the service area. Park and ride sites can range from gravelled lots to major facilities with paved parking and indoor waiting areas. Underutilized parking space at malls can benefit both the mall businesses and transit by designating spaces for park and ride customers. Providing parking and frequent, direct, limited stop transit to major destinations can reduce the number of automobiles travelling into congested areas. Currently, Metrobus has no park and ride sites available during off-peak hours, these sites could be served by regular transit routes.

Examples of possible park and ride locations with service to the study area to consider are:

1. A park and ride location in the vicinity of Airport Heights and Portugal Cove Road with peak express service following the Route 24 along Portugal Cove Road, Higgins Line, Allandale to Prince Phillip Drive serving Prince Phillip Drive with stops at the Health Sciences Centre and Memorial University.
2. A park-and-ride location in the area of the O'Leary Industrial Park near Pippy Place and Kenmount Road with peak express service following Kenmount Road to Prince Phillip Drive and serving Memorial University and the Confederation building. A park-and-ride site at this location would serve commuters from the Conception Bay South area as well as local residents. This service could be interlined with express service from the Airport Heights area to create an express route from Airport Heights to the O'Leary Industrial Park area providing express service to the Health Sciences Center, Memorial University and the Confederation Building in both directions.
3. A park-and-ride location in the area of Topsail Road and Commonwealth Drive with peak express service along Topsail Road to Blackmarsh Drive to Columbus Drive to Prince Phillip Drive serving Memorial University. This park and ride site would serve commuters from the City of Mount Pearl.
4. A park-and-ride location in the area of Smallwood Drive and Commonwealth Drive with peak express service along Smallwood Drive, Dunn's Road to Topsail to the Village Mall and continuing on Columbus Drive to Prince Phillip Drive to Memorial University.
5. A park-and-ride site located in the area of Kenmount Road and Mount Carson Avenue with peak express service along Kenmount Road to Prince Phillip Drive serving Memorial University. This location would serve commuters from Paradise and surrounding area.
6. Park-and-ride spaces at the Avalon Mall, the Village Mall and the Torbay Mall.

Recommendations – Transit Planning:

- The St. John's Transit Commission continue to engage the Province and neighbouring municipalities in discussions to develop a regional transit system.
- Metrobus staff work with City planning staff to promote transit-oriented design in future development plans.
- Metrobus staff work with the City of St. John's to install transit priority signals and queue-jump lanes at key intersections.
- Metrobus work with Memorial University to improve the Arctic Avenue terminal.
- Metrobus work with City staff to install transit priority signals along Prince Phillip Drive.

- Metrobus identify a suitable location for a new transit terminal to serve the Health Sciences Center and Memorial University. The corner lot at Clinch Crescent and Prince Phillip Drive should be considered as a possible location.
- Metrobus work with the Avalon Mall to improve transit facilities.
- Metrobus develop a bus shelter program to increase the number of bus shelters including criteria for locating shelters and guidelines to determine the amenities that should be included at each location.
- Metrobus develop a park-and-ride program to identify possible locations for park-and-ride sites and transit service to the study area.

5.4 Service Review

A survey of Memorial University students and faculty was conducted in 2010. Surveys of on-board passengers, focus groups, stakeholder meeting and public open houses were carried out as part of the "Metrobus Market Assessment and Strategic Directions Study". A number of issues were identified including the need for improved transit schedules, new routing and improved customer information. Since the completion of the "Metrobus Market Assessment and Strategic Directions Study", Metrobus has introduced a number of service improvements.

5.4.1 New Transit Services to Study Area

Metrobus operates a number of transit routes serving Memorial University and the Health Sciences Centre with Routes 1, 5, 9, 10, 13, 14, 15, 16, 17, 20, 23, 24 and 26 serving the Artic Avenue entrance to Memorial University with Routes 10, 13, 15, 16, 20 and 23 also serving the Clinch Crescent entrance of the Health Sciences Centre. Routes 2 and 5 serve Memorial University at the Elizabeth Avenue entrance. Routes 1, 9 and 17 serve the Confederation Building.

Recently, Metrobus has increased service to these institutions:

Route 24 - a new express route providing local service to the Airport Road, Airport Heights Drive area with non-stop express service from Rhodora Drive to Memorial University's Artic Avenue entrance. This route operates one (1) morning trip starting at Airport Road and Major's Path at 7:40 am and arriving at Memorial University at 8:00 am.

Route 26 - A new express route providing local service starting at Ladysmith Drive serving Great Eastern Avenue, Kelsey Drive, Goldstone Street, Seaborn Street, Bambrick Crescent and Thorburn Road with non-stop express service to Memorial University. This route operates one (1) morning trip starting at 7:35 am and arriving at Memorial University at 8:00 am.

Route 16 - Service between Kenmount Terrance to the Avalon Mall terminal, Health Sciences Centre and Memorial University increased on Saturday evenings until 11:10 pm and Sunday evenings until 6:10 pm.

Route 20 - Service between the Avalon Mall and Airport Road at Major Path and serving the Health Sciences Centre and Memorial University extended on Saturdays between 8:30 am until 6:30 pm.

5.4.2 Transit Route Review

The last route review was conducted in 2007. A study of a U-Pass program will include a review of service to the university and possible realignment of service or additional service to meet student ridership. (More discussion on the U-Pass program is included in Appendix E).

5.4.3 Express Bus Service

Frequent, direct transit service encourages more commuters and travellers to take public transit. Providing express service between transit terminals with convenient transfers to local service and express service from park-and-ride sites to major destinations can improve travel times.

5.4.4 Accessible Transit Routes

Presently, paratransit services are contracted by the City of St. John's. Metrobus does not offer accessible transit service. Providing trips to persons with mobility challenges on regular transit service is much cheaper than providing those trips using door-to-door service and provides the transit customer with frequent travel times compared to door-to-door service, which may not be available at convenient times for the traveller. Accessible transit service requires careful planning. Bus stops and shelters must be identified as accessible and free of barriers, destinations must be fully accessible, and information on which routes and stops are accessible must be promoted. Metrobus has replaced most of the buses in the transit fleet with accessible, low floor vehicles. Accessible, low floor bus service not only provides easy access to persons using mobility aids such as wheelchairs and scooters, but also for persons with limited mobility, seniors and persons with strollers.

5.4.5 Community Transit Service

Metrobus recently received funding to implement four (4) neighbourhood bus routes using a smaller bus than a standard forty (40) foot vehicle. Two routes will serve the eastern part of St. John's, with one route providing service from neighbourhoods around the Mount Cashel area, travelling along Elizabeth Avenue and include a stop at the entrance to Memorial University. Two other routes will serve the western part of the city.

5.4.6 Late Night Shuttle

Presently, transit service between the University area and downtown area ends around 12:30 am on weekdays and Saturdays.

5.4.7 Active Transportation

Active transportation and transit complement each other and provide multimodal travel options for travellers. Metrobus has recently tendered for the purchase of bicycle racks for all transit vehicles.

5.4.8 New Customer Programs

Programs such as "Guaranteed Ride Home" and "Request Stop" and stop announcements provide added value to the transit customer. A "Guaranteed Ride Home" program ensures employees that, if they are unable to take their usual mode home due to some emergency, they will have other options such as a subsidized taxi to return home.

A "Request Stop" program allows transit customers to request the bus operator stop at a location other than a regular transit stop during evening hours. Metrobus offers a "Request Stop" program during evening hours.

Stop announcements reduces uncertainty for persons with visual impairment or passengers travelling to new areas.

Recommendations – Service Review:

- Routes 24 and 26 to provide express service with one (1) morning trip only. Due to fleet availability constraints, no evening return express trip is available. Staff should look at realigning other service to allow a return express trip on Routes 24 and 26.
- Metrobus to conduct regular passenger counts and surveys to ensure transit routes are meeting ridership goals and performance.
- There is a high level of service along Prince Phillip Drive to the Health Sciences Center and Memorial University. Investigate if some service could be re-routed along Elizabeth Avenue and up Westerland Road to these institutions.
- Metrobus to investigate the implementation of an express bus network connecting major transit terminals and park and ride locations to major destinations.
- Metrobus to begin planning of accessible transit service on conventional transit routes considering transit routes that serve the Health Sciences Center and Memorial University as a priority.
- Metrobus to evaluate the response to the service with possible expansion of neighbourhood bussing to serve communities popular for off-campus student housing such as the Kenmount Terrace and Crosby Road areas.
- Metrobus to consider extending Friday and Saturday evening service by providing a late night shuttle between the terminal at City Hall/Mile One and the University. This service could be delivered using the smaller Community Transit vehicle.
- Metrobus to develop policies and procedures for providing bicycle travel on transit.
- Plan the installation of bicycle racks at transit terminals and major transit destinations.
- Work closely with the local cycling community to promote transit and cycling as a travel options.
- Metrobus investigate the introduction of a "Guaranteed Ride Home" program for Metrobus customers.
- Metrobus consider the introduction of stop announcements at transit stops and destinations.

6 Transportation Demand Management & Parking

6.1 Introduction to TDM

6.1.1 What is Transportation Demand Management?

Transportation Demand Management (TDM) involves the use of various policies, programs, services and products to influence the manner in which people travel. The idea of TDM is to motivate people to travel using different modes of transportation including walking, cycling, transit and ridesharing. TDM can also motivate people to make fewer trips on the road network through, for example, technologies that allow people to work from home, and shop online. TDM also encourages people to drive more efficient by planning trips that accomplish a number of goals and that avoid peak traffic periods and congested routes. Many large employers and Universities throughout North America have typically embraced TDM as means of providing a comprehensive coordinated set of programs and services that address a range of common transportation issues such as congestion, parking, infrastructure needs, pedestrian safety and greenhouse gas emissions.

6.1.2 Who Benefits from Transportation Demand Management?

Communities, large employers, and the employees of organizations with a good TDM plan will all benefit in the end.

The City of St. John's would enjoy better returns on their investments in transit, walking, and cycling facilities. TDM leads to cleaner air, less congestion and lower health care costs. For larger employers such as Memorial University, Eastern Health and the Provincial Government, TDM allows for easier employee recruitment and better employee retention.

For individuals that take advantage of TDM programs and services, they have greater choices and convenience, they save both time and money, and they reap the benefits of a healthier more sustainable lifestyle.

6.1.3 Why a TDM Plan is Necessary?

Maintaining a balance between supply and demand is a crucial element of any transportation system. It is also good business for Municipalities, many of whom already have successful recycling and water conservation programs offering real economic benefits and social benefits to the community. Many Municipalities have also realized that their transportation infrastructure is also a valuable resource that has to be managed properly to avoid costly and unnecessary upgrades.

By properly managing the demand for travel, Municipalities can, and have in some instances, reduce the need for new or widened roads, reduce the environmental and social costs of car use, and have increased their return on the investments they have made in walking, cycling, transit and ridesharing throughout the communities they manage.

6.2 Public Transit and TDM

6.2.1 Introduction

Transit systems have an important role in Transportation Demand Management. Transit systems have managed demand through marketing, pricing and promotion strategies. TDM measures including investment in public transportation together with integrated land use can effectively address growing traffic congestion and its associated effects on a city and municipality. Investment in public transit reduces vehicle traffic and associated greenhouse gases and harmful pollutants.

Public transit's role in Transportation Demand Management is to promote a transit culture through marketing and awareness of public transit, make transit easy to understand and use by providing adequate and clear transit information, trip planning, customer information and real-time transit information using displays, online and wireless devices, and making transit affordable through such initiatives as employer provided and universal pass programs, discounted transit fares and electronic fare media.

Setting targets for shifting trip demand from cars to transit, matching future settlement locations to take advantage of best transit opportunities and boosting investment in transit can avoid the need for major roadway projects and result in overall savings in capital investment. Investment to strengthen traditional transit services, introduce new services such as Bus Rapid Transit (BRT), Express Bus service and other service delivery options and investment in modern transit vehicles, transit priority measures and improved customer facilities and amenities can focus on achieving these targets.

Using Intelligent Transportation Systems (ITS) such as Automated Vehicle Location (AVL), Automated Passenger Counting (APC), Real-Time Transit Information, Trip Planner Systems and Automated Fare Collection (AFC) results in better management of transit operations, transit service planning and improved customer convenience, attracting new ridership.

Placing emphasis on the marketing and promotion of public transit to increase awareness and use of transit includes strong design and branding to maintain an image of a modern, efficient and reliable transit system, introducing customer loyalty programs and added value services such as "Guaranteed Ride Home" and "Request Stop" programs, stop announcements and real-time route and schedule information, all contributing to the public's perception of the transit system and the customers' transit experience.

Modal integration of public transit with other TDM measures, such as active transportation initiatives, can boost transit ridership by making transit a part of the overall trip. This can be achieved through the installation of bike racks on buses, bicycle storage at transit stops and terminals and direct and accessible walking paths to and from transit facilities.

Transit systems, in partnership with city government and other agencies such as schools, universities and employers, can work together to develop programs and projects that benefit all parties.

6.2.2 Knowledge and Awareness – Marketing Transit

Marketing activities by public transit are a form of TDM. There are several aspects of marketing public transit to bring awareness and knowledge of a transit system. These activities include branding and positioning, target marketing, special events, customer information, fare incentives, partnerships and research to promote and encourage transit use.

6.2.3 Transit Orientated Design (TOD)

Transit Oriented Design (TOD) is the creation of compact communities centered on high quality transit service with high density development within walking and cycling distance of a main transit terminal with local transit services supporting the main line.

Sustainable development and transit-oriented design have several direct benefits including increased transit use and revitalized neighbourhoods creating development opportunities and enhanced economic development as well as increased land values, increased labour pool access and affordable housing. Benefits also include reduced traffic congestion, increased property tax revenues, reduced crime, reduced infrastructure costs and preserves open spaces. Transit Oriented Design should take advantage of transit opportunities to ensure that future development is located and designed to make the best use of transit investment.

Well planned Transit Oriented Design offers several benefits such as greater mobility for moving around the community, increased transit ridership, reduced traffic congestion, accidents and emissions, reduced household spending on transportation, higher property values and a healthier lifestyle for the residents.

"Smart Growth" is defined as land use and development practices that enhance the quality of life in communities preserve the natural environment and save money over time. This is achieved through the comprehensive use of alternative development standards and strategies that reduce the impact of urban growth on the natural environment, integrate infrastructure in ecosystems, thus reducing its cost, and create more liveable communities that increase our enjoyment of the places we live in."

- Smart Growth BC

6.2.4 Active Transportation and Transit

Promoting active transportation such as walking and cycling is a key element to improve the health of a community's residents. Transit and active transportation complement each other and offer a suite of travel options that help individuals adopt multimodal lifestyles and minimize automobile use.

Transit friendly design including safe and convenient walking and cycling paths from high density development to local transit terminals can encourage increased use of walking, cycling and public transit. By providing conveniences such as walking paths to transit stops and bike paths, bike storage at transit terminals, bike racks at key destinations, and bike-rack equipped buses for cyclists, there is greater

encouragement for individual to combine walking and bicycle travel with public transit. Initiatives such as free transit trips to bicycle users and interactive route maps of cycling and transit routes can further encourage this activity. In some cases, the installation of bike racks at downtown transit stops may be cost shared between the city or transit agency and local businesses and they benefit both parties.

Providing bicycle storage at transit terminals and stops can extend the service area of the transit route by attracting cyclists who travel further than the walking distance to the transit service.

“Transit and walking have a strong relationship. Research shows that the willingness of passengers to walk to a transit stop increases with the quality of both transit service and the pedestrian environment, a dynamic that yields larger transit catchment areas and higher ridership.”

- Cervero, R. and Seskin, S. - An Evaluation of the Relationship between Transit and Urban Form
TCRP Research

6.2.5 Transit and Parking

Parking management measures has a direct influence on public transit use, especially in downtown and areas of high employment. Such policies as parking pricing, regulated parking and limited parking duration can encourage other modes of transportation.

City owned parking rates can be set to encourage transit use. In Kelowna, British Columbia, city owned parking facilities parking rates are set at a minimum of 10% higher than a monthly bus pass. Cities can also redirect parking revenues to fund improve transit service and facilities in the downtown area making transit use more attractive.

6.2.6 Transit Priority Measures (TPM)

Transit Priority Measures (TPM) are used in most major cities to improve transit service, avoid congested intersections and reduce delays in service. Transit Priority Measures include regulatory measures, physical measures and transit signal priorities. Transit Priority Measures combined with limited stop service can make the bus travel competitive with automobile travel along the same route.

Regulatory Measures



Regulatory measures include restrictions to vehicle lanes and restrictions to on-street parking along major transit corridors. On-street parking restrictions can apply during certain hours such as peak travel times.

Figure 20: Regulatory measures transit signs

Physical Measures

Physical measures include exclusive transit lanes or high occupancy vehicle (HOV) lanes, queue-jump lanes, bus gates and busways. Transit lanes and bus ways are restricted to public transit vehicles only.

High Occupancy Lanes are restricted to vehicles carrying more than one person. Transit lanes may be open to general travel during off-peak travel periods.



Figure 21: Ottawa's Busway



Figure 22: Quebec City's Bus Only Lane

Transit Signal Priorities



Figure 23: Typical Bus Priority Signal

Transit signal priorities are signalized intersections that give transit vehicles priority over other traffic through the intersection. Transit signals are usually combined with queue-jump lanes allowing the bus to enter the intersection ahead of other traffic heading in the same direction. This is accomplished by an indicator signalled to the bus to enter the intersection while other traffic at the intersection is stopped with a red light. This can be scheduled for every light change, during peak travel times only or by the bus activating the signal.

Bus Gates and Bus ONLY Crossings

Bus gates and bus only crossings are used in locations to provide priority connections between areas and communities for transit and emergency vehicles only. Bus gates and bus only crossings permit buses to provide direct transit connections reducing route length and travel time.



Figure 24: Calgary Transit Bus Gate and Bus Only Crossing

6.2.7 Intelligent Transit Systems (ITS)

Intelligent Transportation Systems are technologies used in the transit industry to provide data to transit operators to plan and manage transit service and provide travel information to transit customers. Computer and communication systems are integrated to provide effective management of the transit system by monitoring on-road service, schedule adherence, passenger count and fare collection. This information can be communicated to transit users advising the location of their bus and expected arrival times at their stop. Travel planner applications assist transit users plan their transit travel and automated fare collection allows customers fare payment options and ease of fare payment.

6.2.8 Automated Vehicle Location (AVL)

Automated Vehicle Location systems allows transit dispatchers to monitor the actual location of vehicles along transit routes and indicate vehicles that may be running behind or ahead of schedule where corrective action can be taken. Using this information, transit passengers can then be informed of the expected arrival time of their bus. AVL systems can include Automated Passenger Counting (APC) features can be provide important data collection for route and schedule planning and improve schedule adherence, service frequency and service reliability.

6.2.9 Real-Time Transit Information

Real-Time transit information systems provide transit passengers with information regarding the arrival times of buses serving their stop. This information can be provided by phone, text, online and e-mail and displays at transit terminals and major stops.

6.2.10 Trip Planner

Trip planning systems use technology to assist transit users plan their transit travel. Passengers can enter their location and destination and the system will provide information including the bus stop to start from, which route to take, the departing time of the bus, any transfers involved, how long the trip will take and what the fare will be.

Many systems include alerts and notifications to smart phones and other devices indicating when a bus is departing from a bus stop.

6.2.11 Automated Fare Collection (AFC)



Figure 25: Smart Card Fare Payment

Automated Fare Collection (AFC) systems provide simple user-friendly fare collection, offering transit customers convenient and flexible methods of fare payment. Automated fare collection improves fare collection security and provides transit management with important data collection and reporting information. Automated fare collection speeds boarding times, reduces fare disputes between bus drivers and passengers, reduces fare fraud and can eliminate the need for bus transfers. There are a variety of AFC systems available on the market ranging from electronic fare boxes to contactless smart card processors with wireless data transfer, GPS information and data reporting.

6.2.12 Universal Bus Pass Program (U-Pass)

Universal Bus Pass (U-PASS) programs are offered to many universities and colleges across Canada. A U-Pass program gives full-time students the opportunity to travel public transit at a deep discounted fare. All full-time students are enrolled in the program and the cost is added to the student tuition and registration fees. U-Pass programs have resulted in significant increases in student use of public transit. A more detailed discussion of the U-Pass program is included in Appendix E.

6.2.13 Employer Provided Bus Passes

Many transit agencies have partnered with major employers to provide employer provided transit passes to their employees. Often referred to as an EcoPass program, it is designed to make public transit as an attractive and affordable option to the automobile for work commutes. Bus passes are provided to employees through payroll deductions. Employers who wish to subsidize the program can offer passes to employees at a discount or the transit agency can sell the passes at a reduced cost to the employees.

Employer provided bus pass programs have shown considerable increases in transit use by employees.

“Many employers offer free or subsidized parking as a benefit to their employees. This access to free or inexpensive parking reduces commuting costs for automobile users and provides a disincentive to transit use. In several jurisdictions, employer-sponsored bus pass programs have been implemented to reduce commuting costs for transit users, to reduce the demand for parking, to provide a more equitable benefit program to employees, and to make the purchase of transit passes more convenient. The natures of these programs vary. In some instances, employers provide a direct subsidy to employees for the purchase of bus passes. In others, employees are able to buy annual passes through a payroll deduction plan.”

- Winnipeg Transit EcoPass

6.2.14 Service Delivery

Public transit is more than conventional fixed route service. Service delivery is tailored to the customers varying needs from commuter rail and bus rapid transit to express routes, neighbourhood routes and shuttle and van services. A transit system can offer a suite of service options to the public.

Conventional Fixed Route Transit Service

Conventional or fixed route transit service must provide a network of transit routes throughout the service area. These routes must be monitored carefully to ensure schedules and connections to other routes and services are maintained

Bus Rapid Transit (BRT)

Bus Rapid Transit (BRT) is a higher order transit service offering commuters a high quality, rapid transit service that is customer-focused, fast, affordable, comfortable, accessible and reliable. BRT has many important features including safe, comfortable and attractive stops and stations, park and ride facilities, frequent, limited stop service to key destinations and upgraded transit vehicles. A number of transit priority measures such as transit signal priority can be employed to provide buses with a travel advantage over automobiles travelling the same routes.

BRT buses provide upgraded customer comfort features such low floor accessibility, high-backed seats, additional leg room, air conditioning and noise dampening interiors. BRT vehicles, shelters, stops and promotional materials are branded in a strong, easily recognizable color scheme and logo.

Bus Rapid Transit terminals and stations offer customers amenities such as indoor seating, bicycle storage, transit route and schedule information, washroom facilities, Wi-Fi, coffee, newspaper and food service in a well-lit and secure area.

Intelligent transportation systems such as automated vehicle location and real-time passenger information are used to make the service convenient to customers.



Figure 26: Saint John Transit's "Comex" Service



Figure 27: Saint John Transit's "Comex" Park & Ride" BRT service



Figure 28: Halifax's "MetroLink" BRT service

Express Bus Service

While Bus Rapid Transit offers a higher order transit service, express bus service operated by public transit systems provides direct, limited stop service, usually from high residential areas, to major commuter destinations. Express bus service operates frequent trips during peak travel periods with reduced service off-peak.



Figure 29: Halifax's MetroX service provides express service from rural communities into downtown

Shuttle and Van Service

Shuttle and van service provides travel from smaller residential areas to the nearest transit terminal or transfer point where passengers can connect to main transit routes. Shuttle and van service can operate in areas where it is not economical to operate conventional bus service. This type of service can be fixed route or demand based.

"Neighbourhood" Bussing

"Neighbourhood" bussing is a local community shuttle bus service (usually using smaller buses) circulating within a community and connecting to the main transit network. "Neighbourhood" service allows residents to travel, particularly for short trips, throughout their community for shopping, medical appointments, educational and social activities. Commuters can take a local bus to connect to other transit routes and services for longer trips.

Subsidized Taxi Service Program

In areas where regular transit service is not viable or during hours when transit service is not available, a transit system may offer subsidized taxi service to registered customers. Subsidized taxi programs are often used to provide additional accessible transit service.

Special Events

Providing transit shuttle service to special events such as concerts, air shows, parades and other public events can attract riders who would normally not take transit. This gives the transit system an opportunity to show how effective and convenient transit can be and encourage greater transit use.

Park-and-Ride Facilities

Providing park-and-ride facilities are an effective way of increasing transit use and ridesharing especially during peak travel times. Park-and-ride facilities combined with frequent transit service are an effective method of reducing automobile traffic especially into the downtown. Park-and-ride facilities are often located at transit stations and bus stops on the outer edges of the city with frequent limited stop service into the downtown.



Figure 30: Park-and-Ride utilizing a City Owned Vacant Gravel Lot

Local transit service in outlying communities can use park-and-ride lots as a transfer point to a main haul line into the downtown area.

Park-and-ride facilities can range from paved lots at major locations to modest gravel lots. Major facilities include sheltered waiting areas, transit route and schedule information, waste cans, newspaper bins, washroom facilities, bicycle storage, security cameras, landscaping, and coffee and food services. Underutilized mall parking lots in partnership with the mall owners are often used for park-and-ride locations as there is a mutual benefit in that commuters will often shop at the mall since they are parking there and many of the customer amenities are available within the mall.

Preferential parking spots at park-and-ride facilities can be reserved for accessible vehicles, carpooling and vanpooling customers. Parking is usually free or at a modest charge to the commuter.



Figure 31: Major Park-and-Ride facility at a BRT station fully paved & accommodates 230 vehicles

Bike and Ride

Most park-and-ride facilities include bicycle paths, secure bicycle storage and bike racks on the buses serving the facility. Bus racks installed at major destinations encourage bicycle and transit use.



Figure 32: Example of a bicycle storage facility

Kiss and Ride

Kiss-and-Ride is a designated location at park and ride facilities or transit terminals for commuters who are being dropped off and picked up by private vehicle.



Figure 33: Kiss-and-Ride Sign

6.2.15 Bus Stops and Transit Waiting Areas

A customer's experience while waiting for a transit bus has a direct impact on the decision of using public transit and satisfaction of the transit service. Bus stops and waiting areas communicate the reputation and quality of the transit service. Bus stops and waiting areas should be designed to be functional, attractive and safe and well-maintained to the customer's waiting experience.

Waiting for a bus should be a comfortable, safe and positive experience. Bus stops should be easily identified conveniently located with easy access and provides adequate amenities for transit riders. Passenger amenities include comfortable seating, bus shelters, garbage and recycling containers, signage, route maps and timetables, bicycle racks and storage, lighting, video surveillance, and landscaping. All bus stops and waiting areas should be fully accessible.

Bus stops and waiting areas should be located according to standards considering spacing, traffic, passenger volumes, visibility and access. Bus stops can be categorized from basic stops to high use waiting areas with appropriate amenities assigned to each.

6.2.16 Transit Security

Over the past decade, transit systems across North America have been reviewing and improving security offering employees and passengers a measure of comfort and safety. The use of electronic surveillance on buses and at transit facilities, introducing rules of the conduct for transit passengers and introducing transit security and policing policies have become a priority with most transit agencies.

Transit facilities including terminals, bus stops and waiting areas can be designed following CPTED (Crime Prevention through Environmental Design) strategies. These strategies include natural surveillance, natural access control, territoriality, activity support and maintenance, defining the ownership of an area, increasing security by placing physical features, activities and people to maximize visibility in an area and maintaining the area in good repair to reduce the likelihood of criminal activity and convey a sense of security.

"CPTED is a proactive design philosophy built around a core set of principles that is based on the belief that the proper design and effective use of the built environment can lead to a reduction in the fear and incidence of crime as well as an improvement in the quality of life. CPTED goes well beyond conventional approaches to safeguarding the environment by exploiting natural forms of surveillance, access control and territorial reinforcement in a deliberate attempt to present psychological deterrent for the purpose of positively influencing human behaviour as people interact with the environment."

- CPTED Ontario

6.2.17 Other Initiatives

There are many other initiatives to improve transit service and increase ridership.

"Yield to Bus" Legislation

Yield to Bus legislation requires traffic to yield to transit vehicles entering traffic from bus stops improving service reliability and reducing accidents involving transit vehicles and other traffic.

Yield to Bus legislation is now in place in a number of provinces including Ontario, British Columbia, Quebec and Nova Scotia.



Figure 34: Yield to Bus Sign

Cars for Transit Passes Program

Programs such as the "Retire Your Ride" and B.C.'s "Scrap-it" programs offer individuals incentives such as transit passes, bicycles, car sharing memberships and cash to retire older high polluting vehicles.

"Guaranteed Ride Home" Program

A "Guaranteed Ride Home" program is a transportation demand management measure designed as an incentive for commuters to use other modes of transportation such as walking, cycling, carpooling, vanpooling or transit. These programs can be offered by the transit agency and/or employers. The program guarantees that if employees are unable to take their usual mode home for unforeseen reasons such as some emergency or unexpected overtime, they will have access to other travel options such as a subsidized taxi ride home.

Individuals can register with the program providing their usual commute information or employers can register for employees who use an alternate mode of transportation to the automobile for all or a portion of their commute.

Programs provided by the transit agency can be offered in a variety of ways and limited to a small number of times of use a year. A "Guaranteed Ride Home" program is especially attractive to customers traveling from outlying areas where transit service may be infrequent and/or ends in early evening. Since use of a "Guaranteed Ride Home" program is seldom used, it is inexpensive to operate while offering customers the assurance that they will have a travel option should they be unable to use their regular mode of transportation.

"Request Stop" Program

A "Request Stop" program offers any transit customer feeling vulnerable the opportunity to disembark the bus at a location other than a designated bus stop if they make a request to the bus operator. The program is usually in effect during evening hours only. The bus operator will oblige the request provided the operator can stop safely. This program improves safety for passengers by reducing their walking distance, especially at night.

Bus Stop Announcements

Stop announcements can be made either by the bus operator or in conjunction with a GPS or AVL system. Major stops and transfer points are announced on the bus improving the transit experience and reducing uncertainty for passengers, particularly those with visual impairment and travelers to new destinations.

Real-Time Bus Arrival Alert

A real-time bus arrival alert system delivers text messages to transit users notifying them of the arrival time of their bus. Alerts are up-dated in the case of bus delays. A real-time bus arrival alert system improves customer satisfaction, reduces uncertainty and improves security by reducing waiting times.

Customer Loyalty Programs

Many transit agencies offer loyalty programs to reward regular transit users and attract new customers. These can range from discounted fares for bulk tickets and monthly bus passes to free transit days or award programs such as the Air Miles reward miles program offered by Metrobus in St. John's.

Transit Tax Credit Program

Increasing the use of public transit helps ease traffic congestion and reduce air pollution. To encourage greater use of transit, reduce traffic congestion and air pollution, and help make transit more affordable, the Government of Canada launched a non-refundable tax credit on July 1, 2006. Some provinces including Nova Scotia offer a provincial transit tax credit as well.

Transit agencies can use value of the Transit Tax Credit Program to transit users in marketing their service.

6.3 Parking and TDM

There are approximately 3,500 parking spaces on Campus and another 1,300 on the periphery and in locations adjacent to the Health Sciences complex. With a student population of just under 15,000 and a faculty and support staff of some 4,100 employees parking is in high demand on the MUN Campus.

Table 14: Parking throughout MUN Campus

Type	Organization	Number of Spaces
Permit Parking	MUN	2807
Pay & Display Parking	MUN	438
Metered Parking	MUN	242
Private Parking	MUN	207
	Total MUN	3694
Surface Parking	Eastern Health Centre	1907
Surface Parking	MUN Private	185

As part of most TDM programs, parking is typically priced as a parking management strategy to reduce parking problems in specific areas or as mobility management strategy to help reduce the vehicle trips in an area. It can also be priced to recover capital costs for new parking facilities over prescribed time periods. The table above, reflects the parking after Lot 16 was removed to make way for the construction of the Core Science Facility.

6.3.1 Costs of Parking on Campus

While there are slight variations in the cost of parking between different parking lot facilities on Campus, it should be highlighted that the overall cost of parking on Campus is well below what would be considered a reasonable market rates. The cost for a student parking permit is very low relative to demands. Students typically have to be in their second year and have to enter a draw to obtain a parking permit. The cost of parking for staff and faculty are slightly higher. These rates do not cover the maintenance and operations cost of existing parking, nor do they cover the capital expense of constructing parking spaces.

6.3.2 Collective Agreements

As part of the MUNFA collective agreement, each academic staff member is entitled to one parking space with reasonable walking distance of his or her office. Rates are tied to previous years and increases in rates are limited to prescribed amounts on a yearly basis. Similarly, the CUPE 1615 agreement also restricts the extent to which parking fees can be increased; limiting the yearly increases to the consumer price index.

The low cost of parking on Campus and the inability of the staff to easily change that because of the collective agreements encourages the single occupant vehicle use and a whole range of related problems that go along with that including peak hour traffic congestion, low transit usage, and pedestrian safety concerns.

Memorial University needs to completely separate parking from their collective agreements. In doing so, they will be able to increase rates and influence the transportation choices the students and staff and faculty members make on a daily basis. Parking pricing is an integral component of any successful TDM strategy.

6.3.3 HOV Priority

High Occupancy Vehicle (HOV) priority refers to strategies that give priority high occupant vehicles, including transit buses, vanpools and carpools. While many of the strategies provide operation advantages to HOV vehicles, there are also parking strategies that can be utilized to encourage ridesharing including parking discounts and preferred parking locations.

6.4 Cycling/Walking and Active Transportation

6.4.1 Cycling Plan

In 2010, the City of St. John's started to implement the first phases of its cycling master plan. Although not as robust as plans presently in place in other major centres throughout Canada it is a start and provides a foundation upon which to expand.

6.5 Study Area TDM Strategies/Recommendations

Strategy 1: Partnerships to promote sustainable transportation and awareness of the benefits of public transportation.

The Health Sciences Center, Memorial University and Provincial Departments located at the Confederation Building in St. John's to partner with Metrobus in encouraging greater use of public transportation bus their students and employees as part of their sustainability initiatives.

Strategy 2: Improve transit facilities to improve bus access and customer amenities using transit-friendly design guidelines.

Bus passenger pick-up and drop-off locations serving Memorial University are located at the bus terminal on Artic Avenue, and stops on Westerland Road and Elizabeth Avenue. Stops on Clinch Crescent serve the Health Sciences Center and the Confederation Building is served with a stop at the main entrance adjacent to Prince Phillip Drive and bus stops along Allandale Road.

Thirteen (13) bus routes serve Memorial University at the Artic Avenue terminal, two (2) routes serve the university along Elizabeth Avenue, six (6) Routes serve the Health Sciences Center and three (3) routes serve the Confederation Building.

The Artic Avenue terminal in particular lacks adequate room for bus pick-ups and drop-offs. During peak travel times, as many as five (5) buses can be in the terminal at one time. Space for passenger pick-ups and drop-offs is only available on one side of the street requiring buses travelling routes that provide service in both directions to circle the building to continue the route. This, combined with parked vehicles and automobile traffic, creates unsafe conditions for passengers boarding and exiting buses. All three locations

require improvements to bus access and boarding and drop-off areas, appropriate waiting areas, bus shelters, walking and bicycle paths and bike racks and storage.

Strategy 3: Partnerships to promote active transportation initiatives.

Active transportation and transit complement each other and encourage a multimodal lifestyle. Every transit trip starts and ends with another mode of transportation with the bus user traveling to and from a bus stop by walking, cycling or using a mobility device such as a wheelchair or motorized scooter. Metrobus vehicles are all accessible low floor vehicles. Metrobus is now in the process of tendering for bicycle racks for all transit buses. Memorial University, the Health Sciences Center, and the Provincial offices located in the Confederation Building should promote public transit a part of their active transportation initiatives. The development of good walking and cycling paths to transit terminals and the installation of bicycle racks and storage will encourage greater opportunities for combining active transportation options with public transit.

Strategy 4: Develop parking policies that encourage greater transit use.

There is a strong relationship between parking availability, parking rates and transit use. Memorial University, the Health Sciences Center and the Provincial Departments at the Confederation Building should review their respective parking policies to reduce competitiveness with public transit. Measures could include ensuring parking rates are near or above the cost of a monthly transit pass, subsidizing transit passes for employees in lieu of parking and limiting parking duration. The introduction of a U-Pass and/or EcoPass program would be an excellent opportunity to introduce revised parking policies.

Strategy 5: Investigate the use of transit priority measures to reduce transit travel times and improve schedule adherence and on-time performance.

The installation of transit priority signals, queue-jump lanes and other transit priority measures improve travel times and on-time performance making bus travel more competitive to automobile travel times along the same route. Metrobus has looked at a number of intersections where transit priority signals would improve the transit service. In particular, intersections along Prince Phillip Dr. should be considered for priority signals and queue-jump lanes. Transit priority signals at Prince Phillip Road and Clinch Crescent/Westerland Road, Prince Phillip Drive and Morrissey Road, Prince Phillip Drive and Portugal Cove Road have all been identified as intersections where transit service would benefit from transit signal priority measures.

Strategy 6: Use Intelligent Transportation Systems to improve transit service.

Intelligent Transportation Systems such as Automated Fare Collection, Automated Vehicle Location, Transit Trip Planner and Real-Time Passenger Information Systems provide important information to both transit users and transit planners and dispatchers.

Strategy 7: Establish a U-Pass program for full-time Memorial University students and an EcoPass program for Memorial University faculty and employees and employees at the Health Sciences Center and Confederation Building.

U-Pass programs established in other universities have seen significant increases in student use of public transit. Improved transit service funded by a U-Pass program not only benefits students but all transit customers. Metrobus is undertaking an initiative to negotiate a U-Pass program with Memorial University in the coming months.

The study area is a major employment node in the City of St. John's. The development of an EcoPass program for faculty and employees of Memorial University and employees of the Health Sciences Center and Confederation Building would increase transit use in the area. The introduction of a U-Pass program for Memorial University students and an EcoPass program for employees would be a major incentive for increased transit use in the area, transit use in the area would see significant increases.

Strategy 8: Develop a "suite" of service delivery options for public transit.

One of the challenges to providing effective public transportation is meeting the diverse needs of its customers. Commuters, students, seniors, persons with limited mobility, all have different lifestyles and travel for different reasons. By developing a "suite" of service delivery options, the transit system can meet many of these needs. Metrobus has recently introduced two morning express trips to the study area and have plans for four (4) community transit routes, one of which will serve the study area. Increasing express bus service during peak travel times, developing park and ride sites with direct, limited stop service to the area and implementing accessible transit routes would encourage greater travel use.

Strategy 9: Adding value to the transit experience

Providing programs such as "Guaranteed Ride Home" and "Request Stop" programs and stop announcements provide extra value to the transit customer. Metrobus now offers the Air Miles rewards miles program to customers using the Metrobus M-Card fare payment system and a "Request Stop Program" during evening service.

Strategy 10: Develop park-and-ride sites strategically located at the periphery of the urban core with express bus service into the study area.

The need for public transportation extends beyond the metropolitan area and into neighbouring and smaller communities. Developing park-and-ride facilities at the periphery of the urban core with express service to major destinations can extend the reach of the transit service. Sites to consider would be park-and-ride facilities to capture commuters from Conception Bay South, Paradise and Mount Pearl.

7 Crosswalks & Pedestrian Safety

As with any university campus, the main method of travel throughout the campus is walking. Throughout the study area, there are over 70 pedestrian crosswalks, some at signalized intersections and others at mid-block crossings. Some of the crosswalks are across high vehicular corridors with high speeds. Eight different locations were identified throughout the study network with high vehicular volumes and speeds and also have a high volume of pedestrians crossing at these specific locations. These eight locations were assessed using the TAC – Pedestrian Crossing Control Guide as discussed below in Section 7.1. Other crosswalks throughout the MUN Campus have a high volume of pedestrians, however are more internal and on internal roadways. A total of 14 locations were selected for crosswalk assessments and is discussed below in Section 7.2.

7.1 Pedestrian Crossing Control Assessments

There are eight crosswalks throughout the MUN Campus that are extremely busy with pedestrian traffic as well as vehicular traffic. Traffic and pedestrian counts were collected at eight intersections, by HTC, to complete a pedestrian crossing control assessment and determine the adequate pedestrian crossing control at each location. The detailed pedestrian counts can be found in Appendix A. The crosswalks listed below were counted and are shown in Figure 35 with respect to the MUN Campus.

- | | |
|-------------------------------------|---|
| 1 Clinch Crescent/Bridge | 5 Elizabeth Avenue/Newtown Road |
| 2 Arctic Avenue/Kerwin Place | 6 Elizabeth Avenue/Rodney Street |
| 3 Westerland Road/Pedagogue's Close | 7 Livyer's Loop |
| 4 Westerland Road/Lambe's Lane | 8 Allandale Road/Civic Address #84 – 86 |



Figure 35: Crosswalks throughout the MUN Campus

Each of the crosswalk locations mentioned above were analyzed using the TAC – Pedestrian Crossing Control Guide, this included the following minimum requirements/parameters to continue with the crosswalk assessment:

- Greater than 15 EAU's (Equivalent Adult Units)
- A minimum of 100 pedestrians over a 7-hour continuous counting period
- A minimum of 1,500 vehicles per day.

If all of the above requirements were met, the assessment continued to analyze the average daily traffic and speed limit of the roadway with the total number of lanes the pedestrians would be crossing. From the analysis, three treatment selections were selected for the above intersections and descriptions can be found below:

- Ground Mounted System – There are two options with this type of system, one includes having a crosswalk with side-mounted signs and the second option is to have a crosswalk with overhead-mounted signs. Neither option has a flashing beacon or a push-button application.
- Overhead Flashing Beacon System – This system is considered to be a special crosswalk due to the overhead mounted system with flashing beacons and push-button application.
- Traffic Signal Systems – This system provides pedestrian crossing opportunities using traffic signals (red, amber, green).

Discussion of the Results

After completing a pedestrian count and assessment at each of the pedestrian crossings, three things were common at each pedestrian crossing:

- a. All eight pedestrian crossings zebra crosswalk markings were either completely worn away or barely visible to both the pedestrians and motorists. These should be replaced/repainted at each pedestrian crossing.
- b. WC-2 signs should be placed on each approach in advance to the pedestrian crossings to warn/advise the motorists of a crossing ahead.
- c. At the locations where there are yellow or red flashing beacons, they must be removed as they are not part of any code or regulation.

Six pedestrian crossings warranted a ground mounted system with side mounted signs:

- | | |
|--|---|
| • 2 Arctic Avenue/Kerwin Place | • 5 Elizabeth Avenue/Newtown Road |
| • 3 Westerland Road/Pedagogue's Close | • 6 Elizabeth Avenue/Rodney Street |
| • 4 Westerland Road/Lambe's Lane | • 7 Livyer's Loop |

One pedestrian crossing warranted a Ground Mounted System with an overhead mounted signs:

- **1** Clinch Crescent/Bridge

One pedestrian crossing warranted an Overhead Flashing Beacon System:

- **8** Allandale Road/Civic Address #84 – 86

Please note that the above pedestrian controls are the minimum requirements at these specific locations. If the existing pedestrian crossing control is a higher pedestrian crossing control which is deemed adequate.

7.2 Crosswalk Assessments

The study team reviewed the crosswalks throughout the MUN Campus and 14 crosswalks were selected to have a crosswalk assessment completed to determine any deficiencies. The 14 locations are identified on Figure 36 (A through N) and the detailed results can be found in Appendix A.

- | | |
|--|---|
| A Clinch Crescent/Mosdell Road | H Livyer's Loop #3/Phelan Road |
| B Clinch Crescent/North Parking Lot | I Livyer's Loop #4 |
| C Clinch Crescent/Arctic Avenue | J Burton's Pond Road/Phelan Road |
| D Irwin's Road | K Burton's Pond Road #4 |
| E Irwin's Road under the overhead walkway | L Burton's Pond Road #3 |
| F Loop off of Elizabeth Avenue | M Burton's Pond Road #2 |
| G Livyer's Loop #2 | N Burton's Pond Road #1 |



Figure 36: Overall Layout of Crosswalk Assessments

Discussions of the Results

The 14 crosswalk locations were assessed with the following parameters:

- Pavement Markings
- Wheelchair Accessibility
- Signage
- Stopping Sight Distance
- Street Lighting
- Parking
- Overall conditions

The above findings are detailed in Appendix A for each crossing and Table 15 below summarizes the findings.

Table 15: Pedestrian Crossing Summary

Items that require attention	Clinch Crescent / Mosdell Road	Clinch Crescent / North Parking Lot	Clinch Crescent / Arctic Avenue	Irwin's Road	Irwin's Road under the overhead walkway	Loop off of Elizabeth Avenue	Livyer's Loop #2	Livyer's Loop #3 / Phelan Road	Livyer's Loop #4	Burton's Pond Road / Phelan Road	Burton's Pond Road #4	Burton's Pond Road #3	Burton's Pond Road #2	Burton's Pond Road #1
Pavement Markings														
Zebra Pavement Markings	A	B	C	D		F	G	H	I	J	K		M	N
Vehicular Pavement Markings	A	B	C	D		F	G	H	I	J	K	L	M	N
Remove "X's" at crosswalks				D							K	L	M	N
Wheelchair Accessibility														
No Low Back Curb		B							I					
Rough Asphalt	A													
Signage														
Needs signage	A			D	E				I		K	L	M	N
Needs to be replaced								H						
Needs to be double sided		B		D	E			H	I		K	L	M	N
Remove Flashing Beacons			C	D		F		H				L		N
Signage not required			C			F	G			J				
Stopping Sight Distance														
Objects blocking the view of crosswalk								H			K			
Crosswalk near a bend in the road	A	B			E				I			L		N
Hill near crosswalk				D										
Street Lighting														
Lighting on one side of the road	A					F		H						
No lighting		B			E					J				

As shown above in Table 15, 12 of the 14 crosswalks require the pavement markings to be re-painted and the other deficiencies, noted above, require attention.

7.3 Internal Network

There are various pedestrian paths throughout the MUN Campus involving underground pedestrian tunnels, pedestrian overhead walkways and exterior sidewalks. Most of the MUN Building network is connected with either an underground or overhead walkway however the new residences, as well as the residences around Burton's Pond Road, are only connected via sidewalks. Therefore, the only way for students in those residences to get to class is to navigate through the exterior MUN Network.

7.3.1 Livyer's Loop

Two new residences were constructed over the past couple of years, West Wing and East Wing on Livyer's Loop, each housing 250 students. This creates an addition of students, on top of the original 2,000, travelling to class throughout the day. Most students travel outdoors, use the sidewalks and crosswalks to create the most direct path to class. This in turn requires students to cross multiple roadways to get to their destination.

During the construction of these new residences, a portion of Livyer's Loop was designated a one-way only street, from Irwin's Road to the Doyle Residence. This controls the traffic flow and direction of the vehicles that are driving internally, either accessing parking lots for the buildings or residences. The only access point onto Prince Philip Drive would be a right-turn from Livyer's Loop by the Bowater Residence. Keeping Livyer's Loop as a one-way section for the portion mentioned above would reduce the amount of vehicles using the MUN Campus as a shortcut route.

7.3.2 Burton's Pond Road

Burton's Pond Road currently operates as a two-way road system with an access point on Allandale Road and two access points along Elizabeth Avenue. Burton's Pond Road has multiple parking lots for the residences, as well as a larger parking lot to access various buildings along Elizabeth Avenue. Therefore, there are vehicles entering this network at all times during the day.

The apartment style residences are also along this corridor and the only path to class for these students is to travel outdoors along the sidewalks, due to their being no tunnel system on this part of campus. There are various crosswalks along Burton's Pond Road that are marked with RA-4 signs and zebra marked crosswalks. However, throughout the winter these crosswalks wear away from the vehicle traffic and the snowplows, limiting visibility. Signage is required at the crosswalks along Burton Pond Road to warn motorists that they are approaching a crosswalk.

7.4 Pedestrian Safety

7.4.1 Roundabouts

Roundabouts significantly reduce the speed on the roadway, which in turn reduces the amount of road user collisions and also reduces the number of conflict points between pedestrians and vehicles from 24 to 8. Due to the reduction of conflict points and a slower speed travelling through the roundabout the likelihood of a pedestrian/vehicle injury is significantly less. Figure 37 shows the reduced conflict points between vehicle to vehicle as well as vehicle to pedestrian.

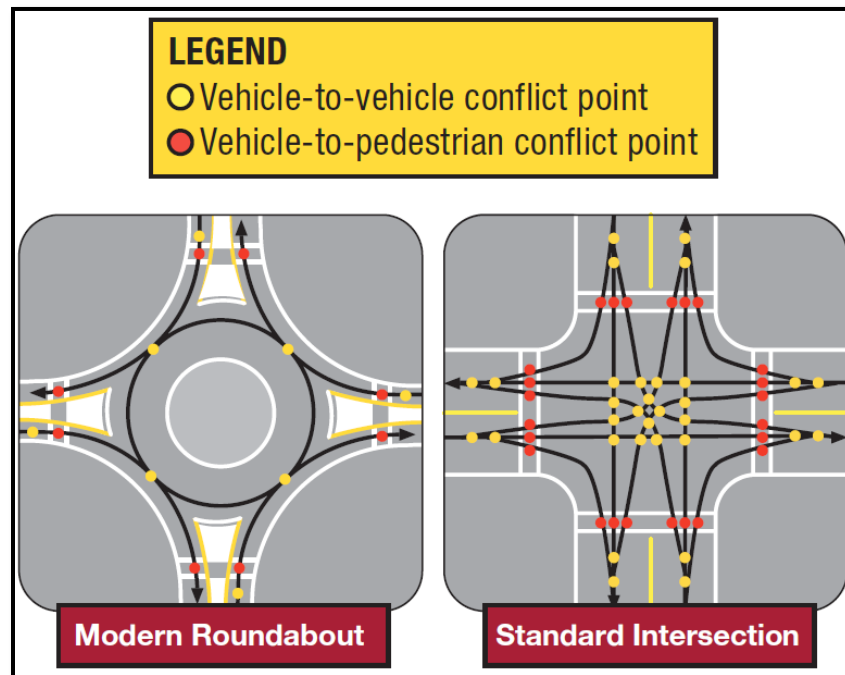


Figure 37: Conflict Points

7.4.2 Curb Extensions for Pedestrians

When vehicles are parked on the road, approaching vehicles have an obstructed view of the pedestrians waiting to cross the road. A curb extension is a traffic calming measure that extends the curb so that the approaching vehicle can see the pedestrian waiting to cross. This allows for the pedestrian to make eye contact with the driver and also reduces the crossing distance. Figure 38 shows an example of a curb extension.

There are three (3) main roadways throughout the MUN Campus that have adjacent parking on the street and it is recommended to install curb extensions:

- Westerland Road
- Burton's Pond Road
- Phelan Road



Figure 38: Curb Extensions with on-street parking

7.4.3 Pedestrian Tunnels and Pedways

Prince Philip Drive is a high traffic volume 70 km/hr roadway that runs in an east/west direction through the center of the MUN campus. This roadway has caused many problems in the past with pedestrian safety. There are a number of pedestrian skywalks and tunnels that run across this roadway at the present time; one of which was just recently removed from service. Despite the availability of these grade separated walkways there remain two pedestrian routes that are still concerning.

The intersection of Morrissey Road and Prince Philip Drive is a signalized intersection at the present time. This traffic signal does provide a protected walk phase and signal indications for pedestrians crossing Prince Philip Drive in the north/south direction. Despite the protected pedestrian phase that has been incorporated within this traffic signal there remain conflicts and near misses at this location. The existing pedestrian tunnel near St. John's College has recently been upgraded to provide a usable grade separated link in this area of campus. A new multi-use underpass on the Morrissey to Livyer's alignment should be investigated as part of this closure of this intersection. This underpass may also be able to serve smaller maintenance vehicles.

The intersection of Westerland Road and Prince Philip Drive also handles a fair amount of pedestrian traffic as part of the traffic signal system present at this intersection. These crossings are accommodated along with the heavy traffic volumes present at this intersection which again is somewhat concerning. HTC is suggesting consideration be given to installing a series of skywalks that would link the Education building to the new Core Sciences building, the Core Sciences building to the parking garage structure and the parking garage structure to the Health Sciences Complex. Care should be taken to ensure the connection

at the Education Building is also accessible from street level. Please see Figure 40 and drawing SSK-16 in Appendix C for the suggested routing.

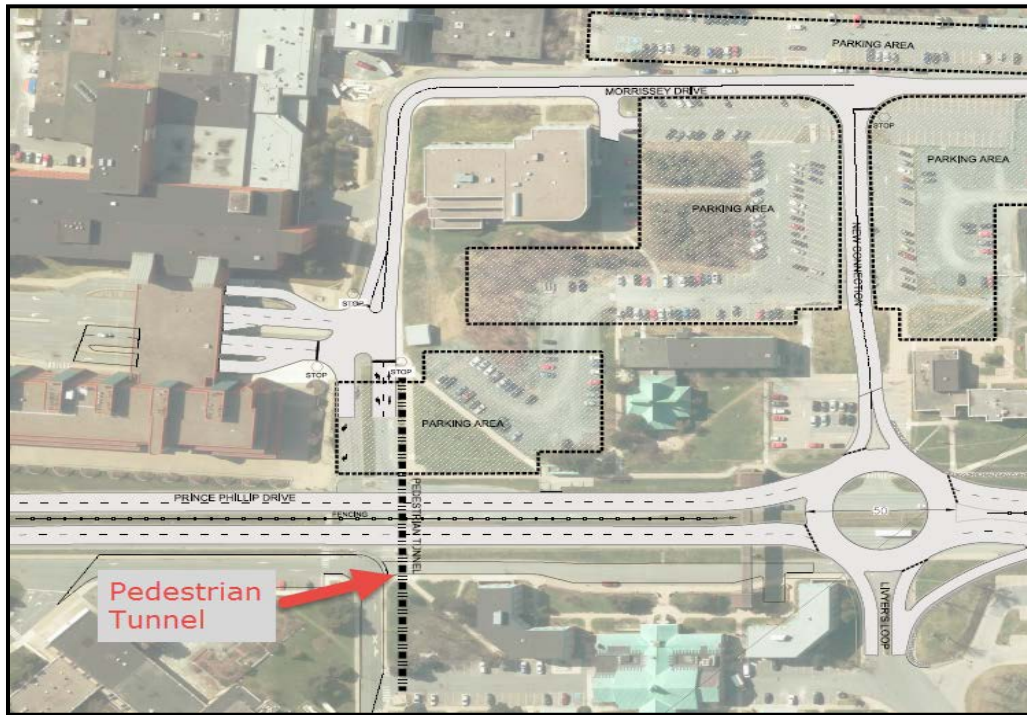


Figure 39: Pedestrian Tunnel – Morrissey Road @ Prince Philip Drive



Figure 40: Pedestrian Skywalks – Westerland Road Area

7.5 Crosswalk Design

7.5.1 Pavement Markings

The existing pavement markings at the crosswalks throughout campus fade every year, especially throughout the winter and need to be re-painted in the spring/summer. Pavement markings for crosswalks are crucial for allowing the vehicular traffic to identify the crosswalks and the adequate measures that need to be taken, such as stop bars and no passing lane.

A common application being used today, are Inlaid Thermoplastic Crosswalks. This application provides a high skid/slip resistance to ensure safety of pedestrians in slippery conditions, require low maintenance, and are snowplow friendly as the material sits slightly below the asphalt surface. Multiple patterns can be designed to allow for high visibility to both the pedestrian and traffic.



Figure 41: Inlaid Preformed Thermoplastic Crosswalks

7.5.2 Signage

All crosswalks will be clearly marked with the proper signage as indicated above in Section 7.1, as well as have adequate lighting to ensure visibility of the pedestrians. Each sign should have adequate retro-reflectivity with the proper sheeting to guarantee 10 years. After the warrantee is surpassed, a reflectometer shall be used to determine if the sign needs to be replaced. Some examples of signs are shown below in Figure 42.



Figure 42: Typical Signage for Pedestrian Crosswalks

7.6 Crosswalk & Pedestrian Safety Recommendations

7.6.1 Crosswalk Recommendations

The study team completed 8 pedestrian crossing control assessments and 14 crosswalk assessments throughout the MUN Campus. Based on the 8 pedestrian crossings, the following should be applied at the identified locations:

The following pedestrian crossings require the minimum of a ground mounted system with side mounted signs:

- Arctic Avenue/Kerwin Place
 - Requires signage
- Westerland Road/Pedagogue's Close
 - This intersection has been upgraded since the assessments were completed. This crossing now has curb extensions, proper signage and new push button RRFB system.
- Westerland Road/Lambe's Lane
 - This intersection has been upgraded since the assessments were completed. This crossing now has curb extensions, proper signage and new push button RRFB system.
- Elizabeth Avenue/Newtown Road
 - This intersection currently has an Overhead Flashing beacon as the pedestrian crossing control, which is adequate.
- Elizabeth Avenue/Rodney Street
 - This intersection currently has an Overhead Flashing beacon as the pedestrian crossing control, which is adequate.
- Livyer's Loop
 - Requires signage

The following pedestrian crossings require the minimum of a ground mounted system with an overhead mounted signs:

- Clinch Crescent/Bridge
 - This crossing location requires the installation of the overhead mounted sign system.

The following pedestrian crossings require the minimum of an overhead flashing beacon system:

- Allandale Road/ Civic Address #84/86
 - This location currently has a half signal crossing and is adequate for this location.

The study team complete 14 crosswalk assessments and identified the deficiencies at each individual location. The following items should be addressed such as pavement markings, wheelchair accessibility, signage, stopping sight distance and street lighting.

A common trend was that the pavement marking were barely visible and required re-painting as well as signage was missing at most of the pedestrian crossings. HTC recommends the following at all crosswalks throughout the MUN campus, not just the 22 that were assessed:

- Re-painting the zebra crosswalk markings (Inlaid Thermoplastic Crosswalks)
- WC-2 signs should be placed on each approach to pedestrian crossings
- Removal of red and/or amber flashing beacons
- All signage should be inspected for retro reflectivity

7.6.2 Curb Extension Recommendations

HTC reviewed the road network throughout the MUN campus and identified the locations where there is on-street parking and pedestrian crossings. There are 3 main roadways that have adjacent parking on the street and it is recommended that curb extensions be placed along the following roadways:

- Westerland Road
 - Currently installed.
- Burton's Pond Road
- Phelan Road

8 Campus Specific Issues

8.1 Campus Master Plan/Assessment

In 2007 Memorial University released the Memorial University of Newfoundland St. John's Campus Master Plan (CMP). This chapter reviews the transportation recommendations from the CMP, discussing the recommendations that have been implemented, as well as those that remain to be addressed. Following this review is a commentary regarding the compatibility of the MUN Area Traffic Study to the CMP.

The CMP proposed a set of strategies to rationalize transportation access and circulation patterns within the Campus to foster a better balance between vehicular, transit and pedestrian movement between the Campus and the city of St. John's. The Master Plan is based on the premise that parking should not drive plans for expansion and modernization, and that a proactive approach to transportation improvements must be taken. Key transportation themes from the CMP have been derived from Sections 1.5 Campus Planning Principles (pg. 18 to 20), 1.6 Campus Community Consultation (pg. 22 to 24) and 2.2 Key Structuring Elements of Campus Development (pg. 38 to 52) of the CMP. These themes include:

1. **The Campus should be welcoming and accessible and emphasize its setting in Pippy Park and the City of St. John's:**

The Campus should be perceived as a year-round welcoming environment providing ease of orientation and clearly marked access to student and visitor services, recreational facilities and other community use facilities. Improved gateways should be considered to better mark one's arrival to the Campus through their presence at its edges.

The University's civic role and stewardship in the community also require that the campus edges positively interface with the surrounding community and Pippy Park. The setting, scale and design of new buildings, the development of outdoor spaces and circulation networks should be integrated with the surrounding community.

2. **The Campus should be pedestrian-friendly and encourage a balance among transportation modes:**

Over time, the campus should rationalize vehicular accesses to limit opportunities for conflicts between pedestrians and vehicles, redesign parking lots to limit their visual impact, strengthen pedestrian routes and in general encourage transit and carpooling.

3. **The Campus should be accessible to all:**

All development and redevelopment on campus should seek to improve accessibility to students, staff, faculty and visitors with a broad range of disabilities. This includes barrier free access along pathways and to primary building entrances, 'desire lines' that cross parking and grassed areas, improved lighting and wayfinding, and the creation of clear, legible and continuous outdoor pedestrian networks.

4. The Campus transportation network should promote sustainability:

The University is committed to becoming a model of environmental responsibility through an enhanced focus on public transit, pedestrian and cycling facilities, compact development and residences and services within walking distance as a means for reducing automobile use both on

5. A Reconfigured Campus Road Network

Access to the Campus is primarily by private automobile. The road configuration on Campus promotes conflicts between pedestrians and vehicles, and access from public roads, particularly at the Prince Philip Drive intersections, resulting in congestion, stacking issues and occasional accidents.

The internal roadway system of the University should have the following characteristics:

- Low traffic volumes assisted by parking provisions provided at the perimeter of Campus;
- Clear, consistent wayfinding signage;
- Well-signed, visible pedestrian crossings identified by feature paving indicating pedestrian priority at all intersections;
- The ability to accommodate cyclists and parking at building entrances and where feasible, within buildings in dedicated security monitored areas;
- Low traffic speeds, reinforced by incorporating metered parking as a natural deterrent to speeding or other traffic calming measures if necessary;
- The provision of adequate bus stops and associated waiting areas throughout campus; and
- Well-lit, frequently located emergency call kiosks.

6. A Balanced Parking Strategy

Surface parking lots are dispersed in large and small lots throughout the University Campus with the larger lots typically adjacent the Campus perimeter roads, including Elizabeth Avenue, Prince Philip Drive and Westerland Road.

A key principle underlying the CMP's parking plan recommendations is that parking provisions should not be allowed to grow faster than the campus population. Parking provisions should not be solely based on need resulting from an increased campus population, but instead met through a variety of expanded opportunities, including transit, carpooling, walking and cycling to campus. The CMP focuses parking on the periphery of the Campus in a combination of below grade garages and a well-designed structured and surface parking.

The items noted below identify the CMP transportation recommendations and status of implementation.

**Master Plan Direction
Section 5.3 (Access and Circulation)**

5.3.1 Sidewalk Design

To enhance pedestrian access and safety as well as snow storage, sidewalks in the range of 2.0 to 6.0 meters should be specified as campus streets are rebuilt.

Walkways:

The following is the recommended palette of materials and colours:

Primary Walkways (Major north-south, east-west connections):

- Minimum 6.0 m wide to accommodate emergency and service vehicles;
- High quality easily recognizable paving materials such as, unit pavers, natural stone, concrete paving;
- Unit pavers minimum 60 mm unit thick in areas of exclusive pedestrian use. Install on concrete base or use 70 mm to 80 mm thick pavers where paving will sustain vehicular use; and
- Specify textured surfaces to reduce slipping.

Secondary Walkways (Building to building connections):

- Minimum 3.0 m wide. High quality unit pavers.

Tertiary Walkways:

- Minimum 2.0 m wide;
- Unit pavers or natural concrete paving with broom finish;
- Location to be measured against overall plan; and
- Location to respond to path of desire.

Streetscape Paving:

- Minimum 2.0 m wide high quality concrete paving, natural colour, broom finish. Areas of enhanced paving to be unit paving or natural local stone.
- Crosswalks to be paved with texturized, interlocking unit pavers.

Status: As roads are rebuilt the University should increase the minimum width of sidewalks to 2.0 meters with larger sidewalks located along primary roads with a set back from the curb.

Implementation Recommendations: Walkways should be implemented in the following hierarchy of priority:

- Primary Streets (Prince Philips Drive, Elizabeth Avenue, Westerland Road, Allandale Road and Arctic Avenue);
- Primary pedestrian walkways along Phelan Road and Livyer's Loop
- Secondary walkways between buildings; and
- Tertiary walkways.

Wherever unit pavers are prescribed a concrete sub-base is preferred. Asphalt or natural brushed concrete are alternatives.

5.3.2 Crosswalk Design

The CMP identifies the need to improve pedestrian crossings at intersections including clear pavement marking and signage, adequate lighting, as well as textured and coloured pavement at crossings to clearly signal these areas to both pedestrians and motorists.

The use of feature paving or where necessary the use of raised crosswalks should be considered to slow traffic and enhance pedestrian safety and security. These crosswalks should only be implemented on internal campus streets so that transit services are not negatively impacted.

Curb cuts should be included at all crossings, to promote universal accessibility with detectable warning plates.

Pedestrian call buttons at crosswalks should be located to be accessible even in periods of high snow accumulation. As the crosswalks are to be reconstructed to provide additional priority, the call buttons should be relocated to separate poles placed back from the road. This would also benefit users in wheelchairs throughout the year.

Status: Aside from curb cuts at most intersections none of these improvements have been implemented to date.

As part of the Traffic Area Study pedestrian counts were conducted at the following eight crosswalks:

1. Clinch Crescent/Bridge;
2. Arctic Avenue/Kerwin Place;
3. Westerland Road/Pedagogue's Close;
4. Westerland Road/Lambe's Lane;
5. Elizabeth Avenue/Newton Road;
6. Elizabeth Avenue/Rodney Street;
7. Livyer's Loop; and
8. Allandale Road/Civic Address #84-86.

It was noted that three things were in common at each of the pedestrian crossings:

1. All crosswalks require replacing/ repainting;
2. WC-2 (Pedestrian Crossing Ahead signs) should be placed on each approach in advance to the pedestrian crossings to warn/advise the motorists of a crossing ahead; and

At the locations where there are yellow or red flashing beacons, they must be removed as they are not part of any code or regulation.

Implementation Recommendations: Improving crosswalks at the intersections with the highest pedestrian counts should take priority. As much as possible implementation should be conducted at the same time as road reconstruction.

5.3.3 Drop-off Areas:

A new drop-off and bus stop should be provided at the proposed east wing of the Arts and Science Building where an enclosed common and waiting area will be located. This should replace the existing transit stop at Elizabeth Avenue in front of the Arts and Administration Building. A formal drop-off area should be provided along the circular drive at the front entrance of the Arts and Administration Building.

The area at the Science Building and along Phelan Road should be reconfigured to provide a structured pick-up/drop-off area on the west side, immediately south of the Science parking access route. The Science Building permit parking in the quad should be controlled by an access gate to eliminate the problem of drivers blocking this access while waiting to pick people up.

A drop-off at the north east corner of the INCO Innovation Centre is proposed in conjunction with a limited amount of surface parking to the north at the eastern edge of Memorial Common.

A drop-off at Morrissey Drive at the north end of Long Common should be built.

Drop-offs to new buildings fronting Prince Philip Drive should be provided on Arctic Avenue to the north and Pedagogues Close Extension to the south.

Drop-offs to the new residences west and east of Burton's Pond should be located at the north end of each building along Livyer's Loop and Burton's Pond Road.

Implementation Recommendations: As new buildings are constructed, or existing buildings undergo renovations, drop off areas should be considered as part of site design and built form.

Drop off areas should prioritize barrier free accessibility, weather protection and minimizing walking distance. Traffic flow and the potential conflicts with pedestrians should be considered when selecting the location of drop off areas.

5.3.4 Dedicated right turn lanes

The dedicated (channelized) right turn lanes on Elizabeth Avenue at Westerland Road and Allandale Road should be removed when reconstruction occurs to slow down traffic and provide a more pedestrian-friendly environment.

Status: This recommendation has yet to be implemented.

Campus Edges: Prince Philip Drive

Prince Philip Drive is to be transformed as a landscaped 'parkway' with banner poles and other site furnishings to animate the space.

Status: Street trees, banner poles and site furnishings have not been installed.

A 'green bridge' should be built to extend pedestrian access between new buildings across the Parkway, provide common university space and provide a new landmark gateway structure.

Status: No new pedestrian bridges have been built across Prince Philip Drive since the completion of the CMP.

The chain link barrier is to be replaced by a centre raised median of planted majestic columnar oaks that retain their leaves in winter. The edges of the parkway should allow for cyclists and pedestrians to travel safely within the boulevard between a double row of trees on both the north and south sides of the street.

Status: The chain link barrier has not yet been replaced. Trees have not been planted and the existing 1.8 meter sidewalk widths are too narrow.

Implementation Recommendations: Banners poles and other site furnishings for Prince Philip Drive and other campus roads should be installed as part of an overall streetscape strategy for the University.

Streetscape upgrades for Prince Philip Drive should be built as per the proposed plan and section identified on page 104 of the CMP and shown in Figure 43.

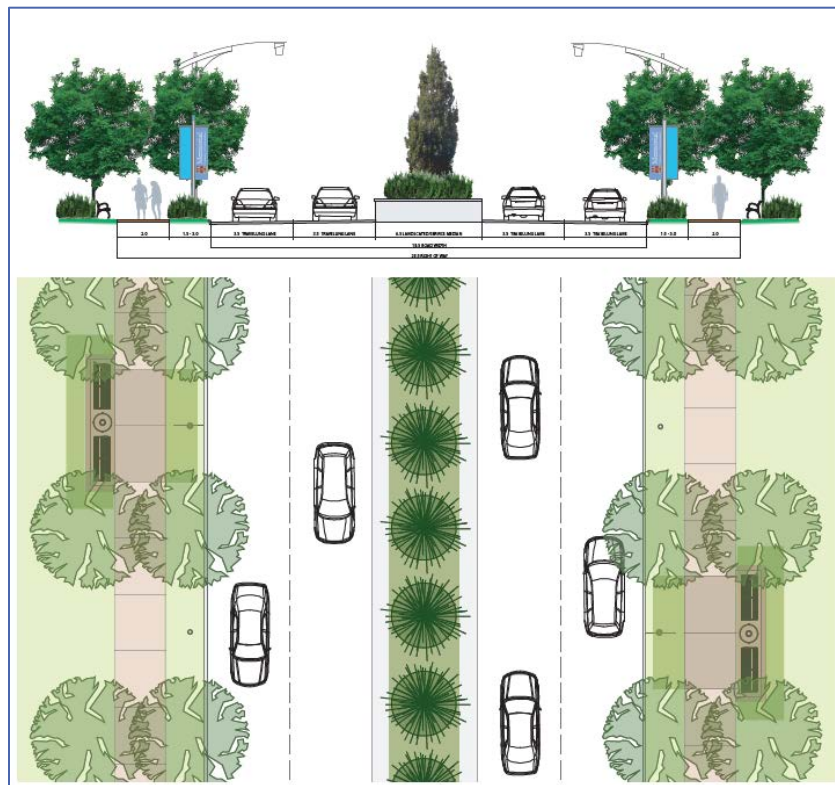


Figure 43: Prince Philip Drive, proposed plan and section from the CMP

Campus Edges: Elizabeth Avenue

Elizabeth Avenue is a residential street that borders the campus along its south side. The broad boulevard on the campus side provides opportunities to enhance the campus image by intensifying the planting and improving the streetscape with a double row of trees and installation of new site furnishings, including university banners, pedestrian-scaled lighting and feature paving.

Status: The University has yet to plant a double row of trees and new site furnishings, including university banners, pedestrian-scaled lighting and feature paving have not been installed.

A widening of Elizabeth Avenue at the University Edge would not only be detrimental to the character of this important gateway to the Campus and walkability along its southern edge, but could create excess

capacity. This would likely attract more demand, potentially involving more traffic infiltration through campus, resulting in a future congestion level that would prompt a need for further road improvements.

Status: To date Elizabeth Avenue has not been widened. The CMP recommendation remains to review alternative options to improving vehicle movement without expanding the width of the roadway.

Prior to proceeding with a widening, it was recommended that the City undertake a broad update of the needs for Elizabeth Avenue, based on updated travel demand forecasts, on an option for a three-lane cross-section. The third turning lane would provide improved storage for vehicles turning at Westerland Road, Russell Road and the proposed north-south road to the western edge of Campus.

The large 10 to 20 meter setback at Elizabeth Avenue should be landscaped to buffer existing and realigned surface parking areas.

Status: The setback has not been landscaped.

Implementation Recommendations: At the very least a double set of trees should be installed on the north side of Elizabeth Avenue. Changes should be designed in concert with the new cross-section.

Streetscape upgrades for Elizabeth Avenue should be built as per the proposed plan and section identified on page 101 of the CMP and shown in Figure 44.

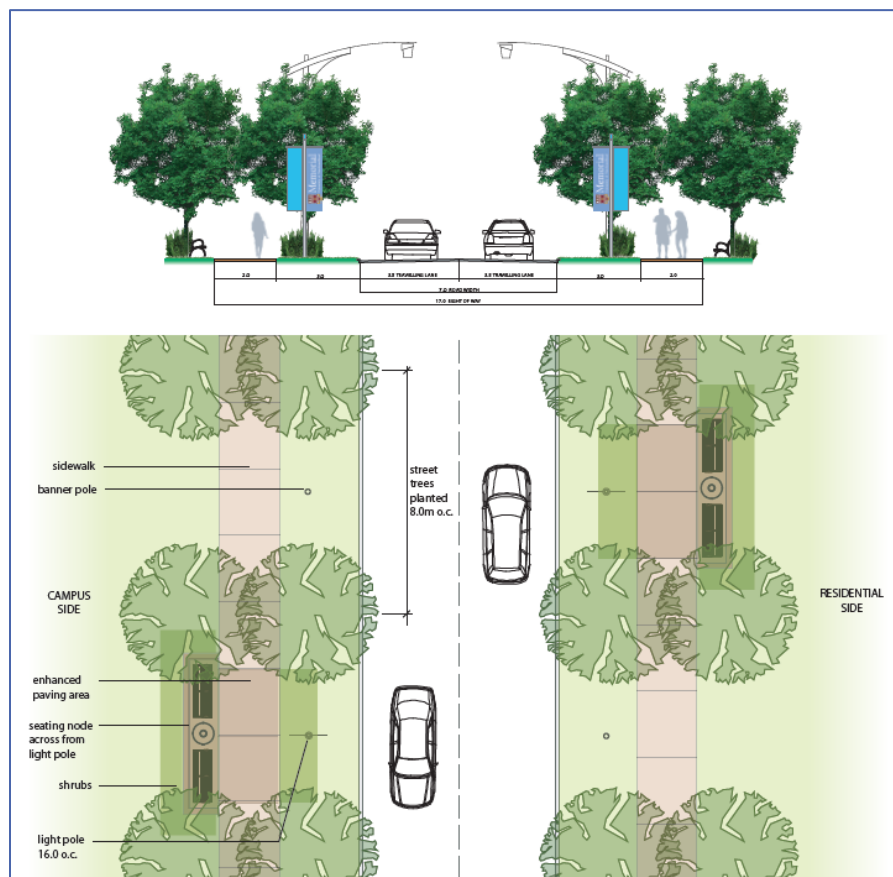


Figure 44: Elizabeth Avenue, proposed plan and section from the CMP

Campus Edges: Westerland Road

Westerland Road is a wide, open roadway surrounded by large scale buildings and parking areas. The CMP proposes to improve the aesthetics and scale of the pedestrian experience by installing sidewalks on both sides and planting a double row of street trees.

Status: South of the Aquarena sidewalks are located along both sides of Westerland Road south of the Aquarena. North of the Aquarena sidewalks are only located along the eastern boulevard of Westerland Road. A double row of street trees have not been planted along Westerland Road.

Implementation Recommendations: Sidewalks should be installed along the western boulevard of Westerland Road. Changes in concert with long term concepts.

Streetscape upgrades for Westerland Road should be built as per the proposed plan and section identified on page 102 of the CMP as shown in Figure 45.

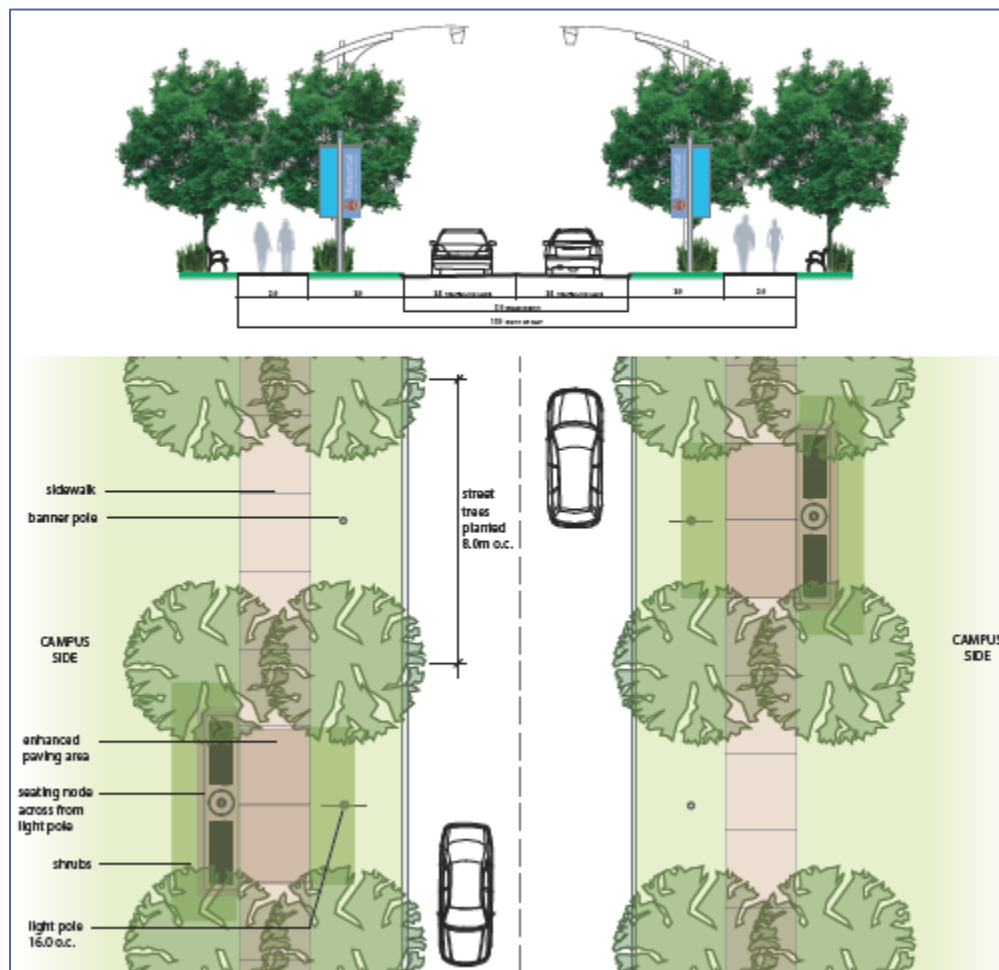


Figure 45: Westerland Road, proposed plan and section from the CMP

Campus Edges: Allandale Road

Allandale Road is a residential street that borders the campus along its east side. Although residential in nature, Allandale sustains heavy traffic and would benefit from intensified planting and improvements to the streetscape, such as a double row of trees and the installation of new site furnishings.

Status: Improvements, including a double row of trees and the installation of new site furnishings have not been installed.

Implementation Recommendations: Streetscape upgrades for Allandale Road should be built as per the proposed plan and section identified on page 103 of the CMP as shown in Figure 45.

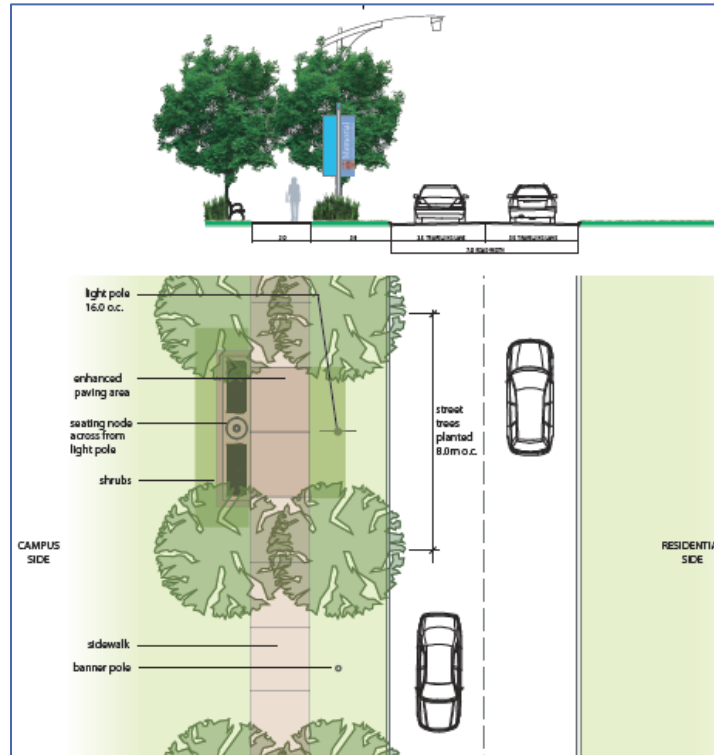


Figure 46: Allandale Road, proposed plan and section from the CMP

Boulevard Design: Prince Philip Drive

As indicated within the proposed plan and section on page 104 of the CMP (Figure 43), Prince Philip Drive has a 28.5 m right-of-way (ROW).

From north to south, this ROW includes a:

- Row of street trees;
- 2.0 meter pedestrian clearway (sidewalk);
- Row of street trees within a 1.5 to 3.0 meter landscaped buffer
- 3.5 meter travel lane
- 3.5 meter travel lane;
- 4.5 meter landscaped median;
- 3.5 meter travel lane;
- 3.5 meter travel lane;

- Row of street trees within a 1.5 to 3.0 meter landscaped buffer
- 2.0 meter pedestrian clearway; and
- Row of street trees

Street furniture including seating and banner poles are to be located within the double row of trees.

Implementation Recommendations: Prince Philip Drive should be reconstructed to the proposed section and plan within the timeline identified within the University's Capital Plan in concert with the roundabouts and transit terminal.

Boulevard Design: Elizabeth Avenue

As indicated within the proposed plan and section on page 101 of the CMP (Figure 44), Elizabeth Avenue has a 17.0 m ROW.

From north to south, this ROW includes a:

- Row of street trees;
- 2.0 meter pedestrian clearway (sidewalk);
- Row of street trees within a 3.0 meter landscaped buffer
- 3.5 meter travel lane
- 3.5 meter travel lane;
- Row of street trees within a 3.0 meter landscaped buffer
- 2.0 meter pedestrian clearway; and
- Row of street trees

Street furniture including seating and banner poles are to be located within the double row of trees.

Implementation Recommendations: Elizabeth Avenue should be reconstructed to the proposed section and plan within the timeline identified within the University's Capital Plan in concert with long term concept.

Boulevard Design: Westerland Road

As indicated within the proposed plan and section on page 102 of the CMP (Figure 45), Westerland Road has a 17.0 m ROW.

From east to west, this ROW includes a:

- Row of street trees;
- 2.0 meter pedestrian clearway (sidewalk);
- Row of street trees within a 3.0 meter landscaped buffer
- 3.5 meter travel lane
- 3.5 meter travel lane;
- Row of street trees within a 3.0 meter landscaped buffer
- 2.0 meter pedestrian clearway; and
- Row of street trees

Street furniture including seating and banner poles are to be located within the double row of trees.

Implementation Recommendations: Westerland Road should be reconstructed to the proposed section and plan within the timeline identified within the University's Capital Plan in concert with long term concept.

Boulevard Design: Allandale Road

As indicated within the proposed plan and section on page 103 of the CMP (Figure 46), Allandale Road is proposed to have the following cross section

From east to west:

- Row of street trees;
- 2.0 meter pedestrian clearway (sidewalk);
- Row of street trees within a 3.0 meter landscaped buffer
- 3.5 meter travel lane
- 3.5 meter travel lane; and
- Residential property

Street furniture including seating and banner poles are to be located within the double row of trees.

Implementation Recommendations: Allandale Road should be reconstructed to the proposed section and plan within the timeline identified within the University's Capital Plan in concert with short term roundabout and new lanes.

Gateway Markers

Gateway markers are designed to signal arrival at key intersections.

Primary Gateway were identified for the intersections of Prince Philip Drive and Westerland Road and Prince Philip Drive and Allandale Road.

Secondary Gateway Markers were identified for:

- Elizabeth Avenue and Westerland Road;
- Elizabeth Avenue; and
- Elizabeth Avenue and Allandale Road (see Figure 4.2: Edges and Gateways, page 139 of the CMP).

Status: At the Prince Philip Drive and Westerland Road intersection a small gateway marker exists adjacent to the G.A. Hickman Building.

No gateway markers exist at the Prince Philip Drive and Allandale Road, Elizabeth Avenue and Allandale Road, and Elizabeth Avenue and Westerland Road intersections.

Implementation Recommendations: Page 137 of the CMP provides examples of potential gateway features and the centre island of a roundabout could also be used as a gateway.

A more prominent gateway marker should be installed to announce the entrance to the University. The CMP envisions a vertical wind turbine in combination with a landscape feature to mark this location (CMP page 136).

5.3.5 Improvements to the Westerland Road / Clinch Crescent Area

Pedestrian connections along Westerland Road / Clinch Crescent between the Aquarena / Field House and the parking facilities north of Prince Philip Drive (and leading to the Hospital) should be improved. As part of any future developments along this route, consideration should be given to integrating another elevated walkway across Prince Philip.

In addition, shelter for pedestrians from the ‘horizontal rain’ and wind is recommended along Westerland Road and Clinch Crescent. This protection may take the form of colonnaded buildings, potentially combined with plantings or other windbreak installations.

Status: None of these improvements have yet to be implemented.

Implementation Recommendations: As new buildings are constructed, or existing buildings undergo renovations, shelter from the elements, including a potential elevated walkway, should be considered as part of site design and built form.

Pedestrian connections should prioritize barrier free accessibility, weather protection and minimizing walking distance.

5.3.6 Russell Road Area

To improve access and safety, facilitate traffic operations on Elizabeth Avenue and establish a gateway into the campus, Russell Road should be reconfigured to align with Phelan Road to the north and Rodney Street to the south. In addition, exclusive left turn lanes should be provided at the Elizabeth / Russell intersection.

Status: These recommendations have yet to be implemented.

Implementation Recommendations: This is to be completed as part of Elizabeth Avenue upgrades.

5.3.7 Intersection of Livyer’s Loop / Morrissey Road at Prince Philip Drive

At the intersection of Livyer’s Loop / Morrissey Road at Prince Philip Drive, a widening is recommended to improve safety impacts due to the overlapping southbound and northbound left turns.

Status: The northbound left turn lane from Prince Philip Drive has been removed at this location. Please note that in Section 4.1, the recommendations supersede this.

5.3.8 Intersection of Irwin’s Road / Livyer’s Loop at Prince Philip Drive

The Irwin’s Road / Livyer’s Loop intersection is extremely close to Prince Philip Drive. It is recommended that Irwin’s Road be realigned south at this location to clearly separate the two intersections and provide more space for pedestrians at the intersection.

Status: This recommendation has yet to be implemented and this intersection has been recommended to be removed in the long term.

5.3.9 Morrissey Road

To optimize traffic flow in the north east quadrant of campus, Morrissey Road should be separated from the parking lots as much as possible.

It is recommended that the break in the median on Prince Philip be closed and the existing access be relocated to the east.

A new signalized intersection was recommended midway between Morrissey Road / Livyer's Loop and Allandale Road. This intersection would accommodate development in the northeast quadrant of campus and facilitate pedestrian crossings of Prince Philip Drive. A two-phase pedestrian-activated traffic signal would be installed, with an elevated enclosed crosswalk as an alternative.

The eastern arm of Morrissey Road is extended directly south to connect with Prince Philip Drive and replaces the intersection directly to the east, reducing traffic circulation in front of the Colleges.

Status: These recommendations have yet to be implemented.

Implementation Recommendation: Reconstruction of Prince Philip Drive is a priority of the CMP. Reconstruction of Prince Philip Drive should take into consideration the recommendations for Morrissey Drive to ensure that future changes to this road are not compromised.

5.3.11 Livyer's Loop

Operate Livyer's Loop as one-way either clockwise or counter-clockwise between the Livyer's Loop / Irwin's Road intersection and the Phelan Road intersection. The north-south section between Phelan Road / Russell Road and Prince Philip Drive would remain two-way. This would simplify operations and enhance safety at the Prince Philip intersection. The easterly access onto Prince Philip Drive should at least be redesigned to restrict eastbound right turns into campus, to avoid an unsafe situation. A preferred option would be to close this access, as it does not conform to acceptable design standards.

Status: This recommendation has been implemented. Livyer's Loop between Irwin's Road and the Phelan Road intersection is operating as a one-way street in a counter-clockwise direction.

Pedagogue Close

Pedagogue Close is to be extended north to connect with Irwin's Road directly east of the Education Building, eliminating the section of Irwin's Road that extends in front of the Education Building and connects to Westerland Road.

Status: The recommendations have not been implemented. Pedagogue's close ends in a cul-de-sac directly north of the Education Building.

Implementation Recommendation: This is to be completed as part of short term roundabout at Clinch Crescent and Westerland Road.

Arctic Avenue

Arctic Avenue is to be redefined by new buildings fronting on both sides.

Status: New buildings have not been built yet along Arctic Avenue. Over time this recommendation will be implemented.

Clinch Crescent

Clinch Crescent remains in its current configuration, but is landscaped and ‘greened’ as an important entry road to the Health Sciences Centre Complex, Mt. Scio Road and the landscape beyond.

Status: This recommendation has not been implemented.

Master Plan Direction Section 5.4 (Parking)

5.4.3 Surface Parking Areas:

Parking lots should be screened with intensive groundcover, shrubs and tree planting to minimize their visual impact. Healthy existing trees near or within parking areas should be preserved. All opportunities to plant evergreen plant material along the perimeter of parking areas or within internal islands should be pursued.

Surface materials should be selected to support the nature of the pedestrian oriented campus. Although making a clear distinction between pedestrian and vehicular areas is an important issue, parking lot surfaces should blend well with surrounding pedestrian spaces. Surface materials such as unit pavers may be a preferable alternative to large expanses of asphalt. Combinations of materials, such as concrete with unit paving banding or unit paving with natural stone can also be considered.

Status: Surface parking presently comprises a significant component of Campus land and is visually intrusive with a lack of vegetative buffer.

Implementation Recommendations: As peripheral roads are rebuilt they should incorporate vegetation to screen adjacent surface parking lots and to contribute to the theme of a Campus within a park.

5.4.3 Structured Parking:

Two potential locations for structured parking were recommended.

The first location was identified on top of parking lot #27 located on the north side of campus in front of the Utilities Annex. This was intended to be a four level structure totaling 752 parking spaces.

Status: This parking structure has been constructed as recommended in the CMP.

The second proposed garage was recommended to be located behind the Aquarena. This proposed garage would be on four levels, with a total of 480 parking spaces.

Status: The second proposed garage has not been constructed.

5.4.3 Below Grade Parking:

Two below grade parking structures for buildings located on the north side of Prince Philip Drive, west of the University Centre was recommended. These buildings were identified as each having 96 parking spaces totaling 192 new spaces.

A third parking structure was proposed to be located below a proposed new academic building just north of the Library and would contain 60 new spaces.

A second set of below grade parking structures was recommended to be included in the proposed Residence and Residence / Academic Building in the North East Campus, split between the two buildings. Each building would contain 60 below grade spaces, totaling 120 new parking spaces.

Status: These recommendations have not been implemented.

Implementation Recommendations: As new buildings are constructed below grade parking should take advantage of the grade changes on campus and be considered as part of site design and built form.

5.4.4 Pricing Structure:

The CMP recommended raising parking fees for all lots with the exception of some parking for car pool users to encourage people to carpool.

The CMP recommended that parking fee increases be introduced in a phased manner over a five year period.

Status: The overall cost of parking on Campus is well below what would be considered a reasonable market rate and should be increased to encourage alternative modes of transport.

Implementation Recommendations: Campus collective agreements make it very difficult to raise rates. A key policy recommendation from the Traffic Area Study is for Memorial University to completely separate parking from their collective agreements. In doing so, they will be able to increase rates, influence transportation choice and limit the risk associated with taxable benefits

Master Plan Direction Section 5.5 (Planning for Alternatives)

5.5.1 Transportation Management Association (TMA)

Promote the formation of a TMA with other large area employers such as the Hospital System and the provincial government. The TMA should meet regularly with the City and collectively plan for transportation in a holistic fashion, recognizing that all modes are tied to one another and related to metropolitan planning decisions.

Status: Requires verification

5.5.1 Transportation Demand Management (TDM)

A TDM strategy should be developed to minimize travel by single occupant vehicles, requiring that transportation would be managed holistically at the University. This should include regular monitoring of progress towards sustainability.

Status: A formal TDM strategy is required for the University.

Implementation Recommendations: Many of the recommendations from the CMP and Traffic Area Study should form key elements of the TDM strategy. Chapter 6 of the Traffic Area Study provides further detail on the requirements for a formal TDM strategy.

5.5.2 Transit Signage and Wayfinding

Collaboration with Metrobus would improve the public transit provider's presence on campus. Information kiosks at all transit stops that provide schedule and route information should be installed.

Status: Since the release of the CMP, advances in smartphone technology have changed the primary manner in which transit route information is shared such that while information kiosks have not been built at all transit stops the intent of this recommendation has largely been met.

Metrobus presently provides a number of customer conveniences to assist with travel including Google Transit Trip Planner, interactive route maps, text alerts on bus arrivals, printed route maps and schedules, electronic fare payment and the AIR MILES loyalty program.

Implementation Recommendations: Metrobus should investigate the installation of interactive electronic screen displays in major transit points, malls and transit terminals displaying transit route and real-time transit information and transit trip planning capability.

5.5.3 Campus Design for Transit

Installation of traffic signals at the intersection of Clinch Crescent and Arctic Avenue would improve future traffic operations and permit introduction of transit priority signaling.

Status: Traffic signals have not been installed at the intersection of Clinch Crescent and Arctic Avenue.

Proper signage and high quality pavement markings (preferably unit pavers installed with a proper base) also need to be implemented for the transit station on Arctic Avenue at the University Centre, so that traffic will respect the priority of the buses. In the longer term, as transit use grows, the space may need to be reconfigured to create two separate lanes for buses, with appropriate shelters and sidewalks.

Status: The recommendations have not been implemented.

Over the longer term, consideration should be given to make Arctic Avenue a transit priority corridor. At Clinch Crescent, a queue jump lane for buses turning left should be considered.

Status: The recommendations have not yet been implemented.

The CMP includes a new road parallel to Westerland Road, west of the Aquarena. This presents an opportunity to separate transit vehicles from the general traffic stream, to further prioritize transit. At the intersection of Elizabeth Avenue and Westerland Road, the eastbound left turns should be restricted to buses only. Cars would be redirected to the new route road parallel to Westerland Road, extending between Prince Philip Drive and Elizabeth Avenue.

Status: The CMP recommendations have not been implemented.

A new bus stop and shelter along Elizabeth Avenue are also recommended to improve transit access on the south side of campus adjacent to the existing and proposed residences. The location would be adjacent to the Arts and Administration Building. This would require buses to enter campus via the reconfigured central access driveway.

Status: A bus layby, bus stop and shelter has been built along Elizabeth Avenue, south of the Arts and Administration Building.

5.7 Cycling

A staged evolution to increased cycling was recommended, as follows:

As a first step, replace the existing bike racks with a design that provides adequate support for bicycles. The ring and post style (Figure 47) is widely used and favoured by cyclists and facilitates snow removal. The bike racks should as a minimum to replace the existing capacity. Additional bike parking should be introduced outside every building, in a minimal initial number such as five to ten spaces.

Status: Requires verification.



Figure 47: Ring & Post style bike racks

Introduce bike parking inside new structured parking facilities. Using one weather-protected parking space for bike parking as a starting point will further encourage bike use. Create indoor bike parking in buildings where there is available space. Clearly defined areas designated for bicycle parking can provide shelter from harsh weather, as well as increased security of parked bicycles.

Status: Requires verification.

Assuming that bike use continues to expand, the University should work with the City to plan for enhanced bike security on well-used bike routes to campus. These can take the form of painting travel lanes as 'shared lanes' with a bicycle symbol, or if space permits, restriping existing roads to provide reserved lanes. In the case of road widening, work with the City to introduce bike lanes where feasible and indicated by demand.

Status: These recommendations have yet to be implemented.

As part of future developments, the University should consider providing secure in-building bicycle storage and changing / shower facilities to further encourage cycling.

Status: Requires verification.

The recommendations outlined above anticipate that changes to the campus transportation network will occur over time as the campus builds out. Open space and public space requirements should be seen as priorities that are directly tied to the transportation network. Prince Philip Drive, Elizabeth Avenue, Allandale Road and Westerland Road must capitalize on the opportunity for them to serve more than a

strictly transportation function, emphasizing their placemaking role as welcoming entrances to a campus within a park. We recommend the four most critical projects for implementation to include (1) raising the cost of parking to reflect market rates; (2) reconstruction of Prince Philip Drive and (3) Elizabeth Avenue to reflect the preferred CMP cross-sections, including boulevard space to accommodate snow loads; and (4) an open space network that seamlessly integrates cycling, pedestrian and transit connections.

8.2 MUN Area Traffic Study

The findings from the MUN Area Traffic Study (Traffic Study) are generally consistent with the goals of the CMP. The relationship between key recommendations from the Traffic Study and the CMP are as follows:

8.2.1 Elizabeth Avenue

Level of Service results from the 1998 St. John's Transportation Study show that existing conditions along Elizabeth Avenue/Westerland and Elizabeth/Bonaventure operate at failing level of service (F). To mitigate this measure, the study recommended widening the corridor to four lanes and providing turning lanes at the intersections. The Scenario 0 results completed by HTC for the MUN Traffic Study showed conditions that are somewhat better than those noted in the 1998 St. John's Transportation Study. Please refer to Section 2.1.1 for details in this regard.

The CMP suggested that the widening of Elizabeth Avenue at the University edge would not only be detrimental to the character of the campus gateway but could create excess capacity. It was recommended that, prior to proceeding with any widening, the City should undertake a broad update of the needs for Elizabeth Avenue, based on updated travel demand forecasts and an option for a three-lane cross section. The Traffic Study recognizes that Elizabeth Avenue needs to serve a number of functions, including providing alternate access to the campus and creating a safe, efficient route for pedestrians and cyclists. The intersections must operate safely and efficiently and the roadway should balance the needs of all users and promote a campus setting.

To address these issues, the Traffic Study proposed a roundabout corridor in the long term and traversable median. While not a direct recommendation from the CMP, this concept is consistent with the goals of the master plan. This option is worth considering as it provides the ability for the corridor to accommodate greater levels of traffic without the need to widen the street.

8.2.2 Prince Philip Drive / Morrissey Road / Irwin's Road and Livyer's Loop

The Traffic Study recommends a reconfiguration of the road network within this general area. The reconfiguration involves closing the intersection of Morrissey Road and Prince Philip Drive. The segment of Morrissey Road between Arctic Avenue and Prince Philip Drive would be removed and the median on Prince Philip Drive would be closed and fenced to prevent pedestrian crossing. Traffic on Arctic Avenue would be re-routed left onto Morrissey Road and eventually to a new roadway extending from Morrissey Road to the east intersection of Livyer's Loop with Prince Philip Drive. A roundabout would then be installed at this location. The Traffic Area Study also recommends a new pedestrian tunnel be installed in line with the east side of Livyer's Loop. The median on Prince Philip Drive would be fenced at this location to prevent further pedestrian crossings.

As stated in the table above, the CMP recommends that the intersection of Livyer's Loop / Morrissey Road at Prince Philip Drive be widened to improve safety impacts due to the overlapping southbound and northbound left turns. As the Irwin's Road / Livyer's Loop intersection is extremely close to Prince Philip Drive, the CMP recommends that Irwin's Road be realigned south at this location to clearly separate the two intersections and provide more space for pedestrians. As well, consistent with the Traffic Study, the CMP recommends that the eastern arm of Morrissey Drive be extended directly south to connect with Prince Philip Drive. Similar to the Traffic Study, the intent of these recommendations is to improve circulation and reduce conflicts between pedestrians and vehicles. However, to be consistent with the CMP, the median on Prince Philip Drive should only be fenced as an interim solution with the long term goal being the installation of a 4.5 meter landscaped median.

8.2.3 Westerland Road

The long term Traffic Study recommendation is to relocate Westerland Road to the west, effectively moving the road from the interior of campus to its periphery, west of any on-campus parking. The existing Westerland Road would be closed completely to through-traffic. This major change would create the conditions for a pedestrian-friendly corridor within the existing Westerland Road right-of-way.

The recommendation to close Westerland Road to through-traffic and repurpose it as a pedestrian-friendly corridor exceeds the CMP recommendations for Westerland Road. However, this move is consistent with the CMP Planning Principles that the campus should be pedestrian-friendly, encourage a balance between transportation modes and minimize conflicts between pedestrians and vehicles. Therefore, relocating Westerland Road and converting the existing street to a pedestrian friendly corridor is fully supported by the CMP. Under this scenario, Westerland Road should be resurfaced using high quality, distinctive paving materials such as unit pavers, natural stone and concrete paving. Street trees with deep soil cells should also be planted.

8.2.4 Costs of Parking on Campus

There is a strong relationship between parking availability, parking rates and travel mode choice. Both the CMP and Traffic Area Study recognize that parking on campus is well below what would be considered a reasonable market rate. Memorial University needs to completely separate parking from their collective agreements in order to increase rates and promote more sustainable transportation choices.

Overall there is a strong compatibility between the Campus Master Plan and the MUN Area Traffic Study. Adoption of the above mentioned Traffic Study recommendations will advance the goals and objectives of the CMP.

9 Conclusions, Recommendations & Costs

Detailed Traffic Analysis

The City of St. John's, in their review of the high level analysis results raised concerns that the 2025 AM and PM peak hour VISUM models, that were provided by the City of St. John's and used by Harbourside Transportation Consultants (HTC) in the high level analysis work for this study, appeared to be over representing the expected forecasted traffic volumes for 2025.

As a result of these concerns the City of St. John's and Hatch Mott MacDonald decided to conduct a detailed analysis of 6 study area intersections using existing traffic volumes that were both factored and adjusted by an agreed amount to reflect anticipated growth and the redistribution of traffic patterns expected to occur with the completion of the Team Gushue Highway. These volumes were prepared by Hatch Mott MacDonald, approved by the City of St. John's and provided to HTC to complete the detailed traffic analysis.

It was agreed that the high level analysis results would be used to highlight, conceptually, the improvements that would be required at some point in the future within the Study Area. These improvements would be used for planning purposes but would be reaffirmed in a more comprehensive Transportation Planning exercise that is planned by the City of St. John's as they update their Transportation Plan in the near future. The detailed analysis results would be used to plan capital improvements that are required at the key intersections within the study area within the next 5 years.

The study area for this detailed analysis included six intersections; three on Prince Philip Drive and three on Elizabeth Avenue near Memorial University. The six intersections that were analyzed included:

- Prince Philip Drive/Columbus Drive & Thorburn Road
- Prince Philip Drive & Clinch Crescent/Westerland Road
- Prince Philip Drive & Allandale Road
- Elizabeth Avenue & Allandale Road/Bonaventure Avenue
- Elizabeth Avenue & Westerland Road
- Elizabeth Avenue & Freshwater Road

Findings / Recommendations – Detailed Traffic Analysis

Prince Philip Drive/Columbus Drive & Thorburn Road

The intersection of Prince Philip Drive and Thorburn Road is one of the largest most complex intersections that the City of St. John's controls. This intersection already has three through lanes in both the north and southbound directions and a dual left turning lane on Thorburn Road. The results of our analysis indicates that little or nothing can be done with the present method of traffic control at this intersection in terms of signal timing, phasing, cycle length changes or with auxiliary lane additions that will provide an acceptable level of service at this intersection in either of the analysis periods for 2025. Our analysis using a multi-lane roundabout as the method of traffic control yielded acceptable results in terms of the LOS during both analysis periods.

Accordingly our recommendation, is to reconfigure the intersection to a multi-lane roundabout as shown in Figure 7.

Prince Philip Drive & Clinch Crescent / Westerland Road

The intersection of Prince Philip Drive and Clinch Crescent/Westerland Road is also a major intersection for the City of St. John's. It provides a secondary access to the Health Sciences complex from Prince Philip Drive and provides both vehicular and pedestrian connections to both sides of campus. The result of our analysis, again, indicate that little or nothing can be done with the present method of traffic control at this intersection in terms of signal timing, phasing, cycle length changes or with auxiliary lane additions that will provide an acceptable level of service at this intersection in either of the analysis periods for 2025. Our analysis using a multi-lane roundabout as the method of traffic control yielded acceptable results in terms of the LOS during both analysis periods. Our recommendation is to reconfigure this intersection to a multi-lane roundabout as shown in Figure 8.

HTC would also like to point out that this design does not match with the overall concept plan developed for this area of the study. This intersection was configured as a 3-way roundabout with Westerland Road being closed to through traffic. This being done to address the public input HTC had received and concerns in relation to pedestrian safety.

Prince Philip Drive & Allandale Road

The intersection of Prince Philip Drive and Allandale is again a very large, somewhat complicated signalized intersection with heavy traffic flows on most approaches of the intersection. This intersection also has a high collision rate – 98 traffic collisions over a 3 year period. The results of our analysis, again, indicate that little or nothing can be done with the present method of traffic control at this intersection in terms of signal timing, phasing, and cycle length changes or with auxiliary lane additions that will provide an acceptable level of service at this intersection in either of the analysis periods for 2025. Our analysis using a multi-lane roundabout as the method of traffic control yielded acceptable results in terms of the LOS during both analysis periods. Our recommendation is to reconfigure this intersection to a multi-lane roundabout. HTC added a right turn by-pass lane on the northwest side of the roundabout to accommodate the heavy right turn volume sat this location. Figure 9 shows the concept for the roundabout.

Elizabeth Avenue & Allandale Road / Bonaventure Avenue

The intersection of Elizabeth Avenue and Allandale is also a busy signalized intersection located at the eastern boundary of the study area. The results of our analysis indicate that the traffic volumes projected or forecasted to be present at this intersection can work under a signalized intersection control configuration. Some timing changes and some geometric lane improvements will be necessary. Based on this conceptual plan shown in Figure 10, HTC are estimating the cost of the proposed geometric changes to this intersection will be approximately \$200,000.

Elizabeth Avenue & Westerland Road

The Elizabeth Avenue intersection with Westerland Road is one of the smaller intersections included within this detailed analysis. Our analysis of the 2025 peak hour volumes indicates that an acceptable LOS can be achieved with a minor geometric improvements (the addition of an auxiliary right turn lane in the westbound direction) and some timing changes to the controller. The estimated cost based on the conceptual design shown in Figure 11 is estimated at \$150,000.

Again, HTC would also like to point out that this design does not match the overall concept plan that was developed for the Elizabeth Avenue area of the study. Under that concept plan this intersection was removed totally from the network in this area.

Elizabeth Avenue & Freshwater Road

The analysis work completed by HTC at the intersection of Elizabeth Avenue Road and Freshwater Road shows that this intersection functions well during the both analysis periods of 2025.

It should be noted that traffic currently spills back during both peak periods from the Oxen Pond Intersection with Freshwater and affects the operation at Freshwater Road and Elizabeth Avenue. So, while the detailed analysis shows a good level of service, things are likely to be much worse because of the operational problems at the Freshwater Road intersection with Oxen Pond Road.

The results of this detailed analysis clearly indicate that the three intersections along Prince Philip Drive will be over capacity by the year 2025 in both analysis periods. The recommendations are largely the same as those that had been identified as being required in the high level analysis.

It should be noted that while only minor improvements are suggested along Elizabeth Avenue at the high level analysis area intersections, the volumes are not significantly different than those used in the original analysis. Single lane volumes of 650-850 vehicles per hour, do not leave much spare capacity for unanticipated or expected growth in volumes. Much of the public feedback on this project, indicates that pedestrian safety is a major concern along Westerland Road and hence the comments and concepts that were developed in section 4.2 of report still apply. HTC remains of the opinion that the segment of Westerland Road from Prince Philip Drive to Elizabeth Avenue should be removed from service altogether.

HTC also heard during the public consultation process that that many people, including the administration of the campus, did not want to see any widening of Elizabeth Avenue. This was a significant influencing factor in our rationale to provide a roundabout corridor along Elizabeth Avenue. HTC are able to handle the traffic flows without any widening. A raised median in the centre of Elizabeth Avenue and an AT trail along the north side of the road was also provided. In HTC's opinion, maintaining a conventional corridor of traffic signals will not facilitate that vision.

Table 16: Detailed Analysis Cost

Detailed Analysis	
Priority	
1 Prince Philip Drive & Allandale Road	\$ 1,600,000
2 Prince Philip Drive & Clinch Crescent/Westerland Road	\$ 1,200,000
3 Prince Philip Drive/Columbus Drive & Thorburn Road	\$ 1,800,000
4 Elizabeth Avenue & Allandale Road/Bonaventure Avenue	\$ 200,000
4 Elizabeth Avenue & Westerland Road	\$ 150,000
Total Cost of Detailed Analysis	\$ 4,950,000

High Level Traffic Analysis

The high level traffic analysis for this study was completed by the study team using a number of different software packages including VISUM, Synchro/ SimTraffic (V9) and ARCADY/ Junctions 8. The analysis included an AM and PM peak hour review of the following 5 scenarios:

- Scenario 1: 2025 Projection of normal growth with no new development in the study area.
- Scenario 2: 2025 Projection of normal growth with no new development in the study area with improvements to the road network such as auxiliary lanes, and/or intersection signal timing/phasing improvements.
- Scenario 3: 2025 Projection of normal growth with new development in the study area with improvements to the road network such as auxiliary lanes, and/or intersection signal timing/phasing improvements.
- Scenario 4: 2025 Projection of normal growth with new development in the study area with improvements to the road network (such as auxiliary lanes, signal timing improvements or phasing). This scenario also includes the widening of Elizabeth Avenue and a proposed link from the Allandale Road Interchange with the Outer Ring Road and Clinch Crescent.

HTC also added an additional scenario 4B that was evaluated to consider roundabouts as an alternative to signal controls in the road network.

Findings – High Level Analysis

Scenario S1 is a year 2025 projection of the traffic volumes expected to be present on the study area road network under existing intersection timing/phasing and lane configurations in both the AM and PM peak periods of day. During the PM peak hour, under the volumes for the Scenario (S1), most of the intersections in the study area suffer from poor levels of service and congestion. Even with minor improvements to signal timings/phasing and lane configurations where appropriate, as modelled under Scenario (S2), there is little improvement in levels of service and congestion throughout the study area road network. LOS conditions under Scenario (S3), the campus study area growth scenario, are slightly better because of improvements put in place at the Elizabeth Avenue intersection with Freshwater Road, but overall many intersections throughout the study area still suffer from poor levels of service and congestion and more predominately so during the PM peak hour.

Under Scenario (S4) Option A traffic volumes are again projected to the year 2025, growth is considered, and several significant changes are made to the MUN area road network including the addition of a new link from the intersection of Mt. Scio Road/Allandale Road to Clinch Crescent and the widening of Elizabeth Avenue to two through lanes in each direction from Allandale Road to Freshwater Road and Stamp's Lane. The results of the LOS analysis for Scenario (S4) Option A in the PM peak hour indicate some improvements in the LOS for some study area intersections when compared to the LOS results for Scenario (S3), 6 of the study areas 20 intersections show an improvement.

The new roadway connecting the intersection of Mt. Scio Road and Allandale Road to Clinch Crescent is expected to draw an average daily traffic volume of 18,500 vpd. The PM peak hour volumes are the heaviest, with 1,450 in the NB direction and 925 in the SB direction. This new roadway in combination with the additional lanes on Elizabeth Avenue reduce the overall traffic volumes on segments of Prince Philip Drive and Allandale Road, but the relief, while significant and needed, is not sufficient enough itself to re-establish acceptable levels of service at the vast majority of intersections throughout the study area.

With signal systems optimized, the options available to gain additional capacity at many of the study areas signalized intersections and improve the level of service results to within acceptable norms are limited. Traffic volumes either have to be reduced (i.e. more emphasis placed on transit/active transportation and other TDM measures), streets have to be widened to provide additional lanes, or there has to be a departure from the traditional method of traffic control (i.e. traffic signals) that are presently used at many of the study area intersections.

Scenario (S4) Option B is the roundabouts scenario for the study area. The study team replaced the traffic signals at 14 intersections throughout the study area with roundabout control and in doing so were able to re-establish acceptable levels of service at the vast majority of the study area intersections without the need to widen any existing streets in the study including Elizabeth Avenue.

Summaries of the overall intersection LOS results from both Synchro/SimTraffic and ARCADY for both the AM and PM peak hour analysis periods for Scenarios S1, S2, S3, S4, Option A and S4, Option B are shown in Table 12 and Table 13. All concept drawings can be found in Appendix C.

Table 17: High Level Analysis Cost

Road Network Modifications		
New Roadways		
New Clinch Crescent Connector	\$	3,000,000
Prince Philip Drive & Elizabeth Avenue Corridor (New Road - Roundabout B to Roundabout E)	\$	1,000,000
Total New Roadway Cost	\$	4,000,000
Road Network Improvements		
1 Freshwater Road/Elizabeth Avenue to Elizabeth Avenue/New Road	\$	600,000
2 Elizabeth Avenue/New Road to Elizabeth Avenue/Allandale Road/Bonaventure Avenue	\$	1,000,000
3 Prince Philip Drive/Clinch Crescent (West) to Prince Philip Drive/New Road	\$	500,000
4 Prince Philip Drive/New Road to Prince Philip Drive & Clinch Crescent (East)	\$	300,000
5 Prince Philip Drive & Clinch Crescent (East) to Prince Philip Drive & New Campus Road	\$	500,000
6 Prince Philip Drive & New Campus Road to Prince Philip Drive & Allandale Road	\$	600,000
7 Clinch Crescent & Arctic Avenue to Clinch Crescent & New Clinch Crescent Connector	\$	300,000
Campus Road	\$	250,000
Total Road Network Improvements Cost	\$	4,050,000
Roundabouts		
A Freshwater Road & Elizabeth Avenue	\$	750,000
B Elizabeth Avenue & New Road	\$	600,000
C Elizabeth Avenue & Allandale Road/Bonaventure Avenue	\$	1,000,000
D Prince Philip Drive & Clinch Crescent (West)	\$	900,000
E Prince Philip Drive & New Road	\$	900,000
F Prince Philip Drive & Clinch Crescent (East) ¹	\$	900,000
G Prince Philip Drive & New Campus Road	\$	1,100,000
H Prince Philip Drive & Allandale Road ¹	\$	1,500,000
I Clinch Crescent & Arctic Avenue	\$	750,000
J Clinch Crescent & New Clinch Crescent Connector	\$	750,000
K Allandale Road & Mt. Scio Road	\$	1,200,000
L Allandale Road & Confederation Building Entrance	\$	750,000
M Allandale Road & Higgins Line	\$	750,000
N Prince Philip Drive/Columbus Drive & Thorburn Road ¹	\$	1,800,000
Total Roundabout Cost	\$	13,650,000
Total Cost for High Level Analysis		\$ 21,700,000

¹ Please note that the configurations for Roundabouts F, H & N are different between the detailed analysis and high-level analysis. As a result, the costs between Table A and Table B for these roundabouts are different.

Please note the estimates included in both Table 16 and Table 17 are Class 'D' estimates and they are based on conceptual drawings only. It is recommended that the City of St. John's proceed to at least the preliminary design stage to allow for land acquisition, underground sewer and utility relocations to be included in the cost. This will provide a more accurate cost for budgeting purposes.

Long Term Based Network Improvements

Widening of Elizabeth Avenue

The widening of Elizabeth Avenue from Bonaventure Avenue to Freshwater Road has been an on and off again topic of discussion many years with the City of St. John's. In 1998, this project was discussed in the City's Transportation Plan and contemplated as an improvement that could to reduce the traffic pressures on Prince Philip Drive by providing additional capacity on a parallel route. The thought at that time was to widen Elizabeth Avenue to five lanes to provide that capacity.

Elizabeth Avenue is a critical connection and access route for students, faculty and the staff at MUN. It serves as an access area for vehicles, pedestrians and cyclists. There is a need to continue and improve upon this access to the south side of campus, but solutions must to be sensitive to local residents and side street accesses and to pedestrian safety. The ultimate solution should provide additional vehicle capacity at the intersections while providing an environment which promotes lower speeds, pedestrian safety and side street/driveway access.

The public feedback on this issue has indicated that there was no desire to create another high speed, high capacity facility like Prince Philip Drive. There is, however, a need to create additional vehicle capacity to share the traffic load with Prince Philip Drive. Without it, Prince Philip Drive traffic will continue to grow to levels that will exceed the capacity of the intersections.

An alternative concept plan for Elizabeth Avenue was developed by HTC that will increase the capacity of the street and its intersections, while also minimizing capital improvement costs and disturbance to the local neighbourhood. This concept involves the introduction of a roundabout corridor, complete with a non-traversable median and AT trail provisions.

The introduction of roundabouts at key intersection locations, medians and a narrower corridor will enable the City to create a greener, more aesthetically-pleasing streetscape which can easily accommodate all users – vehicles, pedestrians, cyclists and others.

Sketches SSK-12 to SSK-14 illustrate the proposed changes HTC is recommending along Elizabeth, between Freshwater and Bonaventure Avenue including a typical road cross-section for Elizabeth Avenue. The overall plan can be seen on drawing SSK -1. All drawings can be found in Appendix C.

Proposed Roadway connection - Allandale Road to Clinch Crescent

The proposed road network connection from the Mt. Scio Road intersection with Allandale Road to Clinch Crescent has also been an on and off again topic of discussion for as far back as when the original planning was completed for the Outer Ring Road; and while this link may have generated some discussion at various times it has never formed part of the original planning package for the construction of the Outer Ring Road.

The comparison of the VISUM model analysis completed by HTC for Scenarios 3 and 4A indicate that the proposed roadway from the intersection of Mt. Scio Road and Allandale Road to Clinch Crescent will handle

fairly significant volumes during both the AM (1,370 vph) and PM (2,370 vph) peak hour periods with 18,500 vpd. The proposed route is attractive for motorists in the study area and will help reduce the traffic volumes on Prince Philip Drive and Allandale Road to more manageable levels. The roadway does provide a much more direct route from the Outer Ring Road to the University and the Health Sciences Complex; both of which are major traffic generators. It also provides an alternative means of access to Health Sciences complex that is not reliant on Prince Philip Drive.

The proposed roadway from the intersection of Mt. Scio Road and Allandale Road to Clinch Crescent will be needed at some point beyond the year 2025 based on the VISUM analysis completed by HTC. The roadway should be built to a two lane standard with roundabouts used as the method of traffic control at intersections. Flaring to two lanes may be required on the entrance to the roundabouts. A 35m right-of-way should be reserved to allow for future needs.

Operational Based Network Improvements

Prince Philip Drive/Morrissey Road/Irwin's Road and Livyer's Loop

The Prince Philip Drive intersection with Morrissey Road has been a source of complaints for both pedestrians and motorists for many years. The geometric alignment and configuration of this intersection is not typical in terms of what motorists expect from a four way signalized intersection. The east intersection of Irwin's Road and Livyer's has also been problematic for quite some time. The poor alignment and merge onto Prince Philip Drive do not meet any of the TAC geometric design guideline standards. To deal with these problems HTC is recommending that a reconfiguration of the road network in this area. The reconfiguration involves closing the Morrissey Road intersection with Prince Philip Drive. The segment of Morrissey Road between Artic Avenue and Prince Philip Drive would be removed and the medians on Prince Philip Drive closed and fenced accordingly to prevent pedestrian movements across Prince Philip Drive at this location. Traffic on Arctic Avenue would be re-routed left onto Morrissey Road and eventually to a new roadway extending from Morrissey Road to the east intersection of Livyer's Loop with Prince Philip Drive. A roundabout would be installed at this intersection. The Livyer's Loop approach to the roundabout would be restricted to a right turn by-pass lane. This of course would be optional and is being suggested for the sole purpose of controlling the amount of short cutting traffic moving from Elizabeth Avenue to Arctic Avenue and point's west on campus. The segment of Irwin's Road along the frontage of the Main Dining Hall would be turned into a limited access cul-de-sac; used mainly for deliveries, etc.

HTC is also suggesting that a new U/G pedestrian tunnel be constructed at the former intersection of Morrissey Road with Prince Philip Drive to facilitate existing pedestrian patterns in the area.

Westerland Road/Pedestrian Concerns

One of the more predominant and reoccurring themes that came up during the public consultation process (the interactive website) and through the stakeholder consultation process, was the pedestrian safety issue on Westerland Road. Westerland Road is the only direct connection between Elizabeth Avenue and Prince Phillip Drive that exists west of Allandale Road, and the only such connection which runs through the MUN campus. Due to the nature of its connectivity, Westerland Road is subject to relatively heavy traffic volumes

as an alternate path to and from the MUN campus and the Health Sciences Center. Besides the vehicular traffic on Westerland Road, it is also the site of a large volume of pedestrian traffic, including the two of the busiest pedestrian crossings within the study area.

There has been a long-standing concern with the conflicts introduced between the heavy vehicle traffic and the heavy pedestrian traffic on Westerland Road. This has created a number of accidents and near-misses through the years. The University has undertaken a pedestrian crossing study in the recent past and one of the sets of recommendations included a set of improvements intended to improve pedestrian safety on Westerland Road. These recommendations included high visibility flashing beacons to increase crosswalk visibility and roadside bulb-outs intended to reduce vehicle speeds and to minimize crossing distances. These improvement measures have recently been installed and the University, by all accounts, is pleased with the resulting road section. The improvements are getting favourable feedback and reaction from the students, faculty and other users.

While these improvements are appearing to have a positive impact, there is concern that the positive impacts may be a function of drivers reacting to a change in conditions and that the driver behaviour may migrate towards its previous conditions (high volumes, high speeds) after drivers become familiar with the new conditions. It is recommended that the crossings be monitored over time to ensure that the new beacon system remains effective.

In the long term, and in keeping with the goals of the Campus Master Plan (Brook McIlroy), it is HTC's recommendation that the vehicle/pedestrian conflicts be completely eliminated. This could be achieved by relocating Westerland Road to the west, effectively removing the road from the interior of campus and building it on the periphery of the campus, to the west of any on-campus parking. The proposed layout is illustrated in Figure 38 and on drawing sketch SSK-14 in Appendix C.

HTC is also recommending a new series of pedestrian skywalks be installed on the western end of the campus. The skywalks should link the Education Building with the new Core Sciences Building, the new Core Sciences Building with the parking garage, and the parking garage with the Health Sciences Complex. A concept plan of the proposed connections are shown in Figure 40 and on drawing SSK-16 included within Appendix C.

Public Transit

As part of the Public Transit review for this project a number of key areas were examined in some detail by the sub-consultant dealing with Transit and TDM issues on this project, Brian Taylor. From a transit perspective these areas included a public transit operational review, a fare strategy review, a review of transit planning and a service review. The recommendations stemming from each area review are noted below.

Public Transit Operational Review

- Metrobus to develop a comprehensive printed route map and schedule booklet showing all bus routes and scheduling information such as major transfer points, terminals and major destinations as well as bicycle routes and walking paths connecting to transit service.

- Metrobus to install printed route map and schedule displays at major transit destinations, transit terminals and bus shelters and in the Health Sciences Center, Memorial University and the Confederation Building.
- Metrobus to investigate the installation of interactive electronic screen displays in major transit points, malls and transit terminals displaying transit route and real-time transit information and transit trip planning capability.
- Metrobus to develop a transit information booklet for inclusion the university student orientation package.

Fare Strategies

- M-Card has become the method of choice for most Metrobus customers. Effort should be made to reduce the time lag in loading and uploading of rides and passes on M-Cards and expand sales outlets.
- Metrobus to complete the study of a U-Pass program for Memorial University students and consider expansion of the program to other educational institutions (refer to Appendix E).
- Metrobus to investigate the implementation of an employer-provided bus pass program with major employers, including the faculty and staff at Memorial University, the Health Sciences Center and the Provincial Departments located in the Confederation Building and the City of St. John's. The combination of a U-Pass program for Memorial University students and an EcoPass program for employees at the university, Health Sciences Center and Confederation Building would significantly increase ridership and fund service improvements on transit routes serving these institutions.
- Metrobus to revisit the timed transfer policy. Many transit systems have adopted a timed transfer policy. Research should be carried out on other transit systems regarding policies to reduce abuse of the policy. It is recommended to reduce the time allowed for a valid transfer from 120 minutes to 90 minutes after the last time point on a route.

Transit Planning

- The St. John's Transit Commission continue to engage the Province and neighbouring municipalities in discussions to develop a regional transit system.
- Metrobus staff work with City planning staff to promote transit-oriented design in future development plans.
- Metrobus staff work with the City of St. John's to install transit priority signals and queue-jump lanes at key intersections.
- Metrobus work with Memorial University to improve the Arctic Avenue terminal.
- Metrobus work with City staff to install transit priority signals along Prince Phillip Drive.
- Metrobus identify a suitable location for a new transit terminal to serve the Health Sciences Center and Memorial University. The corner lot at Clinch Crescent and Prince Phillip Drive should be considered as a possible location.
- Metrobus work with the Avalon Mall to improve transit facilities.

- Metrobus develop a bus shelter program to increase the number of bus shelters including criteria for locating shelters and guidelines to determine the amenities that should be included at each location.
- Metrobus develop a park-and-ride program to identify possible locations for park-and-ride sites and transit service to the study area.

Service Review

- Routes 24 and 26 to provide express service with one (1) morning trip only. Due to fleet availability constraints, no evening return express trip is available. Staff should look at realigning other service to allow a return express trip on Routes 24 and 26.
- Metrobus to conduct regular passenger counts and surveys to ensure transit routes are meeting ridership goals and performance.
- There is a high level of service along Prince Phillip Drive to the Health Sciences Center and Memorial University. Investigate if some service could be re-routed along Elizabeth Avenue and up Westerland Road to these institutions.
- Metrobus to investigate the implementation of an express bus network connecting major transit terminals and park and ride locations to major destinations.
- Metrobus to begin planning of accessible transit service on conventional transit routes considering transit routes that serve the Health Sciences Center and Memorial University as a priority.
- Metrobus to evaluate the response to the service with possible expansion of neighbourhood bussing to serve communities popular for off-campus student housing such as the Kenmount Terrace and Crosby Road areas.
- Metrobus to consider extending Friday and Saturday evening service by providing a late night shuttle between the terminal at City Hall/Mile One and the University. This service could be delivered using the smaller Community Transit vehicle.
- Metrobus to develop policies and procedures for providing bicycle travel on transit.
- Plan the installation of bicycle racks at transit terminals and major transit destinations.
- Work closely with the local cycling community to promote transit and cycling as a travel options.
- Metrobus investigate the introduction of a "Guaranteed Ride Home" program for Metrobus customers.
- Metrobus consider the introduction of stop announcements at major transit stops and destinations.

Transportation Demand Management (TDM)

Transportation Demand Management (TDM) involves the use of various policies, programs, services and products to influence the manner in which people travel. The idea of TDM is to motivate people to travel using different modes of transportation including walking, cycling, transit and ridesharing. For individuals that take advantage of TDM programs and services, they have greater choices and convenience, they save both time and money, and they reap the benefits of a healthier more sustainable lifestyle.

By properly managing the demand for travel, Municipalities can, and have in some instances, reduce the need for new or widened roads, reduce the environmental and social costs of car use, and have increased their return on the investments they have made in walking, cycling, transit and ridesharing throughout the communities they manage.

The project team has examined and made recommendations on a number of different strategies that could be employed to more effectively promote and enhance Transportation Demand Management in relation to Public Transit, Parking, Cycling, Walking and Active Transportation. These strategies include:

- Strategy 1: Partnerships to promote sustainable transportation and awareness of the benefits of public transportation.
- Strategy 2: Improve transit facilities to improve bus access and customer amenities using transit-friendly design guidelines.
- Strategy 3: Partnerships to promote active transportation initiatives.
- Strategy 4: Develop parking policies that encourage greater transit use.
- Strategy 5: Investigate the use of transit priority measures to reduce transit travel times and improve schedule adherence and on-time performance.
- Strategy 6: Use Intelligent Transportation Systems to improve transit service.
- Strategy 7: Establish a U-Pass program for full-time Memorial University students and an EcoPass program for Memorial University faculty and employees and employees at the Health Sciences Center and Confederation Building.
- Strategy 8: Develop a "suite" of service delivery options for public transit.
- Strategy 9: Adding value to the transit experience
- Strategy 10: Develop park-and-ride sites strategically located at the periphery of the urban core with express bus service into the study area.

Crosswalks and Pedestrian Safety

As part of the Crosswalk and Pedestrian Safety component of the project, the study team reviewed a total of 22 pedestrian crossing locations with the MUN campus study area. Eight of these crossings are located on streets with significant traffic volumes and speeds. These were assessed using the TAC – Pedestrian Crossing Control Guide to determine whether or not appropriate control measures are in presently in place. Several locations required some upgrading to meet the TAC standards. The remaining 14 pedestrian crossings were in located within the internal campus road network and were evaluated for the presence of signage, pavement markings, lighting, sight distance obstructions etc. Summaries of the assessments results are contained in Section 7 of the report.

HTC recommends the following improvements be made at all crosswalks throughout the MUN campus, not just the 22 that were assessed:

- Re-painting the zebra crosswalk markings (Inlaid Thermoplastic Crosswalks)
- WC-2 signs should be placed on each approach to pedestrian crossings
- Removal of red and/or amber flashing beacons
- All signage should be inspected for retro reflectivity

In addition to the crosswalk assessments HTC is also recommending a new pedestrian tunnel be installed across Prince Philip Drive at the Morrissey Drive intersection and that new overhead pedestrian walkways be installed connecting the Education Building to the new Core Sciences Building to the parking garage and finally to the Health Sciences Centre. Concept plans of the proposed connections and of the tunnel location are noted in Figure 39 and Figure 40 and in drawings xx and contained in Appendix C.

Campus Specific Issues

As part of the Campus Specific Issues section of the MUN Area Traffic Study, Brook McIlroy, the authors of the original Campus Master Plan (CMP), reviewed the transportation recommendations from the CMP, discussing the recommendations that have been implemented, as well as those that remain to be addressed.

As part of this section of the report Brook McIlroy as examined key improvements that are being proposed as part of the MUN Area Traffic and provided commentary as to the compatibility of these improvements to the overall CMP. The key improvements included the Elizabeth Avenue upgrading, the improvements suggested in the area of Prince Philip Drive/ Morrissey Road and on Irwin's Road and Livyer's Loop, the Westerland Road relocation plan and the cost of parking on Campus.

The findings indicated that overall there is a strong compatibility between the Campus Master Plan and the MUN Area Traffic Study and that the adoption of the Traffic Study recommendations will advance the goals and objectives of the CMP.

APPENDIX A

DATA COLLECTION

- 1 – Traffic Counts
- 2 – Pedestrian Counts

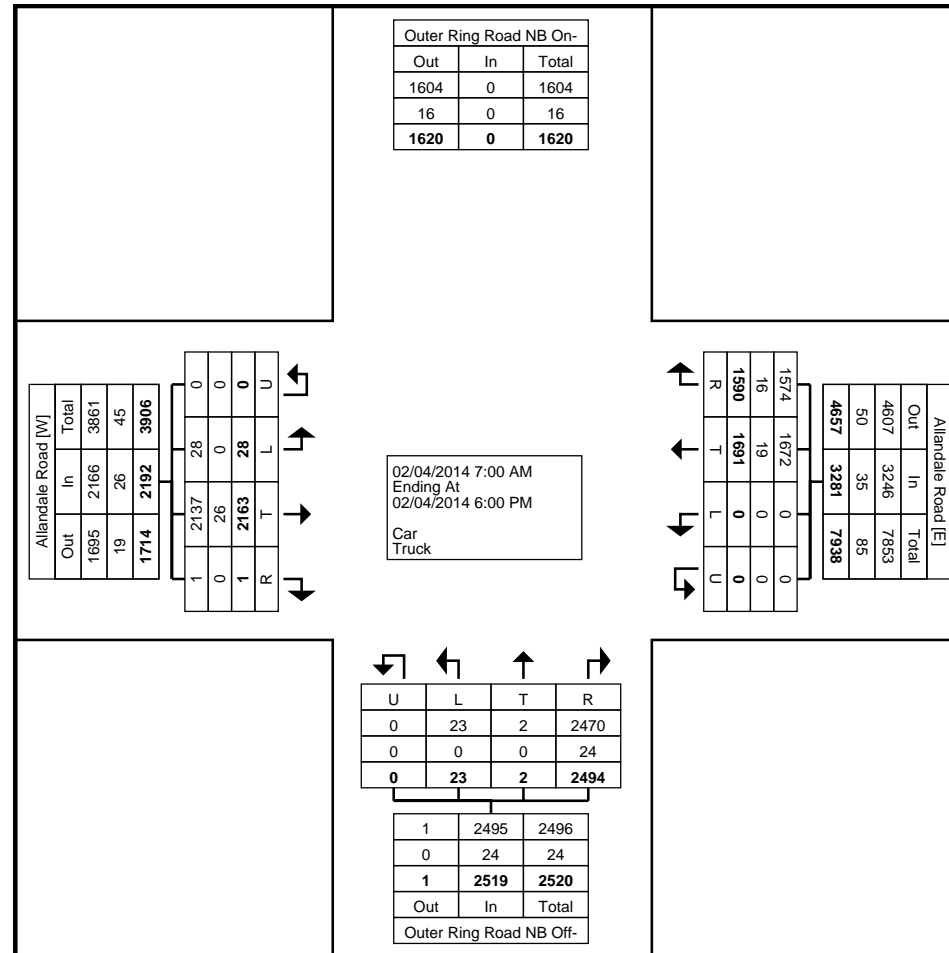
Study Name MUN Area Traffic Study
Intersection Clinch Crescent/ Arctic Avenue
Start Date 02/05/2014
Start Time 7:00 AM
Project 330086 - MUN
Type Road

Classification Totals

Start Time	Clinch Crescent Southbound				Arctic Avenue Westbound				Clinch Crescent Northbound				15 min volumes	Peak Hour - Hourly Volumes
	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn	Right	Thru	Left	U-Turn		
7:00 AM	18	6	0	0	39	8	0	0	10	34	0	0	115	
7:15 AM	39	3	0	0	63	4	0	0	32	57	0	0	198	
7:30 AM	46	7	0	0	79	12	0	0	37	55	0	0	236	
7:45 AM	57	11	0	0	79	9	0	0	65	75	0	0	296	845
8:00 AM	44	18	0	0	68	22	0	0	73	83	0	0	308	1038
8:15 AM	50	25	0	0	87	21	0	0	109	68	0	0	360	1200
8:30 AM	57	35	0	0	68	28	0	0	148	66	0	0	402	1366
8:45 AM	29	52	0	0	64	23	0	0	154	45	0	0	367	1437 8:00am - 9:00am
Peak Hour Total	180	130	0	0	287	0	94	0	484	262				PHF = 0.89
12:00 PM	71	8	0	0	33	74	0	0	50	38	1	0	275	
12:15 PM	44	7	0	0	23	36	0	0	38	53	0	0	201	
12:30 PM	46	5	0	0	37	34	0	0	28	50	0	0	200	
12:45 PM	45	8	0	0	36	54	0	0	48	72	0	0	263	939
1:00 PM	65	5	0	0	35	84	0	0	44	49	0	0	282	946
1:15 PM	53	7	0	0	25	34	0	0	49	52	0	0	220	965
1:30 PM	43	8	0	0	18	29	0	0	55	52	0	0	205	970 12:45pm - 1:45pm
1:45 PM	50	6	0	0	31	48	0	0	66	50	0	0	251	958
Peak Hour Total	206	28	0	0	114	0	201	0	196	225				PHF = 0.86
4:00 PM	223	22	0	0	47	43	0	0	30	37	0	0	402	
4:15 PM	135	14	0	0	28	45	0	0	36	45	0	0	303	
4:30 PM	126	13	0	0	31	78	0	0	41	33	0	0	322	
4:45 PM	100	8	0	0	37	91	0	0	34	36	0	0	306	1333 4:00pm - 5:00pm
5:00 PM	81	3	0	0	20	107	0	0	36	40	0	0	287	1218
5:15 PM	75	7	0	0	19	67	0	0	29	23	0	0	220	1135
5:30 PM	47	3	0	0	12	40	0	0	22	18	0	0	142	955
5:45 PM	43	3	0	0	15	45	0	0	26	25	1	0	158	807
Peak Hour Total	584	57	0	0	143	0	257	0	141	151				PHF = 0.83

Turning Movement Data

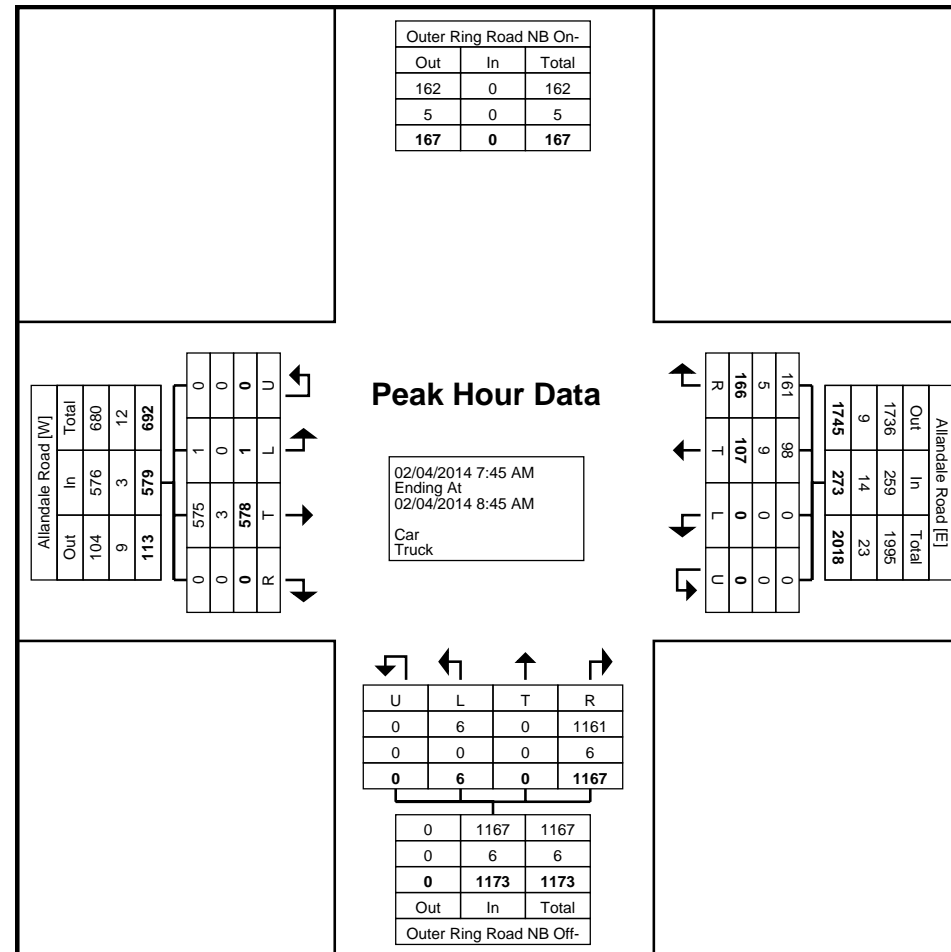
Start Time	Allandale Road Westbound					Outer Ring Road NB Off-Ramp Northbound					Allandale Road Eastbound					Int. Total
	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	
7:00 AM	14	11	0	0	25	31	0	1	0	32	0	55	1	0	56	113
7:15 AM	13	22	0	0	35	103	0	3	0	106	0	59	3	0	62	203
7:30 AM	27	24	0	0	51	144	0	0	0	144	0	105	0	0	105	300
7:45 AM	41	28	0	0	69	239	0	1	0	240	0	143	0	0	143	452
Hourly Total	95	85	0	0	180	517	0	5	0	522	0	362	4	0	366	1068
8:00 AM	24	20	0	0	44	293	0	2	0	295	0	138	0	0	138	477
8:15 AM	40	27	0	0	67	328	0	2	0	330	0	154	0	0	154	551
8:30 AM	61	32	0	0	93	307	0	1	0	308	0	143	1	0	144	545
8:45 AM	41	25	0	0	66	247	0	1	0	248	0	110	0	0	110	424
Hourly Total	166	104	0	0	270	1175	0	6	0	1181	0	545	1	0	546	1997
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12:00 PM	82	38	0	0	120	46	1	0	0	47	0	66	4	0	70	237
12:15 PM	59	36	0	0	95	61	0	0	0	61	0	91	1	0	92	248
12:30 PM	73	37	0	0	110	51	0	1	0	52	0	70	2	0	72	234
12:45 PM	69	46	0	0	115	67	0	1	0	68	0	79	3	0	82	265
Hourly Total	283	157	0	0	440	225	1	2	0	228	0	306	10	0	316	984
1:00 PM	69	30	0	0	99	50	0	0	0	50	0	100	1	0	101	250
1:15 PM	49	33	0	0	82	48	0	1	0	49	0	89	4	0	93	224
1:30 PM	49	31	0	0	80	46	0	0	0	46	0	88	0	0	88	214
1:45 PM	42	49	0	0	91	52	0	4	0	56	0	105	2	0	107	254
Hourly Total	209	143	0	0	352	196	0	5	0	201	0	382	7	0	389	942
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4:00 PM	128	225	0	0	353	42	0	1	0	43	0	69	0	0	69	465
4:15 PM	115	152	0	0	267	53	0	0	0	53	1	76	0	0	77	397
4:30 PM	122	258	0	0	380	57	0	1	0	58	0	91	1	0	92	530
4:45 PM	127	192	0	0	319	48	0	1	0	49	0	77	0	0	77	445
Hourly Total	492	827	0	0	1319	200	0	3	0	203	1	313	1	0	315	1837
5:00 PM	113	159	0	0	272	41	0	2	0	43	0	73	2	0	75	390
5:15 PM	112	90	0	0	202	56	1	0	0	57	0	62	2	0	64	323
5:30 PM	70	69	0	0	139	45	0	0	0	45	0	63	0	0	63	247
5:45 PM	50	57	0	0	107	39	0	0	0	39	0	57	1	0	58	204
Hourly Total	345	375	0	0	720	181	1	2	0	184	0	255	5	0	260	1164
Grand Total	1590	1691	0	0	3281	2494	2	23	0	2519	1	2163	28	0	2192	7992
Approach %	48.5	51.5	0.0	0.0	-	99.0	0.1	0.9	0.0	-	0.0	98.7	1.3	0.0	-	-
Total %	19.9	21.2	0.0	0.0	41.1	31.2	0.0	0.3	0.0	31.5	0.0	27.1	0.4	0.0	27.4	-
Car	1574	1672	0	0	3246	2470	2	23	0	2495	1	2137	28	0	2166	7907
% Car	99.0	98.9	-	-	98.9	99.0	100.0	100.0	-	99.0	100.0	98.8	100.0	-	98.8	98.9
Truck	16	19	0	0	35	24	0	0	0	24	0	26	0	0	26	85
% Truck	1.0	1.1	-	-	1.1	1.0	0.0	0.0	-	1.0	0.0	1.2	0.0	-	1.2	1.1



Turning Movement Data Plot

Turning Movement Peak Hour Data (7:45 AM)

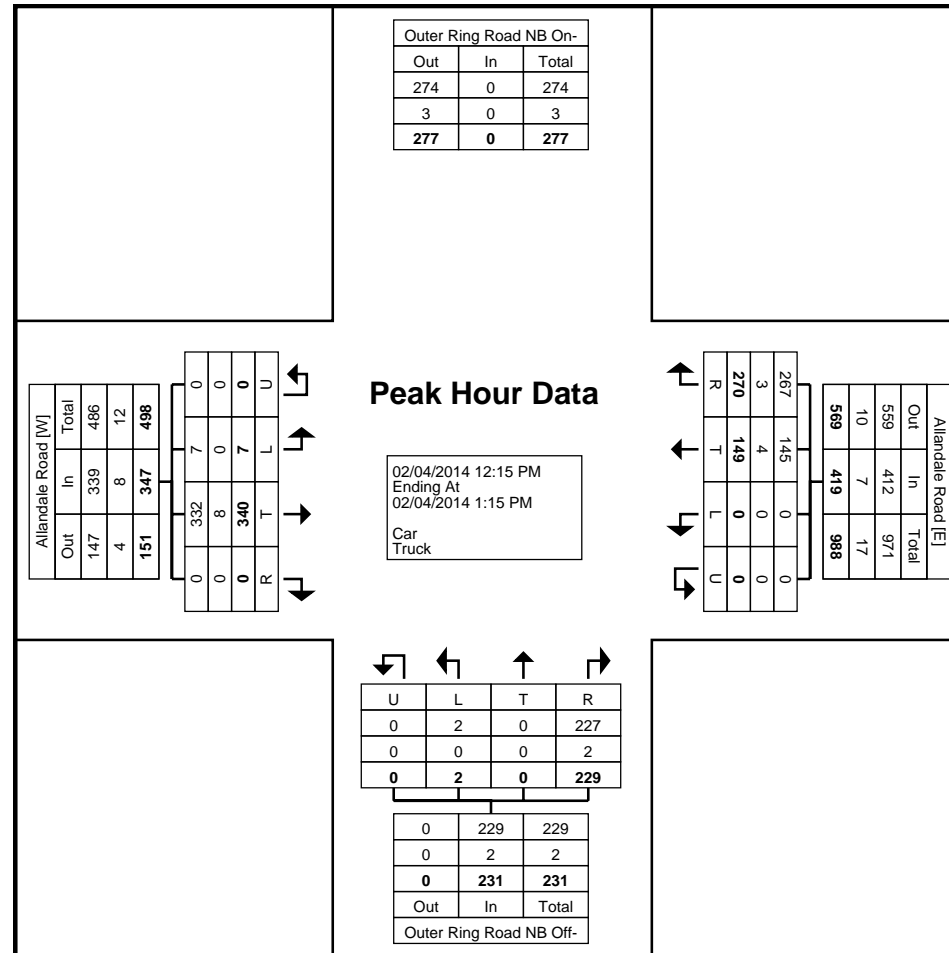
Start Time	Allandale Road Westbound					Outer Ring Road NB Off-Ramp Northbound					Allandale Road Eastbound					Int. Total
	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	
7:45 AM	41	28	0	0	69	239	0	1	0	240	0	143	0	0	143	452
8:00 AM	24	20	0	0	44	293	0	2	0	295	0	138	0	0	138	477
8:15 AM	40	27	0	0	67	328	0	2	0	330	0	154	0	0	154	551
8:30 AM	61	32	0	0	93	307	0	1	0	308	0	143	1	0	144	545
Total	166	107	0	0	273	1167	0	6	0	1173	0	578	1	0	579	2025
Approach %	60.8	39.2	0.0	0.0	-	99.5	0.0	0.5	0.0	-	0.0	99.8	0.2	0.0	-	-
Total %	8.2	5.3	0.0	0.0	13.5	57.6	0.0	0.3	0.0	57.9	0.0	28.5	0.0	0.0	28.6	-
PHF	0.680	0.836	0.000	0.000	0.734	0.889	0.000	0.750	0.000	0.889	0.000	0.938	0.250	0.000	0.940	0.919
Car	161	98	0	0	259	1161	0	6	0	1167	0	575	1	0	576	2002
% Car	97.0	91.6	-	-	94.9	99.5	-	100.0	-	99.5	-	99.5	100.0	-	99.5	98.9
Truck	5	9	0	0	14	6	0	0	0	6	0	3	0	0	3	23
% Truck	3.0	8.4	-	-	5.1	0.5	-	0.0	-	0.5	-	0.5	0.0	-	0.5	1.1



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

Turning Movement Peak Hour Data (12:15 PM)

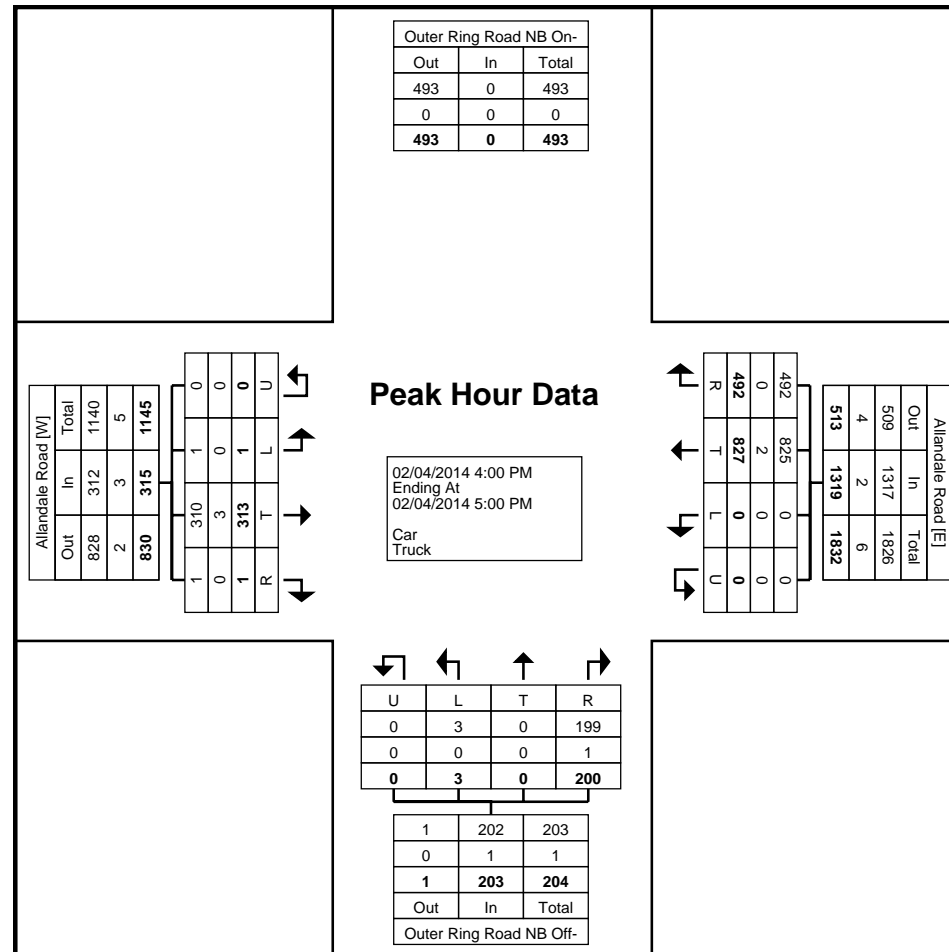
Start Time	Allandale Road Westbound					Outer Ring Road NB Off-Ramp Northbound					Allandale Road Eastbound					Int. Total
	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	
12:15 PM	59	36	0	0	95	61	0	0	0	61	0	91	1	0	92	248
12:30 PM	73	37	0	0	110	51	0	1	0	52	0	70	2	0	72	234
12:45 PM	69	46	0	0	115	67	0	1	0	68	0	79	3	0	82	265
1:00 PM	69	30	0	0	99	50	0	0	0	50	0	100	1	0	101	250
Total	270	149	0	0	419	229	0	2	0	231	0	340	7	0	347	997
Approach %	64.4	35.6	0.0	0.0	-	99.1	0.0	0.9	0.0	-	0.0	98.0	2.0	0.0	-	-
Total %	27.1	14.9	0.0	0.0	42.0	23.0	0.0	0.2	0.0	23.2	0.0	34.1	0.7	0.0	34.8	-
PHF	0.925	0.810	0.000	0.000	0.911	0.854	0.000	0.500	0.000	0.849	0.000	0.850	0.583	0.000	0.859	0.941
Car	267	145	0	0	412	227	0	2	0	229	0	332	7	0	339	980
% Car	98.9	97.3	-	-	98.3	99.1	-	100.0	-	99.1	-	97.6	100.0	-	97.7	98.3
Truck	3	4	0	0	7	2	0	0	0	2	0	8	0	0	8	17
% Truck	1.1	2.7	-	-	1.7	0.9	-	0.0	-	0.9	-	2.4	0.0	-	2.3	1.7



Turning Movement Peak Hour Data Plot (12:15 PM)

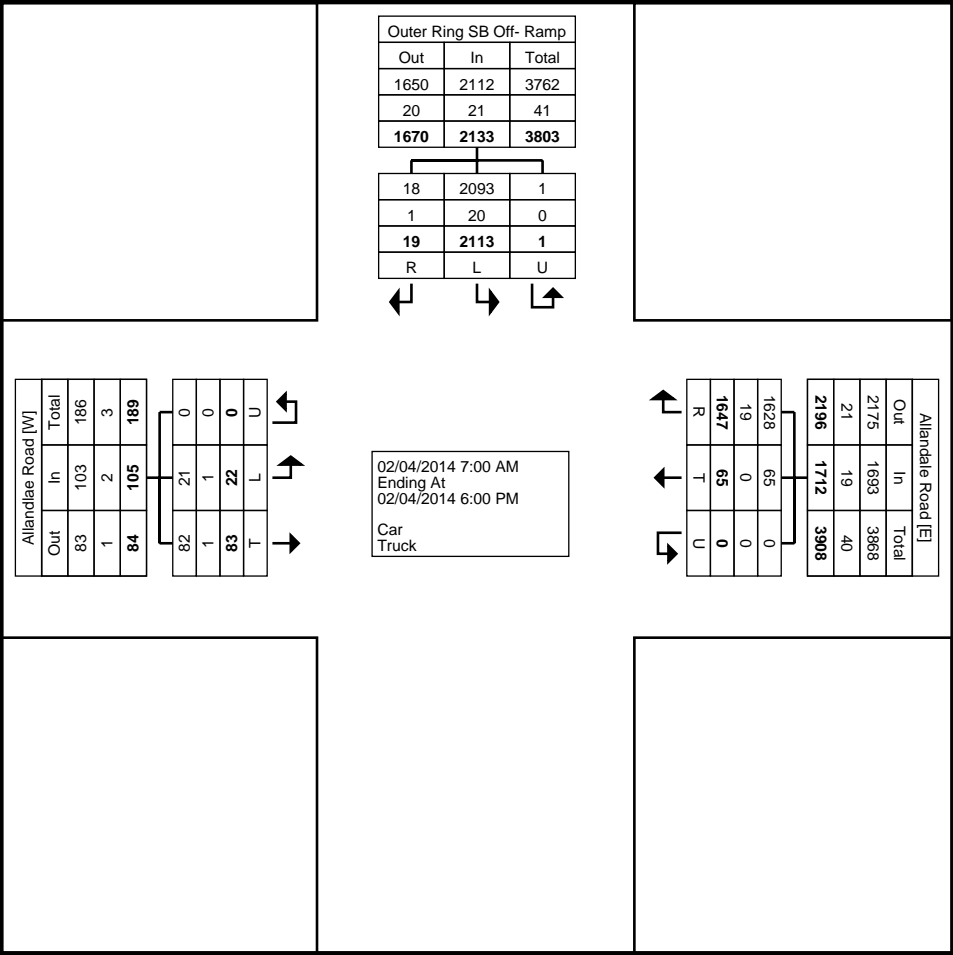
Turning Movement Peak Hour Data (4:00 PM)

Start Time	Allandale Road Westbound					Outer Ring Road NB Off-Ramp Northbound					Allandale Road Eastbound					Int. Total
	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	
4:00 PM	128	225	0	0	353	42	0	1	0	43	0	69	0	0	69	465
4:15 PM	115	152	0	0	267	53	0	0	0	53	1	76	0	0	77	397
4:30 PM	122	258	0	0	380	57	0	1	0	58	0	91	1	0	92	530
4:45 PM	127	192	0	0	319	48	0	1	0	49	0	77	0	0	77	445
Total	492	827	0	0	1319	200	0	3	0	203	1	313	1	0	315	1837
Approach %	37.3	62.7	0.0	0.0	-	98.5	0.0	1.5	0.0	-	0.3	99.4	0.3	0.0	-	-
Total %	26.8	45.0	0.0	0.0	71.8	10.9	0.0	0.2	0.0	11.1	0.1	17.0	0.1	0.0	17.1	-
PHF	0.961	0.801	0.000	0.000	0.868	0.877	0.000	0.750	0.000	0.875	0.250	0.860	0.250	0.000	0.856	0.867
Car	492	825	0	0	1317	199	0	3	0	202	1	310	1	0	312	1831
% Car	100.0	99.8	-	-	99.8	99.5	-	100.0	-	99.5	100.0	99.0	100.0	-	99.0	99.7
Truck	0	2	0	0	2	1	0	0	0	1	0	3	0	0	3	6
% Truck	0.0	0.2	-	-	0.2	0.5	-	0.0	-	0.5	0.0	1.0	0.0	-	1.0	0.3



Turning Movement Data

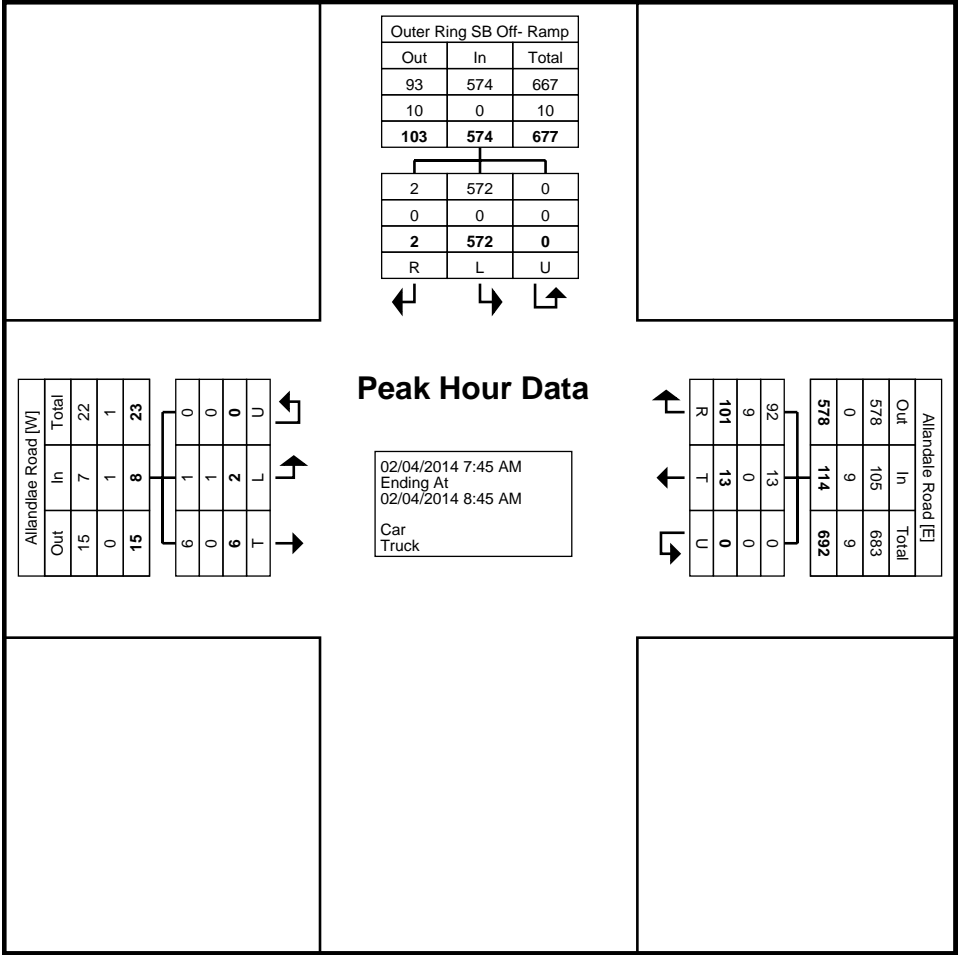
Start Time	Outer Ring SB Off- Ramp Southbound				Allandale Road Westbound				Allandale Road Eastbound				Int. Total
	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	
7:00 AM	1	55	0	56	10	3	0	13	1	0	0	1	70
7:15 AM	1	58	0	59	21	4	0	25	3	1	0	4	88
7:30 AM	0	104	0	104	21	1	0	22	2	0	0	2	128
7:45 AM	2	140	0	142	26	3	0	29	1	1	0	2	173
Hourly Total	4	357	0	361	78	11	0	89	7	2	0	9	459
8:00 AM	0	137	0	137	20	3	0	23	2	0	0	2	162
8:15 AM	0	151	0	151	26	5	0	31	2	0	0	2	184
8:30 AM	0	144	0	144	29	2	0	31	1	1	0	2	177
8:45 AM	2	112	0	114	27	0	0	27	0	0	0	0	141
Hourly Total	2	544	0	546	102	10	0	112	5	1	0	6	664
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-
12:00 PM	2	66	0	68	35	3	0	38	6	2	0	8	114
12:15 PM	0	86	0	86	34	2	0	36	7	0	0	7	129
12:30 PM	2	67	0	69	36	2	0	38	4	0	0	4	111
12:45 PM	0	80	0	80	45	3	0	48	3	1	0	4	132
Hourly Total	4	299	0	303	150	10	0	160	20	3	0	23	486
1:00 PM	0	99	0	99	27	1	0	28	1	1	0	2	129
1:15 PM	2	87	0	89	30	5	0	35	6	0	0	6	130
1:30 PM	0	86	1	87	27	2	0	29	3	0	0	3	119
1:45 PM	0	101	0	101	44	7	0	51	5	2	0	7	159
Hourly Total	2	373	1	376	128	15	0	143	15	3	0	18	537
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-
4:00 PM	1	63	0	64	214	2	0	216	7	4	0	11	291
4:15 PM	1	72	0	73	159	1	0	160	4	0	0	4	237
4:30 PM	0	87	0	87	247	1	0	248	6	0	0	6	341
4:45 PM	0	73	0	73	197	5	0	202	5	1	0	6	281
Hourly Total	2	295	0	297	817	9	0	826	22	5	0	27	1150
5:00 PM	4	68	0	72	159	3	0	162	6	2	0	8	242
5:15 PM	1	60	0	61	82	3	0	85	4	2	0	6	152
5:30 PM	0	59	0	59	76	3	0	79	3	1	0	4	142
5:45 PM	0	58	0	58	55	1	0	56	1	3	0	4	118
Hourly Total	5	245	0	250	372	10	0	382	14	8	0	22	654
Grand Total	19	2113	1	2133	1647	65	0	1712	83	22	0	105	3950
Approach %	0.9	99.1	0.0	-	96.2	3.8	0.0	-	79.0	21.0	0.0	-	-
Total %	0.5	53.5	0.0	54.0	41.7	1.6	0.0	43.3	2.1	0.6	0.0	2.7	-
Car	18	2093	1	2112	1628	65	0	1693	82	21	0	103	3908
% Car	94.7	99.1	100.0	99.0	98.8	100.0	-	98.9	98.8	95.5	-	98.1	98.9
Truck	1	20	0	21	19	0	0	19	1	1	0	2	42
% Truck	5.3	0.9	0.0	1.0	1.2	0.0	-	1.1	1.2	4.5	-	1.9	1.1



Turning Movement Data Plot

Turning Movement Peak Hour Data (7:45 AM)

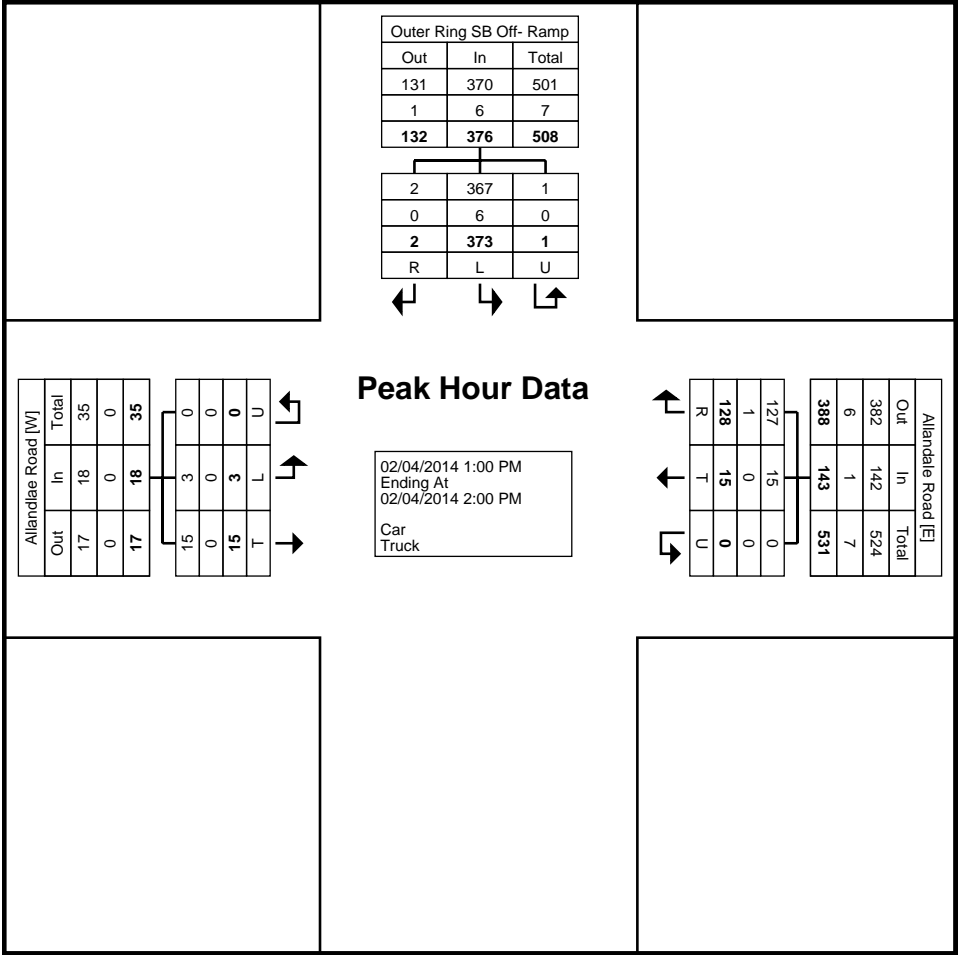
Start Time	Outer Ring SB Off- Ramp Southbound				Allandale Road Westbound				Allandale Road Eastbound				Int. Total
	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	
7:45 AM	2	140	0	142	26	3	0	29	1	1	0	2	173
8:00 AM	0	137	0	137	20	3	0	23	2	0	0	2	162
8:15 AM	0	151	0	151	26	5	0	31	2	0	0	2	184
8:30 AM	0	144	0	144	29	2	0	31	1	1	0	2	177
Total	2	572	0	574	101	13	0	114	6	2	0	8	696
Approach %	0.3	99.7	0.0	-	88.6	11.4	0.0	-	75.0	25.0	0.0	-	-
Total %	0.3	82.2	0.0	82.5	14.5	1.9	0.0	16.4	0.9	0.3	0.0	1.1	-
PHF	0.250	0.947	0.000	0.950	0.871	0.650	0.000	0.919	0.750	0.500	0.000	1.000	0.946
Car	2	572	0	574	92	13	0	105	6	1	0	7	686
% Car	100.0	100.0	-	100.0	91.1	100.0	-	92.1	100.0	50.0	-	87.5	98.6
Truck	0	0	0	0	9	0	0	9	0	1	0	1	10
% Truck	0.0	0.0	-	0.0	8.9	0.0	-	7.9	0.0	50.0	-	12.5	1.4



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

Turning Movement Peak Hour Data (1:00 PM)

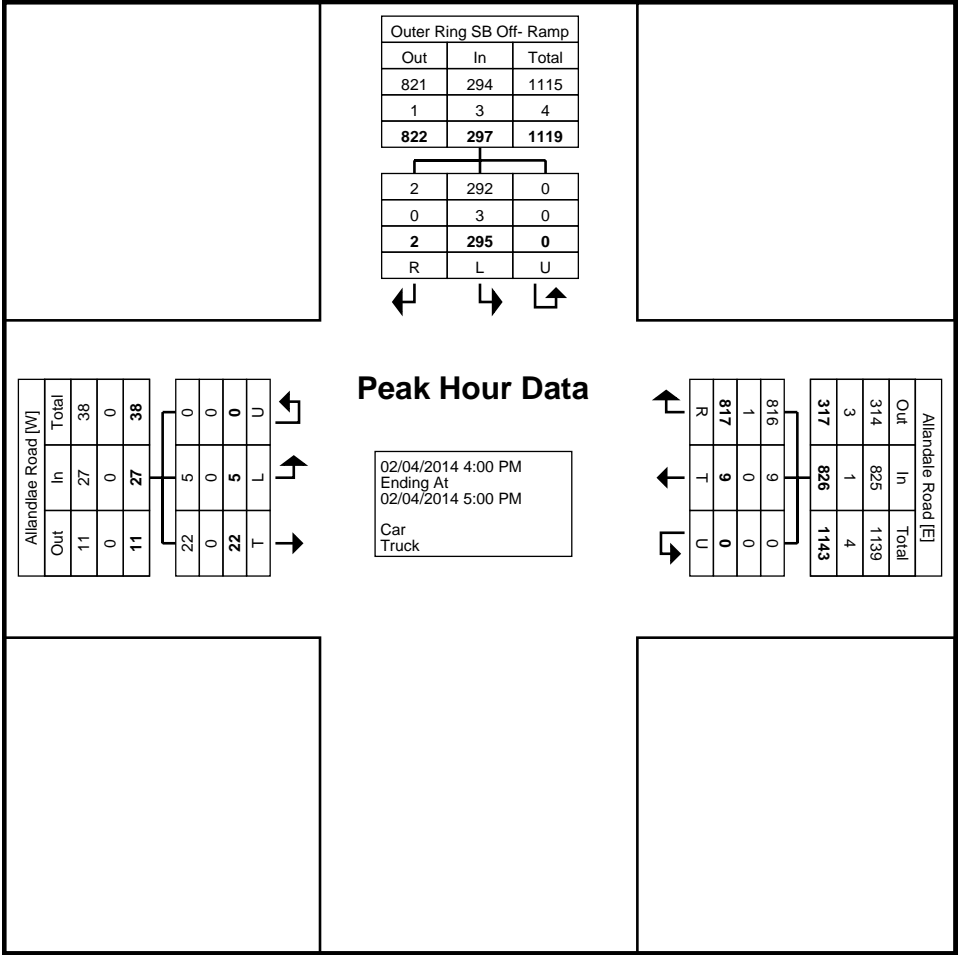
Start Time	Outer Ring SB Off- Ramp Southbound				Allandale Road Westbound				Allandale Road Eastbound				Int. Total
	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	
1:00 PM	0	99	0	99	27	1	0	28	1	1	0	2	129
1:15 PM	2	87	0	89	30	5	0	35	6	0	0	6	130
1:30 PM	0	86	1	87	27	2	0	29	3	0	0	3	119
1:45 PM	0	101	0	101	44	7	0	51	5	2	0	7	159
Total	2	373	1	376	128	15	0	143	15	3	0	18	537
Approach %	0.5	99.2	0.3	-	89.5	10.5	0.0	-	83.3	16.7	0.0	-	-
Total %	0.4	69.5	0.2	70.0	23.8	2.8	0.0	26.6	2.8	0.6	0.0	3.4	-
PHF	0.250	0.923	0.250	0.931	0.727	0.536	0.000	0.701	0.625	0.375	0.000	0.643	0.844
Car	2	367	1	370	127	15	0	142	15	3	0	18	530
% Car	100.0	98.4	100.0	98.4	99.2	100.0	-	99.3	100.0	100.0	-	100.0	98.7
Truck	0	6	0	6	1	0	0	1	0	0	0	0	7
% Truck	0.0	1.6	0.0	1.6	0.8	0.0	-	0.7	0.0	0.0	-	0.0	1.3



Turning Movement Peak Hour Data Plot (1:00 PM)

Turning Movement Peak Hour Data (4:00 PM)

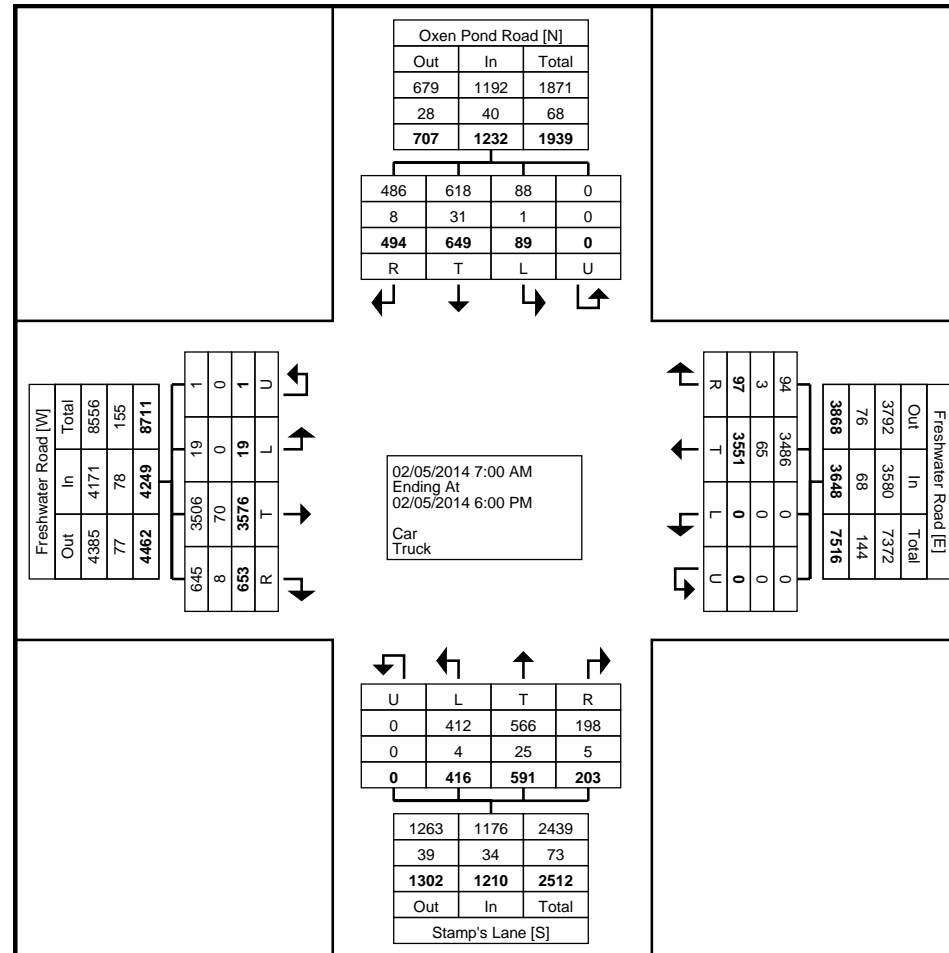
Start Time	Outer Ring SB Off- Ramp Southbound				Allandale Road Westbound				Allandale Road Eastbound				Int. Total
	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Thru	Left	U-Turn	App. Total	
4:00 PM	1	63	0	64	214	2	0	216	7	4	0	11	291
4:15 PM	1	72	0	73	159	1	0	160	4	0	0	4	237
4:30 PM	0	87	0	87	247	1	0	248	6	0	0	6	341
4:45 PM	0	73	0	73	197	5	0	202	5	1	0	6	281
Total	2	295	0	297	817	9	0	826	22	5	0	27	1150
Approach %	0.7	99.3	0.0	-	98.9	1.1	0.0	-	81.5	18.5	0.0	-	-
Total %	0.2	25.7	0.0	25.8	71.0	0.8	0.0	71.8	1.9	0.4	0.0	2.3	-
PHF	0.500	0.848	0.000	0.853	0.827	0.450	0.000	0.833	0.786	0.313	0.000	0.614	0.843
Car	2	292	0	294	816	9	0	825	22	5	0	27	1146
% Car	100.0	99.0	-	99.0	99.9	100.0	-	99.9	100.0	100.0	-	100.0	99.7
Truck	0	3	0	3	1	0	0	1	0	0	0	0	4
% Truck	0.0	1.0	-	1.0	0.1	0.0	-	0.1	0.0	0.0	-	0.0	0.3



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

Turning Movement Data

Start Time	Oxen Pond Road Southbound					Freshwater Road Westbound					Stamp's Lane Northbound					Freshwater Road Eastbound					Int. Total
	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	
7:00 AM	8	5	0	0	13	0	44	0	0	44	1	7	10	0	18	11	63	0	0	74	149
7:15 AM	7	4	3	0	14	2	66	0	0	68	2	13	9	0	24	12	102	0	0	114	220
7:30 AM	11	12	1	0	24	1	98	0	0	99	5	18	21	0	44	19	113	0	0	132	299
7:45 AM	14	25	3	0	42	2	108	0	0	110	10	24	25	0	59	27	135	0	0	162	373
Hourly Total	40	46	7	0	93	5	316	0	0	321	18	62	65	0	145	69	413	0	0	482	1041
8:00 AM	28	22	1	0	51	0	123	0	0	123	11	44	10	0	65	39	165	0	0	204	443
8:15 AM	23	28	7	0	58	4	150	0	0	154	17	57	8	0	82	24	188	0	0	212	506
8:30 AM	31	36	9	0	76	1	139	0	0	140	10	48	17	0	75	21	163	0	0	184	475
8:45 AM	17	16	3	0	36	6	146	0	0	152	11	40	18	0	69	22	148	1	0	171	428
Hourly Total	99	102	20	0	221	11	558	0	0	569	49	189	53	0	291	106	664	1	0	771	1852
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12:00 PM	17	21	3	0	41	4	194	0	0	198	4	27	24	0	55	20	136	4	0	160	454
12:15 PM	23	18	1	0	42	6	159	0	0	165	6	19	19	0	44	16	130	2	0	148	399
12:30 PM	21	29	3	0	53	2	156	0	0	158	11	25	22	0	58	33	159	2	0	194	463
12:45 PM	20	36	2	0	58	9	137	0	0	146	16	19	16	0	51	40	184	3	0	227	482
Hourly Total	81	104	9	0	194	21	646	0	0	667	37	90	81	0	208	109	609	11	0	729	1798
1:00 PM	26	29	4	0	59	2	173	0	0	175	9	19	25	0	53	29	160	0	1	190	477
1:15 PM	26	30	4	0	60	4	167	0	0	171	8	16	14	0	38	32	155	0	0	187	456
1:30 PM	16	20	2	0	38	3	149	0	0	152	11	20	27	0	58	24	167	0	0	191	439
1:45 PM	24	24	3	0	51	5	168	0	0	173	9	24	20	0	53	25	164	1	0	190	467
Hourly Total	92	103	13	0	208	14	657	0	0	671	37	79	86	0	202	110	646	1	1	758	1839
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4:00 PM	23	46	4	0	73	6	191	0	0	197	13	20	21	0	54	28	119	0	0	147	471
4:15 PM	24	41	6	0	71	1	164	0	0	165	6	24	18	0	48	22	150	2	0	174	458
4:30 PM	25	41	8	0	74	8	179	0	0	187	3	21	26	0	50	29	195	2	0	226	537
4:45 PM	21	40	3	0	64	3	193	0	0	196	6	23	14	0	43	39	154	2	0	195	498
Hourly Total	93	168	21	0	282	18	727	0	0	745	28	88	79	0	195	118	618	6	0	742	1964
5:00 PM	40	41	1	0	82	6	167	0	0	173	13	24	13	0	50	38	193	0	0	231	536
5:15 PM	16	39	6	0	61	9	193	0	0	202	9	21	9	0	39	39	149	0	0	188	490
5:30 PM	23	23	9	0	55	8	148	0	0	156	3	11	16	0	30	35	150	0	0	185	426
5:45 PM	10	23	3	0	36	5	139	0	0	144	9	27	14	0	50	29	134	0	0	163	393
Hourly Total	89	126	19	0	234	28	647	0	0	675	34	83	52	0	169	141	626	0	0	767	1845
Grand Total	494	649	89	0	1232	97	3551	0	0	3648	203	591	416	0	1210	653	3576	19	1	4249	10339
Approach %	40.1	52.7	7.2	0.0	-	2.7	97.3	0.0	0.0	-	16.8	48.8	34.4	0.0	-	15.4	84.2	0.4	0.0	-	-
Total %	4.8	6.3	0.9	0.0	11.9	0.9	34.3	0.0	0.0	35.3	2.0	5.7	4.0	0.0	11.7	6.3	34.6	0.2	0.0	41.1	-
Car	486	618	88	0	1192	94	3486	0	0	3580	198	566	412	0	1176	645	3506	19	1	4171	10119
% Car	98.4	95.2	98.9	-	96.8	96.9	98.2	-	-	98.1	97.5	95.8	99.0	-	97.2	98.8	98.0	100.0	100.0	98.2	97.9
Truck	8	31	1	0	40	3	65	0	0	68	5	25	4	0	34	8	70	0	0	78	220
% Truck	1.6	4.8	1.1	-	3.2	3.1	1.8	-	-	1.9	2.5	4.2	1.0	-	2.8	1.2	2.0	0.0	0.0	1.8	2.1



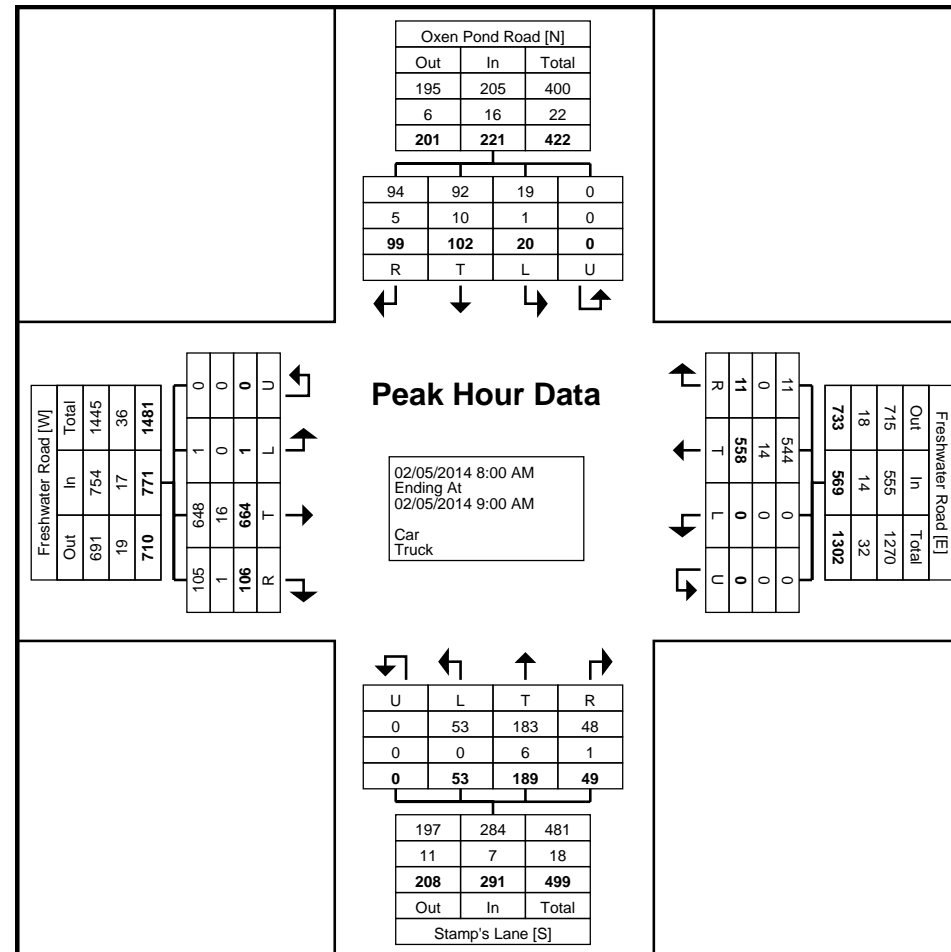
Turning Movement Data Plot

Hatch Mott McDonald Parent Account
 370 Torbay Rd
 Suite E200, Bally Rou Place
 St. John's, Newfoundland and Labrador, Canada A1A 3W8
 7097002049 courtney.mccarthy@hatchmott.com

Count Name: MUN Area Traffic Study
 Site Code:
 Start Date: 02/05/2014
 Page No: 3

Turning Movement Peak Hour Data (8:00 AM)

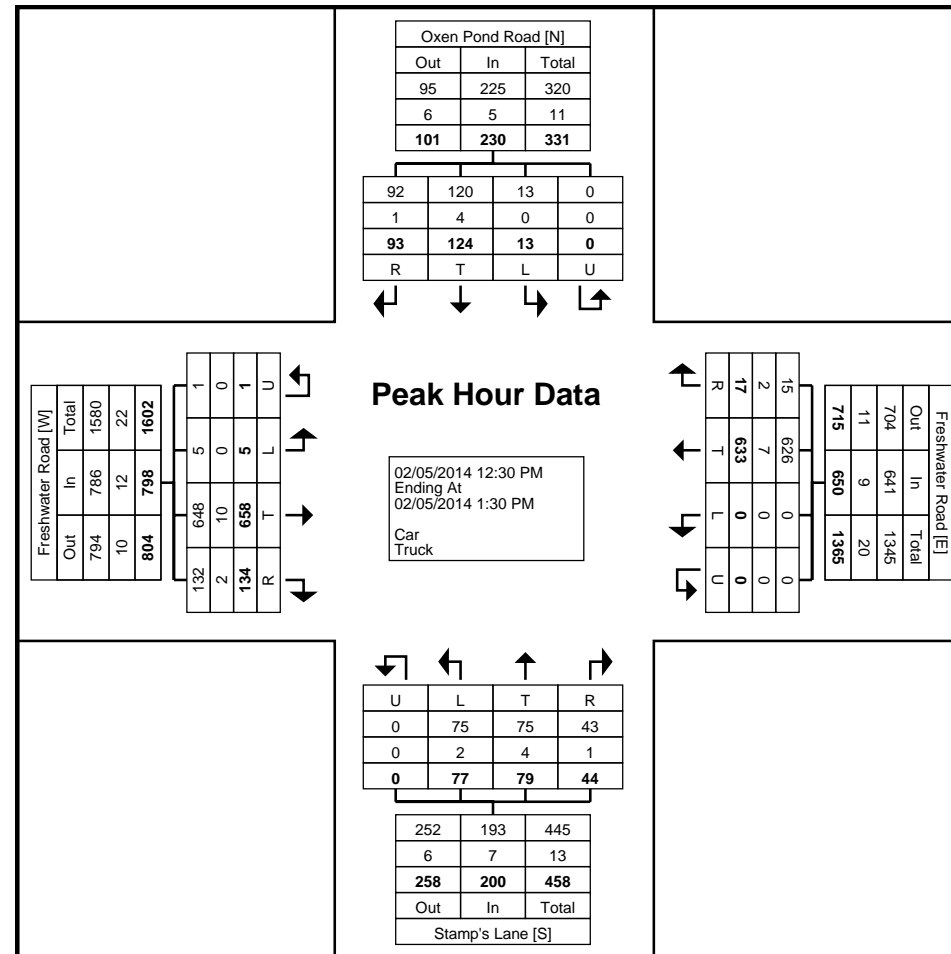
Start Time	Oxen Pond Road Southbound					Freshwater Road Westbound					Stamp's Lane Northbound					Freshwater Road Eastbound					Int. Total
	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	
8:00 AM	28	22	1	0	51	0	123	0	0	123	11	44	10	0	65	39	165	0	0	204	443
8:15 AM	23	28	7	0	58	4	150	0	0	154	17	57	8	0	82	24	188	0	0	212	506
8:30 AM	31	36	9	0	76	1	139	0	0	140	10	48	17	0	75	21	163	0	0	184	475
8:45 AM	17	16	3	0	36	6	146	0	0	152	11	40	18	0	69	22	148	1	0	171	428
Total	99	102	20	0	221	11	558	0	0	569	49	189	53	0	291	106	664	1	0	771	1852
Approach %	44.8	46.2	9.0	0.0	-	1.9	98.1	0.0	0.0	-	16.8	64.9	18.2	0.0	-	13.7	86.1	0.1	0.0	-	-
Total %	5.3	5.5	1.1	0.0	11.9	0.6	30.1	0.0	0.0	30.7	2.6	10.2	2.9	0.0	15.7	5.7	35.9	0.1	0.0	41.6	-
PHF	0.798	0.708	0.556	0.000	0.727	0.458	0.930	0.000	0.000	0.924	0.721	0.829	0.736	0.000	0.887	0.679	0.883	0.250	0.000	0.909	0.915
Car	94	92	19	0	205	11	544	0	0	555	48	183	53	0	284	105	648	1	0	754	1798
% Car	94.9	90.2	95.0	-	92.8	100.0	97.5	-	-	97.5	98.0	96.8	100.0	-	97.6	99.1	97.6	100.0	-	97.8	97.1
Truck	5	10	1	0	16	0	14	0	0	14	1	6	0	0	7	1	16	0	0	17	54
% Truck	5.1	9.8	5.0	-	7.2	0.0	2.5	-	-	2.5	2.0	3.2	0.0	-	2.4	0.9	2.4	0.0	-	2.2	2.9



Turning Movement Peak Hour Data Plot (8:00 AM)

Turning Movement Peak Hour Data (12:30 PM)

Start Time	Oxen Pond Road Southbound					Freshwater Road Westbound					Stamp's Lane Northbound					Freshwater Road Eastbound					Int. Total
	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	
12:30 PM	21	29	3	0	53	2	156	0	0	158	11	25	22	0	58	33	159	2	0	194	463
12:45 PM	20	36	2	0	58	9	137	0	0	146	16	19	16	0	51	40	184	3	0	227	482
1:00 PM	26	29	4	0	59	2	173	0	0	175	9	19	25	0	53	29	160	0	1	190	477
1:15 PM	26	30	4	0	60	4	167	0	0	171	8	16	14	0	38	32	155	0	0	187	456
Total	93	124	13	0	230	17	633	0	0	650	44	79	77	0	200	134	658	5	1	798	1878
Approach %	40.4	53.9	5.7	0.0	-	2.6	97.4	0.0	0.0	-	22.0	39.5	38.5	0.0	-	16.8	82.5	0.6	0.1	-	-
Total %	5.0	6.6	0.7	0.0	12.2	0.9	33.7	0.0	0.0	34.6	2.3	4.2	4.1	0.0	10.6	7.1	35.0	0.3	0.1	42.5	-
PHF	0.894	0.861	0.813	0.000	0.958	0.472	0.915	0.000	0.000	0.929	0.688	0.790	0.770	0.000	0.862	0.838	0.894	0.417	0.250	0.879	0.974
Car	92	120	13	0	225	15	626	0	0	641	43	75	75	0	193	132	648	5	1	786	1845
% Car	98.9	96.8	100.0	-	97.8	88.2	98.9	-	-	98.6	97.7	94.9	97.4	-	96.5	98.5	98.5	100.0	100.0	98.5	98.2
Truck	1	4	0	0	5	2	7	0	0	9	1	4	2	0	7	2	10	0	0	12	33
% Truck	1.1	3.2	0.0	-	2.2	11.8	1.1	-	-	1.4	2.3	5.1	2.6	-	3.5	1.5	1.5	0.0	0.0	1.5	1.8



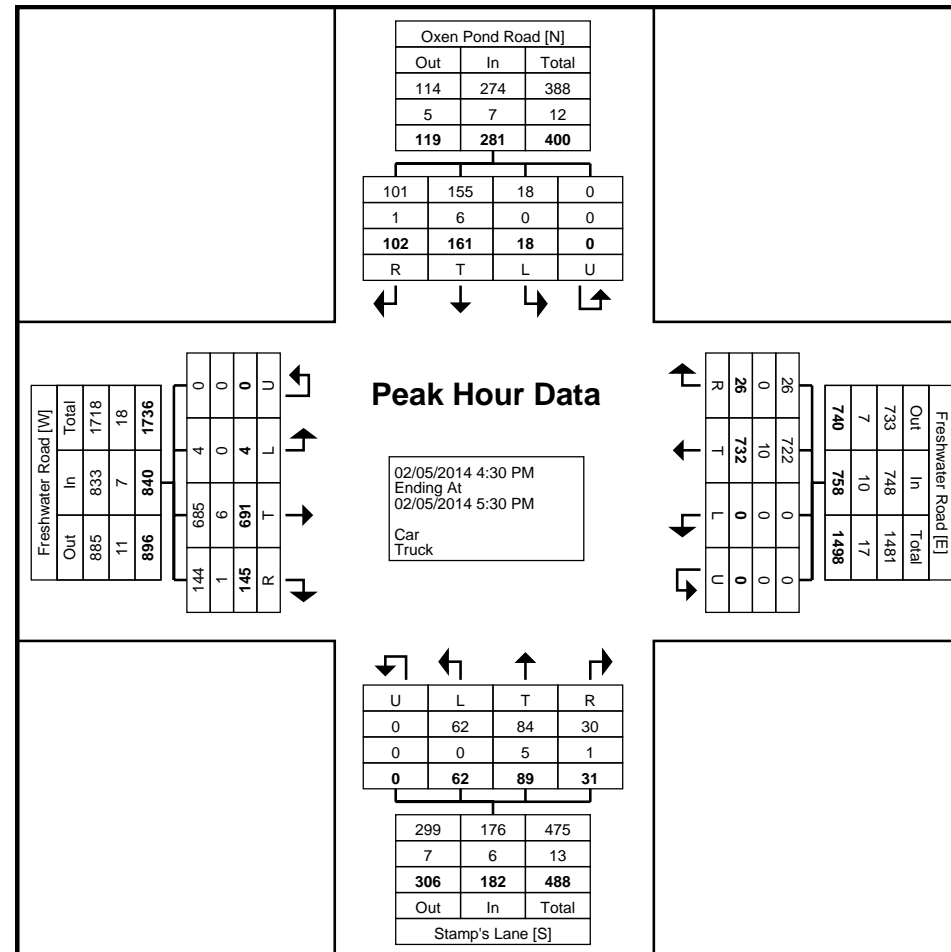
Turning Movement Peak Hour Data Plot (12:30 PM)

Hatch Mott McDonald Parent Account
370 Torbay Rd
Suite E200, Bally Rou Place
St. John's, Newfoundland and Labrador, Canada A1A 3W8
7097002049 courtney.mccarthy@hatchmott.com

Count Name: MUN Area Traffic Study
Site Code:
Start Date: 02/05/2014
Page No: 7

Turning Movement Peak Hour Data (4:30 PM)

Start Time	Oxen Pond Road Southbound					Freshwater Road Westbound					Stamp's Lane Northbound					Freshwater Road Eastbound					Int. Total
	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	
4:30 PM	25	41	8	0	74	8	179	0	0	187	3	21	26	0	50	29	195	2	0	226	537
4:45 PM	21	40	3	0	64	3	193	0	0	196	6	23	14	0	43	39	154	2	0	195	498
5:00 PM	40	41	1	0	82	6	167	0	0	173	13	24	13	0	50	38	193	0	0	231	536
5:15 PM	16	39	6	0	61	9	193	0	0	202	9	21	9	0	39	39	149	0	0	188	490
Total	102	161	18	0	281	26	732	0	0	758	31	89	62	0	182	145	691	4	0	840	2061
Approach %	36.3	57.3	6.4	0.0	-	3.4	96.6	0.0	0.0	-	17.0	48.9	34.1	0.0	-	17.3	82.3	0.5	0.0	-	-
Total %	4.9	7.8	0.9	0.0	13.6	1.3	35.5	0.0	0.0	36.8	1.5	4.3	3.0	0.0	8.8	7.0	33.5	0.2	0.0	40.8	-
PHF	0.638	0.982	0.563	0.000	0.857	0.722	0.948	0.000	0.000	0.938	0.596	0.927	0.596	0.000	0.910	0.929	0.886	0.500	0.000	0.909	0.959
Car	101	155	18	0	274	26	722	0	0	748	30	84	62	0	176	144	685	4	0	833	2031
% Car	99.0	96.3	100.0	-	97.5	100.0	98.6	-	-	98.7	96.8	94.4	100.0	-	96.7	99.3	99.1	100.0	-	99.2	98.5
Truck	1	6	0	0	7	0	10	0	0	10	1	5	0	0	6	1	6	0	0	7	30
% Truck	1.0	3.7	0.0	-	2.5	0.0	1.4	-	-	1.3	3.2	5.6	0.0	-	3.3	0.7	0.9	0.0	-	0.8	1.5



Turning Movement Peak Hour Data Plot (4:30 PM)

Study Name MUN Area Traffic Study

Start Date 4/3/2014

Start Time 8:00 AM

Site Code Livyer's Loop

Weather Cloud cover, -5 to -1 degrees, light wind

Distance to another traffic control device	120m
Site is candidate for pedestrian crossing control	Table 1
ADT	1420
Speed Limit	50 km/hr
Lanes	1
Warrants	Does Not Warrant

Vehicles

Pedestrians

Channel	Direction	Combined	Total
Direction	southeastbound		Hourly

8:00 AM	29	29	
8:15 AM	31	31	
8:30 AM	51	51	
8:45 AM	56	56	167
9:00 AM	31	31	
9:15 AM	14	14	
9:30 AM	15	15	
9:45 AM	24	24	84
10:00 AM	29	29	
10:15 AM	53	53	
10:30 AM	33	33	
10:45 AM	23	23	138
11:00 AM	21	21	
11:15 AM	28	28	
11:30 AM	27	27	
11:45 AM	39	39	115
12:00 PM	21	21	
12:15 PM	25	25	
12:30 PM	23	23	
12:45 PM	40	40	109
1:00 PM	25	25	
1:15 PM	31	31	
1:30 PM	35	35	
1:45 PM	54	54	145
2:00 PM	25	25	
2:15 PM	20	20	
2:30 PM	32	32	
2:45 PM	33	33	110
3:00 PM	36	36	
3:15 PM	30	30	
3:30 PM	24	24	
3:45 PM	39	39	129
4:00 PM	29	29	
4:15 PM	34	34	
4:30 PM	55	55	
4:45 PM	43	43	161
5:00 PM	42	42	
5:15 PM	31	31	
5:30 PM	22	22	
5:45 PM	22	22	117

TOTAL

1275

Channel	Direction	Direction	Combined	Total
Direction	Southwestbound	Northeastbound		Hourly

8:00 AM	0	1	1	
8:15 AM	0	3	3	
8:30 AM	1	4	5	
8:45 AM	6	24	30	39
9:00 AM	1	5	6	
9:15 AM	2	3	5	
9:30 AM	0	3	3	
9:45 AM	0	8	8	22
10:00 AM	0	6	6	
10:15 AM	0	9	9	
10:30 AM	0	6	6	
10:45 AM	0	3	3	24
11:00 AM	0	4	4	
11:15 AM	1	4	5	
11:30 AM	0	2	2	
11:45 AM	3	12	15	26
12:00 PM	2	4	6	
12:15 PM	1	9	10	
12:30 PM	1	11	12	
12:45 PM	0	7	7	35
1:00 PM	0	1	1	
1:15 PM	0	3	3	
1:30 PM	0	4	4	
1:45 PM	1	7	8	16
2:00 PM	0	2	2	
2:15 PM	1	0	1	
2:30 PM	2	3	5	
2:45 PM	1	2	3	11
3:00 PM	2	3	5	
3:15 PM	1	4	5	
3:30 PM	0	3	3	
3:45 PM	0	1	1	14
4:00 PM	1	2	3	
4:15 PM	1	0	1	
4:30 PM	2	0	2	
4:45 PM	3	1	4	10
5:00 PM	1	1	2	
5:15 PM	1	0	1	
5:30 PM	2	1	3	
5:45 PM	1	3	4	10

207

Study Name MUN Area Traffic Study
 Start Date 03/20/2014
 Start Time 8:00 AM
 Site Code Elizabeth Avenue & Rodney Street
 Weather clear skies, -5 deg, high of 0-1 deg

Distance to another traffic control device	275m	
Site is candidate for pedestrain crossing control		Table 1
ADT	9940	9000 < ADT < 12000
Speed Limit	50 km/hr	
Lanes	2	
Warrants	GM1	Figure 7

Vehicles

Channel	Direction	Direction	Combined	Total
Direction	Westbound	Eastbound		Hourly

8:00 AM	105	115	220	
8:15 AM	138	131	269	
8:30 AM	125	155	280	
8:45 AM	107	154	261	1030
9:00 AM	79	108	187	
9:15 AM	64	69	133	
9:30 AM	94	72	166	
9:45 AM	95	106	201	687
10:00 AM	86	101	187	
10:15 AM	95	108	203	
10:30 AM	78	121	199	
10:45 AM	94	87	181	770
11:00 AM	77	119	196	
11:15 AM	96	114	210	
11:30 AM	108	104	212	
11:45 AM	133	163	296	914
12:00 PM	127	124	251	
12:15 PM	119	122	241	
12:30 PM	114	136	250	
12:45 PM	125	143	268	1010
1:00 PM	130	129	259	
1:15 PM	142	118	260	
1:30 PM	124	154	278	
1:45 PM	138	182	320	1117
2:00 PM	127	121	248	
2:15 PM	105	148	253	
2:30 PM	107	115	222	
2:45 PM	98	147	245	968
3:00 PM	138	144	282	
3:15 PM	144	156	300	
3:30 PM	119	141	260	
3:45 PM	133	141	274	1116
4:00 PM	130	155	285	
4:15 PM	134	158	292	
4:30 PM	148	154	302	
4:45 PM	172	176	348	1227
5:00 PM	130	151	281	
5:15 PM	108	130	238	
5:30 PM	111	116	227	
5:45 PM	111	101	212	958

TOTAL 9797

Pedestrians

Channel	Direction	Direction	Combined	Total
Direction	Southbound	Northbound		Hourly

8:00 AM	4	0	4	
8:15 AM	7	0	7	
8:30 AM	13	0	13	
8:45 AM	13	0	13	37
9:00 AM	6	1	7	
9:15 AM	4	0	4	
9:30 AM	1	1	2	
9:45 AM	4	0	4	17
10:00 AM	5	0	5	
10:15 AM	8	3	11	
10:30 AM	5	0	5	
10:45 AM	4	1	5	26
11:00 AM	0	0	0	
11:15 AM	0	0	0	
11:30 AM	2	3	5	
11:45 AM	1	1	2	7
12:00 PM	1	1	2	
12:15 PM	0	1	1	
12:30 PM	2	0	2	
12:45 PM	0	0	0	5
1:00 PM	2	0	2	
1:15 PM	2	3	5	
1:30 PM	4	2	6	
1:45 PM	5	3	8	21
2:00 PM	1	0	1	
2:15 PM	5	1	6	
2:30 PM	2	0	2	
2:45 PM	0	0	0	9
3:00 PM	2	5	7	
3:15 PM	5	5	10	
3:30 PM	1	4	5	
3:45 PM	3	5	8	30
4:00 PM	0	1	1	
4:15 PM	1	3	4	
4:30 PM	1	4	5	
4:45 PM	0	8	8	18
5:00 PM	0	9	9	
5:15 PM	1	3	4	
5:30 PM	0	5	5	
5:45 PM	1	1	2	20

7 hours

122

115

116

110

190

Study Name MUN Area Traffic Study

Start Date 03/19/2014

Start Time 7:30 AM

Site Code Westerland Road & Pedagogue's Close

Weather Cloud cover, -4 deg, high of -2 deg

Distance to another traffic control device **180m**

Site is candidate for pedestrain crossing control

Table 1

ADT **9160** **9000 < ADT < 12000**

Speed Limit **50 km/hr**

Lanes **2**

Warrants **GM1**

Figure 7

Vehicles

Pedestrians

Channel	Direction	Direction	Combined	Total
Direction	Southbound	Northbound		Hourly

Channel	Direction	Direction	Combined	Total
Direction	Westbound	Eastbound		Hourly

7:30 AM	65	88	153	
7:45 AM	87	130	217	
8:00 AM	65	148	213	
8:15 AM	105	161	266	849
8:30 AM	117	166	283	
8:45 AM	106	147	253	
9:00 AM	72	86	158	
9:15 AM	61	77	138	832
9:30 AM	73	105	178	
9:45 AM	86	91	177	
10:00 AM	62	78	140	
10:15 AM	56	54	110	605
10:30 AM	73	82	155	
10:45 AM	74	113	187	
11:00 AM	78	85	163	
11:15 AM	89	84	173	678
11:30 AM	83	80	163	
11:45 AM	101	114	215	
12:00 PM	100	116	216	
12:15 PM	91	96	187	781
12:30 PM	76	81	157	
12:45 PM	91	90	181	
1:00 PM	109	110	219	
1:15 PM	87	76	163	720
1:30 PM	85	86	171	
1:45 PM	83	120	203	
2:00 PM	91	87	178	
2:15 PM	78	100	178	730
2:30 PM	69	88	157	
2:45 PM	104	120	224	
3:00 PM	113	128	241	
3:15 PM	121	91	212	834
3:30 PM	80	91	171	
3:45 PM	96	91	187	
4:00 PM	113	92	205	
4:15 PM	134	102	236	799
4:30 PM	152	105	257	
4:45 PM	160	121	281	
5:00 PM	151	98	249	
5:15 PM	89	107	196	983

7:30 AM	6	11	17	
7:45 AM	2	12	14	
8:00 AM	4	9	13	
8:15 AM	3	28	31	75
8:30 AM	11	55	66	
8:45 AM	4	62	66	
9:00 AM	6	17	23	
9:15 AM	4	21	25	180
9:30 AM	10	20	30	
9:45 AM	12	20	32	
10:00 AM	10	13	23	
10:15 AM	8	12	20	105
10:30 AM	15	18	33	
10:45 AM	27	33	60	
11:00 AM	16	15	31	
11:15 AM	9	8	17	141
11:30 AM	13	16	29	
11:45 AM	42	15	57	
12:00 PM	31	24	55	
12:15 PM	14	5	19	160
12:30 PM	12	15	27	
12:45 PM	39	15	54	
1:00 PM	27	15	42	
1:15 PM	17	14	31	154
1:30 PM	16	17	33	
1:45 PM	40	17	57	
2:00 PM	15	14	29	
2:15 PM	7	11	18	137
2:30 PM	10	7	17	
2:45 PM	26	17	43	
3:00 PM	13	15	28	
3:15 PM	15	9	24	112
3:30 PM	19	6	25	
3:45 PM	22	9	31	
4:00 PM	20	3	23	
4:15 PM	24	4	28	107
4:30 PM	43	7	50	
4:45 PM	32	5	37	
5:00 PM	33	1	34	
5:15 PM	18	7	25	146

TOTAL 10hrs = **7811**

10hrs = **1317**

Study Name MUN Area Traffic Study
 Start Date 03/19/2014
 Start Time 7:30 AM
 Site Code Westerland Rd & Lambe's Lane
 Weather Cloud cover, -4 deg, high of -2 deg

Distance to another traffic control device	80m	
Site is candidate for pedestrian crossing control		Table 1
ADT	8210	4500 < ADT < 9000
Speed Limit	50 km/hr	
Lanes	2	
Warrants	GM1	Figure 7

Vehicles

Pedestrians

Channel	Direction	Direction	Combined	Total
Direction	Southbound	Northbound		Hourly

Channel	Direction	Direction	Combined	Total
Direction	Southbound	Northbound		Hourly

7:30 AM	45	89	134	
7:45 AM	74	121	195	
8:00 AM	56	139	195	
8:15 AM	75	164	239	763
8:30 AM	96	158	254	
8:45 AM	74	144	218	
9:00 AM	57	86	143	
9:15 AM	47	92	139	754
9:30 AM	59	132	191	
9:45 AM	78	104	182	
10:00 AM	59	87	146	
10:15 AM	53	72	125	644
10:30 AM	66	89	155	
10:45 AM	57	110	167	
11:00 AM	67	83	150	
11:15 AM	59	76	135	607
11:30 AM	68	79	147	
11:45 AM	86	108	194	
12:00 PM	88	99	187	
12:15 PM	79	82	161	689
12:30 PM	69	90	159	
12:45 PM	80	101	181	
1:00 PM	96	115	211	
1:15 PM	74	91	165	716
1:30 PM	75	82	157	
1:45 PM	76	115	191	
2:00 PM	85	89	174	
2:15 PM	71	89	160	682
2:30 PM	72	78	150	
2:45 PM	91	103	194	
3:00 PM	92	124	216	
3:15 PM	106	87	193	753
3:30 PM	81	87	168	
3:45 PM	84	82	166	
4:00 PM	100	83	183	
4:15 PM	123	87	210	727
4:30 PM	128	102	230	
4:45 PM	132	117	249	
5:00 PM	120	98	218	
5:15 PM	81	101	182	879

7:30 AM	0	0	0	
7:45 AM	1	1	2	
8:00 AM	0	0	0	
8:15 AM	0	1	1	3
8:30 AM	0	45	45	
8:45 AM	4	58	62	
9:00 AM	1	13	14	
9:15 AM	0	17	17	138
9:30 AM	0	25	25	
9:45 AM	5	23	28	
10:00 AM	10	16	26	
10:15 AM	4	11	15	94
10:30 AM	2	13	15	
10:45 AM	11	24	35	
11:00 AM	8	3	11	
11:15 AM	4	3	7	68
11:30 AM	6	16	22	
11:45 AM	22	16	38	
12:00 PM	14	16	30	
12:15 PM	3	8	11	101
12:30 PM	3	8	11	
12:45 PM	33	10	43	
1:00 PM	10	9	19	
1:15 PM	6	20	26	99
1:30 PM	10	20	30	
1:45 PM	26	21	47	
2:00 PM	6	6	12	
2:15 PM	9	4	13	102
2:30 PM	3	5	8	
2:45 PM	16	4	20	
3:00 PM	19	7	26	
3:15 PM	21	9	30	84
3:30 PM	9	4	13	
3:45 PM	25	5	30	
4:00 PM	21	5	26	
4:15 PM	10	0	10	79
4:30 PM	11	5	16	
4:45 PM	14	7	21	
5:00 PM	12	3	15	
5:15 PM	15	6	21	73

TOTAL

7214

841

Study Name MUN Area Traffic Study

Start Date 03/20/2014

Start Time 8:00 AM

Site Code Elizabeth Avenue & Newtown Road

Weather clear skies, -5 deg, high of 0-1 deg

Distance to another traffic control device **200m**

Site is candidate for pedestrian crossing control

Table 1

ADT **10020** **9000 < ADT < 12000**

Speed Limit **50 km/hr**

Lanes **2**

Warrants **GM1**

Figure 7

Vehicles

Pedestrians

Channel	Direction	Direction	Combined	Total
Direction	Westbound	Eastbound		Hourly

Channel	Direction	Direction	Combined	Total
Direction	Southbound	Northbound		Hourly

8:00 AM	105	127	232	
8:15 AM	103	168	271	
8:30 AM	128	155	283	
8:45 AM	120	148	268	1054
9:00 AM	105	92	197	
9:15 AM	67	76	143	
9:30 AM	63	94	157	
9:45 AM	93	102	195	692
10:00 AM	96	96	192	
10:15 AM	100	118	218	
10:30 AM	110	91	201	
10:45 AM	83	107	190	801
11:00 AM	91	81	172	
11:15 AM	116	105	221	
11:30 AM	91	125	216	
11:45 AM	138	143	281	890
12:00 PM	124	142	266	
12:15 PM	103	131	234	
12:30 PM	125	127	252	
12:45 PM	121	150	271	1023
1:00 PM	122	139	261	
1:15 PM	107	154	261	
1:30 PM	142	142	284	
1:45 PM	137	167	304	1110
2:00 PM	130	134	264	
2:15 PM	132	117	249	
2:30 PM	111	116	227	
2:45 PM	135	113	248	988
3:00 PM	128	148	276	
3:15 PM	146	160	306	
3:30 PM	134	122	256	
3:45 PM	124	148	272	1110
4:00 PM	158	128	286	
4:15 PM	131	142	273	
4:30 PM	146	169	315	
4:45 PM	168	186	354	1228
5:00 PM	133	142	275	
5:15 PM	123	117	240	
5:30 PM	114	117	231	
5:45 PM	86	118	204	950

8:00 AM	0	10	10	
8:15 AM	0	15	15	
8:30 AM	0	21	21	
8:45 AM	3	62	65	111
9:00 AM	2	21	23	
9:15 AM	1	13	14	
9:30 AM	1	17	18	
9:45 AM	3	17	20	75
10:00 AM	4	24	28	
10:15 AM	7	37	44	
10:30 AM	6	20	26	
10:45 AM	7	11	18	116
11:00 AM	10	11	21	
11:15 AM	8	4	12	
11:30 AM	9	13	22	
11:45 AM	14	18	32	87
12:00 PM	16	8	24	
12:15 PM	10	11	21	
12:30 PM	3	9	12	
12:45 PM	10	23	33	90
1:00 PM	10	9	19	
1:15 PM	12	9	21	
1:30 PM	1	14	15	
1:45 PM	18	31	49	104
2:00 PM	15	8	23	
2:15 PM	10	10	20	
2:30 PM	10	7	17	
2:45 PM	6	5	11	71
3:00 PM	19	10	29	
3:15 PM	18	15	33	
3:30 PM	17	5	22	
3:45 PM	9	8	17	101
4:00 PM	25	5	30	
4:15 PM	14	5	19	
4:30 PM	20	6	26	
4:45 PM	27	4	31	106
5:00 PM	24	11	35	
5:15 PM	16	4	20	
5:30 PM	18	3	21	
5:45 PM	8	3	11	87

TOTAL

9846

948

Study Name MUN Area Traffic Study
 Start Date 3/26/2014
 Start Time 8:00 AM
 Site Code Clinch Crescent & Bridge
 Weather clear skies, -15 deg, high of -8 deg, little wind

Distance to another traffic control device	150m
Site is candidate for pedestrian crossing control	Table 1
ADT	13440 12000 < ADT < 15000
Speed Limit	50 km/hr
Lanes	2
Warrants	GM2 with WC-: Figure 13

Vehicles

Channel	Direction	Direction	Combined	Total
Direction	Southbound	Northbound		Hourly

8:00 AM	147	172	319	
8:15 AM	189	206	395	
8:30 AM	193	201	394	
8:45 AM	207	179	386	1494
9:00 AM	139	130	269	
9:15 AM	111	89	200	
9:30 AM	117	93	210	
9:45 AM	115	104	219	898
10:00 AM	85	87	172	
10:15 AM	86	89	175	
10:30 AM	101	92	193	
10:45 AM	119	113	232	772
11:00 AM	113	108	221	
11:15 AM	93	97	190	
11:30 AM	123	130	253	
11:45 AM	157	159	316	980
12:00 PM	164	138	302	
12:15 PM	140	128	268	
12:30 PM	134	155	289	
12:45 PM	124	161	285	1144
1:00 PM	142	121	263	
1:15 PM	101	137	238	
1:30 PM	123	122	245	
1:45 PM	156	142	298	1044
2:00 PM	100	111	211	
2:15 PM	121	124	245	
2:30 PM	106	102	208	
2:45 PM	123	151	274	938
3:00 PM	138	159	297	
3:15 PM	115	166	281	
3:30 PM	114	159	273	
3:45 PM	120	155	275	1126
4:00 PM	163	195	358	
4:15 PM	146	156	302	
4:30 PM	166	221	387	
4:45 PM	166	184	350	1397
5:00 PM	181	219	400	
5:15 PM	127	160	287	
5:30 PM	132	121	253	
5:45 PM	136	118	254	1194

TOTAL 10987

Pedestrians

Channel	Direction	Direction	Combined	Total
Direction	Southwestbound	Northeastbound		Hourly

8:00 AM	24	0	24	
8:15 AM	49	3	52	
8:30 AM	69	6	75	
8:45 AM	113	8	121	272
9:00 AM	35	4	39	
9:15 AM	21	7	28	
9:30 AM	22	5	27	
9:45 AM	38	11	49	143
10:00 AM	29	7	36	
10:15 AM	13	3	16	
10:30 AM	12	10	22	
10:45 AM	9	36	45	119
11:00 AM	9	9	18	
11:15 AM	4	6	10	
11:30 AM	8	14	22	
11:45 AM	16	18	34	84
12:00 PM	13	19	32	
12:15 PM	18	12	30	
12:30 PM	25	19	44	
12:45 PM	39	26	65	171
1:00 PM	27	14	41	
1:15 PM	15	13	28	
1:30 PM	23	12	35	
1:45 PM	23	38	61	165
2:00 PM	11	22	33	
2:15 PM	6	33	39	
2:30 PM	2	11	13	
2:45 PM	8	14	22	107
3:00 PM	8	24	32	
3:15 PM	12	21	33	
3:30 PM	10	40	50	
3:45 PM	9	62	71	186
4:00 PM	2	53	55	
4:15 PM	7	41	48	
4:30 PM	3	42	45	
4:45 PM	4	39	43	191
5:00 PM	2	58	60	
5:15 PM	3	22	25	
5:30 PM	2	6	8	
5:45 PM	2	13	15	108

1546

Study Name MUN Area Traffic Study

Start Date 3/26/2014

Start Time 8:00 AM

Site Code Allandale Road & Civic Address #84-86

Weather clear skies, -15 deg, high of -8 deg, little wind

Distance to another traffic control device	170m
Site is candidate for pedestrian crossing control	Table 1
ADT	13440
Speed Limit	50 km/hr
Lanes	4 no median
Warrants	OF
	Figure 22

Vehicles

Channel	Direction	Direction	Combined	Total
Direction	Southbound	Northbound		Hourly

8:00 AM	147	172	319	
8:15 AM	189	206	395	
8:30 AM	193	201	394	
8:45 AM	207	179	386	1494
9:00 AM	139	130	269	
9:15 AM	111	89	200	
9:30 AM	117	93	210	
9:45 AM	115	104	219	898
10:00 AM	85	87	172	
10:15 AM	86	89	175	
10:30 AM	101	92	193	
10:45 AM	119	113	232	772
11:00 AM	113	108	221	
11:15 AM	93	97	190	
11:30 AM	123	130	253	
11:45 AM	157	159	316	980
12:00 PM	164	138	302	
12:15 PM	140	128	268	
12:30 PM	134	155	289	
12:45 PM	124	161	285	1144
1:00 PM	142	121	263	
1:15 PM	101	137	238	
1:30 PM	123	122	245	
1:45 PM	156	142	298	1044
2:00 PM	100	111	211	
2:15 PM	121	124	245	
2:30 PM	106	102	208	
2:45 PM	123	151	274	938
3:00 PM	138	159	297	
3:15 PM	115	166	281	
3:30 PM	114	159	273	
3:45 PM	120	155	275	1126
4:00 PM	163	195	358	
4:15 PM	146	156	302	
4:30 PM	166	221	387	
4:45 PM	166	184	350	1397
5:00 PM	181	219	400	
5:15 PM	127	160	287	
5:30 PM	132	121	253	
5:45 PM	136	118	254	1194

TOTAL 10987

Pedestrians

Channel	Direction	Direction	Combined	Total
Direction	Westbound	Eastbound		Hourly

8:00 AM	0	0	0	
8:15 AM	0	0	0	
8:30 AM	4	0	4	
8:45 AM	2	1	3	7
9:00 AM	1	0	1	
9:15 AM	0	0	0	
9:30 AM	1	0	1	
9:45 AM	1	0	1	3
10:00 AM	0	0	0	
10:15 AM	0	0	0	
10:30 AM	2	0	2	
10:45 AM	2	0	2	4
11:00 AM	0	1	1	
11:15 AM	0	0	0	
11:30 AM	0	0	0	
11:45 AM	0	0	0	1
12:00 PM	1	3	4	
12:15 PM	0	2	2	
12:30 PM	0	3	3	
12:45 PM	2	1	3	12
1:00 PM	0	3	3	
1:15 PM	0	1	1	
1:30 PM	1	1	2	
1:45 PM	3	0	3	9
2:00 PM	1	0	1	
2:15 PM	0	2	2	
2:30 PM	1	1	2	
2:45 PM	6	0	6	11
3:00 PM	0	0	0	
3:15 PM	0	2	2	
3:30 PM	0	1	1	
3:45 PM	0	1	1	4
4:00 PM	0	3	3	
4:15 PM	1	0	1	
4:30 PM	1	2	3	
4:45 PM	0	2	2	9
5:00 PM	2	4	6	
5:15 PM	1	1	2	
5:30 PM	0	0	0	
5:45 PM	1	0	1	9

69

Study Name MUN Area Traffic Study
 Start Date 4/3/2014
 Start Time 8:00 AM
 Site Code Arctic Avenue & Kerwin Place
 Weather Cloud cover, -5 to -1 degrees, light wind

Distance to another traffic control device	>200m
Site is candidate for pedestrian crossing control	Table 1
ADT	5870 4500 < ADT < 9000
Speed Limit	50 km/hr
Lanes	4 median
Warrants	GM1 Figure 9

Vehicles

Channel	Direction	Direction	Combined	Total
Direction	Southwestbound	Northeastbound		Hourly

8:00 AM	38	126	164	
8:15 AM	53	147	200	
8:30 AM	57	138	195	
8:45 AM	55	147	202	761
9:00 AM	30	89	119	
9:15 AM	20	75	95	
9:30 AM	25	63	88	
9:45 AM	33	65	98	400
10:00 AM	46	89	135	
10:15 AM	78	93	171	
10:30 AM	37	81	118	
10:45 AM	32	60	92	516
11:00 AM	30	56	86	
11:15 AM	26	52	78	
11:30 AM	49	64	113	
11:45 AM	58	81	139	416
12:00 PM	58	53	111	
12:15 PM	28	56	84	
12:30 PM	45	77	122	
12:45 PM	55	88	143	460
1:00 PM	36	80	116	
1:15 PM	35	70	105	
1:30 PM	45	86	131	
1:45 PM	56	98	154	506
2:00 PM	53	67	120	
2:15 PM	37	67	104	
2:30 PM	30	40	70	
2:45 PM	36	54	90	384
3:00 PM	50	61	111	
3:15 PM	38	56	94	
3:30 PM	59	66	125	
3:45 PM	81	81	162	492
4:00 PM	73	55	128	
4:15 PM	52	57	109	
4:30 PM	79	69	148	
4:45 PM	54	65	119	504
5:00 PM	76	59	135	
5:15 PM	55	73	128	
5:30 PM	31	49	80	
5:45 PM	28	42	70	413

TOTAL

4852

Pedestrians

Channel	Direction	Direction	Combined	Total
Direction	Northwestbound	Southeastbound		Hourly

8:00 AM	9	1	10	
8:15 AM	5	4	9	
8:30 AM	21	0	21	
8:45 AM	30	3	33	73
9:00 AM	15	2	17	
9:15 AM	9	2	11	
9:30 AM	4	2	6	
9:45 AM	8	4	12	46
10:00 AM	9	4	13	
10:15 AM	13	8	21	
10:30 AM	2	4	6	
10:45 AM	10	6	16	56
11:00 AM	6	2	8	
11:15 AM	4	3	7	
11:30 AM	1	6	7	
11:45 AM	17	15	32	54
12:00 PM	9	8	17	
12:15 PM	9	8	17	
12:30 PM	9	4	13	
12:45 PM	11	9	20	67
1:00 PM	11	7	18	
1:15 PM	7	4	11	
1:30 PM	9	3	12	
1:45 PM	17	19	36	77
2:00 PM	6	10	16	
2:15 PM	5	5	10	
2:30 PM	4	5	9	
2:45 PM	4	9	13	48
3:00 PM	7	8	15	
3:15 PM	15	9	24	
3:30 PM	2	7	9	
3:45 PM	4	11	15	63
4:00 PM	2	9	11	
4:15 PM	3	10	13	
4:30 PM	2	13	15	
4:45 PM	4	8	12	51
5:00 PM	3	15	18	
5:15 PM	6	12	18	
5:30 PM	2	10	12	
5:45 PM	4	14	18	66

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APPENDIX B

2025 VISUM MODEL ASSUMPTIONS

To	Project File
From	Courtney McCarthy, EIT
Date	July 3, 2015
Project #	14322
Page	1 of 5
CC	Michael MacDonald, Robin King

SUBJECT: MUN AREA TRAFFIC STUDY – VISUM MODEL – ZONE ADJUSTMENTS

Harbourside Transportation Consultants (HTC) reviewed the 2025 VISUM Models for the MUN Area Traffic Study and made a number of changes to the model(s) traffic analysis zones within the study area. The purpose of this technical memorandum is to document those changes.

Project Zone Adjustments

In total, HTC adjusted the model information for zones 227, 228, 230, 231, and 402. A new TAZ was added to reflect the new growth in the study area expected to be in place by 2025; zone 229. For all the existing project zones the standard model traffic analysis zone attributes were replaced by the ITE trip generation rates.

Zone 227

- This zone encompasses the Health Science Center (HSC), and a portion of the residential housing area immediately to the west. The existing Multi-Point Assignment (MPA) showed the traffic being directed to Clinch Crescent (Node 2003). These percentage allocations were changed to match the existing traffic patterns on the 2014 network. The MPA's were change from 5/80/15 to 5/60/35.
- The ITE trip generation rates used for zone 227 are noted Table 1. HTC adjusted the trips generated for Zone 227 to match the existing 2014 traffic volumes on Clinch Crescent and on Prince Philip Drive. In order to match the existing traffic volumes a factor of 2 was applied to the Zone.

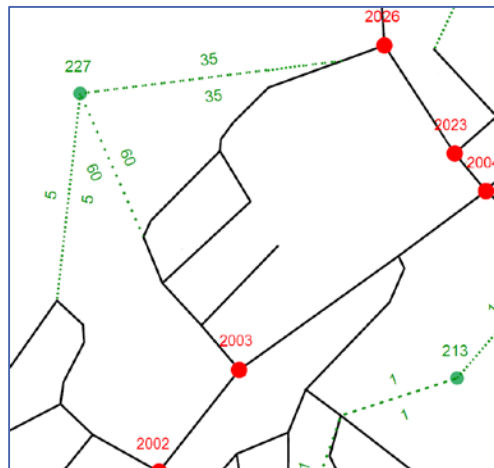


Figure 1 – New Percentage Allocations for Zone 227

Zone 228

- This zone encompasses a portion of the Memorial University campus on the north side of Prince Philip Drive just east of the HSC. The existing Multi-Point Assignment (MPA) showed the traffic being directed onto two roadways to then access Artic Avenue. HTC added a third point to Kerwins Place. The new MPA for this zone is 40/40/20.
- The ITE trip generation rates used for zone 228 are noted below in Table 1. HTC adjusted the trips generated for Zone 228 to match the existing 2014 traffic volumes on Arctic Avenue, Clinch Crescent and on Prince Philip Drive. In order to match the existing traffic volumes a factor of 1.5 was applied to the Zone.

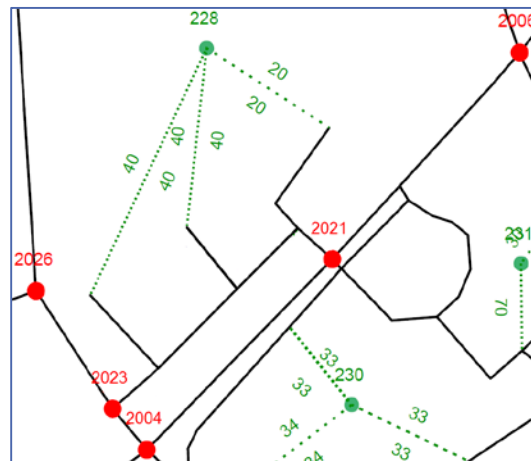


Figure 2 – New Percentage Allocations and new road for Zone 228

Zone 229

- A new TAZ, Zone 229, was added to the VISUM models to reflect the future growth in the study area; the new Core Sciences Building which is scheduled to begin construction in the fall of 2015. This new zone reflects the ITE trip generation rates associated with a new 300,000 sq. ft. Core Sciences Building with an additional 125,000 sq. ft. (500 Students) for the Faculty of Engineering and Applied Sciences. The Multi-Point Assignment (MPA) for this zone matched existing traffic patterns and the split is 70/30 with 70% going towards Clinch Crescent and 30% proceeding to Morrissey Drive.

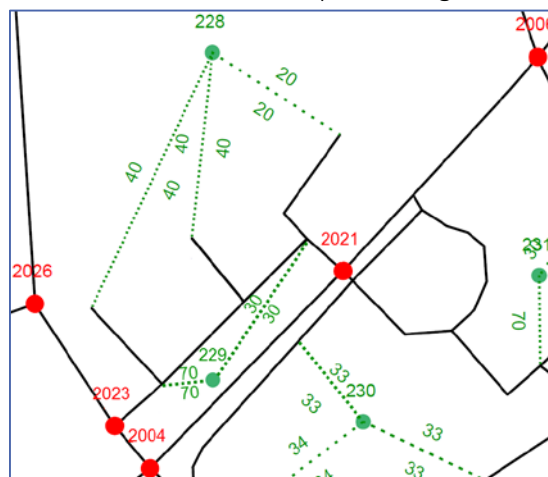


Figure 3 – New Zone (Zone 229) and Percentage Allocations

Zone 230

- This zone encompasses the MUN Fieldhouse on Westerland Road and buildings along Irwin's Road, south of Prince Philip Drive. The existing Multi-Point Assignment (MPA) showed the traffic being directed onto four roadways to then access Prince Philip Drive or Elizabeth Avenue. HTC removed a connection to Livyer's Loop. The new MPA for this zone is 34/33/33.
- The ITE trip generation rates used for zone 230 are noted below in Table 1.

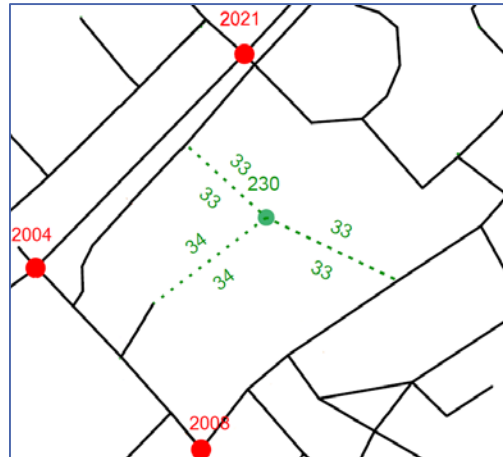


Figure 4 – New Percentage Allocations for Zone 230

Zone 231

- This zone encompasses the MUN Residences for students and buildings along Livyer's Loop, south of Prince Philip Drive. The existing Multi-Point Assignment (MPA) showed the traffic being directed onto three roadways to then access Prince Philip Drive or Elizabeth Avenue. HTC removed a MPA to Livyer's loop to better reflect existing traffic patterns in this zone. The new MPA for this zone is 70/30, with 70% going towards Elizabeth Avenue and 30% going towards Allandale Road.
- The ITE Trip Generation rates used for zone 231 are noted below in Table 1.

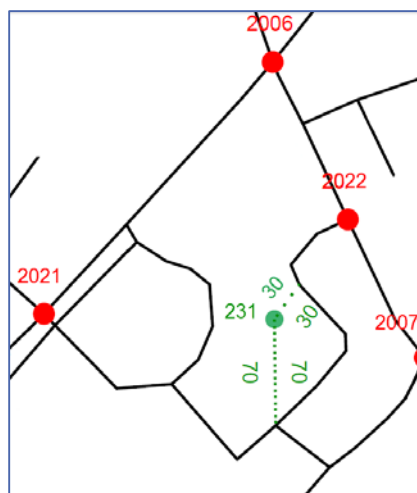


Figure 5 – New Percentage Allocations for Zone 231

Other Model Zone Adjustments

HTC reviewed the land use data for a number of other large development projects in the surrounding area that will either be completed or partially completed by 2025. These include the Southlands Development, the Glencrest Development, Developments in Paradise and the 190m Contour Development proposed in the Kenmount Road area. The following adjustments were made to the project zones:

- Southlands: The project is assumed to be fully built-out by year 2025.
- Glencrest: The project zones associated with the Glencrest project were reduced to 1/3 of the forecasted attributes to better represent the project development by the year 2025.
- Paradise: The projected growth in the Town of Paradise noted in the Paradise Transportation Study is fully reflected in the 2025 models.
- 190m Contour: The project zones associated with 190m Contour project were reduced to 1/3 of the originally forecasted attributes to better represent the anticipated build out of the project by the year 2025.

Transportation Network

Scenario (S4) Option A & B include a new roadway connection between Mount Scio Road and Clinch Crescent. The new roadway will be a four-lane cross section with a posted speed limit of 60 km/hr. Two new nodes were added to this model, Node 2020 and Node 2026. This road network changes is shown in Figure 6.

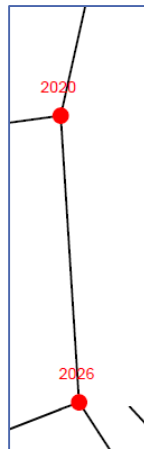


Figure 6 – New Connection from Mt. Scio to Clinch Crescent

Zone Land Use

As discussed in Section 2.1, HTC adjusted five (5) traffic analysis zones using the ITE trip generation rates to more accurately reflect the traffic patterns and volumes in the study area. The 5 zones that were modified are, Zone 227, 228, 230, 231 and 402. HTC used the ITE trip generation rates instead of the standard VISUM model zone inputs. These ITE Trip generation rates were applied to modeling Scenarios (S1) thru (S4). The ITE trip generation rates that were used in the VISUM Model are noted below in Table 1.

Table 1 – Updated Zones with ITE Trip Generation

Health Science & Memorial University - Trip Generation (2010 - 2015)																	
VISUM Zone	Use	Number	Unit	1000 sq ft GFA * Coverage	ITE Code	Daily Rate	Daily Trips	Trips In	Trips Out	AM Peak Rate	AM Peak Trip Gen	AM Peak Rate In	AM Peak Rate Out	PM Peak Rate	PM Peak Rate Gen	PM Peak In	PM Peak Out
EXISTING (2010)																	
Zone 227	Health and Sciences Centre ¹	1960	employees		610	5.2	10192	5096	5096	0.33	647	466	181	0.33	647	201	446
Zone 227	Dwelling Units	210	units		210	9.57	2010	1005	1005	0.75	158	39	118	1.01	212	134	78
Zone 227	Faculty of Medicine and Human Genetic Research Facility	152,000	sq. ft	152	760	8.11	1233	616	616	1.22	185	154	32	1.07	163	24	138
Zone 227	Janeway Hostel	18,000	sq. ft	18	610	16.5	297	149	149	1.12	20	12	8	1.14	21	9	12
Zone 227	Cancer Bunkers	4,000	sq. ft	4	610	16.5	66	33	33	1.12	4	3	2	1.14	5	2	3
Zone 227	TOTAL						13798	6899	6899		1014	674	341		1047	369	678
Zone 228	Memorial University	4,961	students		550	2.38	11808	5904	5904	0.21	1042	834	208	0.21	1042	313	729
Zone 228	TOTAL						11808	5904	5904		1042	834	208		1042	313	729
Zone 230	Memorial University	4,961	students		550	2.38	11808	5904	5904	0.21	1042	834	208	0.21	1042	313	729
Zone 230	TOTAL						11808	5904	5904		1042	834	208		1042	313	729
Zone 231	Memorial University	4,961	students		550	2.38	11808	5904	5904	0.21	1042	834	208	0.21	1042	313	729
Zone 231	TOTAL						11808	5904	5904		1042	834	208		1042	313	729
Zone 402	Marine Institute	1152	students		550	2.38	2742	1371	1371	0.21	242	194	48	0.21	242	73	169
Zone 402	YMCA	60,000	sq. ft	60	492	32.93	1976	988	988	1.38	83	37	46	3.53	212	121	91
Zone 402	L'Ecole de Grands Vents	175	students		536	2.48	434	217	217	0.81	142	86	55	0.17	30	13	17
Zone 402	TOTAL						5152	2576	2576		466	317	149		483	206	277
Existing Total							54374	27187	27187		4606	3491	1115		4656	1513	3143
PROPOSED DEVELOPMENT (2015 - 2025)																	
Zone 229	Core Sciences Building (finished) ²	300,000	sq. ft	300	540	27.49	8247	4124	4124	2.99	897	664	233	2.54	762	442	320
Zone 229	Core Sciences Building (shelled) ³	500	students		550	2.38	1190	595	595	0.21	105	84	21	0.21	105	32	74
Proposed Development Total^{5,6}							9437	4719	4719		1002	748	254		867	473	394

Notes:

¹ Parking and Trip Generation - Characteristics of Hospitals written by Michael Trueblood, P.E., PTOE

² ITE Land Use 540 - Junior/ Community College - was used as no rate per 1000 sq. ft was available for University Land Use

³ The Core Sciences Building (shelled) that is approximately 125,000 sq. ft, will be used to accommodate the Faculty of Engineering and Applied Sciences 500 students and 64 employees.

⁴ There are projects mentioned in the MUN - Multi-Year Infrastructure (2014-2020) that were deemed not significant by Darrel Miles, these include: S. J. Carew Building Extension and Dr. Jack Clark Geotechnical Engineering Building Expansion

⁵ After the year 2025, it is anticipated that a new Life Sciences Building including the School of Nursing, Pharmacy, Animal Care and Social Work, the Faculty of Business Building and the School of Music will be constructed. These buildings were not included in this traffic analysis due to the buildings not generating traffic until the year 2026 or later.

APPENDIX D

INTERVIEW MINUTES & PUBLIC ENGAGEMENT RESULTS

MUN-area traffic study gathering comments from public

[CBC News](#) Posted: Jun 13, 2014 6:15 AM NT Last Updated: Jun 13, 2014 6:15 AM NT

A study of traffic congestion around Memorial University's main campus in St. John's started public consultations on Thursday to find a resolution to the area's problems, which have included collisions between vehicles and pedestrians.

University staff and students, as well as people working in the area, have provided feedback about the risks faced by pedestrians and drivers alike each day.

While only a handful of people attended the session itself, consultants have received more than 300 comments on the study's website.

Consultant Mira Vervoom said he hasn't had a chance to go over all of the comments yet, but she expects to hear a variety of issues.

"There's definitely an indication that there's lots to be done here," she said.

Michael MacDonald, another consultant working on the study, said between Memorial's main campus and the Prince Philip Parkway, several issues need to be addressed.

"There's a lot going on in this area and it's a huge destination, obviously, for employment. How do we manage that best in all of the growth that's happening in this area of the city?" he said.

A draft report is expected to be completed before another round of public meetings take place in September.

APPENDIX E

U-PASS INFORMATION

MEMORIALUNIVERSITY

U-PASS PROGRAM

INTRODUCTION

Public transportation is a crucial part of the solution to Canada's economic, energy and environmental challenges and contributing to a better quality of life. People are using public transportation in increasing numbers and local communities are expanding public transit to meet this increasing demand for service. Every segment of society - individuals, families, communities and businesses benefit from public transportation.

Each year, Canadian public transit systems spend billions of dollars on operations and infrastructure. Transit's ability to improve our economy and make our communities more competitive is recognized by both government and business.

Public transit allows individuals the freedom to travel to social activities, education, employment, shopping and medical appointments.

Diverse customer needs is a challenge for public transit. Commuters, students, persons with limited mobility, seniors and children each with different interests and lifestyles travel for different reasons. As such, transit systems must always look for new ways to attract new riders to the system. This means developing strategies to meet the needs of specific market segments.

One strategy to achieve this is to introduce innovative fare structures. These include discounted transit tickets, monthly transit passes, discounted fares for seniors and children, reduced off-peak fares, timed transfers and U-Pass programs for University and College students.

UNIVERSIAL TRANSIT PASS - U-PASS PROGRAMS

Over the last number of years, many universities across Canada have experienced growing enrolment placing pressure on transportation needs, parking availability, housing and safety and as a result are looking for innovative ways to meet these challenges. For many students, the cost of attending university - tuition, books, accommodations, meals and so on come before their travel needs. A solution that many universities and students have turned to is the introduction of a Universal Transit Pass or U-Pass program. According to the Canadian Urban Transit Association, over 30 Canadian transit systems offer U-Pass programs to local universities. Transit systems in Canada's larger cities, including Metro Transit in Halifax, offer the U-Pass to a number of local academic institutions.

A U-Pass program is a partnership between the university, students and

local transit agency to provide eligible students with unlimited travel on the transit system during the school year at an affordable cost to the students. Under a U-Pass program, all students (usually full time students only although some programs also offer the U-Pass to faculty and university employees) are required to pay for the U-Pass, meaning the program is supported and funded by all full time students regardless of their interest or need for the pass. The cost of the U-Pass is added to the university's student fees at the time of registration. U-Pass programs are usually approved by the student body through a referendum, and then approved by the university administration. The transit authority must also approve the program. A U-Pass program can take many months of planning and negotiations, often up to 24 months before the program is in place. This is especially true if the transit authority requires new buses and facilities to meet the increased ridership generated by the U-Pass program. The lead-time for new bus tenders and purchases can take a number of months.

BENEFITS OF A U-PASS PROGRAM

A U-Pass program can have many benefits for student, the transit system, the university, local businesses and the community.

Affordable Transportation

A U-Pass program provides students with unlimited travel on the transit

network at an affordable price. In most cases, improved transit service specific to the needs of students form part of the U-Pass program. Some universities offer courses at various locations. A U-Pass allows student to travel to classes at different locations easily and frequently.

"It's great! I use it all the time."

Mount Saint Vincent University student

Improved Housing Options

Improved service and affordable travel on the transit system allows students who choose to live off campus the opportunity to live further from the university campus where living accommodations may be more readily available and affordable and reduce the need for students who choose to live off campus to own and operate their own automobile.

"The U-Pass let's you live off campus, I have no car so use my U-Pass every day. It's much cheaper than regular transit fares."

CLR Saint Mary's University student

Safe Travel for Students

Transit provides safe, reliable travel for social outings where the student may be planning to consume alcohol or walk at night. Safety can be further enhanced with the introduction of programs such as "Request Stop" or Guaranteed Ride Home" initiatives.

Student Employment

Unlimited travel on transit allows students who choose to work part time to travel economically between home, work and classes.

"I have no drive so I use my U-Pass to run errand and go downtown. It's very easy to get around."

JA 4th Year Saint Mary's University student

Benefits Student Car Owners

A U-Pass program benefits student automobile owners as well. Car owners can reduce fuel, parking and maintenance expenses by taking occasional trips by bus. Students, including those living outside the transit service area can drive to Park & Ride facilities and complete their trip by bus thereby "mixing" their commute between alternative modes. Most Park & Ride facilities offer free parking reducing the need for paying for on campus parking. Car owners can also benefit from reduced traffic and reduced demand for parking around the university campus.

Federal Transit Tax Credit

Students charged with a U-Pass fee are eligible for the Federal Transit Tax Credit for the amount of the U-Pass when provided with a receipt for the amount paid.

Reduced Need for Costly Infrastructure Improvements

For a university a U-Pass program can reduce the need for the costly expansion of parking facilities particularly with increased student enrolment and can add to the attractiveness of the university's recruitment efforts by offering the U-Pass program to prospective new students.

Helps the Environment

With more students travelling by public transit, a U-pass program helps reduce their carbon footprint and the level of greenhouse gases generated by automobile use.

Active Transportation

Travel by public transit supports many university's strategy to improve active transportation initiatives. Together, public transit and active transportation complement each other, and offer a "suite" of travel alternatives that help individuals adopt multimodal lifestyles and minimize their automobile use. The installation of bike racks at transit stops and terminals, the use of bicycle racks on transit vehicles and the creation of good walking paths to and from major transit destinations and terminals are examples of co-ordinating transit use with active transportation measures.



Increased Student Ridership

U-pass programs have been implemented at many universities and colleges across Canada with many transit systems experiencing student ridership increases by as much as 50% after the introduction of the program.



Students boarding transit at Saint Mary's University stop.

Improved Transit Service

For the Transit system, a U-pass program provides the opportunity to improve over-all transit service increasing transit ridership through increased transit use by students and regular transit users. Improved transit routes and frequencies, new transit facilities and extended hours of service benefit all transit customers and may attract new non student customers as well. Improved transit service may also reduce traffic

congestion and parking throughout the service area.

Innovative

The introduction of a U-Pass program shows the transit system as innovative and adaptive to new demands.

Retaining Transit Customers

A U-Pass program introduces students to public transit and encourages transit use by students after graduation.

Benefits Business

For businesses, a U-Pass program allows students to travel, live, work, shop and socialize outside the immediate campus area. A U-Pass program may allow students to work part time away from the university campus. Some businesses may choose to offer discounts to students showing their U-Pass.

Benefits the Community

For the community, increased transit service benefits all transit customers. Providing students with unlimited transit travel reduces on-street parking and traffic congestion especially around the university campus and can reduce the need for student housing in neighbourhoods adjacent to the university campus. Increased transit use can reduce traffic on campus and in the surrounding area making those areas friendlier to pedestrians and cyclists.

CHALLENGES TO IMPLEMENTING A U-PASS PROGRAM

Although a U-Pass program offers many benefits to students, the university, the transit system and the community as a whole, there are often challenges to implementing a U-Pass program.

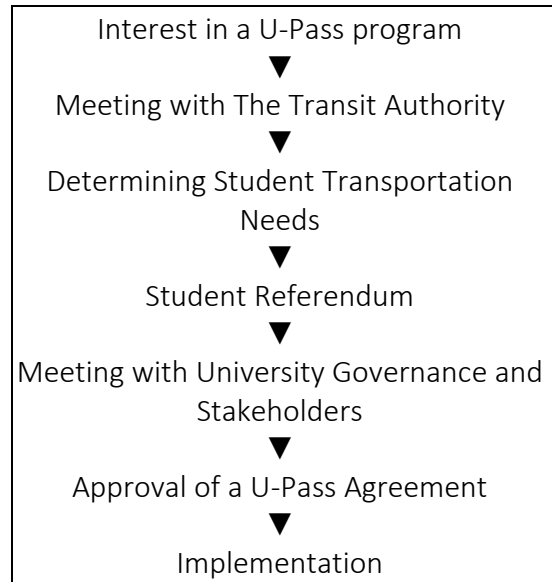
Many students, particularly those that live on campus or own their own automobile, do not see the benefit of paying for a transit pass and may oppose the introduction of a U-Pass program.

Some administrations may express concern regarding the added cost of a U-Pass to already high student fees as well as the cost and effort in issuing and managing the program and collecting and remitting the fees to the transit authority.

The introduction of a U-Pass program may require additional infrastructure, more staff and new demands on the transit system.

Regular transit users may feel that an increase in student ridership will result in fuller buses and service adjustments that the students demand over their own transit needs.

PLANNING FOR A U-PASS PROGRAM



INTEREST IN A U-PASS PROGRAM

A U-Pass program often begins with students or student associations expressing an interest in developing a U-Pass program with the local transit authority.

ESTABLISHING A PARTNERSHIP

The next step to planning a U-Pass program is to establish a discussion group representing the transit authority, student body, university administration and in some cases special interest groups who may have an interest in the program. It is important that this partnership continue throughout the program. Students are usually represented by the student association. Preliminary discussions can identify student transportation issues facing the university and students such as parking, housing, transit service levels and transportation costs.

DETERMINING STUDENT TRANSPORTATION NEEDS

It is important in planning a U-Pass program is to survey students to determine their travel patterns, modes of travel, purpose of travel, exiting transit use, parking issues, housing, attitudes towards the idea of a Universal Pass program and opinions about existing transit service. This information will serve as a baseline for measuring changes in student travel and the success of a U-Pass program as well as provide information regarding strengths and deficiencies in existing transit service.

STUDENT REFERENDUM

The approval by the student body is through a referendum held by the student association. If the student referendum is successful, then negotiations between the student association and transit system can begin. Referendums are often held at the same time as student association elections. To achieve buy-in to the program, extensive information and awareness initiatives such as brochures, newsletters and social media are necessary to ensure students are well informed and understand the benefits of a U-Pass program. The question on the referendum should be clear and direct.

NEGOTIATING A U-PASS AGREEMENT

Once the student association has received approval through a student

referendum, a detailed contract can be negotiated and signed.

There are a number of details to consider in the development of a new agreement including:

- **ELIGIBILITY AND EXEMPTIONS**

Are you in favour of a mandated universal bus pass for full-time SMU students at a cost not to exceed \$110 per student for the months of September - April inclusive, beginning in September 2003?

☐ Yes ☐ No

*Saint Mary's University - 2003
referendum question to adopt a
universal bus pass program*

Most U-Pass programs are usually offered to full time students only, although some programs include faculty and university employees. Part-time students are often not included due to the infrequent need to travel for their education. In addition, there may be a number of students who may be eligible for exemption from the program for a variety of reasons. This might include students with mobility limitations who may not be able to use the conventional transit service, students receiving on-line or distance education programs, students eligible for discounted transit through other programs (such as those for low income families) or students living well outside the transit service area. These exemptions would be identified during the negotiation and planning process.

- ***DURATION OF CONTRACT***

Most U-Pass agreements provide unlimited transit travel for the academic year from September to April including the Fall semester September until December and Spring semester from January until April. If there is agreement between the partners, the U-Pass program can be extended during the summer months May until August as well.

Most contracts extend over two or more years to reduce the need for renegotiations and new referendums every year.

- ***CHANGES AND REVISIONS TO CONTRACT***

The U-Pass contract should identify any changes such as pass prices, service changes and so on expected over the term of the contract. This will reduce disagreements between the parties if changes are necessary. Some changes may require a new referendum by the student body.

- ***RENEWAL OF CONTRACT***

Usually, U-Pass agreements extend beyond the current year to avoid renegotiations each year. The agreement must address and agree to any changes expected over the life of the agreement.

- ***TIMING OF PAYMENTS TO THE TRANSIT SYSTEM***

Student fees for the U-Pass program are collected at the time of registration and forwarded to the student association. The student association then forwards the fees, less any administration fees, to the transit authority. Remittance of payments to the transit authority vary from program to program. Usually the payments are made in instalments over both the Fall and Spring semesters. The student association may be required to provide the transit authority with an audited statement of the student numbers and fees collected.

- ***ESTABLISHING A COST OF THE STUDENT PASS***

Possibly one of the most difficult tasks is establishing a cost for the student pass that meets the needs of all the partners.

The transit system must maintain the revenues already generated from student travel as well as recovering the cost of new services, administration and infrastructure to meet new student demand. The Student Association must realize the cost of administering the program and the students must feel that the cost is affordable. It is important that both the transit system and the students see that the program is "cost-neutral" to the transit authority. The cost of a U-Pass is calculated on the premise that all eligible (usually all full time students) fund the transit system's cost to provide the program whether they use transit or not.

The university may decide to fund a portion of the U-Pass fee as well and this

will be considered when establishing the student fee for the program.

The transit authority and student association may agree to index the fee over the length of the agreement to reflect increased costs to the transit authority.

- *PLANNING SERVICE IMPROVEMENTS*

Students should be surveyed to understand their travel patterns, transportation needs, perception of existing transit service, housing issues and expectations of a proposed U-Pass program. The transit authority must consider the implications of a U-Pass program on infrastructure requirements, new service levels, operating cost and so on.

To make transit service attractive to students and meet their travel needs, the transit system must consider and plan for service improvements that will benefit the students. Service improvements can include increased service frequencies, direct routing to the university, improved transit stops and stations, new and/or larger buses, improved transit information, park and ride facilities and extended hours of service. Service improvements require careful study and planning to ensure the proper levels of service are implemented.

Service improvements can include increased service frequencies; limited stop and direct routes to the university area; park and ride facilities; and

improved bus stops, and shelters and terminals.

The transit authority and student association should meet regularly to review proposed service changes and program management.

- *SERVICE DISRUPTIONS*

A U-Pass agreement should identify what action will be taken in the event of a prolonged disruption of transit service. This would usually be in the form of a reimbursement by the transit authority to the student association of a pro-rated amount of the U-pass fee should the disruption of service exceed an agreed length of time.

- *PASS DESIGN*

U-Passes are usually dedicated transit passes or validated student passes. In the case of a dedicated pass, the pass identifies the student as participating in the program and is accompanied by a current student photo Identification Card. A validated pass is usually a sticker, bar code, chip or other identification affixed to the student's photo university Identification Card.

- *CONDITIONS OF USE*

The negotiation stage should identify the conditions of use for the student U-Pass. This would include the proper use of the card, reasons for confiscation of the card for improper use and cost of a replacement card if lost. Passes are

usually non-transferable and can only be used by the student to whom the pass was issued.

- ***START DATE***

The start date for the program should be set to give the transit system adequate time to acquire any capital equipment needed, plan and install facilities, implement service adjustments and promote service changes to the students and regular transit customers. The start date must also allow the student association and university time to establish the procedures necessary to administer the program.

A U-Pass program is generally planned to begin in September, the start of the academic year.

APPROVAL OF THE U-PASS AGREEMENT

Once an agreement has been developed and finalized, the agreement usually requires approval from the student association and the university or College Board of Governors in order for the institution to collect the U-Pass fees from the students.

IMPLEMENTATION AND PROMOTION

Once an agreement has been approved by the student association and university, the transit authority has the necessary service adjustments and facilities finalized and the student association and university have the necessary administrative policies and procedures in place, implementation of the U-Pass program can begin.

Promotion of the program is important to the growth and success of a U-Pass program. Student newsletters, posters, registration kits and social media are all important methods of promoting the program. Most student associations and transit authorities provide information on their websites including facts and frequently asked questions regarding the program.



Your Pass to the City

U-Pass is accepted 7 days a week, between September and April, and can be used on all conventional Metro Transit buses, ferries, and Community Transit buses (except MetroLink).



"LOCAL" U-PASS PROGRAMS

SAINT MARY'S UNIVERSITY, DALHOUSIE UNIVERSITY, MOUNT SAINT VINCENT UNIVERSITY, NOVA SCOTIA COMMUNITY CAMPUS AND NOVA SCOTIA COLLEGE OF ART & DESIGN





In the Halifax Regional Municipality, Metro Transit has partnered with Dalhousie University, Saint Mary's University, Mount Saint Vincent University, the Nova Scotia Community Campus and the Nova Scotia College of Art & Design for U-Pass programs. The first U-Pass partnership was with the Saint Mary's University in 2003.

The U-Pass programs with Saint Mary's University, Nova Scotia Community Campus and Nova Scotia College of Art & Design were approved by a student referendum. Dalhousie University and Mount Saint Vincent University were approved by the Board of Governors only.

U-Pass fees charged by Metro Transit for the 2013/14 are \$ 143.89 per eligible student for the eight (8) month academic year for students of Dalhousie University, Mount Saint Vincent, Nova Scotia College of Art & Design and Saint Mary's University. Metro Transit charges a fee of \$ 161.07 per eligible student for the Nova Scotia Community Campus for a nine (9) month term.

This represents a saving of \$ 416 over the regular monthly student passes charged by Metro Transit.

The Metro Transit U-Pass allows unlimited travel throughout the academic year (September to April) on all Metro Transit services excluding Bus Rapid Transit (MetroLink) and Rural Express (MetroX) service which require the student to include a premium fare to be paid along with the U-Pass. Students travelling on these services are required to deposit a fare of \$.50 in addition to their U-Pass.

In 2014, Metro Transit will be extending the U-Pass to Dalhousie University students for a summer terms (May until August).

A total of 22,000 U-Passes are issued for travel on Metro Transit service.

U-Passes for all universities, colleges and campuses are mandatory for all full time students. Part time and post-graduate studies as well as faculty and university staff are not eligible for participation in these U-Pass programs.

The U-Pass agreements with Metro transit are for three (3) year terms with an option for an extension of an additional two (2) years.

A U-Pass sticker is placed on the University student ID card and must be shown when boarding the bus. U-Passes are non-transferable and non-refundable.



A sticker is placed on the University student I.D.

Metro Transit enhanced its service to Saint Mary's University, Dalhousie University and Mount Saint Vincent University to accommodate the increase in ridership with the introduction of the U-Pass. A number of transit routes serve the university area with frequent service and connections to transit routes operating throughout the Municipality. Many regular transit routes already serve the Nova Scotia Community Campus and Nova Scotia College of Art & Design.



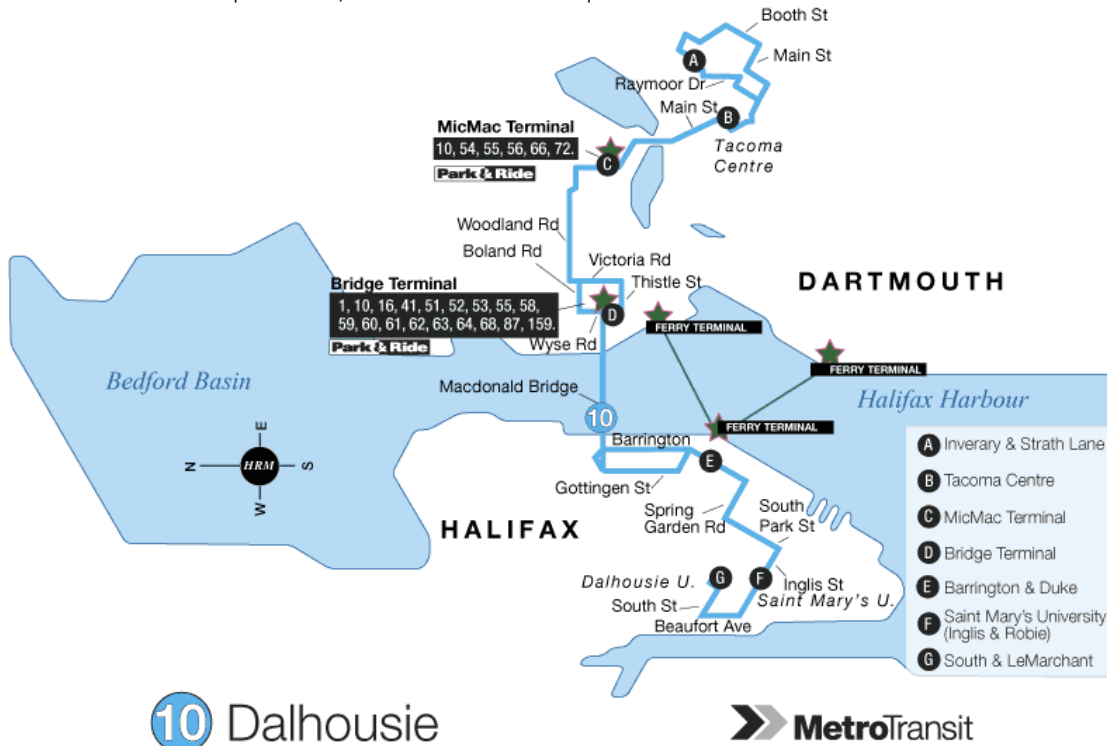
To assist students, the Metro Transit provides route and schedule information specific to transit service to the campuses on its website. (www.halifax.ca/metrotransit/university_routes)

The universities and colleges also provide links to the Metro transit websites for route and schedule information and locations of Metro Transit's Park and Ride facilities.

Below are two examples of Metro Transit bus routes serving the Dalhousie University, Saint Mary's University and Mount Saint Vincent University and connecting to other routes serving the region.

Route 10 - Dalhousie

15 minute service at peak time, 30 minute service off-peak



Route 18 - Universities

Daily from 7 am to 12 midnight, 1/2 hour service throughout, between SMU and the Lacewood Terminal. Three additional afternoon trips, departing SMU to Lacewood at 2:27, 2:55 and 3:40 pm.



UNIVERSITY OF PRINCE EDWARD ISLAND



Students at the University of Prince Edward Island approved a U-Pass partnership with the Charlottetown Trius Transit System in 2008 giving students full access to routes running throughout Charlottetown, Stratford and Cornwall.

The University of Prince Edward Island issues approximately 4,400 U-Passes to full time students. The fee for the UPEI U-Pass is \$26 each semester or \$52 for the academic year, a savings of \$308 over regular student monthly pass fares.

The Trius Transit System increased service frequency service the University from 30 minutes to 15 minutes and introduced extra runs from Stratford and Cornwall.

For more information on U-Pass programs:

Dalhousie University

www.dal.ca/campus_life/student_services/UPass

Saint Mary's University

smusa.ca/services/u_pass/

Mount Saint Vincent University

www.msvu.ca/en/home/student services/upasstransit/

Nova Scotia Community College

www.nsccl.ca/about_nsccl/parking_transportation/upass/

Nova Scotia College of Art & Design

www.nscad/en/home/student sources/student services/u_pass

University of Prince Edward Island

www.upeisu.ca/upass

also:

Brock University

www.brocku.ca/card/faq

University of Calgary

www.ucalgary.ca/unicard/upass

Simon Fraser University
























<https://students.sfu.ca/upass/>

APPENDIX F

DETAILED ANALYSIS - SYNCHRO/SIMTRAFFIC RESULTS

MUN Traffic Study
Elizabeth Avenue & Allandale Road-Bonaventure Avenue

Existing AM
19/04/2016

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	106	270	58	109	374	236	27	443	82	147	365	116
Future Volume (vph)	106	270	58	109	374	236	27	443	82	147	365	116
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	3.5	3.7	3.0	3.5	3.7	3.0	3.4	3.4	3.0	3.4	3.4
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	55.0		0.0	55.0		0.0	55.0		35.0	40.0		0.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.973				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1652	1792	0	1652	1842	1601	1652	1821	1548	1652	1821	1548
Flt Permitted	0.280			0.369			0.493			0.100		
Satd. Flow (perm)	487	1792	0	642	1842	1601	857	1821	1548	174	1821	1548
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		11				300			136			129
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		456.6			391.7			303.3			486.7	
Travel Time (s)		32.9			28.2			21.8			35.0	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.83	0.83	0.83	0.78	0.78	0.78	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	128	325	70	140	479	303	30	492	91	163	406	129
Shared Lane Traffic (%)												
Lane Group Flow (vph)	128	395	0	140	479	303	30	492	91	163	406	129
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6			4		3	8	
Permitted Phases	2			6		6	4		4	8		8
Total Split (s)	13.0	53.0		13.0	53.0	53.0	41.0	41.0	41.0	13.0	54.0	54.0
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
Act Effect Green (s)	54.0	47.0		54.0	47.0	47.0	33.9	33.9	33.9	46.9	46.9	46.9
Actuated g/C Ratio	0.45	0.40		0.45	0.40	0.40	0.29	0.29	0.29	0.39	0.39	0.39
v/c Ratio	0.44	0.55		0.40	0.66	0.37	0.12	0.95	0.17	1.05	0.57	0.19
Control Delay	21.8	30.8		20.6	34.9	4.2	33.0	71.0	2.2	116.4	31.8	4.6
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	21.8	30.8		20.6	34.9	4.2	33.0	71.0	2.2	116.4	31.8	4.6
LOS	C	C		C	C	A	C	E	A	F	C	A
Approach Delay		28.6			22.6			58.9			46.5	
Approach LOS		C			C			E			D	
Stops (vph)	60	242		62	302	19	21	394	3	81	278	13
Fuel Used(l)	12	39		7	31	10	2	46	3	22	32	6
CO Emissions (g/hr)	214	728		133	572	185	36	852	48	405	596	113

MUN Traffic Study
Elizabeth Avenue & Allandale Road-Bonaventure Avenue

Existing AM
19/04/2016



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	41	141		26	110	36	7	164	9	78	115	22
VOC Emissions (g/hr)	49	168		31	132	43	8	196	11	93	137	26
Dilemma Vehicles (#)	0	0		0	0	0	0	0	0	0	0	0
Queue Length 50th (m)	15.8	69.5		17.5	91.6	0.4	5.2	112.5	0.0	~26.7	72.8	0.0
Queue Length 95th (m)	24.7	89.4		24.9	104.4	8.7	12.9	#175.1	3.9	#70.1	103.9	11.6
Internal Link Dist (m)		432.6			367.7			279.3			462.7	
Turn Bay Length (m)	55.0			55.0			55.0		35.0	40.0		
Base Capacity (vph)	290	715		350	728	814	252	536	551	155	735	702
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	0.44	0.55		0.40	0.66	0.37	0.12	0.92	0.17	1.05	0.55	0.18

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 118.9

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.05

Intersection Signal Delay: 37.9

Intersection LOS: D

Intersection Capacity Utilization 77.0%

ICU Level of Service D

Analysis Period (min) 15

~ 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.

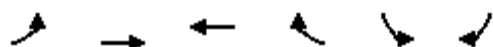
Splits and Phases: 10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue

	Ø1		Ø2		Ø3		Ø4
13 s		53 s		13 s		41 s	
	Ø5		Ø6		Ø7		Ø8
13 s		53 s		54 s			

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	221	334	93	398	291
Future Volume (Veh/h)	0	221	334	93	398	291
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.94	0.94	0.80	0.80	0.91	0.91
Hourly flow rate (vph)	0	235	418	116	437	320
Pedestrians	49					
Lane Width (m)	4.5					
Walking Speed (m/s)	1.2					
Percent Blockage	5					
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1719	525			583	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1719	525			583	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	55			54	
cM capacity (veh/h)	50	524			941	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	235	534	437	320		
Volume Left	0	0	437	0		
Volume Right	235	116	0	0		
cSH	524	1700	941	1700		
Volume to Capacity	0.45	0.31	0.46	0.19		
Queue Length 95th (m)	17.4	0.0	19.0	0.0		
Control Delay (s)	17.3	0.0	12.1	0.0		
Lane LOS	C		B			
Approach Delay (s)	17.3	0.0	7.0			
Approach LOS	C					
Intersection Summary						
Average Delay			6.1			
Intersection Capacity Utilization			52.3%		ICU Level of Service	A
Analysis Period (min)			15			

MUN Traffic Study
Elizabeth Avenue & Westerland Road

Existing AM
19/04/2016



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	311	351	291	234	136	148
Future Volume (vph)	311	351	291	234	136	148
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	2.8	3.0	3.6	3.7	3.4	3.4
Grade (%)		0%	0%		0%	
Storage Length (m)	35.0			0.0	0.0	70.0
Storage Lanes	1			0	1	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.940			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1612	1739	1751	0	1730	1548
Flt Permitted	0.247				0.950	
Satd. Flow (perm)	419	1739	1751	0	1730	1548
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			59			168
Link Speed (k/h)		50	50		50	
Link Distance (m)		444.2	375.5		381.7	
Travel Time (s)		32.0	27.0		27.5	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.78	0.78	0.90	0.90	0.88	0.88
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	399	450	323	260	155	168
Shared Lane Traffic (%)						
Lane Group Flow (vph)	399	450	583	0	155	168
Turn Type	pm+pt	NA	NA		Prot	Perm
Protected Phases	5	2	6		8	
Permitted Phases	2					8
Total Split (s)	19.0	66.0	47.0		24.0	24.0
Total Lost Time (s)	6.0	6.0	6.0		6.0	6.0
Act Effect Green (s)	60.1	60.1	41.1		12.8	12.8
Actuated g/C Ratio	0.71	0.71	0.48		0.15	0.15
v/c Ratio	0.83	0.37	0.66		0.60	0.45
Control Delay	25.1	6.4	20.1		43.3	9.4
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	25.1	6.4	20.1		43.3	9.4
LOS	C	A	C		D	A
Approach Delay		15.2	20.1		25.7	
Approach LOS		B	C		C	
Stops (vph)	115	129	358		122	22
Fuel Used(l)	30	29	58		12	7
CO Emissions (g/hr)	561	539	1072		227	129



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
NOx Emissions (g/hr)	108	104	207		44	25
VOC Emissions (g/hr)	129	124	247		52	30
Dilemma Vehicles (#)	0	0	0		0	0
Queue Length 50th (m)	21.1	24.1	61.6		23.7	0.0
Queue Length 95th (m)	#38.6	37.9	108.8		40.9	14.7
Internal Link Dist (m)		420.2	351.5		357.7	
Turn Bay Length (m)	35.0					70.0
Base Capacity (vph)	479	1231	877		367	461
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	0.83	0.37	0.66		0.42	0.36

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 84.9

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 18.7

Intersection LOS: B

Intersection Capacity Utilization 69.4%

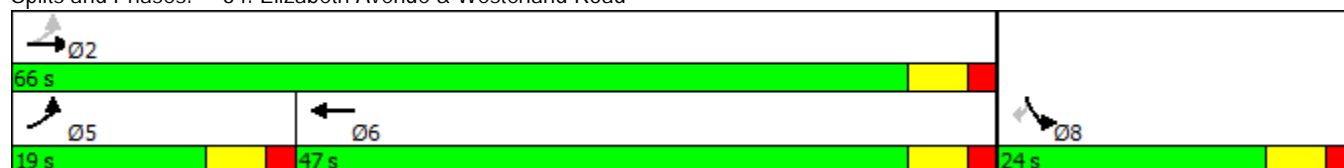
ICU Level of Service C

Analysis Period (min) 15

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
























Queue shown is maximum after two cycles.













Splits and Phases: 34: Elizabeth Avenue & Westerland Road



MUN Traffic Study
Prince Philip Drive & Allandale Road

Existing AM
19/04/2016

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	354	599	131	137	674	7	201	285	149	10	470	899
Future Volume (vph)	354	599	131	137	674	7	201	285	149	10	470	899
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	3.8	3.8	3.0	3.7	3.7	3.5	3.5	3.5	3.0	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	200.0		120.0	65.0		0.0	70.0		0.0	42.0		50.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	0.95	0.88
Ped Bike Factor			0.98	1.00	1.00		1.00		0.98	1.00		
Frt			0.850		0.998				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1652	3618	1619	1652	3571	0	1750	1842	1566	1652	3500	2756
Flt Permitted	0.128			0.412			0.950			0.577		
Satd. Flow (perm)	223	3618	1593	715	3571	0	1746	1842	1541	1001	3500	2756
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			149		1				159			99
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		488.1			514.8			486.7			105.7	
Travel Time (s)		25.1			26.5			35.0			7.6	
Confl. Peds. (#/hr)	2		2	2		2	2		2	2		2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.93	0.93	0.93	0.95	0.95	0.95	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	373	631	138	147	725	8	212	300	157	11	522	999
Shared Lane Traffic (%)												
Lane Group Flow (vph)	373	631	138	147	733	0	212	300	157	11	522	999
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Prot	NA	Perm	Perm	NA	pt+ov
Protected Phases	5	2		1	6		7	4			8	8 5
Permitted Phases	2		2	6					4	8		
Total Split (s)	30.0	45.0	45.0	16.0	31.0		20.0	49.0	49.0	29.0	29.0	
Total Lost Time (s)	6.0	7.0	7.0	6.0	7.0		6.0	6.0	6.0	6.0	6.0	
Act Effect Green (s)	55.0	38.6	38.6	35.6	25.2		14.0	43.0	43.0	23.0	23.0	51.8
Actuated g/C Ratio	0.50	0.35	0.35	0.32	0.23		0.13	0.39	0.39	0.21	0.21	0.47
v/c Ratio	0.92	0.50	0.21	0.47	0.89		0.95	0.42	0.22	0.05	0.71	0.74
Control Delay	53.6	42.2	19.6	22.8	56.4		98.5	26.6	4.2	35.8	46.7	24.9
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	53.6	42.2	19.6	22.8	56.4		98.5	26.6	4.2	35.8	46.7	24.9
LOS	D	D	B	C	E		F	C	A	D	D	C
Approach Delay		43.2			50.8			44.1			32.4	
Approach LOS		D			D			D			C	
Stops (vph)	318	577	118	96	607		172	202	15	10	428	646
Fuel Used(l)	54	88	17	12	85		28	24	8	1	43	64
CO Emissions (g/hr)	1009	1632	310	230	1578		528	438	143	16	808	1193

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	195	315	60	44	305		102	85	28	3	156	230
VOC Emissions (g/hr)	233	376	71	53	364		122	101	33	4	186	275
Dilemma Vehicles (#)	0	4	0	0	29		0	0	0	0	0	0
Queue Length 50th (m)	81.3	73.8	15.2	16.7	81.8		45.9	46.2	0.0	1.9	55.2	85.3
Queue Length 95th (m)	#118.0	92.0	m28.0	28.4	#118.0		#90.7	69.5	12.2	6.8	73.6	111.9
Internal Link Dist (m)		464.1			490.8			462.7			81.7	
Turn Bay Length (m)	200.0		120.0	65.0			70.0			42.0		50.0
Base Capacity (vph)	423	1270	655	320	819		222	720	699	209	731	1379
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	0.50	0.21	0.46	0.89		0.95	0.42	0.22	0.05	0.71	0.72

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 8 (7%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.95

Intersection Signal Delay: 41.0

Intersection LOS: D

Intersection Capacity Utilization 83.4%

ICU Level of Service E

Analysis Period (min) 15

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.

Splits and Phases: 7: Allandale Road & Prince Philip Drive















MUN Traffic Study
Prince Philip Drive & Clinch Crescent-Westerland Road

Existing AM
19/04/2016

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	285	889	454	158	871	91	139	380	100	81	90	72
Future Volume (vph)	285	889	454	158	871	91	139	380	100	81	90	72
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.7	4.0	3.5	3.5	3.5	3.7	3.0	3.7	3.5	3.7	3.7	3.7
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	75.0		75.0	90.0		0.0	60.0		45.0	80.0		80.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.89	0.98	1.00		1.00		0.72			0.98
Frt			0.850		0.986				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1789	3697	1566	1750	3442	0	1652	1883	1566	1789	1883	1601
Flt Permitted	0.103			0.176			0.661			0.163		
Satd. Flow (perm)	194	3697	1394	319	3442	0	1146	1883	1125	307	1883	1576
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			478		10				159			159
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		209.5			470.5			381.7			113.2	
Travel Time (s)		10.8			24.2			27.5			8.2	
Confl. Peds. (#/hr)	2		30	30		2	2		150	150		2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.74	0.74	0.74	0.82	0.82	0.82	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	300	936	478	214	1177	123	170	463	122	88	98	78
Shared Lane Traffic (%)												
Lane Group Flow (vph)	300	936	478	214	1300	0	170	463	122	88	98	78
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2		2	6			4		4	8		8
Total Split (s)	19.0	45.0	45.0	13.0	39.0		13.0	39.0	39.0	13.0	39.0	39.0
Total Lost Time (s)	6.0	7.0	7.0	6.0	7.0		6.0	7.0	7.0	6.0	7.0	7.0
Act Effect Green (s)	56.5	40.0	40.0	44.6	34.1		36.7	30.1	30.1	35.5	27.5	27.5
Actuated g/C Ratio	0.51	0.36	0.36	0.41	0.31		0.33	0.27	0.27	0.32	0.25	0.25
v/c Ratio	0.93	0.70	0.59	0.85	1.21		0.41	0.90	0.29	0.46	0.21	0.15
Control Delay	64.8	29.3	5.8	40.6	132.2		26.8	60.3	3.8	28.6	31.7	0.6
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	64.8	29.3	5.8	40.6	132.2		26.8	60.3	3.8	28.6	31.7	0.6
LOS	E	C	A	D	F		C	E	A	C	C	A
Approach Delay		28.9			119.2			43.6			21.5	
Approach LOS		C			F			D			C	
Stops (vph)	167	577	97	89	696		106	344	6	52	67	0
Fuel Used(l)	56	153	65	21	200		10	39	4	4	5	1
CO Emissions (g/hr)	1047	2838	1207	390	3724		191	727	75	71	87	15

MUN Traffic Study
Prince Philip Drive & Clinch Crescent-Westerland Road

Existing AM
19/04/2016

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	202	548	233	75	719		37	140	15	14	17	3
VOC Emissions (g/hr)	241	655	278	90	859		44	168	17	16	20	3
Dilemma Vehicles (#)	0	66	0	0	38		0	0	0	0	0	0
Queue Length 50th (m)	~58.2	58.0	11.7	~29.0	~185.9		23.2	93.4	0.0	11.4	15.7	0.0
Queue Length 95th (m)	m#78.3	m79.3	m20.2	m#45.3	#166.5		34.4	116.6	4.1	21.2	28.8	0.0
Internal Link Dist (m)		185.5			446.5			357.7			89.2	
Turn Bay Length (m)	75.0		75.0	90.0			60.0		45.0	80.0		80.0
Base Capacity (vph)	323	1345	811	253	1074		413	547	440	192	547	571
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	0.93	0.70	0.59	0.85	1.21		0.41	0.85	0.28	0.46	0.18	0.14

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.21

Intersection Signal Delay: 63.3

Intersection LOS: E

Intersection Capacity Utilization 90.3%

ICU Level of Service E

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

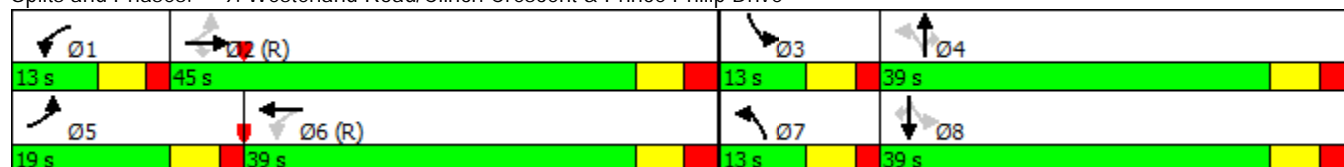
Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.























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

Splits and Phases: 9: Westerland Road/Clinch Crescent & Prince Philip Drive



MUN Traffic Study
Prince Philip Drive-Columbus Drive & Thorburn Road

Existing AM
19/04/2016

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	401	1234	306	48	630	221	0	210	69	558	300	324
Future Volume (vph)	401	1234	306	48	630	221	0	210	69	558	300	324
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.8	4.2	3.5	3.8	4.0	2.4	3.8	4.3	3.5	3.8	3.8
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	250.0		0.0	110.0		90.0	0.0		0.0	160.0		130.0
Storage Lanes	1		1	1		1	0		0	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.95	0.95	0.97	0.95	0.95
Ped Bike Factor	1.00		0.98			0.98		1.00		1.00	0.99	
Frt			0.850			0.850		0.963			0.922	
Flt Protected	0.950			0.950						0.950		
Satd. Flow (prot)	1750	3618	1689	1750	5198	1654	0	3469	0	3395	3309	0
Flt Permitted	0.197			0.141						0.950		
Satd. Flow (perm)	363	3618	1663	260	5198	1628	0	3469	0	3384	3309	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			274			276		33			282	
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		427.5			198.0			169.5			504.4	
Travel Time (s)		22.0			10.2			12.2			36.3	
Confl. Peds. (#/hr)	2		2	2		2	2		2	2		2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.93	0.93	0.93	0.80	0.80	0.80	0.83	0.83	0.83	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	431	1327	329	60	788	276	0	253	83	587	316	341
Shared Lane Traffic (%)												
Lane Group Flow (vph)	431	1327	329	60	788	276	0	336	0	587	657	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm		NA		Prot	NA	
Protected Phases	5	2		1	6			4		3	8	
Permitted Phases	2		2	6		6						
Total Split (s)	28.0	49.0	49.0	13.0	34.0	34.0		20.0		28.0	48.0	
Total Lost Time (s)	6.0	7.0	7.0	6.0	7.0	7.0		7.0		6.0	7.0	
Act Effect Green (s)	57.0	45.6	45.6	36.4	28.4	28.4		12.6		21.4	40.0	
Actuated g/C Ratio	0.52	0.41	0.41	0.33	0.26	0.26		0.11		0.19	0.36	
v/c Ratio	0.94	0.89	0.39	0.33	0.59	0.44		0.79		0.89	0.48	
Control Delay	52.3	39.6	6.4	12.5	29.9	15.8		56.7		59.8	15.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Total Delay	52.3	39.6	6.4	12.5	29.9	15.8		56.7		59.8	15.7	
LOS	D	D	A	B	C	B		E		E	B	
Approach Delay		37.0			25.5			56.7			36.5	
Approach LOS		D			C			E			D	
Stops (vph)	251	1048	47	32	605	124		236		513	266	
Fuel Used(l)	41	127	14	8	113	35		22		64	43	
CO Emissions (g/hr)	765	2355	264	142	2105	654		408		1189	808	

MUN Traffic Study
Prince Philip Drive-Columbus Drive & Thorburn Road

Existing AM
19/04/2016



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	148	454	51	27	406	126		79		229	156	
VOC Emissions (g/hr)	176	543	61	33	486	151		94		274	186	
Dilemma Vehicles (#)	0	54	0	0	5	0		0		0	0	
Queue Length 50th (m)	64.4	144.4	7.5	5.1	64.7	35.1		33.6		63.3	30.4	
Queue Length 95th (m)	#123.4	#191.4	26.8	m5.1	m54.5	m29.6		44.5		#91.0	46.3	
Internal Link Dist (m)		403.5			174.0			145.5			480.4	
Turn Bay Length (m)	250.0			110.0		90.0				160.0		
Base Capacity (vph)	465	1499	849	180	1340	624		439		679	1410	
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	0.93	0.89	0.39	0.33	0.59	0.44		0.77		0.86	0.47	

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 28 (25%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.94

Intersection Signal Delay: 35.6

Intersection LOS: D

Intersection Capacity Utilization 85.6%

ICU Level of Service E

Analysis Period (min) 15

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.

Splits and Phases: 37: Thorburn Road & Columbus Drive/Prince Philip Drive



Summary of All Intervals

Run Number	1	10	2	3	4	5	6
Start Time	6:30	6:30	6:30	6:30	6:30	6:30	6:30
End Time	8:00	8:00	8:00	8:00	8:00	8:00	8:00
Total Time (min)	90	90	90	90	90	90	90
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	5	5	5	5	5	5	5
# of Recorded Intervals	4	4	4	4	4	4	4
Vehs Entered	8503	8643	8541	8460	8538	8579	8451
Vehs Exited	8512	8580	8591	8537	8489	8642	8470
Starting Vehs	473	473	491	485	460	494	442
Ending Vehs	464	536	441	408	509	431	423
Travel Distance (km)	14521	14765	14771	14515	14720	14690	14460
Travel Time (hr)	486.8	538.4	520.7	494.2	536.0	517.0	477.6
Total Delay (hr)	197.2	244.0	225.7	204.8	242.2	223.2	189.0
Total Stops	13511	14820	14712	13626	14862	14370	13178
Fuel Used (l)	1272.3	1323.7	1315.4	1275.7	1326.1	1306.4	1259.7

Summary of All Intervals

Run Number	7	8	9	Avg
Start Time	6:30	6:30	6:30	6:30
End Time	8:00	8:00	8:00	8:00
Total Time (min)	90	90	90	90
Time Recorded (min)	60	60	60	60
# of Intervals	5	5	5	5
# of Recorded Intervals	4	4	4	4
Vehs Entered	8464	8301	8606	8507
Vehs Exited	8564	8385	8612	8537
Starting Vehs	519	455	445	472
Ending Vehs	419	371	439	447
Travel Distance (km)	14714	14268	14648	14607
Travel Time (hr)	510.7	464.1	482.3	502.8
Total Delay (hr)	216.3	179.0	189.2	211.0
Total Stops	14105	12508	13287	13899
Fuel Used (l)	1309.7	1239.4	1279.3	1290.8

Interval #0 Information Seeding

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

Interval #1 Information Recording #1

Start Time	7:00
End Time	7:15
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	2046	2086	2036	1998	2002	2061	2015
Vehs Exited	2096	2112	2088	2062	2058	2114	2015
Starting Vehs	473	473	491	485	460	494	442
Ending Vehs	423	447	439	421	404	441	442
Travel Distance (km)	3530	3641	3563	3473	3479	3596	3480
Travel Time (hr)	110.4	117.1	114.1	108.4	107.1	118.5	109.7
Total Delay (hr)	40.0	44.6	42.6	39.3	37.6	46.4	40.4
Total Stops	2976	3159	3107	2928	2865	3177	2987
Fuel Used (l)	304.9	315.0	309.3	298.3	299.9	316.7	300.0

Interval #1 Information Recording #1

Start Time	7:00
End Time	7:15
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	2073	1987	2084	2037
Vehs Exited	2125	2026	2074	2076
Starting Vehs	519	455	445	472
Ending Vehs	467	416	455	430
Travel Distance (km)	3683	3419	3555	3542
Travel Time (hr)	126.4	103.1	107.0	112.2
Total Delay (hr)	52.6	34.9	35.9	41.4
Total Stops	3431	2648	2807	3006
Fuel Used (l)	329.3	290.6	302.1	306.6

Interval #2 Information Recording #2

Start Time	7:15
End Time	7:30
Total Time (min)	15
Volumes adjusted by PHF, Growth Factors.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	2321	2413	2402	2334	2422	2383	2381
Vehs Exited	2151	2259	2205	2174	2173	2203	2197
Starting Vehs	423	447	439	421	404	441	442
Ending Vehs	593	601	636	581	653	621	626
Travel Distance (km)	3764	3961	3976	3831	3901	3883	3847
Travel Time (hr)	131.6	139.3	141.1	133.3	142.5	137.6	128.6
Total Delay (hr)	56.4	60.6	61.9	56.9	64.7	59.7	51.8
Total Stops	3837	3932	4138	3835	4208	3928	3672
Fuel Used (l)	332.1	351.6	355.9	339.3	352.9	344.7	337.0

Interval #2 Information Recording #2

Start Time	7:15
End Time	7:30
Total Time (min)	15
Volumes adjusted by PHF, Growth Factors.	

Run Number	7	8	9	Avg
Vehs Entered	2365	2341	2413	2379
Vehs Exited	2190	2159	2245	2195
Starting Vehs	467	416	455	430
Ending Vehs	642	598	623	614
Travel Distance (km)	3902	3728	3911	3870
Travel Time (hr)	140.7	128.0	130.8	135.3
Total Delay (hr)	62.6	53.4	52.6	58.0
Total Stops	4067	3609	3776	3895
Fuel Used (l)	351.3	329.3	342.0	343.6

Interval #3 Information Recorsding #3

Start Time	7:30
End Time	7:45
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	1983	2068	2043	2103	2021	2058	2053
Vehs Exited	2148	2074	2146	2175	2117	2169	2211
Starting Vehs	593	601	636	581	653	621	626
Ending Vehs	428	595	533	509	557	510	468
Travel Distance (km)	3619	3571	3587	3630	3654	3602	3705
Travel Time (hr)	131.5	145.4	139.8	134.3	147.1	139.9	134.1
Total Delay (hr)	59.5	74.2	68.0	61.9	74.3	67.9	60.2
Total Stops	3616	3957	3957	3761	3754	3959	3739
Fuel Used (l)	324.2	331.5	326.7	324.9	338.3	331.0	330.5

Interval #3 Information Recorsding #3

Start Time	7:30
End Time	7:45
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	2031	1990	2056	2040
Vehs Exited	2219	2132	2179	2157
Starting Vehs	642	598	623	614
Ending Vehs	454	456	500	500
Travel Distance (km)	3639	3673	3620	3630
Travel Time (hr)	133.6	128.1	132.0	136.6
Total Delay (hr)	61.0	54.7	59.3	64.1
Total Stops	3733	3464	3731	3770
Fuel Used (l)	327.6	326.7	326.0	328.7

Interval #4 Information Recording #4

Start Time	7:45
End Time	8:00
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	2153	2076	2060	2025	2093	2077	2002
Vehs Exited	2117	2135	2152	2126	2141	2156	2047
Starting Vehs	428	595	533	509	557	510	468
Ending Vehs	464	536	441	408	509	431	423
Travel Distance (km)	3607	3592	3645	3581	3686	3610	3428
Travel Time (hr)	113.3	136.6	125.7	118.2	139.4	121.1	105.2
Total Delay (hr)	41.4	64.7	53.2	46.7	65.6	49.1	36.7
Total Stops	3082	3772	3510	3102	4035	3306	2780
Fuel Used (l)	311.1	325.6	323.5	313.2	335.0	314.0	292.3

Interval #4 Information Recording #4

Start Time	7:45
End Time	8:00
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	1995	1983	2053	2053
Vehs Exited	2030	2068	2114	2109
Starting Vehs	454	456	500	500
Ending Vehs	419	371	439	447
Travel Distance (km)	3491	3448	3563	3565
Travel Time (hr)	110.0	105.0	112.5	118.7
Total Delay (hr)	40.1	36.0	41.3	47.5
Total Stops	2874	2787	2973	3226
Fuel Used (l)	301.6	292.8	309.1	311.8

7: Allandale Road & Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.0	0.1	2.4	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	2.5	5.6	0.3	1.6	13.2	0.1	4.1	2.8	0.3	0.1	5.4	2.4
Total Del/Veh (s)	25.2	33.1	7.2	41.8	69.6	35.0	74.4	22.1	7.7	39.9	40.8	9.5
Stop Delay (hr)	1.6	3.7	0.0	1.2	10.8	0.1	3.7	1.9	0.1	0.1	4.7	1.0
Stop Del/Veh (s)	16.1	21.9	0.0	32.9	57.0	28.3	65.7	15.2	2.0	35.9	35.4	4.1

7: Allandale Road & Prince Philip Drive Performance by movement

Movement	All
Denied Delay (hr)	0.1
Denied Del/Veh (s)	0.1
Total Delay (hr)	38.3
Total Del/Veh (s)	33.5
Stop Delay (hr)	28.8
Stop Del/Veh (s)	25.3

9: Westerland Road/Clinch Crescent & Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.1	0.6	3.7	0.7	3.7
Total Delay (hr)	3.7	9.3	2.6	5.6	38.7	3.9	1.5	4.9	0.7	0.8	0.8	0.2
Total Del/Veh (s)	45.2	29.1	20.5	125.7	90.7	151.0	39.4	45.7	23.0	35.0	33.7	10.8
Stop Delay (hr)	3.0	6.5	1.9	4.7	30.6	3.3	1.2	4.0	0.5	0.8	0.7	0.2
Stop Del/Veh (s)	37.4	20.5	14.7	104.1	71.6	129.1	32.3	37.1	17.6	31.8	29.7	9.2

9: Westerland Road/Clinch Crescent & Prince Philip Drive Performance by movement

Movement	All
Denied Delay (hr)	0.2
Denied Del/Veh (s)	0.2
Total Delay (hr)	72.8
Total Del/Veh (s)	57.3
Stop Delay (hr)	57.4
Stop Del/Veh (s)	45.2

10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	2.7	0.4	0.3	4.4	1.9	4.4	0.0	0.0	0.0
Total Delay (hr)	0.7	2.0	0.2	0.7	2.8	0.2	0.7	10.7	1.3	2.4	4.0	0.4
Total Del/Veh (s)	25.5	22.4	10.3	23.4	26.4	3.6	94.8	85.5	58.0	56.3	29.4	12.8
Stop Delay (hr)	0.6	1.5	0.1	0.6	2.2	0.0	0.6	9.1	1.1	1.9	2.6	0.3
Stop Del/Veh (s)	19.9	16.7	5.2	18.5	20.4	0.2	83.3	72.3	47.9	44.4	19.1	8.5

10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue Performance by movement

Movement	All
Denied Delay (hr)	0.5
Denied Del/Veh (s)	0.7
Total Delay (hr)	26.2
Total Del/Veh (s)	37.1
Stop Delay (hr)	20.4
Stop Del/Veh (s)	28.9

34: Elizabeth Avenue & Westerland Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Denied Del/Veh (s)	1.1	0.3	0.0	0.0	0.0	0.0	0.0	0.3
Total Delay (hr)	1.7	0.9	1.7	1.1	1.3	0.1	0.1	6.8
Total Del/Veh (s)	19.3	8.7	19.9	16.0	34.4	1.2	3.5	12.8
Stop Delay (hr)	1.2	0.3	1.0	0.6	1.1	0.1	0.0	4.3
Stop Del/Veh (s)	13.5	3.5	11.2	9.7	31.2	0.5	0.5	8.1

37: Thorburn Road & Columbus Drive/Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.7
Denied Del/Veh (s)	2.0	0.4	0.4	0.0	0.0	0.0	0.1	0.2	0.5	0.5	1.7	0.6
Total Delay (hr)	3.9	10.1	0.5	0.5	3.6	0.3	3.1	0.6	8.1	2.3	1.4	34.4
Total Del/Veh (s)	33.8	28.6	6.2	35.9	16.4	5.3	52.1	29.9	51.0	26.4	15.6	27.2
Stop Delay (hr)	3.1	6.1	0.3	0.4	2.3	0.0	2.7	0.6	7.1	1.8	1.0	25.5
Stop Del/Veh (s)	26.3	17.3	3.9	32.9	10.5	0.0	46.2	28.6	44.6	20.8	11.5	20.1

51: Freshwater Road & Elizabeth Avenue Performance by movement

Movement	WBT	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.4	0.1	0.5
Denied Del/Veh (s)	0.0	0.0	0.4	0.4	3.3	1.3	1.2
Total Delay (hr)	0.0	0.5	0.2	0.0	0.9	0.3	1.9
Total Del/Veh (s)	0.6	7.7	1.8	1.2	8.2	3.6	4.4
Stop Delay (hr)	0.0	0.4	0.0	0.0	0.5	0.0	0.9
Stop Del/Veh (s)	0.0	6.1	0.0	0.2	4.2	0.2	2.0

Total Network Performance

Denied Delay (hr)	2.5
Denied Del/Veh (s)	1.0
Total Delay (hr)	208.6
Total Del/Veh (s)	83.6
Stop Delay (hr)	143.5
Stop Del/Veh (s)	57.5

Intersection: 7: Allandale Road & Prince Philip Drive

Movement	EB	EB	EB	EB	B61	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	T	R	T	L	T	TR	L	T	L	T
Maximum Queue (m)	96.7	83.6	82.6	4.4	1.3	67.4	142.9	137.6	71.4	97.6	40.3	78.0
Average Queue (m)	52.2	54.7	55.9	0.2	0.0	35.5	79.5	78.0	44.3	41.6	3.6	47.0
95th Queue (m)	83.8	78.3	78.0	4.5	1.3	78.6	138.4	130.9	71.8	85.1	19.3	70.1
Link Distance (m)		469.2	469.2		454.2		501.3	501.3		463.4		89.8
Upstream Blk Time (%)												0
Queuing Penalty (veh)												0
Storage Bay Dist (m)	200.0			120.0		65.0			70.0		42.0	
Storage Blk Time (%)						0	20		4	1	0	15
Queuing Penalty (veh)						1	28		11	2	0	2

Intersection: 7: Allandale Road & Prince Philip Drive

Movement	SB	SB	SB	B1	B1
Directions Served	T	R	R	T	T
Maximum Queue (m)	68.6	111.2	52.5	7.1	40.8
Average Queue (m)	38.8	60.7	36.9	0.3	4.1
95th Queue (m)	62.7	121.9	76.1	7.3	25.5
Link Distance (m)	89.8	89.8		267.7	267.7
Upstream Blk Time (%)	0	3			
Queuing Penalty (veh)	0	0			
Storage Bay Dist (m)			50.0		
Storage Blk Time (%)		10	3		
Queuing Penalty (veh)		45	14		

Intersection: 9: Westerland Road/Clinch Crescent & Prince Philip Drive

Movement	EB	EB	EB	EB	B35	B36	WB	WB	WB	B61	B61	NB
Directions Served	L	T	T	R	T	T	L	T	TR	T	T	L
Maximum Queue (m)	77.4	120.9	124.5	77.5	1.6	2.4	92.4	452.9	456.8	71.1	79.9	62.4
Average Queue (m)	57.2	73.6	70.8	53.2	0.1	0.1	60.9	214.2	220.6	12.2	13.6	33.0
95th Queue (m)	87.4	109.8	109.1	90.7	1.6	1.8	116.9	461.5	465.1	80.8	87.1	68.5
Link Distance (m)		191.7	191.7		347.9	178.0		454.2	454.2	469.2	469.2	
Upstream Blk Time (%)								6	8			
Queuing Penalty (veh)								52	65			
Storage Bay Dist (m)	75.0			75.0			90.0					60.0
Storage Blk Time (%)	3	6	4	1			1	38				0
Queuing Penalty (veh)	13	16	19	6			5	60				1

Intersection: 9: Westerland Road/Clinch Crescent & Prince Philip Drive

Movement	NB	NB	SB	SB	SB
Directions Served	T	R	L	T	R
Maximum Queue (m)	162.4	47.5	35.3	39.4	24.4
Average Queue (m)	81.9	24.5	15.1	15.6	10.4
95th Queue (m)	146.5	56.6	28.6	32.4	20.6
Link Distance (m)	357.3			100.6	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (m)		45.0	80.0		80.0
Storage Blk Time (%)	28	1			
Queuing Penalty (veh)	69	3			

Intersection: 10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	R	L	T	R
Maximum Queue (m)	56.9	99.2	57.3	115.3	21.2	57.3	254.7	37.5	42.4	167.7	124.3
Average Queue (m)	19.3	42.2	21.9	54.7	1.1	11.4	139.5	17.5	29.9	64.5	15.6
95th Queue (m)	44.1	76.3	52.0	94.8	12.9	40.1	264.3	44.8	48.9	124.7	79.7
Link Distance (m)		440.2		379.6	379.6		292.4			463.4	463.4
Upstream Blk Time (%)							3				0
Queuing Penalty (veh)							0				0
Storage Bay Dist (m)	55.0		55.0			55.0		35.0	40.0		
Storage Blk Time (%)	0	4	0	8		0	51	0	5	19	
Queuing Penalty (veh)	0	4	0	10		0	56	2	17	28	

Intersection: 34: Elizabeth Avenue & Westerland Road

Movement	EB	EB	WB	SB	SB
Directions Served	L	T	TR	L	R
Maximum Queue (m)	37.3	116.9	131.2	47.7	7.2
Average Queue (m)	27.5	29.2	56.0	20.9	0.3
95th Queue (m)	42.1	81.4	111.4	38.4	7.4
Link Distance (m)		435.0	358.9	357.3	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (m)	35.0				70.0
Storage Blk Time (%)	7	1		0	0
Queuing Penalty (veh)	27	4		0	0

Intersection: 37: Thorburn Road & Columbus Drive/Prince Philip Drive

Movement	EB	EB	EB	EB	WB	WB	WB	WB	B40	NB	NB	SB
Directions Served	L	T	T	R	L	T	T	T	T	T	TR	L
Maximum Queue (m)	103.9	131.2	128.9	41.3	24.9	51.0	55.4	53.8	1.0	57.1	49.2	91.2
Average Queue (m)	57.0	75.1	76.2	17.3	9.6	27.8	30.6	27.3	0.0	34.6	21.8	55.5
95th Queue (m)	91.8	115.9	116.6	31.5	20.6	43.9	48.1	45.7	1.0	54.9	45.1	82.1
Link Distance (m)		411.9	411.9	411.9		178.0	178.0	178.0	347.9	151.6	151.6	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	250.0				110.0							160.0
Storage Blk Time (%)												
Queuing Penalty (veh)												

Intersection: 37: Thorburn Road & Columbus Drive/Prince Philip Drive

Movement	SB	SB	SB
Directions Served	L	T	TR
Maximum Queue (m)	94.7	59.6	73.4
Average Queue (m)	61.0	33.7	39.8
95th Queue (m)	87.3	52.5	64.0
Link Distance (m)	487.2	487.2	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			130.0
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 51: Freshwater Road & Elizabeth Avenue

Movement	WB	B52	NB	SB	SB
Directions Served	R	T	TR	L	T
Maximum Queue (m)	40.8	173.4	17.9	32.2	70.0
Average Queue (m)	18.0	4.7	2.1	20.0	5.7
95th Queue (m)	30.9	78.5	9.8	32.5	34.0
Link Distance (m)	274.8	435.0	253.0		212.2
Upstream Blk Time (%)		0			
Queuing Penalty (veh)		0			
Storage Bay Dist (m)				30.0	
Storage Blk Time (%)				3	0
Queuing Penalty (veh)				8	1

Network Summary

Network wide Queuing Penalty: 570

Intersection: 7: Allandale Road & Prince Philip Drive

Phase	1	2	4	5	6	7	8
Movement(s) Served	WBL	EBTL	NBT	EBL	WBTL	NBL	SBTL
Maximum Green (s)	10.0	38.0	43.0	24.0	24.0	14.0	23.0
Minimum Green (s)	7.0	9.0	10.0	7.0	9.0	7.0	10.0
Recall	None	C-Max	None	None	C-Max	None	None
Avg. Green (s)	9.0	40.8	43.0	24.0	24.0	13.5	23.6
g/C Ratio	-0.01	NA	NA	NA	NA	NA	NA
Cycles Skipped (%)	10	0	0	0	0	0	0
Cycles @ Minimum (%)	19	0	0	0	0	0	0
Cycles Maxed Out (%)	45	100	100	97	100	81	100
Cycles with Peds (%)	0	13	13	0	10	0	0

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Intersection: 9: Westerland Road/Clinch Crescent & Prince Philip Drive

Phase	1	2	3	4	5	6	7	8
Movement(s) Served	WBL	EBTL	SBL	NBTL	EBL	WBTL	NBL	SBTL
Maximum Green (s)	7.0	38.0	7.0	32.0	13.0	32.0	7.0	32.0
Minimum Green (s)	7.0	9.0	7.0	9.0	7.0	9.0	7.0	9.0
Recall	None	C-Max	None	None	None	C-Max	None	None
Avg. Green (s)	9.0	40.9	7.1	31.0	14.9	34.4	8.9	29.7
g/C Ratio	-0.01	NA	-0.01	NA	NA	NA	-0.01	-0.01
Cycles Skipped (%)	3	0	19	0	0	0	6	3
Cycles @ Minimum (%)	52	0	81	0	0	0	90	0
Cycles Maxed Out (%)	68	100	81	48	66	100	94	48
Cycles with Peds (%)	0	71	0	100	0	74	0	68

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Intersection: 10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue

Phase	1	2	3	4	5	6	8
Movement(s) Served	WBL	EBTL	SBL	NBTL	EBL	WBL	SBTL
Maximum Green (s)	7.0	47.0	7.0	35.0	7.0	47.0	48.0
Minimum Green (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Recall	None	Max	None	None	None	Max	None
Avg. Green (s)	6.7	49.1	6.8	35.0	6.6	49.7	45.7
g/C Ratio	-0.01	NA	-0.01	NA	-0.01	NA	NA
Cycles Skipped (%)	14	0	13	0	21	0	0
Cycles @ Minimum (%)	0	0	0	0	0	0	0
Cycles Maxed Out (%)	59	100	70	83	52	100	59
Cycles with Peds (%)	0	0	0	0	0	0	0

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Intersection: 34: Elizabeth Avenue & Westerland Road

Phase	2	5	6	8
Movement(s) Served	EBTL	EBL	WBL	SBL
Maximum Green (s)	60.0	13.0	41.0	18.0
Minimum Green (s)	4.0	4.0	4.0	4.0
Recall	Max	None	Max	None
Avg. Green (s)	66.0	10.4	46.6	11.5
g/C Ratio	-0.01	-0.01	NA	-0.01
Cycles Skipped (%)	8	12	0	7
Cycles @ Minimum (%)	0	2	0	0
Cycles Maxed Out (%)	93	37	100	10
Cycles with Peds (%)	0	0	0	0

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Intersection: 37: Thorburn Road & Columbus Drive/Prince Philip Drive
























Phase	1	2	3	4	5	6	8
Movement(s) Served	WBL	EBTL	SBL	NBT	EBL	WBTL	SBT
Maximum Green (s)	7.0	42.0	22.0	13.0	22.0	27.0	41.0
Minimum Green (s)	7.0	9.0	7.0	9.0	7.0	9.0	9.0
Recall	None	C-Max	None	None	None	C-Max	None
Avg. Green (s)	7.4	52.1	21.6	13.2	20.8	28.9	40.3
g/C Ratio	-0.01	NA	NA	NA	-0.01	NA	NA
Cycles Skipped (%)	66	0	0	0	6	0	0
Cycles @ Minimum (%)	31	0	0	3	0	0	0
Cycles Maxed Out (%)	28	100	81	77	62	100	77
Cycles with Peds (%)	0	13	0	0	0	16	16

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

MUN Traffic Study
Elizabeth Avenue & Allandale Road-Bonaventure Avenue

Existing PM
20/04/2016

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	134	385	79	166	420	298	27	446	96	158	499	121
Future Volume (vph)	134	385	79	166	420	298	27	446	96	158	499	121
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.7	3.5	3.7	3.7	3.5	3.7	3.0	3.4	3.4	3.0	3.4	3.4
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	55.0		0.0	55.0		0.0	55.0		35.0	40.0		0.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.975				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1789	1796	0	1789	1842	1601	1652	1821	1548	1652	1821	1548
Flt Permitted	0.319			0.179			0.371			0.122		
Satd. Flow (perm)	601	1796	0	337	1842	1601	645	1821	1548	212	1821	1548
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		10				314			149			132
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		456.6			391.7			303.3			486.7	
Travel Time (s)		32.9			28.2			21.8			35.0	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.97	0.97	0.97	0.95	0.95	0.95	0.90	0.90	0.90	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	138	397	81	175	442	314	30	496	107	172	542	132
Shared Lane Traffic (%)												
Lane Group Flow (vph)	138	478	0	175	442	314	30	496	107	172	542	132
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6			4		3	8	
Permitted Phases	2			6		6	4		4	8		8
Total Split (s)	11.0	40.0		15.0	44.0	44.0	41.0	41.0	41.0	14.0	55.0	55.0
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
Act Effect Green (s)	39.3	34.3		46.9	38.1	38.1	32.2	32.2	32.2	46.2	46.2	46.2
Actuated g/C Ratio	0.37	0.32		0.44	0.36	0.36	0.30	0.30	0.30	0.43	0.43	0.43
v/c Ratio	0.50	0.82		0.66	0.68	0.41	0.16	0.91	0.19	0.87	0.69	0.18
Control Delay	27.4	47.2		31.6	36.3	4.6	29.6	58.3	2.4	59.9	30.1	3.8
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	27.4	47.2		31.6	36.3	4.6	29.6	58.3	2.4	59.9	30.1	3.8
LOS	C	D		C	D	A	C	E	A	E	C	A
Approach Delay		42.8			24.7			47.5			32.1	
Approach LOS		D			C			D			C	
Stops (vph)	98	398		98	352	26	20	398	4	88	391	13
Fuel Used(l)	16	62		12	35	13	2	42	3	17	43	6
CO Emissions (g/hr)	291	1162		231	656	237	34	777	56	308	807	116

MUN Traffic Study
Elizabeth Avenue & Allandale Road-Bonaventure Avenue

Existing PM
20/04/2016



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	56	224		45	127	46	7	150	11	59	156	22
VOC Emissions (g/hr)	67	268		53	151	55	8	179	13	71	186	27
Dilemma Vehicles (#)	0	0		0	0	0	0	0	0	0	0	0
Queue Length 50th (m)	17.4	94.1		22.6	81.1	0.0	4.6	99.3	0.0	22.3	89.7	0.0
Queue Length 95th (m)	29.8	#148.8		#38.3	116.8	17.9	12.2	#154.6	5.2	#56.7	127.5	10.3
Internal Link Dist (m)		432.6			367.7			279.3			462.7	
Turn Bay Length (m)	55.0			55.0			55.0		35.0	40.0		
Base Capacity (vph)	275	580		269	653	770	210	595	606	198	833	779
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	0.50	0.82		0.65	0.68	0.41	0.14	0.83	0.18	0.87	0.65	0.17

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 107.3

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.91

Intersection Signal Delay: 35.2

Intersection LOS: D

Intersection Capacity Utilization 86.5%

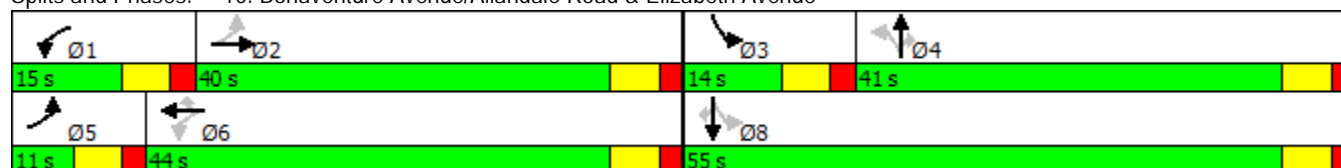
ICU Level of Service E











Analysis Period (min) 15

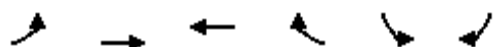
95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

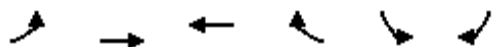
Splits and Phases: 10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue



						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	319	426	69	339	349
Future Volume (Veh/h)	0	319	426	69	339	349
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.88	0.88	0.91	0.91	0.92	0.92
Hourly flow rate (vph)	0	363	468	76	368	379
Pedestrians	9					
Lane Width (m)	4.5					
Walking Speed (m/s)	1.2					
Percent Blockage	1					
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1630	515			553	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1630	515			553	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	35			63	
cM capacity (veh/h)	70	554			1008	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	363	544	368	379		
Volume Left	0	0	368	0		
Volume Right	363	76	0	0		
cSH	554	1700	1008	1700		
Volume to Capacity	0.65	0.32	0.37	0.22		
Queue Length 95th (m)	36.1	0.0	12.8	0.0		
Control Delay (s)	23.0	0.0	10.6	0.0		
Lane LOS	C		B			
Approach Delay (s)	23.0	0.0	5.2			
Approach LOS	C					
Intersection Summary						
Average Delay			7.4			
Intersection Capacity Utilization			53.2%		ICU Level of Service	A
Analysis Period (min)			15			



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	144	409	508	180	184	212
Future Volume (vph)	144	409	508	180	184	212
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	2.8	3.0	3.6	3.7	3.4	3.4
Grade (%)		0%	0%		0%	
Storage Length (m)	35.0			0.0	0.0	70.0
Storage Lanes	1			0	1	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.965			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1612	1739	1798	0	1730	1548
Flt Permitted	0.136				0.950	
Satd. Flow (perm)	231	1739	1798	0	1730	1548
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			26			238
Link Speed (k/h)		50	50		50	
Link Distance (m)		444.2	375.5		381.7	
Travel Time (s)		32.0	27.0		27.5	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.96	0.96	0.88	0.88	0.89	0.89
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	150	426	577	205	207	238
Shared Lane Traffic (%)						
Lane Group Flow (vph)	150	426	782	0	207	238
Turn Type	pm+pt	NA	NA		Prot	Perm
Protected Phases	5	2	6		8	
Permitted Phases	2					8
Total Split (s)	19.0	66.0	47.0		24.0	24.0
Total Lost Time (s)	6.0	6.0	6.0		6.0	6.0
Act Effect Green (s)	60.1	60.1	44.9		14.7	14.7
Actuated g/C Ratio	0.69	0.69	0.52		0.17	0.17
v/c Ratio	0.49	0.35	0.83		0.71	0.52
Control Delay	11.5	6.9	28.4		47.6	8.8
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	11.5	6.9	28.4		47.6	8.8
LOS	B	A	C		D	A
Approach Delay		8.1	28.4		26.8	
Approach LOS		A	C		C	
Stops (vph)	48	157	511		167	29
Fuel Used(l)	12	34	81		17	10
CO Emissions (g/hr)	230	634	1505		319	182



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
NOx Emissions (g/hr)	44	122	290		62	35
VOC Emissions (g/hr)	53	146	347		74	42
Dilemma Vehicles (#)	0	0	0		0	0
Queue Length 50th (m)	7.6	25.8	101.5		32.8	0.0
Queue Length 95th (m)	17.1	43.8	#189.9		54.4	17.7
Internal Link Dist (m)		420.2	351.5		357.7	
Turn Bay Length (m)	35.0					70.0
Base Capacity (vph)	367	1203	942		359	510
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	0.41	0.35	0.83		0.58	0.47

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 86.8

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 21.5

Intersection LOS: C

Intersection Capacity Utilization 70.9%

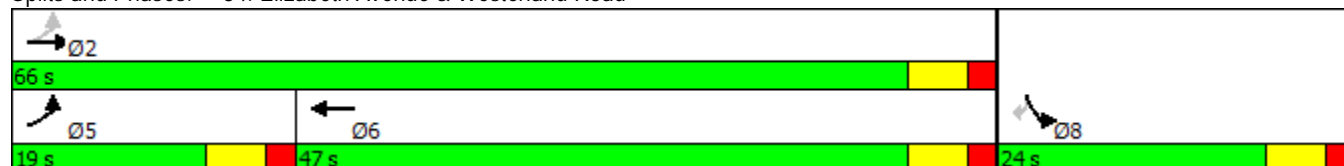
ICU Level of Service C

Analysis Period (min) 15

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
























Queue shown is maximum after two cycles.

Splits and Phases: 34: Elizabeth Avenue & Westerland Road



MUN Traffic Study
Prince Philip Drive & Allandale Road

Existing PM
19/04/2016

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	558	1106	217	144	612	29	197	516	197	13	409	557
Future Volume (vph)	558	1106	217	144	612	29	197	516	197	13	409	557
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	3.8	3.8	3.0	3.7	3.7	3.5	3.5	3.5	3.0	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	200.0		120.0	65.0		0.0	70.0		0.0	42.0		50.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	0.95	0.88
Ped Bike Factor			0.98	1.00	1.00		1.00		0.98	1.00		
Frt			0.850		0.993				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1652	3618	1619	1652	3551	0	1750	1842	1566	1652	3500	2756
Flt Permitted	0.154			0.233			0.950			0.343		
Satd. Flow (perm)	268	3618	1593	405	3551	0	1746	1842	1541	595	3500	2756
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			231		4				182			134
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		488.1			514.8			486.7			105.7	
Travel Time (s)		25.1			26.5			35.0			7.6	
Confl. Peds. (#/hr)	2		2	2		2	2		2	2		2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.94	0.94	0.94	0.91	0.91	0.91	0.94	0.94	0.94	0.84	0.84	0.84
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	594	1177	231	158	673	32	210	549	210	15	487	663
Shared Lane Traffic (%)												
Lane Group Flow (vph)	594	1177	231	158	705	0	210	549	210	15	487	663
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Prot	NA	Perm	Perm	NA	pt+ov
Protected Phases	5	2		1	6		7	4			8	8 5
Permitted Phases	2		2	6					4	8		
Total Split (s)	39.0	53.0	53.0	13.0	27.0		22.0	44.0	44.0	22.0	22.0	
Total Lost Time (s)	6.0	7.0	7.0	6.0	7.0		6.0	6.0	6.0	6.0	6.0	
Act Effect Green (s)	60.0	46.0	46.0	28.0	20.0		15.4	38.0	38.0	16.6	16.6	55.6
Actuated g/C Ratio	0.55	0.42	0.42	0.25	0.18		0.14	0.35	0.35	0.15	0.15	0.51
v/c Ratio	1.06	0.78	0.29	0.87	1.09		0.86	0.86	0.32	0.17	0.92	0.45
Control Delay	74.1	36.3	10.7	65.0	104.2		77.0	49.0	7.0	46.5	71.1	14.9
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	74.1	36.3	10.7	65.0	104.2		77.0	49.0	7.0	46.5	71.1	14.9
LOS	E	D	B	E	F		E	D	A	D	E	B
Approach Delay		44.5			97.0			46.0			38.8	
Approach LOS		D			F			D			D	
Stops (vph)	438	1043	116	107	551		178	452	32	15	364	276
Fuel Used(l)	95	163	24	18	103		25	53	11	1	45	33
CO Emissions (g/hr)	1759	3032	443	334	1908		461	994	202	24	843	608



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	340	585	86	64	368		89	192	39	5	163	117
VOC Emissions (g/hr)	406	699	102	77	440		106	229	47	5	194	140
Dilemma Vehicles (#)	0	14	0	0	25		0	0	0	0	0	0
Queue Length 50th (m)	~126.4	133.0	15.6	16.2	~89.5		44.4	109.0	4.0	2.9	55.2	39.7
Queue Length 95th (m)	m#166.4	m144.4	m24.5	#51.1	#126.7		#82.3	#167.4	19.7	8.6	#77.6	49.5
Internal Link Dist (m)		464.1			490.8			462.7			81.7	
Turn Bay Length (m)	200.0		120.0	65.0			70.0			42.0		50.0
Base Capacity (vph)	561	1512	800	182	648		254	636	651	89	527	1459
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	1.06	0.78	0.29	0.87	1.09		0.83	0.86	0.32	0.17	0.92	0.45

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 8 (7%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.09

Intersection Signal Delay: 52.5

Intersection LOS: D

Intersection Capacity Utilization 105.1%

ICU Level of Service G

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

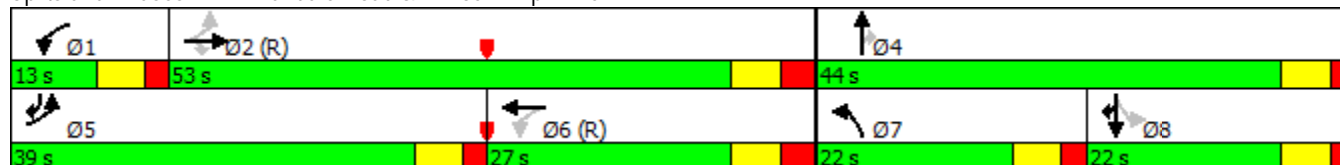
Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.
























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

Splits and Phases: 7: Allandale Road & Prince Philip Drive



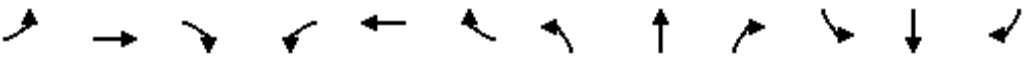
MUN Traffic Study
Prince Philip Drive & Clinch Crescent-Westerland Road

Existing PM
19/04/2016

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	128	1052	259	122	1092	21	240	116	187	261	254	362
Future Volume (vph)	128	1052	259	122	1092	21	240	116	187	261	254	362
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.7	4.0	3.5	3.5	3.5	3.7	3.0	3.7	3.5	3.7	3.7	3.7
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	75.0		75.0	90.0		0.0	60.0		45.0	80.0		80.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.53		0.99		0.96		0.72	0.92		0.72
Frt			0.850		0.997				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1789	3697	1566	1750	3458	0	1652	1883	1566	1789	1883	1601
Flt Permitted	0.105			0.112			0.371			0.674		
Satd. Flow (perm)	198	3697	831	206	3458	0	619	1883	1125	1172	1883	1150
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			237		2				185			177
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		209.5			470.5			381.7			113.2	
Travel Time (s)		10.8			24.2			27.5			8.2	
Confl. Peds. (#/hr)	50		150	50		150	50		150	50		150
Confl. Bikes (#/hr)												
Peak Hour Factor	0.89	0.89	0.89	0.92	0.92	0.92	0.89	0.89	0.89	0.76	0.76	0.76
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	144	1182	291	133	1187	23	270	130	210	343	334	476
Shared Lane Traffic (%)												
Lane Group Flow (vph)	144	1182	291	133	1210	0	270	130	210	343	334	476
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2		2	6			4		4	8		8
Total Split (s)	16.0	45.0	45.0	13.0	42.0		13.0	39.0	39.0	13.0	39.0	39.0
Total Lost Time (s)	6.0	7.0	7.0	6.0	7.0		6.0	7.0	7.0	6.0	7.0	7.0
Act Effect Green (s)	48.3	38.0	38.0	43.7	35.7		40.0	32.0	32.0	40.0	32.0	32.0
Actuated g/C Ratio	0.44	0.35	0.35	0.40	0.32		0.36	0.29	0.29	0.36	0.29	0.29
v/c Ratio	0.65	0.93	0.66	0.74	1.08		0.93	0.24	0.46	0.74	0.61	1.03
Control Delay	33.7	47.5	16.1	37.5	84.9		67.7	31.2	9.9	38.2	39.3	76.6
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	33.7	47.5	16.1	37.5	84.9		67.7	31.2	9.9	38.2	39.3	76.6
LOS	C	D	B	D	F		E	C	A	D	D	E
Approach Delay		40.6			80.2			40.0			54.4	
Approach LOS		D			F			D			D	
Stops (vph)	79	899	148	84	988		186	87	35	247	216	207
Fuel Used(l)	22	201	40	17	203		25	9	9	16	15	30
CO Emissions (g/hr)	404	3731	742	311	3775		472	166	167	298	284	556

MUN Traffic Study
Prince Philip Drive & Clinch Crescent-Westerland Road

Existing PM
19/04/2016

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	78	720	143	60	729		91	32	32	57	55	107
VOC Emissions (g/hr)	93	860	171	72	871		109	38	39	69	65	128
Dilemma Vehicles (#)	0	112	0	0	20		0	0	0	0	0	0
Queue Length 50th (m)	15.3	125.7	17.6	19.1	~159.1		39.5	21.2	3.9	52.0	61.7	~81.1
Queue Length 95th (m)	m23.7	m#157.6	m35.8	m23.6	m#172.4		#83.9	36.2	22.6	61.7	73.6	#100.3
Internal Link Dist (m)		185.5			446.5			357.7			89.2	
Turn Bay Length (m)	75.0		75.0	90.0			60.0		45.0	80.0		80.0
Base Capacity (vph)	232	1277	442	179	1123		290	547	458	465	547	460
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	0.62	0.93	0.66	0.74	1.08		0.93	0.24	0.46	0.74	0.61	1.03

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.08

Intersection Signal Delay: 55.1

Intersection LOS: E

Intersection Capacity Utilization 90.5%

ICU Level of Service E

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

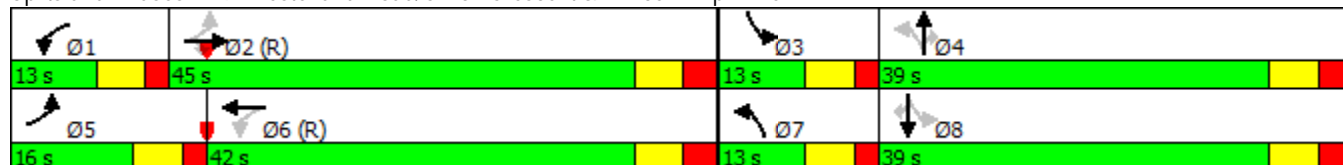
Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.




























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

Splits and Phases: 9: Westerland Road/Clinch Crescent & Prince Philip Drive



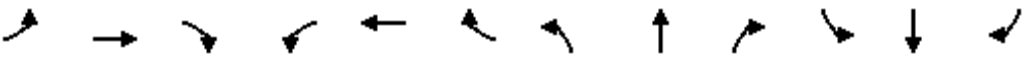
MUN Traffic Study
Prince Philip Drive-Columbus Drive & Thorburn Road

Existing PM
19/04/2016

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			  			 		 	 	
Traffic Volume (vph)	333	674	279	54	1181	571	0	357	124	438	244	479
Future Volume (vph)	333	674	279	54	1181	571	0	357	124	438	244	479
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.8	4.2	3.5	3.8	4.0	2.4	3.8	4.3	3.5	3.8	3.8
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	250.0		0.0	110.0		90.0	0.0		0.0	160.0		130.0
Storage Lanes	1		1	1		1	0		0	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.95	0.95	0.97	0.95	0.95
Ped Bike Factor			0.98	1.00		0.98		1.00		1.00	0.99	
Frt			0.850			0.850		0.961			0.901	
Flt Protected	0.950			0.950						0.950		
Satd. Flow (prot)	1750	3618	1689	1750	5198	1654	0	3462	0	3395	3226	0
Flt Permitted	0.107			0.385						0.950		
Satd. Flow (perm)	197	3618	1663	708	5198	1628	0	3462	0	3385	3226	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			291			462		37			324	
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		427.5			198.0			169.5			504.4	
Travel Time (s)		22.0			10.2			12.2			36.3	
Confl. Peds. (#/hr)	2		2	2		2	2		2	2		2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.96	0.96	0.96	0.95	0.95	0.95	0.91	0.91	0.91	0.91	0.91	0.91
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	347	702	291	57	1243	601	0	392	136	481	268	526
Shared Lane Traffic (%)												
Lane Group Flow (vph)	347	702	291	57	1243	601	0	528	0	481	794	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm		NA		Prot	NA	
Protected Phases	5	2		1	6			4		3	8	
Permitted Phases	2		2	6		6						
Total Split (s)	25.0	50.0	50.0	13.0	38.0	38.0		23.0		24.0	47.0	
Total Lost Time (s)	6.0	7.0	7.0	6.0	7.0	7.0		7.0		6.0	7.0	
Act Effect Green (s)	57.0	45.6	45.6	39.3	31.3	31.3		16.3		17.7	40.0	
Actuated g/C Ratio	0.52	0.41	0.41	0.36	0.28	0.28		0.15		0.16	0.36	
v/c Ratio	0.95	0.47	0.34	0.18	0.84	0.76		0.97		0.88	0.58	
Control Delay	66.0	25.4	3.7	17.0	45.5	23.3		75.6		63.9	17.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Total Delay	66.0	25.4	3.7	17.0	45.5	23.3		75.6		63.9	17.8	
LOS	E	C	A	B	D	C		E		E	B	
Approach Delay		31.2			37.6			75.6			35.2	
Approach LOS		C			D			E			D	
Stops (vph)	226	479	23	40	1158	483		396		404	344	
Fuel Used(l)	38	58	12	9	230	98		45		52	52	
CO Emissions (g/hr)	715	1073	214	163	4276	1823		828		960	972	

MUN Traffic Study
Prince Philip Drive-Columbus Drive & Thorburn Road

Existing PM
19/04/2016

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	138	207	41	31	825	352		160		185	188	
VOC Emissions (g/hr)	165	247	49	38	986	421		191		221	224	
Dilemma Vehicles (#)	0	31	0	0	6	0		0		0	0	
Queue Length 50th (m)	57.9	59.1	0.0	8.6	102.7	63.2		56.3		52.4	41.5	
Queue Length 95th (m)	#112.6	76.0	16.1	m8.5	m96.6	m56.8		#91.5		#78.5	60.4	
Internal Link Dist (m)		403.5			174.0			145.5			480.4	
Turn Bay Length (m)	250.0			110.0		90.0				160.0		
Base Capacity (vph)	370	1499	859	319	1480	794		545		555	1379	
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	0.94	0.47	0.34	0.18	0.84	0.76		0.97		0.87	0.58	

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 28 (25%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.97

Intersection Signal Delay: 39.3

Intersection LOS: D

Intersection Capacity Utilization 89.3%

ICU Level of Service E

Analysis Period (min) 15

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.

Splits and Phases: 37: Thorburn Road & Columbus Drive/Prince Philip Drive



Summary of All Intervals

Run Number	1	10	2	3	4	5	6
Start Time	4:30	4:30	4:30	4:30	4:30	4:30	4:30
End Time	6:00	6:00	6:00	6:00	6:00	6:00	6:00
Total Time (min)	90	90	90	90	90	90	90
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	5	5	5	5	5	5	5
# of Recorded Intervals	4	4	4	4	4	4	4
Vehs Entered	9511	9295	9480	9410	9452	9419	9509
Vehs Exited	9416	9283	9406	9374	9358	9389	9468
Starting Vehs	495	516	559	556	513	515	563
Ending Vehs	590	528	633	592	607	545	604
Travel Distance (km)	15935	15704	15926	15967	15970	15744	15830
Travel Time (hr)	590.4	524.6	664.6	612.6	621.9	586.1	622.1
Total Delay (hr)	306.5	246.2	381.0	328.3	338.1	305.2	339.9
Total Stops	16068	15138	15822	15392	16091	15816	16224
Fuel Used (l)	1493.7	1428.7	1555.7	1519.0	1528.7	1483.2	1523.4

Summary of All Intervals

Run Number	7	8	9	Avg
Start Time	4:30	4:30	4:30	4:30
End Time	6:00	6:00	6:00	6:00
Total Time (min)	90	90	90	90
Time Recorded (min)	60	60	60	60
# of Intervals	5	5	5	5
# of Recorded Intervals	4	4	4	4
Vehs Entered	9544	9448	9255	9434
Vehs Exited	9427	9422	9221	9376
Starting Vehs	480	578	513	527
Ending Vehs	597	604	547	585
Travel Distance (km)	15882	16054	15486	15850
Travel Time (hr)	621.4	641.2	577.7	606.3
Total Delay (hr)	337.9	355.6	300.9	324.0
Total Stops	15671	15627	14769	15663
Fuel Used (l)	1518.1	1552.4	1461.2	1506.4

Interval #0 Information Seeding

Start Time	4:30
End Time	5:00
Total Time (min)	30
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording #1

Start Time	5:00
End Time	5:15
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	2336	2266	2341	2317	2330	2317	2318
Vehs Exited	2273	2316	2333	2348	2295	2336	2348
Starting Vehs	495	516	559	556	513	515	563
Ending Vehs	558	466	567	525	548	496	533
Travel Distance (km)	3946	3947	3967	4040	3956	3850	3884
Travel Time (hr)	125.5	123.2	143.4	130.2	134.6	130.0	139.3
Total Delay (hr)	55.4	53.4	72.8	58.4	64.4	61.4	70.1
Total Stops	3513	3619	3916	3834	3708	3575	3893
Fuel Used (l)	350.7	349.5	368.8	362.8	361.1	350.7	361.9

Interval #1 Information Recording #1

Start Time	5:00
End Time	5:15
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	2303	2319	2225	2309
Vehs Exited	2214	2336	2257	2307
Starting Vehs	480	578	513	527
Ending Vehs	569	561	481	526
Travel Distance (km)	3773	4007	3701	3907
Travel Time (hr)	131.8	145.2	120.5	132.4
Total Delay (hr)	64.7	74.0	53.8	62.8
Total Stops	3653	3877	3422	3698
Fuel Used (l)	347.8	374.5	332.2	356.0

Interval #2 Information Recording #2

Start Time	5:15
End Time	5:30
Total Time (min)	15
Volumes adjusted by PHF, Growth Factors.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	2493	2489	2473	2461	2477	2471	2600
Vehs Exited	2424	2405	2352	2394	2375	2335	2473
Starting Vehs	558	466	567	525	548	496	533
Ending Vehs	627	550	688	592	650	632	660
Travel Distance (km)	4138	4050	4077	4083	4071	4052	4212
Travel Time (hr)	155.0	138.3	174.7	154.9	156.7	159.8	164.8
Total Delay (hr)	81.2	66.1	101.9	82.0	84.5	87.5	89.8
Total Stops	4429	4072	4432	4141	4274	4320	4416
Fuel Used (l)	389.5	371.5	400.5	385.3	388.6	388.7	404.0

Interval #2 Information Recording #2

Start Time	5:15
End Time	5:30
Total Time (min)	15
Volumes adjusted by PHF, Growth Factors.	

Run Number	7	8	9	Avg
Vehs Entered	2515	2496	2437	2493
Vehs Exited	2407	2495	2319	2399
Starting Vehs	569	561	481	526
Ending Vehs	677	562	599	626
Travel Distance (km)	4113	4211	4000	4101
Travel Time (hr)	158.9	165.9	151.2	158.0
Total Delay (hr)	85.2	90.8	79.9	84.9
Total Stops	4165	4300	3882	4242
Fuel Used (l)	390.9	403.6	380.1	390.3

Interval #3 Information Recorsding #3

Start Time	5:30
End Time	5:45
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	2323	2247	2344	2302	2269	2351	2312
Vehs Exited	2349	2317	2438	2363	2327	2441	2366
Starting Vehs	627	550	688	592	650	632	660
Ending Vehs	601	480	594	531	592	542	606
Travel Distance (km)	3935	3945	4005	3882	3988	4045	3958
Travel Time (hr)	159.7	136.2	179.9	163.7	175.6	163.6	159.2
Total Delay (hr)	89.7	66.4	108.6	94.4	104.6	91.2	88.9
Total Stops	4133	3912	4014	3698	4288	4359	4037
Fuel Used (l)	382.0	361.4	403.2	382.7	399.8	393.2	385.2

Interval #3 Information Recorsding #3

Start Time	5:30
End Time	5:45
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	2383	2257	2274	2310
Vehs Exited	2411	2275	2317	2359
Starting Vehs	677	562	599	626
Ending Vehs	649	544	556	570
Travel Distance (km)	4045	3806	3844	3946
Travel Time (hr)	176.5	164.8	160.7	164.0
Total Delay (hr)	104.3	97.0	91.9	93.7
Total Stops	4060	3620	3803	3994
Fuel Used (l)	401.6	379.1	376.6	386.5

Interval #4 Information Recording #4

Start Time	5:45
End Time	6:00
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	2359	2293	2322	2330	2376	2280	2279
Vehs Exited	2370	2245	2283	2269	2361	2277	2281
Starting Vehs	601	480	594	531	592	542	606
Ending Vehs	590	528	633	592	607	545	604
Travel Distance (km)	3916	3762	3875	3961	3955	3797	3775
Travel Time (hr)	150.2	127.0	166.7	163.7	155.0	132.6	158.8
Total Delay (hr)	80.3	60.3	97.7	93.5	84.7	65.1	91.2
Total Stops	3993	3535	3460	3719	3821	3562	3878
Fuel Used (l)	371.5	346.3	383.2	388.2	379.2	350.6	372.3

Interval #4 Information Recording #4

Start Time	5:45
End Time	6:00
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	2343	2376	2319	2326
Vehs Exited	2395	2316	2328	2310
Starting Vehs	649	544	556	570
Ending Vehs	597	604	547	585
Travel Distance (km)	3951	4030	3941	3896
Travel Time (hr)	154.2	165.3	145.3	151.9
Total Delay (hr)	83.7	93.8	75.3	82.6
Total Stops	3793	3830	3662	3726
Fuel Used (l)	377.8	395.3	372.3	373.7

7: Allandale Road & Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.1	0.1	0.1	0.1	0.2	0.0	0.1	0.2	0.1	0.0	0.0	0.0
Denied Del/Veh (s)	0.9	0.2	0.9	3.2	1.0	1.0	2.3	1.4	1.5	0.0	0.0	0.0
Total Delay (hr)	6.0	9.6	0.5	12.8	65.1	2.5	6.4	10.8	0.5	0.2	6.5	0.6
Total Del/Veh (s)	38.9	30.8	8.7	308.1	363.0	331.1	110.0	71.8	9.7	68.7	54.5	4.2
Stop Delay (hr)	4.1	5.4	0.0	12.3	62.0	2.4	5.5	8.3	0.2	0.2	5.8	0.1
Stop Del/Veh (s)	26.4	17.2	0.0	294.1	345.7	319.8	94.7	55.2	3.2	64.2	48.8	0.6

7: Allandale Road & Prince Philip Drive Performance by movement

Movement	All
Denied Delay (hr)	1.0
Denied Del/Veh (s)	0.8
Total Delay (hr)	121.6
Total Del/Veh (s)	94.0
Stop Delay (hr)	106.2
Stop Del/Veh (s)	82.0

9: Westerland Road/Clinch Crescent & Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.1	0.6	0.1	0.0	0.0	0.0	1.2	0.7	0.8	7.6	7.3	10.8
Denied Del/Veh (s)	2.7	1.9	1.9	0.0	0.0	0.0	18.0	19.7	16.0	106.7	99.6	104.2
Total Delay (hr)	1.6	12.6	1.5	1.7	17.5	0.4	9.0	2.4	3.1	3.7	3.2	7.6
Total Del/Veh (s)	44.1	42.6	21.5	51.0	53.4	65.3	131.2	69.2	59.8	51.6	43.1	72.8
Stop Delay (hr)	1.3	9.1	1.1	1.4	12.7	0.3	8.7	2.1	2.9	3.4	2.7	7.6
Stop Del/Veh (s)	36.3	30.7	15.5	40.7	38.7	53.2	126.3	61.2	54.6	46.8	36.6	72.6

9: Westerland Road/Clinch Crescent & Prince Philip Drive Performance by movement

Movement	All
Denied Delay (hr)	29.1
Denied Del/Veh (s)	25.0
Total Delay (hr)	64.4
Total Del/Veh (s)	54.7
Stop Delay (hr)	53.2
Stop Del/Veh (s)	45.2

10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.0	0.0	2.3	0.5	0.3	3.4	0.8	3.2	0.1	0.0	0.0
Total Delay (hr)	1.9	3.3	0.3	2.4	3.1	0.4	0.4	6.4	0.7	2.3	5.0	0.4
Total Del/Veh (s)	51.6	30.7	14.8	52.0	25.9	4.4	59.3	49.9	27.7	52.6	34.5	12.9
Stop Delay (hr)	1.7	2.4	0.2	2.2	2.3	0.1	0.4	5.1	0.6	1.7	2.9	0.3
Stop Del/Veh (s)	44.6	21.9	8.3	46.6	19.2	0.6	51.6	40.1	21.0	38.1	20.4	8.2

10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue Performance by movement

Movement	All
Denied Delay (hr)	0.4
Denied Del/Veh (s)	0.5
Total Delay (hr)	26.8
Total Del/Veh (s)	33.4
Stop Delay (hr)	19.7
Stop Del/Veh (s)	24.6

34: Elizabeth Avenue & Westerland Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Denied Del/Veh (s)	1.2	0.2	0.2	0.2	0.0	0.0	0.0	0.2
Total Delay (hr)	0.7	0.7	3.0	0.8	1.9	0.1	0.3	7.6
Total Del/Veh (s)	17.8	6.2	20.9	16.7	37.0	1.7	5.3	14.5
Stop Delay (hr)	0.6	0.3	1.6	0.5	1.7	0.0	0.0	4.7
Stop Del/Veh (s)	13.6	2.8	11.1	9.5	32.2	0.4	0.7	8.9

37: Thorburn Road & Columbus Drive/Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.2	0.6
Denied Del/Veh (s)	2.4	0.3	0.3	0.0	0.0	0.0	0.1	0.2	0.5	0.5	1.7	0.5
Total Delay (hr)	3.2	3.9	0.4	0.3	12.9	1.1	5.9	1.2	6.8	1.9	2.9	40.4
Total Del/Veh (s)	35.7	20.6	4.9	20.7	39.4	7.2	59.9	34.0	54.4	26.7	21.6	30.8
Stop Delay (hr)	2.7	2.7	0.2	0.3	9.8	0.1	5.2	1.1	6.1	1.5	2.1	31.7
Stop Del/Veh (s)	30.0	14.4	3.0	17.0	30.0	0.5	52.6	31.1	48.7	21.0	15.6	24.1

51: Freshwater Road & Elizabeth Avenue Performance by movement

Movement	WBT	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.3	0.1	0.5
Denied Del/Veh (s)	0.0	0.0	0.4	0.4	3.2	1.2	0.9
Total Delay (hr)	0.1	0.9	0.2	0.0	0.7	0.3	2.2
Total Del/Veh (s)	0.8	10.2	1.8	0.9	7.4	3.0	4.2
Stop Delay (hr)	0.0	0.7	0.0	0.0	0.3	0.0	1.1
Stop Del/Veh (s)	0.0	8.3	0.0	0.1	3.7	0.1	2.1

Total Network Performance

Denied Delay (hr)	31.8
Denied Del/Veh (s)	12.1
Total Delay (hr)	292.1
Total Del/Veh (s)	105.6
Stop Delay (hr)	221.6
Stop Del/Veh (s)	80.1

Intersection: 7: Allandale Road & Prince Philip Drive

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	TR	L	T	R	L	T
Maximum Queue (m)	149.2	133.7	117.7	53.7	67.4	428.6	422.5	72.4	238.7	105.8	33.7	90.5
Average Queue (m)	83.4	79.9	78.6	2.8	58.6	314.4	304.2	61.2	140.3	15.6	4.6	50.5
95th Queue (m)	145.4	117.9	107.8	32.1	91.7	485.2	473.5	88.0	290.4	126.9	21.4	78.5
Link Distance (m)		469.2	469.2			501.3	501.3		463.0	463.0		89.8
Upstream Blk Time (%)						5	4		0	0		1
Queuing Penalty (veh)						0	0		0	0		0
Storage Bay Dist (m)	200.0			120.0	65.0			70.0			42.0	
Storage Blk Time (%)	0	0	0	0	2	78		7	27		0	22
Queuing Penalty (veh)	1	0	0	0	7	113		36	54		0	3

Intersection: 7: Allandale Road & Prince Philip Drive

Movement	SB	SB	SB	B1
Directions Served	T	R	R	T
Maximum Queue (m)	80.6	66.3	36.7	2.5
Average Queue (m)	41.6	7.2	3.9	0.1
95th Queue (m)	70.2	39.2	26.6	1.8
Link Distance (m)	89.8	89.8		267.7
Upstream Blk Time (%)	0	0		
Queuing Penalty (veh)	0	0		
Storage Bay Dist (m)			50.0	
Storage Blk Time (%)		1	0	
Queuing Penalty (veh)		2	1	

Intersection: 9: Westerland Road/Clinch Crescent & Prince Philip Drive

Movement	EB	EB	EB	EB	B35	WB	WB	WB	NB	NB	NB	SB
Directions Served	L	T	T	R	T	L	T	TR	L	T	R	L
Maximum Queue (m)	77.4	161.2	163.3	77.5	0.8	92.4	174.5	177.8	62.4	238.0	45.6	82.3
Average Queue (m)	37.9	91.2	90.3	46.2	0.0	45.2	110.5	115.6	54.7	110.1	22.6	47.6
95th Queue (m)	83.0	152.2	153.3	94.8	0.8	101.7	172.0	176.7	75.4	246.8	43.2	84.1
Link Distance (m)		191.7	191.7		347.9		454.2	454.2		357.3		
Upstream Blk Time (%)		0	0									
Queuing Penalty (veh)		0	0									
Storage Bay Dist (m)	75.0			75.0		90.0			60.0		45.0	80.0
Storage Blk Time (%)	0	15	13	1		0	17		46	1	2	3
Queuing Penalty (veh)	1	20	35	4		1	21		142	5	6	20

Intersection: 9: Westerland Road/Clinch Crescent & Prince Philip Drive

Movement	SB	SB
Directions Served	T	R
Maximum Queue (m)	114.6	82.5
Average Queue (m)	85.4	71.0
95th Queue (m)	137.7	102.5
Link Distance (m)	100.6	
Upstream Blk Time (%)	33	
Queuing Penalty (veh)	0	
Storage Bay Dist (m)		80.0
Storage Blk Time (%)	7	34
Queuing Penalty (veh)	42	184

Intersection: 10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	R	L	T	R
Maximum Queue (m)	57.4	138.4	57.3	148.2	57.7	57.3	193.6	37.5	42.5	246.1	169.7
Average Queue (m)	34.6	61.1	35.4	60.2	4.8	10.0	98.3	19.2	29.7	83.8	19.2
95th Queue (m)	64.4	109.6	63.6	116.7	34.8	36.0	171.8	45.7	49.7	183.9	109.0
Link Distance (m)		440.0		379.5	379.5		292.0			463.0	463.0
Upstream Blk Time (%)										0	0
Queuing Penalty (veh)										0	0
Storage Bay Dist (m)	55.0		55.0			55.0		35.0	40.0		
Storage Blk Time (%)	2	12	3	8		0	40	0	3	22	
Queuing Penalty (veh)	9	17	13	13		0	49	2	16	34	

Intersection: 34: Elizabeth Avenue & Westerland Road

Movement	EB	EB	WB	SB	SB
Directions Served	L	T	TR	L	R
Maximum Queue (m)	37.2	52.7	144.9	60.8	33.3
Average Queue (m)	18.4	21.2	67.0	30.2	2.3
95th Queue (m)	33.1	41.5	128.8	52.6	20.9
Link Distance (m)		435.0	358.9	357.3	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (m)	35.0				70.0
Storage Blk Time (%)	1	1		0	0
Queuing Penalty (veh)	4	2		0	0

Intersection: 37: Thorburn Road & Columbus Drive/Prince Philip Drive

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	B35	NB	NB
Directions Served	L	T	T	R	L	T	T	T	R	T	T	TR
Maximum Queue (m)	83.4	65.4	68.9	31.4	25.7	93.8	94.6	101.6	92.2	19.8	86.1	78.6
Average Queue (m)	48.0	39.1	37.4	14.7	8.7	69.0	69.1	66.2	12.8	0.7	54.3	42.2
95th Queue (m)	76.5	60.6	59.8	25.0	19.1	89.1	88.7	90.7	63.9	20.1	80.0	74.3
Link Distance (m)		411.9	411.9	411.9		178.0	178.0	178.0		191.7	151.6	151.6
Upstream Blk Time (%)										0		
Queuing Penalty (veh)										0		
Storage Bay Dist (m)	250.0				110.0				90.0			
Storage Blk Time (%)						0		0	0			
Queuing Penalty (veh)						0		1	2			

Intersection: 37: Thorburn Road & Columbus Drive/Prince Philip Drive

Movement	SB	SB	SB	SB
Directions Served	L	L	T	TR
Maximum Queue (m)	76.8	84.1	66.0	97.3
Average Queue (m)	44.9	51.3	31.6	55.4
95th Queue (m)	70.7	75.1	53.3	87.8
Link Distance (m)		487.2	487.2	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)	160.0			130.0
Storage Blk Time (%)				0
Queuing Penalty (veh)				0

Intersection: 51: Freshwater Road & Elizabeth Avenue

Movement	WB	B52	NB	SB	SB
Directions Served	R	T	TR	L	T
Maximum Queue (m)	55.6	134.4	10.8	31.5	48.7
Average Queue (m)	23.7	9.5	0.8	18.0	2.6
95th Queue (m)	42.4	115.2	5.2	28.8	22.4
Link Distance (m)	274.8	435.0	253.0		212.2
Upstream Blk Time (%)		0			
Queuing Penalty (veh)		2			
Storage Bay Dist (m)				30.0	
Storage Blk Time (%)				1	0
Queuing Penalty (veh)				5	0

Network Summary

Network wide Queuing Penalty: 868

Intersection: 7: Allandale Road & Prince Philip Drive

Phase	1	2	4	5	6	7	8
Movement(s) Served	WBL	EBTL	NBT	EBL	WBTL	NBL	SBTL
Maximum Green (s)	7.0	46.0	38.0	33.0	20.0	16.0	16.0
Minimum Green (s)	7.0	9.0	10.0	7.0	9.0	7.0	10.0
Recall	None	C-Max	None	None	C-Max	None	None
Avg. Green (s)	7.2	48.2	38.0	32.7	20.3	15.4	17.1
g/C Ratio	-0.01	NA	NA	NA	NA	NA	NA
Cycles Skipped (%)	6	0	0	0	0	0	0
Cycles @ Minimum (%)	94	0	0	0	0	0	0
Cycles Maxed Out (%)	94	100	100	94	100	74	100
Cycles with Peds (%)	0	13	13	0	16	0	0

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Intersection: 9: Westerland Road/Clinch Crescent & Prince Philip Drive

Phase	1	2	3	4	5	6	7	8
Movement(s) Served	WBL	EBTL	SBL	NBTL	EBL	WBTL	NBL	SBTL
Maximum Green (s)	7.0	38.0	7.0	32.0	10.0	35.0	7.0	32.0
Minimum Green (s)	7.0	9.0	7.0	9.0	7.0	9.0	7.0	9.0
Recall	None	C-Max	None	None	None	C-Max	None	None
Avg. Green (s)	7.2	40.2	7.1	31.8	9.0	38.3	7.2	31.8
g/C Ratio	-0.01	NA	NA	NA	-0.01	NA	NA	NA
Cycles Skipped (%)	6	0	0	0	9	0	0	0
Cycles @ Minimum (%)	90	0	100	0	16	0	100	0
Cycles Maxed Out (%)	90	100	100	94	44	100	100	94
Cycles with Peds (%)	0	100	0	97	0	100	0	97

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Intersection: 10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue

Phase	2	3	4	6	8
Movement(s) Served	EBTL	SBL	NBTL	WBTL	SBTL
Maximum Green (s)	47.0	7.0	35.0	47.0	48.0
Minimum Green (s)	4.0	4.0	4.0	4.0	4.0
Recall	Max	None	None	Max	None
Avg. Green (s)	48.2	6.8	35.8	48.2	46.8
g/C Ratio	NA	-0.01	NA	NA	NA
Cycles Skipped (%)	0	12	0	0	0
Cycles @ Minimum (%)	0	0	0	0	0
Cycles Maxed Out (%)	100	67	84	100	66
Cycles with Peds (%)	0	0	0	0	0

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Intersection: 34: Elizabeth Avenue & Westerland Road

Phase	2	5	6	8
Movement(s) Served	EBTL	EBL	WBT	SBL
Maximum Green (s)	60.0	13.0	41.0	18.0
Minimum Green (s)	4.0	4.0	4.0	4.0
Recall	Max	None	Max	None
Avg. Green (s)	64.1	8.4	50.8	13.2
g/C Ratio	-0.01	-0.01	NA	-0.01
Cycles Skipped (%)	3	33	0	2
Cycles @ Minimum (%)	0	3	0	0
Cycles Maxed Out (%)	97	8	100	20
Cycles with Peds (%)	0	0	0	0

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Intersection: 37: Thorburn Road & Columbus Drive/Prince Philip Drive

Phase	1	2	3	4	5	6	8
Movement(s) Served	WBL	EBTL	SBL	NBT	EBL	WBTL	SBT
Maximum Green (s)	7.0	43.0	18.0	16.0	19.0	31.0	40.0
Minimum Green (s)	7.0	9.0	7.0	9.0	7.0	9.0	9.0
Recall	None	C-Max	None	None	None	C-Max	None
Avg. Green (s)	7.2	49.2	17.7	16.2	17.1	33.0	39.9
g/C Ratio	-0.01	NA	NA	NA	-0.01	NA	NA
Cycles Skipped (%)	41	0	0	0	9	0	0
Cycles @ Minimum (%)	59	0	0	0	0	0	0
Cycles Maxed Out (%)	55	100	84	94	54	100	94
Cycles with Peds (%)	0	16	0	0	0	13	13
























Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

MUN Traffic Study
Elizabeth Avenue & Allandale Road-Bonaventure Avenue

Future 2025 AM

20/04/2016

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	116	295	63	119	408	261	31	523	90	160	398	128
Future Volume (vph)	116	295	63	119	408	261	31	523	90	160	398	128
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	3.5	3.7	3.0	3.5	3.7	3.0	3.4	3.4	3.0	3.4	3.4
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	55.0		0.0	55.0		0.0	55.0		35.0	40.0		0.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.974				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1652	1794	0	1652	1842	1601	1652	1821	1548	1652	1821	1548
Flt Permitted	0.142			0.260			0.496			0.094		
Satd. Flow (perm)	247	1794	0	452	1842	1601	862	1821	1548	163	1821	1548
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		10				259			149			142
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		456.6			391.7			303.3			486.7	
Travel Time (s)		32.9			28.2			21.8			35.0	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.83	0.83	0.83	0.78	0.78	0.78	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	140	355	76	153	523	335	34	581	100	178	442	142
Shared Lane Traffic (%)												
Lane Group Flow (vph)	140	431	0	153	523	335	34	581	100	178	442	142
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6			4		3	8	
Permitted Phases	2			6		6	4		4	8		8
Total Split (s)	13.0	41.0		13.0	41.0	41.0	43.0	43.0	43.0	13.0	56.0	56.0
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
Act Effect Green (s)	42.7	35.4		42.4	35.3	35.3	36.4	36.4	36.4	49.4	49.4	49.4
Actuated g/C Ratio	0.39	0.32		0.39	0.32	0.32	0.33	0.33	0.33	0.45	0.45	0.45
v/c Ratio	0.74	0.74		0.61	0.88	0.49	0.12	0.96	0.16	1.07	0.54	0.18
Control Delay	45.7	32.5		32.0	54.1	10.0	26.7	65.7	1.8	122.4	12.1	0.7
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	45.7	32.5		32.0	54.1	10.0	26.7	65.7	1.8	122.4	12.1	0.7
LOS	D	C		C	D	B	C	E	A	F	B	A
Approach Delay		35.7			36.1			54.9			35.8	
Approach LOS		D			D			D			D	
Stops (vph)	75	218		82	360	56	23	460	3	183	120	3
Fuel Used(l)	15	42		9	40	13	2	52	3	27	25	6
CO Emissions (g/hr)	278	784		171	748	241	38	964	52	494	461	113

Synchro 9 Report

MUN Traffic Study
Elizabeth Avenue & Allandale Road-Bonaventure Avenue

Future 2025 AM
20/04/2016



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	54	151		33	144	47	7	186	10	95	89	22
VOC Emissions (g/hr)	64	181		39	173	56	9	222	12	114	106	26
Dilemma Vehicles (#)	0	0		0	0	0	0	0	0	0	0	0
Queue Length 50th (m)	13.9	42.1		19.9	106.4	11.6	5.0	120.8	0.0	~31.4	24.4	0.0
Queue Length 95th (m)	#35.7	61.4		28.5	122.2	22.0	12.5	#188.4	3.7	m#50.4	m29.8	m0.3
Internal Link Dist (m)		432.6			367.7			279.3			462.7	
Turn Bay Length (m)	55.0			55.0			55.0		35.0	40.0		
Base Capacity (vph)	188	584		252	591	689	289	612	619	167	827	781
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	0.74	0.74		0.61	0.88	0.49	0.12	0.95	0.16	1.07	0.53	0.18

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 3 (3%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.07

Intersection Signal Delay: 40.3

Intersection LOS: D

Intersection Capacity Utilization 84.3%

ICU Level of Service E

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

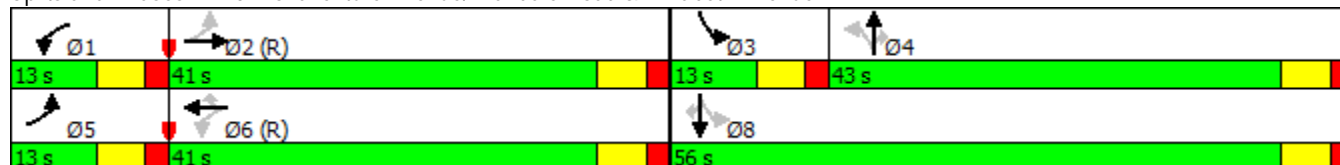
Queue shown is maximum after two cycles.











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

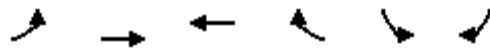
Queue shown is maximum after two cycles.

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

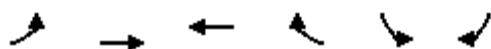
Splits and Phases: 10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue



						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	241	365	102	472	318
Future Volume (Veh/h)	0	241	365	102	472	318
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.94	0.94	0.80	0.80	0.91	0.91
Hourly flow rate (vph)	0	256	456	128	519	349
Pedestrians	49					
Lane Width (m)	4.5					
Walking Speed (m/s)	1.2					
Percent Blockage	5					
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1956	569			633	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1956	569			633	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	48			42	
cM capacity (veh/h)	28	495			901	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	256	584	519	349		
Volume Left	0	0	519	0		
Volume Right	256	128	0	0		
cSH	495	1700	901	1700		
Volume to Capacity	0.52	0.34	0.58	0.21		
Queue Length 95th (m)	22.2	0.0	28.7	0.0		
Control Delay (s)	19.8	0.0	14.3	0.0		
Lane LOS	C		B			
Approach Delay (s)	19.8	0.0	8.5			
Approach LOS	C					
Intersection Summary						
Average Delay		7.3				
Intersection Capacity Utilization		58.6%		ICU Level of Service		B
Analysis Period (min)		15				



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	408	383	318	290	148	162
Future Volume (vph)	408	383	318	290	148	162
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	2.8	3.0	3.6	3.7	3.4	3.4
Grade (%)		0%	0%		0%	
Storage Length (m)	35.0			0.0	0.0	70.0
Storage Lanes	1			0	1	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.936			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1612	1739	1744	0	1730	1548
Flt Permitted	0.081				0.950	
Satd. Flow (perm)	137	1739	1744	0	1730	1548
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			48			184
Link Speed (k/h)		50	50		50	
Link Distance (m)		444.2	375.5		381.7	
Travel Time (s)		32.0	27.0		27.5	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.78	0.78	0.90	0.90	0.88	0.88
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	523	491	353	322	168	184
Shared Lane Traffic (%)						
Lane Group Flow (vph)	523	491	675	0	168	184
Turn Type	pm+pt	NA	NA		Prot	Perm
Protected Phases	5	2	6		8	
Permitted Phases	2					8
Total Split (s)	38.0	86.0	48.0		24.0	24.0
Total Lost Time (s)	6.0	6.0	6.0		6.0	6.0
Act Effect Green (s)	82.9	82.9	43.3		15.1	15.1
Actuated g/C Ratio	0.75	0.75	0.39		0.14	0.14
v/c Ratio	0.94	0.37	0.94		0.71	0.50
Control Delay	57.3	6.0	57.2		48.1	10.3
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	57.3	6.0	57.2		48.1	10.3
LOS	E	A	E		D	B
Approach Delay		32.4	57.2		28.4	
Approach LOS		C	E		C	
Stops (vph)	295	125	514		138	68
Fuel Used(l)	53	31	86		14	9
CO Emissions (g/hr)	984	579	1606		259	162



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
NOx Emissions (g/hr)	190	112	310		50	31
VOC Emissions (g/hr)	227	134	370		60	37
Dilemma Vehicles (#)	0	0	0		0	0
Queue Length 50th (m)	93.7	31.7	137.9		33.5	9.5
Queue Length 95th (m)	#126.1	40.4 m	#191.3		m51.0	m16.0
Internal Link Dist (m)		420.2	351.5		357.7	
Turn Bay Length (m)	35.0					70.0
Base Capacity (vph)	554	1310	715		283	407
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	0.94	0.37	0.94		0.59	0.45

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.94

Intersection Signal Delay: 39.9

Intersection LOS: D

Intersection Capacity Utilization 80.4%

ICU Level of Service D

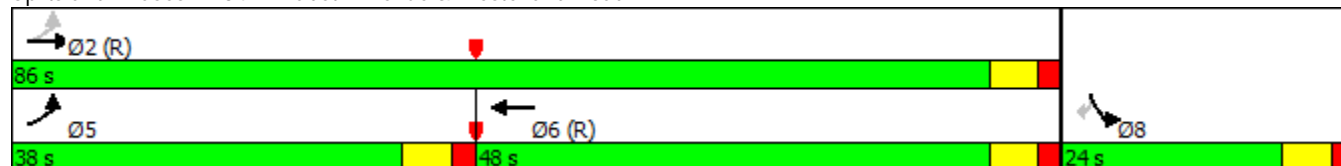
Analysis Period (min) 15

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.
























Splits and Phases: 34: Elizabeth Avenue & Westerland Road















MUN Traffic Study
Prince Philip Drive & Allandale Road

Future 2025 AM

20/04/2016

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	386	654	143	150	800	8	280	311	163	11	513	1054
Future Volume (vph)	386	654	143	150	800	8	280	311	163	11	513	1054
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	3.8	3.8	3.0	3.7	3.7	3.5	3.5	3.5	3.0	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	200.0		120.0	65.0		0.0	70.0		0.0	42.0		50.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	0.95	0.88
Ped Bike Factor			0.98	1.00	1.00		1.00		0.98	1.00		
Frt			0.850		0.998				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1652	3618	1619	1652	3571	0	1750	1842	1566	1652	3500	2756
Flt Permitted	0.121			0.377			0.950			0.563		
Satd. Flow (perm)	210	3618	1593	655	3571	0	1747	1842	1541	977	3500	2756
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			151		1				172			99
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		488.1			514.8			486.7			105.7	
Travel Time (s)		25.1			26.5			35.0			7.6	
Confl. Peds. (#/hr)	2		2	2		2	2		2	2		2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.93	0.93	0.93	0.95	0.95	0.95	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	406	688	151	161	860	9	295	327	172	12	570	1171
Shared Lane Traffic (%)												
Lane Group Flow (vph)	406	688	151	161	869	0	295	327	172	12	570	1171
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Prot	NA	Perm	Perm	NA	pt+ov
Protected Phases	5	2		1	6		7	4			8	8 5
Permitted Phases	2		2	6					4	8		
Total Split (s)	26.0	44.0	44.0	16.0	34.0		24.0	50.0	50.0	26.0	26.0	
Total Lost Time (s)	6.0	7.0	7.0	6.0	7.0		6.0	6.0	6.0	6.0	6.0	
Act Effect Green (s)	54.0	37.4	37.4	37.6	27.0		18.0	44.0	44.0	20.0	20.0	46.0
Actuated g/C Ratio	0.49	0.34	0.34	0.34	0.25		0.16	0.40	0.40	0.18	0.18	0.42
v/c Ratio	1.11	0.56	0.24	0.52	0.99		1.03	0.44	0.24	0.07	0.90	0.97
Control Delay	108.2	10.5	1.2	23.9	70.2		85.3	18.2	2.5	38.6	62.2	48.5
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	108.2	10.5	1.2	23.9	70.2		85.3	18.2	2.5	38.6	62.2	48.5
LOS	F	B	A	C	E		F	B	A	D	E	D
Approach Delay		41.2			62.9			39.8			52.9	
Approach LOS		D			E			D			D	
Stops (vph)	341	387	16	102	722		232	233	28	11	468	868
Fuel Used(l)	75	72	13	14	109		37	24	8	1	54	97
CO Emissions (g/hr)	1398	1343	235	252	2031		680	446	158	18	997	1802

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	270	259	45	49	392		131	86	30	3	192	348
VOC Emissions (g/hr)	322	310	54	58	468		157	103	36	4	230	416
Dilemma Vehicles (#)	0	34	0	0	34		0	0	0	0	0	0
Queue Length 50th (m)	~78.5	27.6	0.9	18.9	98.1		~67.6	46.9	4.8	2.2	63.5	128.4
Queue Length 95th (m)	m#116.6	m40.2	m1.0	31.4	#140.2		m#92.9	m61.2	m6.5	7.6	#93.7	#181.0
Internal Link Dist (m)		464.1			490.8			462.7			81.7	
Turn Bay Length (m)	200.0		120.0	65.0			70.0			42.0		50.0
Base Capacity (vph)	365	1230	641	316	877		286	736	719	177	636	1210
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	1.11	0.56	0.24	0.51	0.99		1.03	0.44	0.24	0.07	0.90	0.97

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 76 (69%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.11

Intersection Signal Delay: 49.9

Intersection LOS: D

Intersection Capacity Utilization 94.3%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

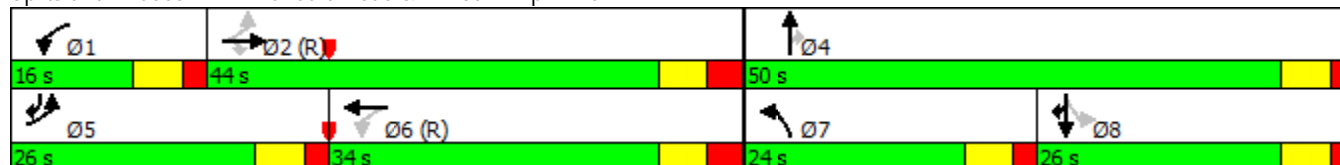
Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

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
























Splits and Phases: 7: Allandale Road & Prince Philip Drive



MUN Traffic Study
Prince Philip Drive & Clinch Crescent-Westerland Road













Future 2025 AM

20/04/2016

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	492	970	496	172	951	171	152	521	109	88	98	79
Future Volume (vph)	492	970	496	172	951	171	152	521	109	88	98	79
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.7	4.0	3.5	3.5	3.5	3.7	3.0	3.7	3.5	3.7	3.7	3.7
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	75.0		75.0	90.0		0.0	60.0		45.0	80.0		80.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.89		1.00		1.00		0.72			0.98
Frt			0.850		0.977				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1789	3697	1566	1750	3406	0	1652	1883	1566	1789	1883	1601
Flt Permitted	0.115			0.118			0.633			0.152		
Satd. Flow (perm)	217	3697	1394	217	3406	0	1097	1883	1125	286	1883	1576
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			507		20				159			159
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		209.5			470.5			381.7			113.2	
Travel Time (s)		10.8			24.2			27.5			8.2	
Confl. Peds. (#/hr)	2		30	30		2	2		150	150		2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.74	0.74	0.74	0.82	0.82	0.82	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	518	1021	522	232	1285	231	185	635	133	96	107	86
Shared Lane Traffic (%)												
Lane Group Flow (vph)	518	1021	522	232	1516	0	185	635	133	96	107	86
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2		2	6			4		4	8		8
Total Split (s)	20.0	42.0	42.0	20.0	42.0		16.0	32.0	32.0	16.0	32.0	32.0
Total Lost Time (s)	6.0	7.0	7.0	6.0	7.0		6.0	7.0	7.0	6.0	7.0	7.0
Act Effect Green (s)	50.9	35.9	35.9	49.1	35.0		37.7	28.7	28.7	35.1	25.2	25.2
Actuated g/C Ratio	0.46	0.33	0.33	0.45	0.32		0.34	0.26	0.26	0.32	0.23	0.23
v/c Ratio	1.73	0.85	0.66	0.83	1.38		0.44	1.29	0.32	0.45	0.25	0.18
Control Delay	356.6	22.2	6.1	35.2	204.4		30.4	178.6	12.5	29.7	36.7	0.8
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	356.6	22.2	6.1	35.2	204.4		30.4	178.6	12.5	29.7	36.7	0.8
LOS	F	C	A	D	F		C	F	B	C	D	A
Approach Delay		102.1			181.9			126.6			23.7	
Approach LOS		F			F			F			C	
Stops (vph)	343	784	258	122	815		140	390	48	60	79	0
Fuel Used(l)	209	165	75	23	296		12	99	6	4	6	1
CO Emissions (g/hr)	3887	3067	1390	426	5505		227	1846	113	80	104	17

MUN Traffic Study
Prince Philip Drive & Clinch Crescent-Westerland Road

Future 2025 AM
20/04/2016

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	750	592	268	82	1063		44	356	22	15	20	3
VOC Emissions (g/hr)	896	707	321	98	1270		52	426	26	18	24	4
Dilemma Vehicles (#)	0	94	0	0	63		0	0	0	0	0	0
Queue Length 50th (m)	~146.2	102.4	28.3	30.6	~224.7		32.0	~192.3	4.7	13.3	18.9	0.0
Queue Length 95th (m)	m#96.9	m61.3	m10.1	m32.1	#195.4		m35.2	m#214.6	m6.5	24.4	34.1	0.0
Internal Link Dist (m)		185.5			446.5			357.7			89.2	
Turn Bay Length (m)	75.0		75.0	90.0			60.0		45.0	80.0		80.0
Base Capacity (vph)	300	1205	796	293	1097		426	491	411	230	430	483
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	1.73	0.85	0.66	0.79	1.38		0.43	1.29	0.32	0.42	0.25	0.18

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.73

Intersection Signal Delay: 129.9

Intersection LOS: F

Intersection Capacity Utilization 114.0%

ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

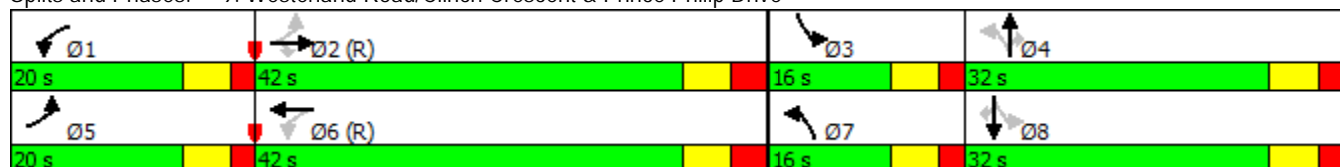
Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

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






















Splits and Phases: 9: Westerland Road/Clinch Crescent & Prince Philip Drive















MUN Traffic Study
Prince Philip Drive & Thorburn Road

Future 2025 AM

20/04/2016

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	438	1453	334	52	688	241	0	229	79	657	329	354
Future Volume (vph)	438	1453	334	52	688	241	0	229	79	657	329	354
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.8	4.2	3.5	3.8	4.0	2.4	3.8	4.3	3.5	3.8	3.8
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	250.0		0.0	110.0		90.0	0.0		0.0	160.0		130.0
Storage Lanes	1		1	1		1	0		0	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.95	0.95	0.97	0.95	0.95
Ped Bike Factor	1.00		0.98			0.98		1.00		1.00	0.99	
Frt			0.850			0.850		0.962			0.922	
Flt Protected	0.950			0.950						0.950		
Satd. Flow (prot)	1750	3618	1689	1750	5198	1654	0	3467	0	3395	3309	0
Flt Permitted	0.176			0.133						0.950		
Satd. Flow (perm)	324	3618	1663	245	5198	1628	0	3467	0	3380	3309	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			216			301		40			304	
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		427.5			198.0			169.5			504.4	
Travel Time (s)		22.0			10.2			12.2			36.3	
Confl. Peds. (#/hr)	2		2	2		2	2		2	2		2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.93	0.93	0.93	0.80	0.80	0.80	0.83	0.83	0.83	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	471	1562	359	65	860	301	0	276	95	692	346	373
Shared Lane Traffic (%)												
Lane Group Flow (vph)	471	1562	359	65	860	301	0	371	0	692	719	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm		NA		Prot	NA	
Protected Phases	5	2		1	6			4		3	8	
Permitted Phases	2		2	6		6						
Total Split (s)	20.0	37.0	37.0	20.0	37.0	37.0		32.0		21.0	53.0	
Total Lost Time (s)	6.0	7.0	7.0	6.0	7.0	7.0		7.0		6.0	7.0	
Act Effect Green (s)	50.5	38.6	38.6	39.0	30.0	30.0		25.0		15.0	46.0	
Actuated g/C Ratio	0.46	0.35	0.35	0.35	0.27	0.27		0.23		0.14	0.42	
v/c Ratio	1.43	1.23	0.50	0.33	0.61	0.45		0.45		1.50	0.46	
Control Delay	232.6	144.5	14.3	22.5	15.1	2.0		34.5		269.7	13.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Total Delay	232.6	144.5	14.3	22.5	15.1	2.0		34.5		269.7	13.7	
LOS	F	F	B	C	B	A		C		F	B	
Approach Delay		142.3			12.2			34.5			139.2	
Approach LOS		F			B			C			F	
Stops (vph)	232	1099	111	22	447	62		231		491	276	
Fuel Used(l)	104	260	20	8	111	34		18		179	46	
CO Emissions (g/hr)	1931	4844	375	156	2057	633		341		3326	858	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	373	935	72	30	397	122		66		642	166	
VOC Emissions (g/hr)	445	1117	87	36	474	146		79		767	198	
Dilemma Vehicles (#)	0	50	0	0	16	0		0		0	0	
Queue Length 50th (m)	~112.5	~227.4	22.6	2.0	36.2	7.3		32.2		~106.2	31.6	
Queue Length 95th (m)	#177.6	#278.1	51.7	m1.5	m24.3	m4.5		42.0		#141.8	47.2	
Internal Link Dist (m)		403.5			174.0			145.5			480.4	
Turn Bay Length (m)	250.0			110.0		90.0				160.0		
Base Capacity (vph)	330	1268	723	291	1417	662		818		462	1560	
Starvation Cap Reductn	0	0	0	0	0	0		0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0		0		0	0	
Storage Cap Reductn	0	0	0	0	0	0		0		0	0	
Reduced v/c Ratio	1.43	1.23	0.50	0.22	0.61	0.45		0.45		1.50	0.46	

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.50

Intersection Signal Delay: 104.6

Intersection LOS: F

Intersection Capacity Utilization 107.2%

ICU Level of Service G

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

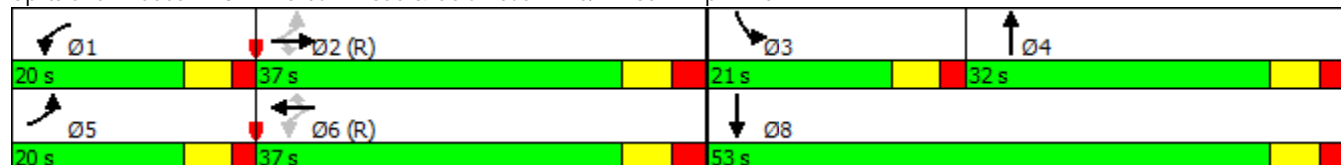
Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

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

Splits and Phases: 37: Thorburn Road & Columbus Drive/Prince Philip Drive



Summary of All Intervals

Run Number	1	10	2	3	4	5	6
Start Time	6:30	6:30	6:30	6:30	6:30	6:30	6:30
End Time	8:00	8:00	8:00	8:00	8:00	8:00	8:00
Total Time (min)	90	90	90	90	90	90	90
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	5	5	5	5	5	5	5
# of Recorded Intervals	4	4	4	4	4	4	4
Vehs Entered	8969	8911	8801	8524	8526	8213	8471
Vehs Exited	8431	8415	8188	8113	8141	7816	7943
Starting Vehs	857	912	785	873	877	1000	845
Ending Vehs	1395	1408	1398	1284	1262	1397	1373
Travel Distance (km)	14307	14423	13886	13964	13830	13305	13455
Travel Time (hr)	1695.7	1597.8	1752.0	1756.7	1777.9	2079.8	1891.3
Total Delay (hr)	1410.0	1309.8	1475.0	1477.4	1502.0	1814.1	1622.1
Total Stops	24634	24271	23956	22784	24155	23429	23133
Fuel Used (l)	2282.6	2211.7	2301.3	2317.7	2320.4	2536.8	2384.5

Summary of All Intervals

Run Number	7	8	9	Avg
Start Time	6:30	6:30	6:30	6:30
End Time	8:00	8:00	8:00	8:00
Total Time (min)	90	90	90	90
Time Recorded (min)	60	60	60	60
# of Intervals	5	5	5	5
# of Recorded Intervals	4	4	4	4
Vehs Entered	8655	8738	8899	8671
Vehs Exited	8036	8162	8348	8160
Starting Vehs	835	771	840	862
Ending Vehs	1454	1347	1391	1370
Travel Distance (km)	13930	13908	14258	13926
Travel Time (hr)	1816.0	1455.9	1770.5	1759.4
Total Delay (hr)	1538.1	1177.7	1485.2	1481.1
Total Stops	24615	23284	25238	23949
Fuel Used (l)	2369.7	2054.8	2360.5	2314.0

Interval #0 Information Seeding

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

Interval #1 Information Recording #1

Start Time	7:00
End Time	7:15
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	2370	2209	2224	2144	2214	2137	2237
Vehs Exited	2158	2241	1967	2086	2097	1991	2021
Starting Vehs	857	912	785	873	877	1000	845
Ending Vehs	1069	880	1042	931	994	1146	1061
Travel Distance (km)	3667	3872	3446	3676	3632	3406	3521
Travel Time (hr)	267.0	265.5	249.9	270.6	279.6	315.1	265.8
Total Delay (hr)	193.9	188.4	181.3	197.3	207.1	247.3	195.5
Total Stops	6018	5943	5242	5350	5695	6244	5590
Fuel Used (l)	448.3	460.3	415.7	450.7	454.0	467.5	430.9

Interval #1 Information Recording #1

Start Time	7:00
End Time	7:15
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	2113	2202	2298	2217
Vehs Exited	2043	2080	2166	2087
Starting Vehs	835	771	840	862
Ending Vehs	905	893	972	989
Travel Distance (km)	3621	3554	3686	3608
Travel Time (hr)	273.7	220.7	278.5	268.6
Total Delay (hr)	201.7	149.8	204.7	196.7
Total Stops	5770	5093	5632	5659
Fuel Used (l)	452.7	401.5	463.6	444.5

Interval #2 Information Recording #2

Start Time	7:15
End Time	7:30
Total Time (min)	15
Volumes adjusted by PHF, Growth Factors.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	2409	2470	2361	2234	2342	2235	2243
Vehs Exited	2193	2175	2170	1999	2102	2028	1983
Starting Vehs	1069	880	1042	931	994	1146	1061
Ending Vehs	1285	1175	1233	1166	1234	1353	1321
Travel Distance (km)	3773	3774	3669	3536	3617	3480	3429
Travel Time (hr)	380.8	332.9	375.4	377.7	393.2	452.2	410.3
Total Delay (hr)	305.3	257.6	302.3	306.7	321.1	382.7	341.6
Total Stops	6693	5976	6236	5452	6270	6264	6012
Fuel Used (l)	543.4	512.3	534.7	532.7	548.4	584.0	544.2

Interval #2 Information Recording #2

Start Time	7:15
End Time	7:30
Total Time (min)	15
Volumes adjusted by PHF, Growth Factors.	

Run Number	7	8	9	Avg
Vehs Entered	2456	2368	2383	2351
Vehs Exited	2149	2089	2143	2104
Starting Vehs	905	893	972	989
Ending Vehs	1212	1172	1212	1241
Travel Distance (km)	3750	3707	3722	3646
Travel Time (hr)	382.0	316.7	390.0	381.1
Total Delay (hr)	307.1	242.5	315.2	308.2
Total Stops	6632	6223	6722	6242
Fuel Used (l)	550.4	489.1	555.7	539.5

Interval #3 Information Recorsding #3

Start Time	7:30
End Time	7:45
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	2061	2146	2118	2191	2029	1846	1958
Vehs Exited	1964	1986	1943	2066	1942	1857	1991
Starting Vehs	1285	1175	1233	1166	1234	1353	1321
Ending Vehs	1382	1335	1408	1291	1321	1342	1288
Travel Distance (km)	3340	3464	3304	3514	3300	3088	3192
Travel Time (hr)	481.8	455.9	513.0	515.1	512.1	600.2	560.4
Total Delay (hr)	415.1	386.6	446.8	444.8	446.1	538.4	496.4
Total Stops	5249	5986	5903	6153	6015	5026	5416
Fuel Used (l)	604.7	586.6	629.4	643.9	624.5	687.6	661.5

Interval #3 Information Recorsding #3

Start Time	7:30
End Time	7:45
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	2048	2185	2181	2073
Vehs Exited	1824	2103	2002	1968
Starting Vehs	1212	1172	1212	1241
Ending Vehs	1436	1254	1391	1344
Travel Distance (km)	3160	3443	3406	3321
Travel Time (hr)	526.9	421.6	509.4	509.6
Total Delay (hr)	463.7	352.4	441.1	443.2
Total Stops	5727	6219	6150	5784
Fuel Used (l)	629.1	558.0	635.8	626.1

Interval #4 Information Recording #4

Start Time	7:45
End Time	8:00
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	2129	2086	2098	1955	1941	1995	2033
Vehs Exited	2116	2013	2108	1962	2000	1940	1948
Starting Vehs	1382	1335	1408	1291	1321	1342	1288
Ending Vehs	1395	1408	1398	1284	1262	1397	1373
Travel Distance (km)	3527	3313	3467	3238	3280	3331	3313
Travel Time (hr)	566.0	543.4	613.7	593.4	592.9	712.3	654.8
Total Delay (hr)	495.6	477.2	544.5	528.6	527.7	645.6	588.6
Total Stops	6674	6366	6575	5829	6175	5895	6115
Fuel Used (l)	686.3	652.6	721.5	690.4	693.5	797.8	747.9

Interval #4 Information Recording #4

Start Time	7:45
End Time	8:00
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	2038	1983	2037	2031
Vehs Exited	2020	1890	2037	2004
Starting Vehs	1436	1254	1391	1344
Ending Vehs	1454	1347	1391	1370
Travel Distance (km)	3399	3204	3444	3352
Travel Time (hr)	633.5	496.9	592.6	599.9
Total Delay (hr)	565.5	432.9	524.2	533.0
Total Stops	6486	5749	6734	6256
Fuel Used (l)	737.5	606.2	705.4	703.9

7: Allandale Road & Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	1.3	6.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.0	0.1	30.9	29.4	27.4	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	3.0	1.6	0.2	9.6	59.0	0.6	15.2	8.8	0.6	0.2	7.3	7.3
Total Del/Veh (s)	37.6	12.2	5.5	238.9	270.9	265.1	187.4	68.3	13.9	54.4	51.4	25.5
Stop Delay (hr)	2.5	0.9	0.0	9.1	55.4	0.6	13.8	7.3	0.3	0.2	6.5	5.3
Stop Del/Veh (s)	32.0	7.0	0.0	226.5	254.3	252.1	170.5	56.4	7.3	49.4	45.2	18.2

7: Allandale Road & Prince Philip Drive Performance by movement

Movement	All
Denied Delay (hr)	7.7
Denied Del/Veh (s)	6.6
Total Delay (hr)	113.5
Total Del/Veh (s)	95.3
Stop Delay (hr)	101.8
Stop Del/Veh (s)	85.6

9: Westerland Road/Clinch Crescent & Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	11.0	39.4	8.4	0.1	0.0	0.1
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	262.0	280.3	281.3	3.7	0.7	3.7
Total Delay (hr)	24.2	13.0	3.3	7.7	69.6	11.1	7.9	26.3	4.8	0.8	0.9	0.2
Total Del/Veh (s)	246.7	57.0	36.4	175.8	152.5	238.7	200.0	204.1	174.9	34.2	34.0	10.1
Stop Delay (hr)	23.3	8.8	1.9	6.1	56.1	9.6	6.9	22.9	4.2	0.8	0.8	0.2
Stop Del/Veh (s)	238.1	38.6	21.3	139.9	122.9	207.3	175.4	177.8	151.5	30.9	29.9	8.5

9: Westerland Road/Clinch Crescent & Prince Philip Drive Performance by movement

Movement	All
Denied Delay (hr)	59.0
Denied Del/Veh (s)	48.4
Total Delay (hr)	169.9
Total Del/Veh (s)	137.6
Stop Delay (hr)	141.7
Stop Del/Veh (s)	114.8

10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.9	0.2	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	2.5	0.4	0.3	8.1	6.0	8.1	0.0	0.0	0.0
Total Delay (hr)	1.1	2.6	0.2	1.2	4.5	0.4	0.8	15.2	1.9	2.0	2.1	0.2
Total Del/Veh (s)	39.2	30.4	11.8	35.4	38.9	5.4	99.9	100.4	75.8	47.4	15.7	7.5
Stop Delay (hr)	0.9	2.1	0.1	1.0	3.6	0.1	0.7	12.7	1.6	1.5	1.1	0.1
Stop Del/Veh (s)	33.2	23.9	6.1	28.4	30.7	1.7	85.1	83.7	62.3	37.5	8.1	3.2

10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue Performance by movement

Movement	All
Denied Delay (hr)	1.3
Denied Del/Veh (s)	1.8
Total Delay (hr)	32.3
Total Del/Veh (s)	43.3
Stop Delay (hr)	25.4
Stop Del/Veh (s)	34.1

34: Elizabeth Avenue & Westerland Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBT	SBR	All
Denied Delay (hr)	15.1	13.7	0.3	0.5	0.0	0.0	0.0	29.5
Denied Del/Veh (s)	134.2	128.7	3.3	5.6	0.0	0.0	0.0	54.3
Total Delay (hr)	15.2	10.7	5.6	4.7	1.3	0.1	0.1	37.9
Total Del/Veh (s)	136.4	103.4	63.2	58.1	44.5	1.2	3.7	69.6
Stop Delay (hr)	13.9	9.3	4.3	3.7	1.2	0.0	0.0	32.5
Stop Del/Veh (s)	124.6	89.3	48.4	45.8	41.0	0.4	0.5	59.7

37: Thorburn Road & Columbus Drive/Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR	All
Denied Delay (hr)	30.5	102.6	24.4	0.0	0.0	0.0	0.0	0.0	151.0	73.7	80.4	462.7
Denied Del/Veh (s)	248.6	251.5	255.3	0.0	0.0	0.0	0.1	0.2	785.8	790.0	776.1	331.6
Total Delay (hr)	42.6	66.2	3.0	0.4	5.0	0.3	2.3	0.5	93.8	12.9	13.0	239.9
Total Del/Veh (s)	377.8	185.0	36.6	32.5	22.3	5.0	35.3	22.7	697.5	218.6	207.5	201.2
Stop Delay (hr)	41.5	53.0	2.0	0.4	4.0	0.0	2.0	0.5	93.0	11.6	11.6	219.5
Stop Del/Veh (s)	367.8	148.1	24.3	29.8	18.2	0.0	30.3	21.7	691.6	196.3	184.9	184.0

51: Freshwater Road & Elizabeth Avenue Performance by movement

Movement	WBT	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.4	0.1	0.6
Denied Del/Veh (s)	0.0	0.0	0.4	0.4	3.3	1.6	1.3
Total Delay (hr)	0.0	0.5	0.2	0.0	1.4	0.5	2.7
Total Del/Veh (s)	0.6	8.4	1.8	1.2	11.0	5.5	5.7
Stop Delay (hr)	0.0	0.4	0.0	0.0	0.8	0.1	1.3
Stop Del/Veh (s)	0.0	6.8	0.0	0.2	6.0	0.9	2.7

Total Network Performance

Denied Delay (hr)	587.5
Denied Del/Veh (s)	214.6
Total Delay (hr)	893.6
Total Del/Veh (s)	337.6
Stop Delay (hr)	801.3
Stop Del/Veh (s)	302.7

Intersection: 7: Allandale Road & Prince Philip Drive

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	T	L	T	TR	L	T	R	L	T	T
Maximum Queue (m)	76.5	30.9	31.5	67.4	472.9	471.3	72.4	372.5	283.2	44.3	98.6	87.5
Average Queue (m)	36.8	12.9	14.7	53.1	274.1	267.7	67.4	192.7	55.3	6.8	57.2	48.8
95th Queue (m)	65.4	26.0	27.9	91.0	531.2	525.6	86.2	416.2	281.3	29.5	90.5	81.9
Link Distance (m)		469.2	469.2		501.3	501.3		463.4	463.4		89.8	89.8
Upstream Blk Time (%)					21	17		2	3		1	0
Queuing Penalty (veh)					0	0		7	12		0	0
Storage Bay Dist (m)	200.0			65.0			70.0			42.0		
Storage Blk Time (%)				1	70		51	4		0	25	
Queuing Penalty (veh)				3	105		158	11		0	3	

Intersection: 7: Allandale Road & Prince Philip Drive

Movement	SB	SB	B1	B1
Directions Served	R	R	T	T
Maximum Queue (m)	119.2	52.5	275.5	281.0
Average Queue (m)	108.3	51.8	160.3	193.4
95th Queue (m)	129.9	60.8	370.0	368.2
Link Distance (m)	89.8		267.7	267.7
Upstream Blk Time (%)	38		9	37
Queuing Penalty (veh)	0		0	0
Storage Bay Dist (m)		50.0		
Storage Blk Time (%)	33	20		
Queuing Penalty (veh)	173	107		

Intersection: 9: Westerland Road/Clinch Crescent & Prince Philip Drive

Movement	EB	EB	EB	EB	B35	B35	B40	B40	B45	B45	B36	B36
Directions Served	L	T	T	R	T	T	T	T	T	T	T	T
Maximum Queue (m)	77.4	219.1	215.9	77.3	377.0	374.6	212.9	211.1	486.0	486.0	183.4	187.5
Average Queue (m)	77.4	208.7	166.8	34.1	358.7	358.2	176.0	175.4	323.4	324.4	83.5	85.0
95th Queue (m)	77.5	214.5	275.2	67.8	410.0	409.5	282.6	281.6	655.2	655.3	219.7	223.0
Link Distance (m)		191.7	191.7		347.9	347.9	184.8	184.8	460.3	460.3	178.0	178.0
Upstream Blk Time (%)		92	22		87	83	77	78	52	53	2	3
Queuing Penalty (veh)		1004	240		949	907	848	855	568	575	19	30
Storage Bay Dist (m)	75.0			75.0								
Storage Blk Time (%)	80	30	1	0								
Queuing Penalty (veh)	390	146	3	1								

Intersection: 9: Westerland Road/Clinch Crescent & Prince Philip Drive

Movement	WB	WB	WB	B61	B61	NB	NB	NB	SB	SB	SB
Directions Served	L	T	TR	T	T	L	T	R	L	T	R
Maximum Queue (m)	92.4	478.6	478.9	512.6	500.7	62.4	363.6	47.5	37.9	40.7	24.2
Average Queue (m)	73.8	384.1	387.7	257.1	255.3	46.2	347.9	26.1	16.0	17.6	10.6
95th Queue (m)	124.2	589.5	587.4	630.0	622.2	80.5	392.3	60.2	30.7	33.4	20.4
Link Distance (m)		454.2	454.2	469.2	469.2		357.3			100.6	
Upstream Blk Time (%)		39	45	25	22		11				
Queuing Penalty (veh)		408	473	259	231		77				
Storage Bay Dist (m)	90.0					60.0		45.0	80.0		80.0
Storage Blk Time (%)	1	63				1	65	1			
Queuing Penalty (veh)	3	108				7	170	4			

Intersection: 10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	R	L	T	R
Maximum Queue (m)	54.4	111.0	57.3	170.7	79.7	57.3	287.6	37.5	42.2	68.1	17.2
Average Queue (m)	21.7	43.5	31.1	74.5	6.7	12.4	187.6	17.8	25.8	25.6	5.4
95th Queue (m)	49.4	90.2	64.9	138.2	39.4	43.3	320.3	45.3	43.1	52.8	14.6
Link Distance (m)		440.2		379.6	379.6		292.4			463.4	463.4
Upstream Blk Time (%)							12				
Queuing Penalty (veh)							0				
Storage Bay Dist (m)	55.0		55.0			55.0		35.0	40.0		
Storage Blk Time (%)	0	7	0	18		0	56	0	4	3	
Queuing Penalty (veh)	0	8	1	23		0	68	2	18	5	

Intersection: 34: Elizabeth Avenue & Westerland Road

Movement	EB	EB	B52	WB	SB	SB
Directions Served	L	T	T	TR	L	R
Maximum Queue (m)	37.5	393.8	2.4	226.4	44.3	7.4
Average Queue (m)	36.9	250.7	0.1	129.1	19.9	0.3
95th Queue (m)	40.9	406.7	2.8	229.4	38.2	5.4
Link Distance (m)		435.0	274.8	358.9	357.3	
Upstream Blk Time (%)		1		0		
Queuing Penalty (veh)		4		0		
Storage Bay Dist (m)	35.0					70.0
Storage Blk Time (%)	65	9				
Queuing Penalty (veh)	250	35				

Intersection: 37: Thorburn Road & Columbus Drive/Prince Philip Drive

Movement	EB	EB	EB	EB	WB	WB	WB	WB	B36	NB	NB	SB
Directions Served	L	T	T	R	L	T	T	T	T	T	TR	L
Maximum Queue (m)	252.5	428.3	425.1	422.3	22.5	40.3	41.2	40.6	1.3	54.2	45.5	162.5
Average Queue (m)	251.6	411.6	406.4	338.7	8.7	20.8	22.8	21.7	0.0	30.5	18.4	162.2
95th Queue (m)	264.8	461.3	460.5	580.5	19.2	35.2	35.8	34.5	1.3	49.3	39.0	163.2
Link Distance (m)		411.9	411.9	411.9		178.0	178.0	178.0	460.3	151.6	151.6	
Upstream Blk Time (%)		75	38	18								
Queuing Penalty (veh)		0	0	0								
Storage Bay Dist (m)	250.0				110.0							160.0
Storage Blk Time (%)	57	44										20
Queuing Penalty (veh)	415	193										67

Intersection: 37: Thorburn Road & Columbus Drive/Prince Philip Drive

Movement	SB	SB	SB
Directions Served	L	T	TR
Maximum Queue (m)	502.1	502.4	132.1
Average Queue (m)	492.9	493.3	58.2
95th Queue (m)	497.3	498.6	128.3
Link Distance (m)	487.2	487.2	
Upstream Blk Time (%)	87	86	
Queuing Penalty (veh)	0	0	
Storage Bay Dist (m)			130.0
Storage Blk Time (%)	82	3	1
Queuing Penalty (veh)	268	14	1

Intersection: 51: Freshwater Road & Elizabeth Avenue

Movement	WB	B52	NB	SB	SB
Directions Served	R	T	TR	L	T
Maximum Queue (m)	45.1	88.1	17.3	32.3	108.9
Average Queue (m)	19.4	1.6	2.6	23.3	14.3
95th Queue (m)	33.5	44.7	10.8	35.2	72.3
Link Distance (m)	274.8	435.0	253.0		212.2
Upstream Blk Time (%)		0			0
Queuing Penalty (veh)		0			0
Storage Bay Dist (m)				30.0	
Storage Blk Time (%)				6	0
Queuing Penalty (veh)				19	2

Network Summary

Network wide Queuing Penalty: 10247

Intersection: 7: Allandale Road & Prince Philip Drive

Phase	1	2	4	5	6	7	8
Movement(s) Served	WBL	EBTL	NBT	EBL	WBTL	NBL	SBTL
Maximum Green (s)	10.0	37.0	44.0	20.0	27.0	18.0	20.0
Minimum Green (s)	7.0	25.0	10.0	7.0	25.0	7.0	10.0
Recall	None	C-Max	None	None	C-Max	None	None
Avg. Green (s)	9.3	40.3	44.0	20.0	27.0	17.9	20.1
g/C Ratio	-0.01	NA	NA	NA	NA	NA	NA
Cycles Skipped (%)	10	0	0	0	0	0	0
Cycles @ Minimum (%)	13	0	0	0	0	0	0
Cycles Maxed Out (%)	52	100	100	100	100	97	100
Cycles with Peds (%)	0	13	13	0	13	0	0

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Intersection: 9: Westerland Road/Clinch Crescent & Prince Philip Drive

Phase	1	2	3	4	5	6	7	8
Movement(s) Served	WBL	EBTL	SBL	NBTL	EBL	WBTL	NBL	SBTL
Maximum Green (s)	14.0	35.0	10.0	25.0	14.0	35.0	10.0	25.0
Minimum Green (s)	7.0	25.0	7.0	10.0	7.0	25.0	7.0	10.0
Recall	None	C-Max	None	None	None	C-Max	None	None
Avg. Green (s)	11.8	38.2	9.4	29.6	14.1	35.0	11.0	27.3
g/C Ratio	-0.01	NA	-0.01	NA	NA	NA	-0.01	-0.01
Cycles Skipped (%)	3	0	17	0	0	0	6	3
Cycles @ Minimum (%)	6	0	7	0	0	0	3	0
Cycles Maxed Out (%)	35	100	43	100	100	100	61	97
Cycles with Peds (%)	0	65	0	100	0	71	0	65

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Intersection: 10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue

Phase	1	2	3	4	5	6	8
Movement(s) Served	WBL	EBTL	SBL	NBTL	EBL	WBL	SBTL
Maximum Green (s)	7.0	35.0	7.0	37.0	7.0	35.0	50.0
Minimum Green (s)	7.0	25.0	7.0	10.0	7.0	25.0	10.0
Recall	None	C-Max	None	None	None	C-Max	None
Avg. Green (s)	7.3	38.7	7.2	38.2	7.2	39.8	49.3
g/C Ratio	-0.01	NA	-0.01	NA	-0.01	NA	NA
Cycles Skipped (%)	13	0	13	0	19	0	0
Cycles @ Minimum (%)	81	0	87	0	77	0	0
Cycles Maxed Out (%)	81	100	87	90	74	100	90
Cycles with Peds (%)	0	0	0	0	0	0	0

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Intersection: 34: Elizabeth Avenue & Westerland Road

Phase	2	5	6	8
Movement(s) Served	EBTL	EBL	WBL	SBL
Maximum Green (s)	80.0	32.0	42.0	18.0
Minimum Green (s)	25.0	7.0	25.0	10.0
Recall	C-Max	None	C-Max	None
Avg. Green (s)	95.5	31.8	49.7	13.4
g/C Ratio	-0.01	NA	NA	-0.01
Cycles Skipped (%)	7	0	0	6
Cycles @ Minimum (%)	0	0	0	26
Cycles Maxed Out (%)	93	65	100	13
Cycles with Peds (%)	0	0	0	0

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Intersection: 37: Thorburn Road & Columbus Drive/Prince Philip Drive

Phase	1	2	3	4	5	6	8
Movement(s) Served	WBL	EBTL	SBL	NBT	EBL	WBTL	SBT
Maximum Green (s)	14.0	30.0	15.0	25.0	14.0	30.0	46.0
Minimum Green (s)	7.0	25.0	7.0	25.0	7.0	25.0	25.0
Recall	None	C-Max	None	None	None	C-Max	None
Avg. Green (s)	8.2	43.7	15.1	25.6	14.0	30.0	45.9
g/C Ratio	-0.01	NA	NA	NA	NA	NA	NA
Cycles Skipped (%)	52	0	0	0	0	0	0
Cycles @ Minimum (%)	28	0	0	100	0	0	0
Cycles Maxed Out (%)	0	100	100	100	97	100	97
Cycles with Peds (%)	0	16	0	0	0	19	16
























Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

MUN Traffic Study
Elizabeth Avenue & Allandale Road-Bonaventure Avenue

Future 2025 PM

20/04/2016

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	146	420	86	181	459	326	29	493	105	172	545	133
Future Volume (vph)	146	420	86	181	459	326	29	493	105	172	545	133
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.7	3.5	3.7	3.7	3.5	3.7	3.0	3.4	3.4	3.0	3.4	3.4
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	55.0		0.0	55.0		0.0	55.0		35.0	40.0		0.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.974				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1789	1794	0	1789	1842	1601	1652	1821	1548	1652	1821	1548
Flt Permitted	0.203			0.153			0.306			0.100		
Satd. Flow (perm)	382	1794	0	288	1842	1601	532	1821	1548	174	1821	1548
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		10				289			149			145
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		456.6			391.7			303.3			486.7	
Travel Time (s)		32.9			28.2			21.8			35.0	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.97	0.97	0.97	0.95	0.95	0.95	0.90	0.90	0.90	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	151	433	89	191	483	343	32	548	117	187	592	145
Shared Lane Traffic (%)												
Lane Group Flow (vph)	151	522	0	191	483	343	32	548	117	187	592	145
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6			4		3	8	
Permitted Phases	2			6		6	4		4	8		8
Total Split (s)	14.0	42.0		14.0	42.0	42.0	40.0	40.0	40.0	14.0	54.0	54.0
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
Act Effect Green (s)	43.9	36.0		44.1	36.1	36.1	34.0	34.0	34.0	48.0	48.0	48.0
Actuated g/C Ratio	0.40	0.33		0.40	0.33	0.33	0.31	0.31	0.31	0.44	0.44	0.44
v/c Ratio	0.59	0.88		0.85	0.80	0.48	0.20	0.98	0.20	1.02	0.75	0.19
Control Delay	30.4	55.0		54.2	45.3	8.0	31.8	70.8	3.0	96.8	17.2	0.3
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.4	55.0		54.2	45.3	8.0	31.8	70.8	3.0	96.8	17.2	0.3
LOS	C	E		D	D	A	C	E	A	F	B	A
Approach Delay		49.5			34.4			57.6			30.7	
Approach LOS		D			C			E			C	
Stops (vph)	117	822		105	403	55	23	428	6	206	320	1
Fuel Used(l)	18	80		17	42	15	2	51	3	25	40	6
CO Emissions (g/hr)	327	1485		309	783	286	38	942	63	472	736	115

Synchro 9 Report

MUN Traffic Study
Elizabeth Avenue & Allandale Road-Bonaventure Avenue

Future 2025 PM
20/04/2016



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	63	287		60	151	55	7	182	12	91	142	22
VOC Emissions (g/hr)	75	343		71	181	66	9	217	15	109	170	27
Dilemma Vehicles (#)	0	0		0	0	0	0	0	0	0	0	0
Queue Length 50th (m)	24.5	110.5		24.4	94.1	8.0	5.0	115.9	0.0	~32.6	41.0	0.1
Queue Length 95th (m)	m37.3	m#128.7		#57.8	#143.1	30.5	13.3	#183.4	7.3	m#37.9	m37.8	m0.1
Internal Link Dist (m)		432.6			367.7			279.3			462.7	
Turn Bay Length (m)	55.0			55.0			55.0		35.0	40.0		
Base Capacity (vph)	255	593		224	603	719	164	562	581	183	794	757
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	0.59	0.88		0.85	0.80	0.48	0.20	0.98	0.20	1.02	0.75	0.19

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 95 (86%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.02

Intersection Signal Delay: 41.3

Intersection LOS: D

Intersection Capacity Utilization 94.4%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

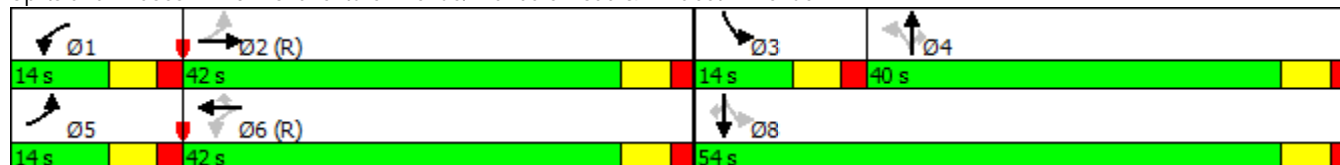
Queue shown is maximum after two cycles.











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

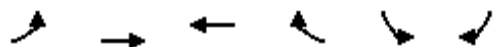
Queue shown is maximum after two cycles.

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

Splits and Phases: 10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue



						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	348	465	75	377	381
Future Volume (Veh/h)	0	348	465	75	377	381
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.88	0.88	0.91	0.91	0.92	0.92
Hourly flow rate (vph)	0	395	511	82	410	414
Pedestrians	9					
Lane Width (m)	4.5					
Walking Speed (m/s)	1.2					
Percent Blockage	1					
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1795	561			602	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1795	561			602	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	24			58	
cM capacity (veh/h)	50	522			966	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	395	593	410	414		
Volume Left	0	0	410	0		
Volume Right	395	82	0	0		
cSH	522	1700	966	1700		
Volume to Capacity	0.76	0.35	0.42	0.24		
Queue Length 95th (m)	50.1	0.0	16.3	0.0		
Control Delay (s)	30.2	0.0	11.4	0.0		
Lane LOS	D		B			
Approach Delay (s)	30.2	0.0	5.7			
Approach LOS	D					
Intersection Summary						
Average Delay			9.2			
Intersection Capacity Utilization			57.4%		ICU Level of Service	B
Analysis Period (min)			15			



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	174	446	555	206	202	233
Future Volume (vph)	174	446	555	206	202	233
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	2.8	3.0	3.6	3.7	3.4	3.4
Grade (%)		0%	0%		0%	
Storage Length (m)	35.0			0.0	0.0	70.0
Storage Lanes	1			0	1	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.963			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1612	1739	1794	0	1730	1548
Flt Permitted	0.147				0.950	
Satd. Flow (perm)	249	1739	1794	0	1730	1548
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			28			262
Link Speed (k/h)		50	50		50	
Link Distance (m)		444.2	375.5		381.7	
Travel Time (s)		32.0	27.0		27.5	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.96	0.96	0.88	0.88	0.89	0.89
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	181	465	631	234	227	262
Shared Lane Traffic (%)						
Lane Group Flow (vph)	181	465	865	0	227	262
Turn Type	pm+pt	NA	NA		Prot	Perm
Protected Phases	5	2	6		8	
Permitted Phases	2					8
Total Split (s)	17.0	86.0	69.0		24.0	24.0
Total Lost Time (s)	6.0	6.0	6.0		6.0	6.0
Act Effect Green (s)	81.0	81.0	65.7		17.0	17.0
Actuated g/C Ratio	0.74	0.74	0.60		0.15	0.15
v/c Ratio	0.61	0.36	0.80		0.85	0.57
Control Delay	15.1	6.3	14.9		60.3	8.2
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	15.1	6.3	14.9		60.3	8.2
LOS	B	A	B		E	A
Approach Delay		8.8	14.9		32.4	
Approach LOS		A	B		C	
Stops (vph)	54	151	347		188	77
Fuel Used(l)	15	37	77		21	12
CO Emissions (g/hr)	285	679	1426		389	216



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
NOx Emissions (g/hr)	55	131	275		75	42
VOC Emissions (g/hr)	66	157	329		90	50
Dilemma Vehicles (#)	0	0	0		0	0
Queue Length 50th (m)	10.3	32.3	54.0		50.4	7.6
Queue Length 95th (m)	21.9	46.6	65.8		m#80.5	m10.2
Internal Link Dist (m)		420.2	351.5		357.7	
Turn Bay Length (m)	35.0					70.0
Base Capacity (vph)	319	1279	1083		283	472
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	0.57	0.36	0.80		0.80	0.56

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 24 (22%), Referenced to phase 2:EBTL and 6:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 17.2

Intersection LOS: B

Intersection Capacity Utilization 77.6%

ICU Level of Service D

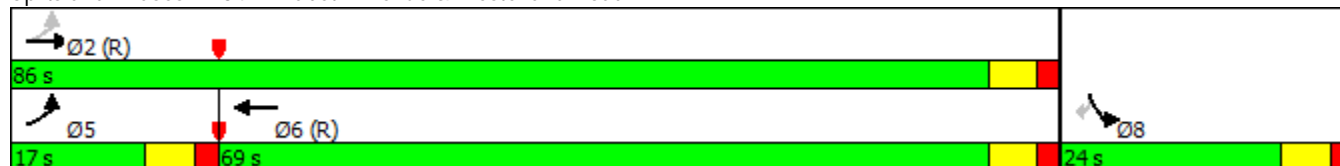
Analysis Period (min) 15

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.
























Splits and Phases: 34: Elizabeth Avenue & Westerland Road















MUN Traffic Study
Prince Philip Drive & Allandale Road

Future 2025 PM

20/04/2016

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	612	1210	239	157	684	32	227	563	215	14	446	624
Future Volume (vph)	612	1210	239	157	684	32	227	563	215	14	446	624
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	3.8	3.8	3.0	3.7	3.7	3.5	3.5	3.5	3.0	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	200.0		120.0	65.0		0.0	70.0		0.0	42.0		50.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	0.95	0.88
Ped Bike Factor			0.98	1.00	1.00		1.00		0.98	1.00		
Frt			0.850		0.993				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1652	3618	1619	1652	3551	0	1750	1842	1566	1652	3500	2756
Flt Permitted	0.118			0.151			0.950			0.286		
Satd. Flow (perm)	205	3618	1593	262	3551	0	1745	1842	1541	497	3500	2756
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			254		4				194			99
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		488.1			514.8			486.7			105.7	
Travel Time (s)		25.1			26.5			35.0			7.6	
Confl. Peds. (#/hr)	2		2	2		2	2		2	2		2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.94	0.94	0.94	0.91	0.91	0.91	0.94	0.94	0.94	0.84	0.84	0.84
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	651	1287	254	173	752	35	241	599	229	17	531	743
Shared Lane Traffic (%)												
Lane Group Flow (vph)	651	1287	254	173	787	0	241	599	229	17	531	743
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Prot	NA	Perm	Perm	NA	pt+ov
Protected Phases	5	2		1	6		7	4			8	8 5
Permitted Phases	2		2	6					4	8		
Total Split (s)	37.0	56.0	56.0	16.0	35.0		18.0	38.0	38.0	20.0	20.0	
Total Lost Time (s)	6.0	7.0	7.0	6.0	7.0		6.0	6.0	6.0	6.0	6.0	
Act Effect Green (s)	66.0	49.3	49.3	38.7	28.0		12.0	32.0	32.0	14.0	14.0	51.0
Actuated g/C Ratio	0.60	0.45	0.45	0.35	0.25		0.11	0.29	0.29	0.13	0.13	0.46
v/c Ratio	1.23	0.79	0.30	0.80	0.87		1.27	1.12	0.39	0.27	1.19	0.56
Control Delay	142.7	19.7	0.7	53.3	50.6		180.8	100.1	6.8	55.3	149.2	20.1
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	142.7	19.7	0.7	53.3	50.6		180.8	100.1	6.8	55.3	149.2	20.1
LOS	F	B	A	D	D		F	F	A	E	F	C
Approach Delay		54.0			51.1			98.3			73.7	
Approach LOS		D			D			F			E	
Stops (vph)	501	998	6	120	648		178	477	79	15	367	383
Fuel Used(l)	137	157	19	18	86		46	80	13	1	76	41
CO Emissions (g/hr)	2547	2912	354	340	1606		857	1490	239	27	1405	759

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	492	562	68	66	310		165	288	46	5	271	146
VOC Emissions (g/hr)	588	672	82	78	370		198	344	55	6	324	175
Dilemma Vehicles (#)	0	61	0	0	32		0	0	0	0	0	0
Queue Length 50th (m)	~153.8	107.5	0.2	19.8	84.9		~67.0	~146.6	13.5	3.4	~72.6	55.0
Queue Length 95th (m)	m#184.5	m135.8	m0.0	#54.8	#115.8		m#93.6	m#184.1	m18.3	9.9	#95.5	66.8
Internal Link Dist (m)		464.1			490.8			462.7			81.7	
Turn Bay Length (m)	200.0		120.0	65.0			70.0			42.0		50.0
Base Capacity (vph)	530	1620	853	219	906		190	535	585	63	445	1330
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	1.23	0.79	0.30	0.79	0.87		1.27	1.12	0.39	0.27	1.19	0.56

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 67 (61%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.27

Intersection Signal Delay: 66.7

Intersection LOS: E

Intersection Capacity Utilization 113.5%

ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

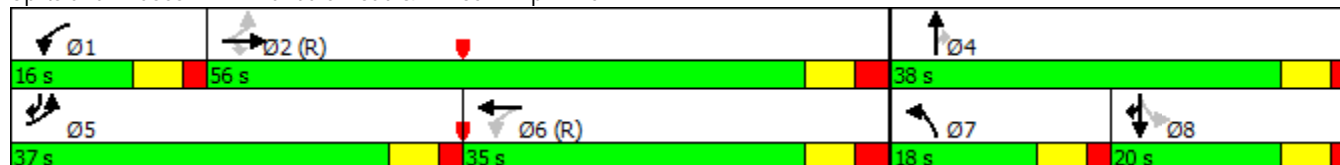
Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

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
























Splits and Phases: 7: Allandale Road & Prince Philip Drive

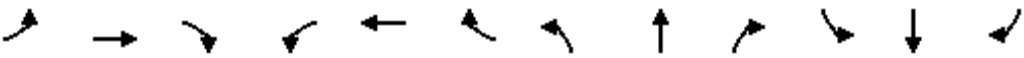


MUN Traffic Study
Prince Philip Drive & Clinch Crescent-Westerland Road

Future 2025 PM

20/04/2016

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	181	1149	283	133	1198	40	262	155	204	286	280	402
Future Volume (vph)	181	1149	283	133	1198	40	262	155	204	286	280	402
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.7	4.0	3.5	3.5	3.5	3.7	3.0	3.7	3.5	3.7	3.7	3.7
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	75.0		75.0	90.0		0.0	60.0		45.0	80.0		80.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.53		0.99		0.95		0.72	0.94		0.72
Frt			0.850		0.995				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1789	3697	1566	1750	3430	0	1652	1883	1566	1789	1883	1601
Flt Permitted	0.103			0.103			0.417			0.462		
Satd. Flow (perm)	194	3697	831	190	3430	0	691	1883	1125	822	1883	1150
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			255		3				218			159
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		209.5			470.5			381.7			113.2	
Travel Time (s)		10.8			24.2			27.5			8.2	
Confl. Peds. (#/hr)	50		150	50		150	50		150	50		150
Confl. Bikes (#/hr)												
Peak Hour Factor	0.89	0.89	0.89	0.92	0.92	0.92	0.89	0.89	0.89	0.76	0.76	0.76
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	203	1291	318	145	1302	43	294	174	229	376	368	529
Shared Lane Traffic (%)												
Lane Group Flow (vph)	203	1291	318	145	1345	0	294	174	229	376	368	529
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2		2	6			4		4	8		8
Total Split (s)	13.0	46.0	46.0	13.0	46.0		13.0	30.0	30.0	21.0	38.0	38.0
Total Lost Time (s)	6.0	7.0	7.0	6.0	7.0		6.0	7.0	7.0	6.0	7.0	7.0
Act Effect Green (s)	47.0	39.0	39.0	47.0	39.0		31.0	23.0	23.0	45.0	31.0	31.0
Actuated g/C Ratio	0.43	0.35	0.35	0.43	0.35		0.28	0.21	0.21	0.41	0.28	0.28
v/c Ratio	1.10	0.99	0.69	0.81	1.10		1.15	0.44	0.56	0.80	0.69	1.21
Control Delay	114.2	41.1	11.8	47.1	83.9		132.1	41.1	11.6	40.0	43.3	139.3
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	114.2	41.1	11.8	47.1	83.9		132.1	41.1	11.6	40.0	43.3	139.3
LOS	F	D	B	D	F		F	D	B	D	D	F
Approach Delay		44.2			80.3			69.8			82.2	
Approach LOS		D			F			E			F	
Stops (vph)	121	809	108	93	1014		203	128	56	203	246	234
Fuel Used(l)	42	206	40	19	221		41	13	10	16	18	53
CO Emissions (g/hr)	787	3828	750	359	4110		757	249	195	305	332	979

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	152	739	145	69	793		146	48	38	59	64	189
VOC Emissions (g/hr)	182	883	173	83	948		175	57	45	70	77	226
Dilemma Vehicles (#)	0	39	0	0	40		0	0	0	0	0	0
Queue Length 50th (m)	~31.5	106.3	21.8	20.1	~173.8		~49.9	31.5	4.2	59.3	70.5	~113.0
Queue Length 95th (m)	m#59.0	m#117.7	m32.1	m#31.0	m#196.7		m#101.2	m46.9	m15.0	69.2	82.6	#129.9
Internal Link Dist (m)		185.5			446.5			357.7			89.2	
Turn Bay Length (m)	75.0		75.0	90.0			60.0		45.0	80.0		80.0
Base Capacity (vph)	184	1310	459	180	1218		255	393	407	468	530	438
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	1.10	0.99	0.69	0.81	1.10		1.15	0.44	0.56	0.80	0.69	1.21

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 103 (94%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.21

Intersection Signal Delay: 67.0

Intersection LOS: E

Intersection Capacity Utilization 97.8%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

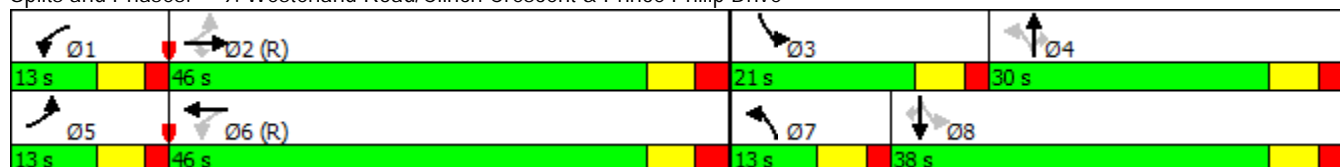
Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

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






















Splits and Phases: 9: Westerland Road/Clinch Crescent & Prince Philip Drive



MUN Traffic Study
Prince Philip Drive-Columbus Drive & Thorburn Road

Future 2025 PM

20/04/2016

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	364	761	305	60	1296	625	0	390	136	484	266	523
Future Volume (vph)	364	761	305	60	1296	625	0	390	136	484	266	523
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.8	4.2	3.5	3.8	4.0	2.4	3.8	4.3	3.5	3.8	3.8
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	250.0		0.0	110.0		90.0	0.0		0.0	160.0		130.0
Storage Lanes	1		1	1		1	0		0	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.95	0.95	0.97	0.95	0.95
Ped Bike Factor			0.98	1.00		0.98		1.00		1.00	0.99	
Frt			0.850			0.850		0.961			0.901	
Flt Protected	0.950			0.950						0.950		
Satd. Flow (prot)	1750	3618	1689	1750	5198	1654	0	3464	0	3395	3226	0
Flt Permitted	0.118			0.299						0.950		
Satd. Flow (perm)	217	3618	1663	550	5198	1628	0	3464	0	3384	3226	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			318			385		41			287	
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		427.5			198.0			169.5			504.4	
Travel Time (s)		22.0			10.2			12.2			36.3	
Confl. Peds. (#/hr)	2		2	2		2	2		2	2		2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.96	0.96	0.96	0.95	0.95	0.95	0.91	0.91	0.91	0.91	0.91	0.91
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	379	793	318	63	1364	658	0	429	149	532	292	575
Shared Lane Traffic (%)												
Lane Group Flow (vph)	379	793	318	63	1364	658	0	578	0	532	867	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm		NA		Prot	NA	
Protected Phases	5	2		1	6			4		3	8	
Permitted Phases	2		2	6		6						
Total Split (s)	22.0	44.0	44.0	13.0	35.0	35.0		32.0		21.0	53.0	
Total Lost Time (s)	6.0	7.0	7.0	6.0	7.0	7.0		7.0		6.0	7.0	
Act Effect Green (s)	51.0	39.6	39.6	36.0	28.0	28.0		25.0		15.0	46.0	
Actuated g/C Ratio	0.46	0.36	0.36	0.33	0.25	0.25		0.23		0.14	0.42	
v/c Ratio	1.17	0.61	0.40	0.25	1.03	0.94		0.71		1.15	0.57	
Control Delay	134.7	32.1	4.5	16.1	57.6	28.5		41.7		133.4	17.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Total Delay	134.7	32.1	4.5	16.1	57.6	28.5		41.7		133.4	17.4	
LOS	F	C	A	B	E	C		D		F	B	
Approach Delay		52.3			47.2			41.7			61.5	
Approach LOS		D			D			D			E	
Stops (vph)	231	613	28	45	1162	343		443		408	400	
Fuel Used(l)	61	72	13	10	260	102		35		82	57	
CO Emissions (g/hr)	1126	1343	240	181	4827	1890		656		1525	1066	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	217	259	46	35	932	365		127		294	206	
VOC Emissions (g/hr)	260	310	55	42	1113	436		151		352	246	
Dilemma Vehicles (#)	0	35	0	0	31	0		0		0	0	
Queue Length 50th (m)	~81.7	75.5	0.0	9.0	~115.3	77.6		56.2		~69.3	48.5	
Queue Length 95th (m)	#139.6	96.2	18.1	m7.9	m91.5	m61.9		75.4		#102.1	67.5	
Internal Link Dist (m)		403.5			174.0			145.5			480.4	
Turn Bay Length (m)	250.0			110.0		90.0				160.0		
Base Capacity (vph)	323	1302	802	256	1323	701		818		462	1516	
Starvation Cap Reductn	0	0	0	0	0	0		0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0		0		0	0	
Storage Cap Reductn	0	0	0	0	0	0		0		0	0	
Reduced v/c Ratio	1.17	0.61	0.40	0.25	1.03	0.94		0.71		1.15	0.57	

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 18 (16%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.17

Intersection Signal Delay: 51.6

Intersection LOS: D

Intersection Capacity Utilization 101.5%

ICU Level of Service G

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

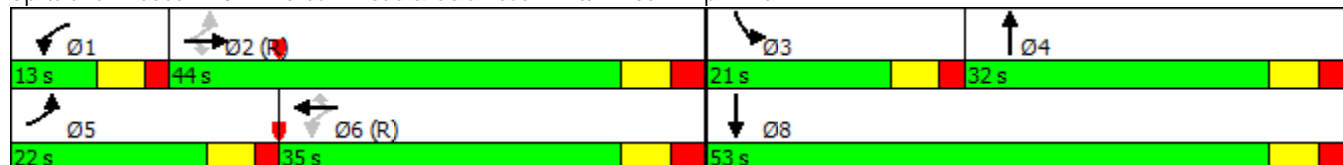
Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

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

Splits and Phases: 37: Thorburn Road & Columbus Drive/Prince Philip Drive



Summary of All Intervals

Run Number	1	10	2	3	4	5	6
Start Time	4:30	4:30	4:30	4:30	4:30	4:30	4:30
End Time	6:00	6:00	6:00	6:00	6:00	6:00	6:00
Total Time (min)	90	90	90	90	90	90	90
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	5	5	5	5	5	5	5
# of Recorded Intervals	4	4	4	4	4	4	4
Vehs Entered	10030	10015	10231	10243	10332	10091	10137
Vehs Exited	9713	9809	9820	10054	10169	9844	9922
Starting Vehs	680	688	697	613	673	657	647
Ending Vehs	997	894	1108	802	836	904	862
Travel Distance (km)	16880	16625	16923	16992	17074	16802	16723
Travel Time (hr)	1013.4	1046.2	1219.2	970.9	950.4	1067.6	1023.1
Total Delay (hr)	714.0	749.9	918.8	669.1	645.9	769.3	726.4
Total Stops	22208	21054	25608	19913	20402	21244	20968
Fuel Used (l)	1925.0	1934.7	2099.3	1891.4	1876.4	1964.7	1926.1

Summary of All Intervals

Run Number	7	8	9	Avg
Start Time	4:30	4:30	4:30	4:30
End Time	6:00	6:00	6:00	6:00
Total Time (min)	90	90	90	90
Time Recorded (min)	60	60	60	60
# of Intervals	5	5	5	5
# of Recorded Intervals	4	4	4	4
Vehs Entered	10035	10004	10016	10116
Vehs Exited	9715	9794	9817	9866
Starting Vehs	675	775	672	677
Ending Vehs	995	985	871	925
Travel Distance (km)	16610	16685	16859	16817
Travel Time (hr)	1116.6	1135.7	1107.5	1065.1
Total Delay (hr)	821.3	838.8	808.6	766.2
Total Stops	21453	22567	20698	21607
Fuel Used (l)	1991.1	2014.0	1997.7	1962.1

Interval #0 Information Seeding

Start Time	4:30
End Time	5:00
Total Time (min)	30
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording #1

Start Time	5:00
End Time	5:15
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	2463	2526	2454	2490	2494	2581	2455
Vehs Exited	2389	2475	2362	2400	2500	2453	2484
Starting Vehs	680	688	697	613	673	657	647
Ending Vehs	754	739	789	703	667	785	618
Travel Distance (km)	4183	4168	4078	4158	4223	4138	4048
Travel Time (hr)	181.9	189.1	213.4	185.0	179.4	176.9	174.5
Total Delay (hr)	107.7	115.2	141.2	111.7	104.1	103.1	102.5
Total Stops	5096	4996	5158	4320	4570	4483	4411
Fuel Used (l)	416.5	423.0	436.1	418.7	416.0	409.5	402.6

Interval #1 Information Recording #1

Start Time	5:00
End Time	5:15
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	2468	2428	2478	2481
Vehs Exited	2386	2444	2427	2431
Starting Vehs	675	775	672	677
Ending Vehs	757	759	723	728
Travel Distance (km)	4083	4165	4179	4142
Travel Time (hr)	196.7	204.0	189.4	189.0
Total Delay (hr)	124.2	129.9	115.3	115.5
Total Stops	4615	4936	4570	4716
Fuel Used (l)	423.6	435.4	421.8	420.3

Interval #2 Information Recording #2

Start Time	5:15
End Time	5:30
Total Time (min)	15
Volumes adjusted by PHF, Growth Factors.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	2697	2542	2767	2795	2771	2697	2784
Vehs Exited	2493	2445	2502	2646	2609	2545	2480
Starting Vehs	754	739	789	703	667	785	618
Ending Vehs	958	836	1054	852	829	937	922
Travel Distance (km)	4346	4213	4429	4444	4390	4345	4311
Travel Time (hr)	236.0	245.7	283.3	235.1	222.3	248.3	235.2
Total Delay (hr)	159.1	170.5	205.1	155.7	143.6	171.2	158.5
Total Stops	5767	5285	6641	5439	5225	5717	5225
Fuel Used (l)	473.1	470.5	515.5	478.6	463.5	483.8	470.0

Interval #2 Information Recording #2

Start Time	5:15
End Time	5:30
Total Time (min)	15
Volumes adjusted by PHF, Growth Factors.	

Run Number	7	8	9	Avg
Vehs Entered	2686	2685	2659	2709
Vehs Exited	2544	2463	2523	2525
Starting Vehs	757	759	723	728
Ending Vehs	899	981	859	911
Travel Distance (km)	4290	4215	4356	4334
Travel Time (hr)	263.1	266.5	248.9	248.4
Total Delay (hr)	186.4	191.5	171.6	171.3
Total Stops	5211	5587	5159	5527
Fuel Used (l)	488.9	490.3	481.5	481.6

Interval #3 Information Recorsding #3

Start Time	5:30
End Time	5:45
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	2428	2469	2490	2498	2534	2393	2471
Vehs Exited	2514	2407	2457	2552	2502	2438	2493
Starting Vehs	958	836	1054	852	829	937	922
Ending Vehs	872	898	1087	798	861	892	900
Travel Distance (km)	4239	4078	4179	4209	4166	4216	4252
Travel Time (hr)	277.9	300.9	351.9	266.9	260.8	302.7	292.9
Total Delay (hr)	202.6	228.4	277.6	192.0	186.7	228.1	217.7
Total Stops	5573	5239	6901	5104	5174	5633	5694
Fuel Used (l)	504.5	513.1	564.0	491.8	481.4	525.6	519.5

Interval #3 Information Recorsding #3

Start Time	5:30
End Time	5:45
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	2487	2442	2500	2468
Vehs Exited	2438	2492	2471	2476
Starting Vehs	899	981	859	911
Ending Vehs	948	931	888	906
Travel Distance (km)	4180	4195	4201	4192
Travel Time (hr)	310.9	323.7	320.3	300.9
Total Delay (hr)	236.7	249.0	245.6	226.4
Total Stops	5614	5909	5566	5645
Fuel Used (l)	527.8	540.3	535.9	520.4

Interval #4 Information Recording #4

Start Time	5:45
End Time	6:00
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	2442	2478	2520	2460	2533	2420	2427
Vehs Exited	2317	2482	2499	2456	2558	2408	2465
Starting Vehs	872	898	1087	798	861	892	900
Ending Vehs	997	894	1108	802	836	904	862
Travel Distance (km)	4112	4167	4236	4181	4296	4103	4112
Travel Time (hr)	317.5	310.3	370.6	283.9	288.0	339.8	320.6
Total Delay (hr)	244.6	235.8	295.0	209.7	211.5	266.8	247.7
Total Stops	5772	5534	6908	5050	5433	5411	5638
Fuel Used (l)	531.0	528.2	583.7	502.2	515.5	545.8	534.0

Interval #4 Information Recording #4

Start Time	5:45
End Time	6:00
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	2394	2449	2379	2449
Vehs Exited	2347	2395	2396	2431
Starting Vehs	948	931	888	906
Ending Vehs	995	985	871	925
Travel Distance (km)	4057	4111	4122	4150
Travel Time (hr)	345.8	341.6	348.9	326.7
Total Delay (hr)	274.0	268.4	276.2	253.0
Total Stops	6013	6135	5403	5731
Fuel Used (l)	550.8	548.0	558.4	539.8

7: Allandale Road & Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	1.6	2.1	0.5	0.1	0.0	0.0	5.8	11.0	5.2	0.0	0.0	0.0
Denied Del/Veh (s)	9.7	6.8	7.1	2.3	0.2	0.3	112.0	82.7	101.4	0.0	0.0	0.0
Total Delay (hr)	17.8	8.6	0.6	3.4	19.3	0.7	23.9	41.1	3.4	0.5	15.7	1.1
Total Del/Veh (s)	105.5	26.6	9.3	75.0	96.9	70.7	430.1	300.0	67.8	148.7	124.5	6.1
Stop Delay (hr)	14.5	4.8	0.0	2.8	16.1	0.6	22.9	37.8	2.5	0.5	14.8	0.3
Stop Del/Veh (s)	85.8	15.0	0.1	62.4	80.6	59.5	411.7	276.3	51.2	144.0	117.4	1.8

7: Allandale Road & Prince Philip Drive Performance by movement

Movement	All
Denied Delay (hr)	26.4
Denied Del/Veh (s)	19.8
Total Delay (hr)	136.0
Total Del/Veh (s)	100.4
Stop Delay (hr)	117.7
Stop Del/Veh (s)	86.8

9: Westerland Road/Clinch Crescent & Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	1.0	5.6	1.6	0.0	0.0	0.0	8.9	5.4	7.2	27.0	26.1	35.9
Denied Del/Veh (s)	21.5	18.5	21.6	0.0	0.0	0.0	123.8	121.1	121.2	316.5	317.8	314.6
Total Delay (hr)	7.6	13.8	1.7	5.0	52.4	1.8	12.8	5.0	6.1	3.9	3.6	10.1
Total Del/Veh (s)	157.1	45.3	23.2	136.1	139.0	163.3	176.8	111.9	104.7	50.2	48.6	96.0
Stop Delay (hr)	7.3	9.7	1.2	4.1	41.7	1.5	12.3	4.5	5.7	3.4	3.1	10.2
Stop Del/Veh (s)	150.5	32.0	15.7	110.1	110.7	138.2	170.6	100.7	97.8	44.2	41.6	97.0

9: Westerland Road/Clinch Crescent & Prince Philip Drive Performance by movement

Movement	All
Denied Delay (hr)	118.8
Denied Del/Veh (s)	91.5
Total Delay (hr)	123.7
Total Del/Veh (s)	96.5
Stop Delay (hr)	104.7
Stop Del/Veh (s)	81.6

10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.1	0.2	0.0	0.1	0.1	0.0	2.8	51.1	11.1	0.0	0.0	0.0
Denied Del/Veh (s)	2.2	1.7	1.6	2.3	0.5	0.4	375.6	373.8	374.6	0.1	0.0	0.0
Total Delay (hr)	6.1	17.7	2.9	3.0	6.2	2.4	1.5	27.5	4.9	2.2	4.9	0.3
Total Del/Veh (s)	156.1	148.3	123.1	57.2	47.3	26.5	251.0	256.1	212.0	46.2	31.5	9.2
Stop Delay (hr)	5.4	15.5	2.5	2.5	4.8	2.1	1.4	26.4	4.7	1.5	2.9	0.2
Stop Del/Veh (s)	140.0	130.4	108.1	49.0	37.1	22.7	241.7	245.2	203.9	32.7	18.4	4.0

10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue Performance by movement

Movement	All
Denied Delay (hr)	65.6
Denied Del/Veh (s)	76.8
Total Delay (hr)	79.5
Total Del/Veh (s)	95.5
Stop Delay (hr)	70.0
Stop Del/Veh (s)	84.1

34: Elizabeth Avenue & Westerland Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.2
Denied Del/Veh (s)	1.2	0.2	0.3	0.3	0.0	0.0	0.0	0.3
Total Delay (hr)	1.1	0.9	3.0	0.9	2.6	0.1	0.3	8.9
Total Del/Veh (s)	22.7	7.0	19.4	15.2	47.8	1.8	5.5	15.7
Stop Delay (hr)	0.9	0.4	1.6	0.5	2.3	0.0	0.0	5.7
Stop Del/Veh (s)	18.2	3.1	10.1	8.4	42.4	0.4	0.6	10.0

37: Thorburn Road & Columbus Drive/Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.2	0.1	0.0	0.1	1.8	0.9	0.0	0.0	5.6	2.9	6.5	18.1
Denied Del/Veh (s)	2.3	0.3	0.3	6.0	5.4	5.7	0.1	0.2	41.7	40.8	44.1	12.8
Total Delay (hr)	9.3	6.1	0.5	0.7	31.8	4.0	4.4	0.8	65.2	5.6	12.1	140.7
Total Del/Veh (s)	90.8	28.5	6.1	43.5	93.2	24.9	39.0	22.3	466.7	79.8	83.3	98.4
Stop Delay (hr)	8.4	4.3	0.3	0.6	27.1	2.5	3.7	0.7	63.8	4.5	9.5	125.5
Stop Del/Veh (s)	81.7	20.2	3.9	36.2	79.3	15.4	32.7	19.8	456.9	63.7	65.3	87.7

51: Freshwater Road & Elizabeth Avenue Performance by movement

Movement	WBT	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.0	0.1	0.0	0.3	0.1	0.5
Denied Del/Veh (s)	0.0	0.0	0.5	0.5	3.3	1.3	1.0
Total Delay (hr)	0.1	1.1	0.3	0.0	0.9	0.4	2.8
Total Del/Veh (s)	0.8	11.4	2.1	1.2	9.1	3.6	4.8
Stop Delay (hr)	0.0	0.9	0.0	0.0	0.5	0.0	1.4
Stop Del/Veh (s)	0.0	9.5	0.0	0.1	5.1	0.2	2.5

Total Network Performance

Denied Delay (hr)	229.7
Denied Del/Veh (s)	78.4
Total Delay (hr)	536.5
Total Del/Veh (s)	179.0
Stop Delay (hr)	439.7
Stop Del/Veh (s)	146.7

Intersection: 7: Allandale Road & Prince Philip Drive

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	T	L	T	TR	L	T	R	L	T	T
Maximum Queue (m)	196.2	256.4	215.8	67.4	208.0	198.1	72.4	468.2	487.7	44.3	108.8	103.3
Average Queue (m)	150.1	117.1	78.0	47.7	112.7	110.0	68.9	450.1	421.8	9.2	82.3	73.2
95th Queue (m)	232.8	277.9	190.9	86.1	211.8	202.3	84.1	500.8	594.6	35.5	121.6	112.0
Link Distance (m)		469.2	469.2		501.3	501.3		463.0	463.0		89.8	89.8
Upstream Blk Time (%)								11	32		25	9
Queuing Penalty (veh)								52	152		0	0
Storage Bay Dist (m)	200.0			65.0			70.0			42.0		
Storage Blk Time (%)	18	5		1	35		33	46		0	66	
Queuing Penalty (veh)	105	30		4	56		187	104		0	9	

Intersection: 7: Allandale Road & Prince Philip Drive

Movement	SB	SB	B1	B1
Directions Served	R	R	T	T
Maximum Queue (m)	105.6	52.5	90.0	99.7
Average Queue (m)	23.4	13.0	14.2	13.6
95th Queue (m)	82.9	50.0	60.5	73.3
Link Distance (m)	89.8		267.7	267.7
Upstream Blk Time (%)	1		0	0
Queuing Penalty (veh)	0		0	0
Storage Bay Dist (m)		50.0		
Storage Blk Time (%)	2	1		
Queuing Penalty (veh)	7	3		

Intersection: 9: Westerland Road/Clinch Crescent & Prince Philip Drive

Movement	EB	EB	EB	EB	B35	B35	WB	WB	WB	B61	B61	NB
Directions Served	L	T	T	R	T	T	L	T	TR	T	T	L
Maximum Queue (m)	77.4	174.2	178.2	77.5	4.9	4.3	92.4	413.3	414.7	31.4	30.7	62.4
Average Queue (m)	60.2	109.4	105.4	43.5	0.3	0.3	61.2	255.5	260.4	5.8	6.5	59.4
95th Queue (m)	97.9	180.8	178.3	90.4	5.5	5.6	119.2	458.0	461.7	41.5	44.8	73.1
Link Distance (m)		191.7	191.7		347.9	347.9		454.2	454.2	469.2	469.2	
Upstream Blk Time (%)		1	1					6	7			
Queuing Penalty (veh)		5	5					44	54			
Storage Bay Dist (m)	75.0			75.0			90.0					60.0
Storage Blk Time (%)	26	17	10	1			0	52				62
Queuing Penalty (veh)	148	31	30	4			2	69				222

Intersection: 9: Westerland Road/Clinch Crescent & Prince Philip Drive

Movement	NB	NB	SB	SB	SB
Directions Served	T	R	L	T	R
Maximum Queue (m)	280.9	47.5	82.1	114.4	82.5
Average Queue (m)	178.3	29.8	49.0	102.8	80.5
95th Queue (m)	310.9	52.9	86.8	128.6	92.4
Link Distance (m)	357.3			100.6	
Upstream Blk Time (%)				52	
Queuing Penalty (veh)				0	
Storage Bay Dist (m)		45.0	80.0		80.0
Storage Blk Time (%)	4	7	4	9	56
Queuing Penalty (veh)	21	28	25	60	315

Intersection: 10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue

Movement	EB	EB	B33	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	T	L	T	R	L	T	R	L	T	R
Maximum Queue (m)	57.4	366.7	53.7	57.4	218.5	149.5	57.4	308.8	37.5	42.4	232.8	116.2
Average Queue (m)	48.2	243.6	16.5	42.5	99.0	37.2	15.5	268.9	25.5	28.8	62.6	11.1
95th Queue (m)	75.5	464.4	95.2	70.7	186.3	131.6	52.3	374.4	52.6	48.1	145.0	75.3
Link Distance (m)		440.0	358.9		379.5	379.5		292.0			463.0	463.0
Upstream Blk Time (%)		12						71			0	0
Queuing Penalty (veh)		80						0			0	0
Storage Bay Dist (m)	55.0			55.0			55.0		35.0	40.0		
Storage Blk Time (%)	5	55		4	24		0	76	1	2	22	
Queuing Penalty (veh)	23	80		20	44		1	102	5	11	37	

Intersection: 34: Elizabeth Avenue & Westerland Road

Movement	EB	EB	WB	SB	SB
Directions Served	L	T	TR	L	R
Maximum Queue (m)	37.3	80.3	125.5	78.6	57.4
Average Queue (m)	22.8	26.4	55.8	36.6	5.0
95th Queue (m)	38.2	59.9	104.0	65.1	33.8
Link Distance (m)		435.0	358.9	357.3	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (m)	35.0				70.0
Storage Blk Time (%)	3	2		0	0
Queuing Penalty (veh)	15	3		1	0

Intersection: 37: Thorburn Road & Columbus Drive/Prince Philip Drive

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	B36	B36	B45
Directions Served	L	T	T	R	L	T	T	T	R	T	T	T
Maximum Queue (m)	149.4	120.2	113.0	34.4	112.4	174.9	173.9	188.1	94.2	80.8	90.8	1.0
Average Queue (m)	94.3	60.3	54.9	16.8	30.4	123.1	121.1	130.2	70.1	32.5	37.6	0.0
95th Queue (m)	184.6	122.2	101.5	27.9	98.6	199.1	191.6	211.0	135.0	185.4	201.5	1.0
Link Distance (m)		411.9	411.9	411.9		178.0	178.0	178.0		460.3	460.3	184.8
Upstream Blk Time (%)						9	4	13		0	0	
Queuing Penalty (veh)						56	24	78		0	1	
Storage Bay Dist (m)	250.0				110.0				90.0			
Storage Blk Time (%)	0	0			0	25		25	5			
Queuing Penalty (veh)	1	0			1	15		155	21			

Intersection: 37: Thorburn Road & Columbus Drive/Prince Philip Drive

Movement	NB	NB	SB	SB	SB	SB
Directions Served	T	TR	L	L	T	TR
Maximum Queue (m)	83.8	71.8	162.5	489.6	491.0	132.5
Average Queue (m)	50.1	37.4	156.3	354.8	285.8	79.1
95th Queue (m)	73.9	65.4	183.5	581.1	617.3	137.6
Link Distance (m)	151.6	151.6		487.2	487.2	
Upstream Blk Time (%)				22	25	
Queuing Penalty (veh)				0	0	
Storage Bay Dist (m)			160.0			130.0
Storage Blk Time (%)			11	64	2	4
Queuing Penalty (veh)			27	156	12	5

Intersection: 51: Freshwater Road & Elizabeth Avenue

Movement	WB	B52	NB	SB	SB
Directions Served	R	T	TR	L	T
Maximum Queue (m)	57.6	219.8	12.3	32.0	66.6
Average Queue (m)	25.5	11.0	1.4	20.1	5.5
95th Queue (m)	44.5	123.9	7.3	31.9	34.9
Link Distance (m)	274.8	435.0	253.0		212.2
Upstream Blk Time (%)		0			
Queuing Penalty (veh)		1			
Storage Bay Dist (m)				30.0	
Storage Blk Time (%)				3	0
Queuing Penalty (veh)				11	1

Network Summary

Network wide Queuing Penalty: 2761

Intersection: 7: Allandale Road & Prince Philip Drive

Phase	1	2	4	5	6	7	8
Movement(s) Served	WBL	EBTL	NBT	EBL	WBTL	NBL	SBTL
Maximum Green (s)	10.0	49.0	32.0	31.0	28.0	12.0	14.0
Minimum Green (s)	7.0	25.0	10.0	7.0	25.0	7.0	10.0
Recall	None	C-Max	None	None	C-Max	None	None
Avg. Green (s)	9.6	50.1	32.0	30.9	28.1	11.9	14.1
g/C Ratio	-0.01	NA	NA	NA	NA	NA	NA
Cycles Skipped (%)	3	0	0	0	0	0	0
Cycles @ Minimum (%)	10	0	0	0	0	0	0
Cycles Maxed Out (%)	68	100	100	97	100	94	100
Cycles with Peds (%)	0	13	16	0	13	0	0

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Intersection: 9: Westerland Road/Clinch Crescent & Prince Philip Drive

Phase	1	2	3	4	5	6	7	8
Movement(s) Served	WBL	EBTL	SBL	NBTL	EBL	WBTL	NBL	SBTL
Maximum Green (s)	7.0	39.0	15.0	23.0	7.0	39.0	7.0	31.0
Minimum Green (s)	7.0	25.0	7.0	10.0	7.0	25.0	7.0	10.0
Recall	None	C-Max	None	None	None	C-Max	None	None
Avg. Green (s)	7.0	39.6	14.0	25.4	7.1	39.2	7.2	31.0
g/C Ratio	-0.01	NA	NA	NA	NA	NA	NA	NA
Cycles Skipped (%)	3	0	0	0	0	0	0	0
Cycles @ Minimum (%)	97	0	0	0	100	0	100	0
Cycles Maxed Out (%)	97	100	68	100	100	100	100	100
Cycles with Peds (%)	0	97	0	100	0	97	0	97

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Intersection: 10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue

Phase	1	2	3	4	5	6	8
Movement(s) Served	WBL	EBTL	SBL	NBTL	EBL	WBTL	SBTL
Maximum Green (s)	8.0	36.0	8.0	34.0	8.0	36.0	48.0
Minimum Green (s)	7.0	25.0	7.0	10.0	7.0	25.0	10.0
Recall	None	C-Max	None	None	None	C-Max	None
Avg. Green (s)	8.1	36.7	7.9	36.8	8.0	37.8	47.9
g/C Ratio	-0.01	NA	-0.01	NA	-0.01	NA	NA
Cycles Skipped (%)	3	0	10	0	9	0	0
Cycles @ Minimum (%)	6	0	10	0	9	0	0
Cycles Maxed Out (%)	84	100	71	100	72	100	97
Cycles with Peds (%)	0	0	0	0	0	0	0

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Intersection: 34: Elizabeth Avenue & Westerland Road

Phase	2	5	6	8
Movement(s) Served	EBTL	EBL	WBT	SBL
Maximum Green (s)	80.0	11.0	63.0	18.0
Minimum Green (s)	25.0	7.0	25.0	10.0
Recall	C-Max	None	C-Max	None
Avg. Green (s)	85.4	9.7	69.8	16.1
g/C Ratio	NA	-0.01	NA	NA
Cycles Skipped (%)	0	19	0	0
Cycles @ Minimum (%)	0	22	0	6
Cycles Maxed Out (%)	100	22	100	52
Cycles with Peds (%)	0	0	0	0

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Intersection: 37: Thorburn Road & Columbus Drive/Prince Philip Drive

Phase	1	2	3	4	5	6	8
Movement(s) Served	WBL	EBTL	SBL	NBT	EBL	WBTL	SBT
Maximum Green (s)	7.0	37.0	15.0	25.0	16.0	28.0	46.0
Minimum Green (s)	7.0	25.0	7.0	25.0	7.0	25.0	25.0
Recall	None	C-Max	None	None	None	C-Max	None
Avg. Green (s)	7.2	41.2	15.0	25.0	15.8	28.2	46.0
g/C Ratio	-0.01	NA	NA	NA	NA	NA	NA
Cycles Skipped (%)	29	0	0	0	0	0	0
Cycles @ Minimum (%)	71	0	0	100	0	0	0
Cycles Maxed Out (%)	71	100	100	100	94	100	100
Cycles with Peds (%)	0	13	0	0	0	13	13
























Controller Summary













Average Cycle Length (s): NA
Number of Complete Cycles : 0

MUN Traffic Study
Elizabeth Avenue & Westerland Road

Future 2025 AM with Improvements

27/06/2016

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	116	295	63	119	408	261	31	523	90	160	398	128
Future Volume (vph)	116	295	63	119	408	261	31	523	90	160	398	128
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	3.5	3.7	3.0	3.5	3.7	3.0	3.4	3.4	3.0	3.4	3.4
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	55.0		0.0	55.0		0.0	55.0		0.0	100.0		0.0
Storage Lanes	1		0	1		1	1		0	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.974				0.850		0.978				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1652	1794	0	1652	1842	1601	1652	3384	0	1652	1821	1548
Flt Permitted	0.211			0.310			0.507			0.130		
Satd. Flow (perm)	367	1794	0	539	1842	1601	881	3384	0	226	1821	1548
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		11				335		16				142
Link Speed (k/h)		50			50			50				50
Link Distance (m)		456.6			391.7			77.0			486.7	
Travel Time (s)		32.9			28.2			5.5			35.0	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.83	0.83	0.83	0.78	0.78	0.78	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	140	355	76	153	523	335	34	581	100	178	442	142
Shared Lane Traffic (%)												
Lane Group Flow (vph)	140	431	0	153	523	335	34	681	0	178	442	142
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Perm	NA		pm+pt	NA	Perm
Protected Phases	5	2		1	6			4		3	8	
Permitted Phases	2			6		6	4			8		8
Total Split (s)	14.0	45.0		14.0	45.0	45.0	31.0	31.0		20.0	51.0	51.0
Total Lost Time (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0
Act Effect Green (s)	48.6	40.5		48.8	40.6	40.6	24.7	24.7		43.3	43.3	43.3
Actuated g/C Ratio	0.44	0.37		0.44	0.37	0.37	0.22	0.22		0.39	0.39	0.39
v/c Ratio	0.55	0.65		0.48	0.77	0.42	0.17	0.88		0.71	0.62	0.20
Control Delay	24.9	34.0		21.8	40.2	4.4	36.8	54.5		39.4	30.8	4.2
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	24.9	34.0		21.8	40.2	4.4	36.8	54.5		39.4	30.8	4.2
LOS	C	C		C	D	A	D	D		D	C	A
Approach Delay		31.8			25.6			53.7			27.9	
Approach LOS		C			C			D			C	
Stops (vph)	68	288		72	349	23	26	548		108	311	14
Fuel Used(l)	13	44		8	36	11	3	66		15	35	7
CO Emissions (g/hr)	240	821		150	663	207	53	1223		273	647	124

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	46	158		29	128	40	10	236		53	125	24
VOC Emissions (g/hr)	55	189		34	153	48	12	282		63	149	28
Dilemma Vehicles (#)	0	0		0	0	0	0	0		0	0	0
Queue Length 50th (m)	16.5	75.7		18.2	100.2	0.0	5.9	72.3		24.9	72.8	0.0
Queue Length 95th (m)	25.7	98.2		25.9	115.1	8.6	14.7	#103.2		#44.7	105.0	11.5
Internal Link Dist (m)		432.6			367.7			53.0			462.7	
Turn Bay Length (m)	55.0			55.0			55.0			100.0		
Base Capacity (vph)	258	667		324	680	802	202	789		270	744	717
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	0.65		0.47	0.77	0.42	0.17	0.86		0.66	0.59	0.20

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 33.9

Intersection LOS: C

Intersection Capacity Utilization 77.2%

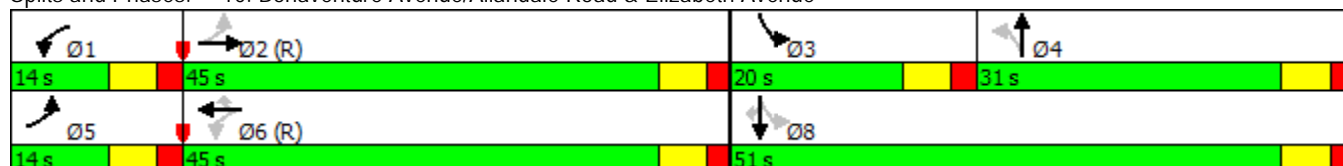
ICU Level of Service D

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue



Summary of All Intervals

Run Number	1	10	2	3	4	5	6
Start Time	6:30	6:30	6:30	6:30	6:30	6:30	6:30
End Time	8:00	8:00	8:00	8:00	8:00	8:00	8:00
Total Time (min)	90	90	90	90	90	90	90
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	5	5	5	5	5	5	5
# of Recorded Intervals	4	4	4	4	4	4	4
Vehs Entered	10360	10504	10467	10192	10370	10418	10266
Vehs Exited	10129	10322	10122	10187	10223	10325	9920
Starting Vehs	749	669	665	716	684	827	699
Ending Vehs	980	851	1010	721	831	920	1045
Travel Distance (km)	15781	16213	15783	15883	16040	16228	15409
Travel Time (hr)	1301.9	990.9	1017.7	1108.4	1065.6	1169.0	1174.8
Total Delay (hr)	986.8	667.3	702.7	791.4	745.8	845.2	867.0
Total Stops	24841	21726	21735	19562	23152	25121	22325
Fuel Used (l)	2057.6	1812.6	1809.1	1921.0	1864.5	1982.0	1914.9

Summary of All Intervals

Run Number	7	8	9	Avg
Start Time	6:30	6:30	6:30	6:30
End Time	8:00	8:00	8:00	8:00
Total Time (min)	90	90	90	90
Time Recorded (min)	60	60	60	60
# of Intervals	5	5	5	5
# of Recorded Intervals	4	4	4	4
Vehs Entered	10413	10318	10397	10371
Vehs Exited	10243	10236	10073	10179
Starting Vehs	656	691	743	711
Ending Vehs	826	773	1067	907
Travel Distance (km)	15841	15955	15553	15869
Travel Time (hr)	956.0	1010.5	1153.6	1094.8
Total Delay (hr)	639.4	692.6	842.5	778.1
Total Stops	21221	21887	24275	22583
Fuel Used (l)	1769.0	1813.8	1907.6	1885.2

Interval #0 Information Seeding

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

Interval #1 Information Recording #1

Start Time	7:00
End Time	7:15
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	2548	2514	2624	2526	2491	2549	2509
Vehs Exited	2513	2564	2638	2547	2471	2635	2457
Starting Vehs	749	669	665	716	684	827	699
Ending Vehs	784	619	651	695	704	741	751
Travel Distance (km)	3961	4029	4038	3955	3947	4100	3840
Travel Time (hr)	226.2	186.7	166.3	203.1	192.8	225.3	190.0
Total Delay (hr)	147.1	106.6	86.0	124.0	114.3	143.5	113.2
Total Stops	5335	4886	3901	4715	4946	5396	4285
Fuel Used (l)	434.7	405.0	385.4	413.9	401.5	442.3	391.8

Interval #1 Information Recording #1

Start Time	7:00
End Time	7:15
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	2525	2471	2562	2531
Vehs Exited	2577	2471	2579	2546
Starting Vehs	656	691	743	711
Ending Vehs	604	691	726	697
Travel Distance (km)	3830	3860	3883	3944
Travel Time (hr)	167.6	184.1	190.0	193.2
Total Delay (hr)	90.9	107.1	112.3	114.5
Total Stops	3969	4536	4985	4700
Fuel Used (l)	373.2	387.5	393.0	402.8

Interval #2 Information Recording #2

Start Time	7:15
End Time	7:30
Total Time (min)	15
Volumes adjusted by PHF, Growth Factors.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	2862	2858	2929	2765	2933	2860	2859
Vehs Exited	2552	2567	2613	2642	2672	2615	2577
Starting Vehs	784	619	651	695	704	741	751
Ending Vehs	1094	910	967	818	965	986	1033
Travel Distance (km)	4018	4164	4211	4213	4258	4147	4067
Travel Time (hr)	314.9	237.9	229.3	273.9	255.1	275.9	273.9
Total Delay (hr)	234.4	154.6	145.0	189.9	169.7	193.0	192.5
Total Stops	6086	5385	6149	5520	6094	6221	5796
Fuel Used (l)	510.7	450.8	447.9	490.7	468.3	486.1	474.6

Interval #2 Information Recording #2

Start Time	7:15
End Time	7:30
Total Time (min)	15
Volumes adjusted by PHF, Growth Factors.	

Run Number	7	8	9	Avg
Vehs Entered	2857	2834	2840	2857
Vehs Exited	2587	2633	2524	2597
Starting Vehs	604	691	726	697
Ending Vehs	874	892	1042	961
Travel Distance (km)	4129	4133	3989	4133
Travel Time (hr)	227.3	241.5	264.9	259.4
Total Delay (hr)	144.5	158.9	184.8	176.7
Total Stops	5258	5556	6129	5819
Fuel Used (l)	442.0	453.3	467.2	469.2

Interval #3 Information Recorsding #3

Start Time	7:30
End Time	7:45
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	2472	2528	2456	2444	2485	2496	2464
Vehs Exited	2516	2581	2442	2533	2531	2554	2436
Starting Vehs	1094	910	967	818	965	986	1033
Ending Vehs	1050	857	981	729	919	928	1061
Travel Distance (km)	3869	4020	3846	3887	3914	4045	3799
Travel Time (hr)	375.8	287.5	300.4	306.1	305.5	322.7	346.8
Total Delay (hr)	298.5	206.9	223.7	228.7	227.6	242.2	270.9
Total Stops	6627	5946	6381	4954	5840	6785	6426
Fuel Used (l)	549.8	482.2	485.8	499.9	494.3	520.8	520.0

Interval #3 Information Recorsding #3

Start Time	7:30
End Time	7:45
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	2484	2509	2458	2483
Vehs Exited	2510	2524	2364	2497
Starting Vehs	874	892	1042	961
Ending Vehs	848	877	1136	940
Travel Distance (km)	3906	4003	3710	3900
Travel Time (hr)	276.0	294.3	339.5	315.5
Total Delay (hr)	198.1	214.7	265.3	237.7
Total Stops	6206	6361	6392	6193
Fuel Used (l)	468.9	487.9	507.2	501.7

Interval #4 Information Recording #4

Start Time	7:45
End Time	8:00
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	2478	2604	2458	2457	2461	2513	2434
Vehs Exited	2548	2610	2429	2465	2549	2521	2450
Starting Vehs	1050	857	981	729	919	928	1061
Ending Vehs	980	851	1010	721	831	920	1045
Travel Distance (km)	3933	4000	3688	3828	3922	3936	3703
Travel Time (hr)	385.0	278.8	321.7	325.3	312.1	345.1	364.0
Total Delay (hr)	306.9	199.2	248.1	248.9	234.2	266.5	290.4
Total Stops	6793	5509	5304	4373	6272	6719	5818
Fuel Used (l)	562.4	474.6	489.9	516.5	500.4	532.8	528.6

Interval #4 Information Recording #4

Start Time	7:45
End Time	8:00
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	2547	2504	2537	2499
Vehs Exited	2569	2608	2606	2535
Starting Vehs	848	877	1136	940
Ending Vehs	826	773	1067	907
Travel Distance (km)	3975	3959	3971	3892
Travel Time (hr)	285.2	290.6	359.2	326.7
Total Delay (hr)	205.9	211.8	280.0	249.2
Total Stops	5788	5434	6769	5876
Fuel Used (l)	484.9	485.2	540.2	511.5

7: Allandale Road & Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.0	0.1	2.4	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	2.7	6.4	0.3	2.1	15.1	0.1	5.3	3.0	0.4	0.2	5.6	5.6
Total Del/Veh (s)	30.4	39.1	7.1	48.4	66.4	47.3	67.8	23.1	8.4	42.2	38.5	19.0
Stop Delay (hr)	2.2	4.6	0.0	1.6	12.0	0.1	4.5	1.9	0.1	0.1	4.8	3.6
Stop Del/Veh (s)	24.0	27.9	0.0	38.2	52.8	38.3	57.1	14.5	1.3	38.1	33.1	12.2

7: Allandale Road & Prince Philip Drive Performance by movement

Movement	All
Denied Delay (hr)	0.2
Denied Del/Veh (s)	0.1
Total Delay (hr)	46.8
Total Del/Veh (s)	37.1
Stop Delay (hr)	35.5
Stop Del/Veh (s)	28.2

9: Westerland Road/Clinch Crescent & Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	17.4	60.4	13.0	0.1	0.0	0.1
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	391.7	398.9	396.0	3.7	0.7	3.7
Total Delay (hr)	28.3	16.1	4.5	6.1	50.3	8.2	3.0	11.1	1.6	0.9	1.0	0.2
Total Del/Veh (s)	229.8	54.1	37.3	129.2	99.9	165.9	77.8	83.1	57.3	39.0	37.1	10.1
Stop Delay (hr)	26.4	10.7	2.7	4.6	37.2	6.7	2.7	9.7	1.4	0.8	0.9	0.2
Stop Del/Veh (s)	213.7	35.8	22.3	97.7	74.0	135.9	68.3	72.3	49.3	35.5	33.0	8.4

9: Westerland Road/Clinch Crescent & Prince Philip Drive Performance by movement

Movement	All
Denied Delay (hr)	91.0
Denied Del/Veh (s)	64.5
Total Delay (hr)	131.3
Total Del/Veh (s)	92.9
Stop Delay (hr)	103.8
Stop Del/Veh (s)	73.4

10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	2.4	0.4	0.3	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	0.9	2.6	0.2	0.9	3.5	0.3	0.4	6.1	0.7	1.8	3.9	0.3
Total Del/Veh (s)	29.2	26.1	13.3	27.8	30.2	3.6	45.2	41.9	28.2	37.9	26.9	7.0
Stop Delay (hr)	0.7	2.0	0.1	0.7	2.7	0.0	0.4	5.4	0.6	1.3	2.5	0.1
Stop Del/Veh (s)	22.9	19.6	7.8	22.0	23.3	0.1	41.9	36.8	26.1	27.3	17.0	1.4

10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue Performance by movement

Movement	All
Denied Delay (hr)	0.1
Denied Del/Veh (s)	0.2
Total Delay (hr)	21.6
Total Del/Veh (s)	27.7
Stop Delay (hr)	16.5
Stop Del/Veh (s)	21.1

34: Elizabeth Avenue & Westerland Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.2	0.0	0.0	0.0	0.0	0.2	0.4
Denied Del/Veh (s)	1.3	0.4	0.1	0.4	0.8	3.7	0.9
Total Delay (hr)	1.5	1.0	1.6	0.8	2.1	0.2	7.1
Total Del/Veh (s)	13.2	9.0	17.5	9.7	49.5	3.6	14.7
Stop Delay (hr)	0.8	0.4	0.9	0.3	1.9	0.0	4.3
Stop Del/Veh (s)	7.0	3.3	10.6	3.2	45.2	0.0	8.9

37: Thorburn Road & Columbus Drive/Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR	All
Denied Delay (hr)	4.2	13.6	3.1	0.0	0.0	0.0	0.0	0.0	64.1	31.5	34.8	151.3
Denied Del/Veh (s)	33.8	33.7	34.0	0.0	0.0	0.0	0.1	0.2	345.3	352.2	345.9	108.0
Total Delay (hr)	10.4	60.5	2.5	0.6	4.1	0.3	2.6	0.6	86.4	12.0	12.5	192.5
Total Del/Veh (s)	84.4	147.2	27.2	36.0	16.7	5.1	39.8	26.9	509.3	161.9	151.1	141.3
Stop Delay (hr)	8.1	46.4	1.7	0.5	3.1	0.0	2.3	0.6	83.1	10.3	10.5	166.6
Stop Del/Veh (s)	65.6	113.0	18.4	33.2	12.7	0.0	34.4	25.4	489.7	138.6	127.4	122.3

51: Freshwater Road & Elizabeth Avenue Performance by movement

Movement	WBT	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.4	0.1	0.6
Denied Del/Veh (s)	0.0	0.0	0.4	0.4	3.5	1.6	1.3
Total Delay (hr)	0.1	0.7	0.2	0.0	1.7	0.6	3.3
Total Del/Veh (s)	0.8	9.8	2.1	1.4	13.0	6.5	6.6
Stop Delay (hr)	0.0	0.6	0.0	0.0	1.0	0.2	1.7
Stop Del/Veh (s)	0.0	8.0	0.0	0.4	7.8	1.7	3.5

Total Network Performance

Denied Delay (hr)	245.3
Denied Del/Veh (s)	81.7
Total Delay (hr)	532.8
Total Del/Veh (s)	173.0
Stop Delay (hr)	416.0
Stop Del/Veh (s)	135.1

Intersection: 7: Allandale Road & Prince Philip Drive

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB
Directions Served	L	L	T	T	L	T	TR	L	L	T	R	L
Maximum Queue (m)	51.5	55.8	88.6	90.7	67.4	162.2	156.4	58.7	71.8	96.4	91.2	37.2
Average Queue (m)	23.3	29.7	60.2	62.5	40.8	96.4	93.3	26.6	38.6	37.7	3.3	4.8
95th Queue (m)	43.6	48.2	86.3	88.4	82.7	171.8	161.7	47.2	64.1	76.8	66.6	23.1
Link Distance (m)			466.8	466.8		499.1	499.1			460.6	460.6	
Upstream Blk Time (%)												0
Queuing Penalty (veh)												0
Storage Bay Dist (m)	200.0	200.0			65.0			70.0	70.0			42.0
Storage Blk Time (%)					0	26		0	0	1		0
Queuing Penalty (veh)					1	39		0	0	4		0

Intersection: 7: Allandale Road & Prince Philip Drive

Movement	SB	SB	SB	SB	B1	B1
Directions Served	T	T	R	R	T	T
Maximum Queue (m)	96.3	86.4	115.7	52.5	207.5	233.4
Average Queue (m)	53.4	45.1	100.6	51.3	40.4	80.0
95th Queue (m)	84.8	76.0	129.3	63.8	181.6	227.9
Link Distance (m)	87.8	87.8	87.8		267.7	267.7
Upstream Blk Time (%)	1	0	24		1	5
Queuing Penalty (veh)	0	0	0		0	0
Storage Bay Dist (m)				50.0		
Storage Blk Time (%)	17		25	12		
Queuing Penalty (veh)	2		132	61		

Intersection: 9: Westerland Road/Clinch Crescent & Prince Philip Drive

Movement	EB	EB	EB	EB	EB	B35	B35	B40	B40	B45	B45	B36
Directions Served	L	L	T	T	R	T	T	T	T	T	T	T
Maximum Queue (m)	76.0	77.5	215.7	214.6	77.5	339.9	342.4	108.1	112.6	193.1	193.1	50.2
Average Queue (m)	73.8	77.1	198.6	183.7	49.9	235.2	233.9	55.0	55.8	80.4	81.1	8.1
95th Queue (m)	76.6	78.9	246.8	262.8	90.1	457.6	460.2	198.3	199.6	345.1	347.4	58.1
Link Distance (m)			191.5	191.5		347.9	347.9	184.8	184.8	460.3	460.3	177.7
Upstream Blk Time (%)			60	22		26	26	20	21	7	7	0
Queuing Penalty (veh)			653	240		282	283	218	228	78	78	0
Storage Bay Dist (m)	75.0	75.0			75.0							
Storage Blk Time (%)	12	59	31	4	2							
Queuing Penalty (veh)	58	285	152	21	9							

Intersection: 9: Westerland Road/Clinch Crescent & Prince Philip Drive

Movement	B36	WB	WB	WB	B61	B61	NB	NB	NB	SB	SB	SB
Directions Served	T	L	T	TR	T	T	L	T	R	L	T	R
Maximum Queue (m)	54.8	92.5	468.5	467.7	341.6	341.8	62.4	139.5	47.5	38.8	43.1	25.1
Average Queue (m)	8.2	65.9	306.5	312.0	100.4	102.1	44.5	130.9	25.7	15.5	19.6	10.7
95th Queue (m)	58.6	121.0	564.5	565.8	358.4	359.1	80.2	135.0	59.3	30.1	35.8	20.1
Link Distance (m)	177.7		454.3	454.3	466.8	466.8		125.4			98.8	
Upstream Blk Time (%)	0		17	21	3	3		64				
Queuing Penalty (veh)	1		177	224	30	26		0				
Storage Bay Dist (m)		90.0					60.0		45.0	80.0		80.0
Storage Blk Time (%)		0	48				1	62	1			
Queuing Penalty (veh)		2	82				8	161	4			

Intersection: 10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue

Movement	EB	EB	WB	WB	WB	NB	NB	NB	B31	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	TR	T	L	T	R
Maximum Queue (m)	57.3	120.3	57.3	139.3	10.2	57.3	77.7	75.3	53.6	87.8	114.3	36.1
Average Queue (m)	22.7	49.5	23.1	62.1	0.4	10.2	54.4	49.2	6.6	28.2	53.0	3.4
95th Queue (m)	52.6	96.0	52.9	115.6	7.4	33.5	79.4	74.0	33.3	64.0	104.6	20.2
Link Distance (m)		439.5		377.7	377.7		61.4	61.4	394.1		460.6	460.6
Upstream Blk Time (%)						0	7	4				
Queuing Penalty (veh)						0	0	0				
Storage Bay Dist (m)	55.0		55.0			55.0				100.0		
Storage Blk Time (%)	0	8	0	11		0	11			0	1	
Queuing Penalty (veh)	0	9	1	15		0	3			0	2	

Intersection: 31: Bend

Movement	SB
Directions Served	T
Maximum Queue (m)	26.3
Average Queue (m)	0.9
95th Queue (m)	13.9
Link Distance (m)	61.4
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (m)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 34: Elizabeth Avenue & Westerland Road

Movement	EB	EB	WB	WB	B33	SB	SB
Directions Served	L	T	T	R	T	L	R
Maximum Queue (m)	37.4	102.2	104.3	52.5	137.1	67.9	21.7
Average Queue (m)	28.2	30.7	38.8	19.6	8.1	31.0	0.5
95th Queue (m)	43.3	74.5	82.5	59.7	107.3	53.9	10.5
Link Distance (m)		436.5	361.8		439.5	181.0	
Upstream Blk Time (%)					0		
Queuing Penalty (veh)					1		
Storage Bay Dist (m)	35.0			50.0			70.0
Storage Blk Time (%)	5	2	3	2		0	0
Queuing Penalty (veh)	19	10	10	7		0	0

Intersection: 37: Thorburn Road & Columbus Drive/Prince Philip Drive

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	B36	NB	NB
Directions Served	L	L	T	T	R	L	T	T	T	T	T	TR
Maximum Queue (m)	78.0	235.6	395.4	394.5	341.6	29.0	43.1	42.6	43.7	1.7	63.4	54.5
Average Queue (m)	43.3	175.4	304.1	301.7	196.3	10.5	21.6	24.3	21.8	0.1	35.1	23.3
95th Queue (m)	68.8	333.8	508.1	502.3	507.3	22.0	36.4	38.6	37.6	1.7	56.5	48.3
Link Distance (m)			411.6	411.6	411.6		177.7	177.7	177.7	460.3	149.9	149.9
Upstream Blk Time (%)			24	19	11							
Queuing Penalty (veh)			0	0	0							
Storage Bay Dist (m)	250.0	250.0				110.0						
Storage Blk Time (%)		1	27									
Queuing Penalty (veh)		7	118									

Intersection: 37: Thorburn Road & Columbus Drive/Prince Philip Drive

Movement	SB	SB	SB	SB
Directions Served	L	L	T	TR
Maximum Queue (m)	162.5	500.9	500.4	124.9
Average Queue (m)	162.0	481.9	472.0	54.2
95th Queue (m)	163.8	543.8	606.2	103.6
Link Distance (m)		485.5	485.5	
Upstream Blk Time (%)		70	70	
Queuing Penalty (veh)		0	0	
Storage Bay Dist (m)	160.0			130.0
Storage Blk Time (%)	14	73	1	0
Queuing Penalty (veh)	46	238	3	1

Intersection: 51: Freshwater Road & Elizabeth Avenue

Movement	WB	B52	NB	SB	SB
Directions Served	R	T	TR	L	T
Maximum Queue (m)	46.6	45.1	24.8	32.3	143.0
Average Queue (m)	21.9	1.6	3.6	23.9	20.4
95th Queue (m)	37.6	46.0	14.7	36.3	88.8
Link Distance (m)	274.8	436.5	253.0		212.2
Upstream Blk Time (%)		0			0
Queuing Penalty (veh)		0			0
Storage Bay Dist (m)				30.0	
Storage Blk Time (%)				8	1
Queuing Penalty (veh)				27	4

Network Summary

Network wide Queuing Penalty: 4063

Intersection: 7: Allandale Road & Prince Philip Drive

Phase	1	2	4	5	6	7	8
Movement(s) Served	WBL	EBT	NBT	EBL	WBTL	NBL	SBTL
Maximum Green (s)	12.0	38.0	51.0	18.0	32.0	13.0	32.0
Minimum Green (s)	7.0	25.0	10.0	7.0	25.0	7.0	10.0
Recall	None	C-Max	None	None	C-Max	None	None
Avg. Green (s)	10.1	41.1	51.0	18.0	32.0	12.6	32.4
g/C Ratio	-0.01	NA	NA	NA	NA	NA	NA
Cycles Skipped (%)	3	0	0	0	0	0	0
Cycles @ Minimum (%)	14	0	0	0	0	0	0
Cycles Maxed Out (%)	38	100	100	97	100	77	100
Cycles with Peds (%)	0	11	14	0	14	0	0

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Intersection: 9: Westerland Road/Clinch Crescent & Prince Philip Drive

Phase	1	2	3	4	5	6	7	8
Movement(s) Served	WBL	EBT	SBL	NBTL	EBL	WBTL	NBL	SBTL
Maximum Green (s)	15.0	39.0	7.0	33.0	13.0	41.0	10.0	30.0
Minimum Green (s)	7.0	25.0	7.0	10.0	7.0	25.0	7.0	10.0
Recall	None	C-Max	None	None	None	C-Max	None	None
Avg. Green (s)	12.6	42.7	7.1	34.9	13.2	41.0	10.2	31.8
g/C Ratio	-0.01	NA	-0.01	NA	NA	NA	-0.01	NA
Cycles Skipped (%)	3	0	14	0	0	0	7	0
Cycles @ Minimum (%)	3	0	86	0	0	0	10	0
Cycles Maxed Out (%)	31	100	86	93	100	100	55	93
Cycles with Peds (%)	0	75	0	96	0	68	0	72

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Intersection: 10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue

Phase	1	2	3	4	5	6	8
Movement(s) Served	WBL	EBTL	SBL	NBTL	EBL	WBTL	SBTL
Maximum Green (s)	8.0	39.0	14.0	25.0	8.0	39.0	45.0
Minimum Green (s)	7.0	25.0	10.0	10.0	7.0	25.0	10.0
Recall	None	C-Max	None	None	None	C-Max	None
Avg. Green (s)	7.9	43.6	12.6	27.6	8.2	44.7	42.6
g/C Ratio	-0.01	NA	-0.01	NA	-0.01	NA	NA
Cycles Skipped (%)	13	0	13	0	20	0	0
Cycles @ Minimum (%)	26	0	19	0	20	0	0
Cycles Maxed Out (%)	42	100	39	71	37	100	68
Cycles with Peds (%)	0	0	0	0	0	0	0

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Intersection: 34: Elizabeth Avenue & Westerland Road

Phase	2	5	6	8
Movement(s) Served	EBTL	EBL	WBT	SBL
Maximum Green (s)	70.0	35.0	29.0	38.0
Minimum Green (s)	25.0	7.0	25.0	10.0
Recall	C-Max	None	C-Max	None
Avg. Green (s)	97.4	16.0	73.9	15.8
g/C Ratio	NA	-0.01	NA	NA
Cycles Skipped (%)	0	16	0	0
Cycles @ Minimum (%)	0	3	0	14
Cycles Maxed Out (%)	100	0	100	0
Cycles with Peds (%)	0	0	0	0

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Intersection: 37: Thorburn Road & Columbus Drive/Prince Philip Drive

Phase	1	2	3	4	5	6	8
Movement(s) Served	WBL	EBT	SBL	NBT	EBL	WBTL	SBT
Maximum Green (s)	7.0	43.0	19.0	25.0	20.0	30.0	50.0
Minimum Green (s)	7.0	25.0	7.0	25.0	7.0	25.0	25.0
Recall	None	C-Max	None	None	None	C-Max	None
Avg. Green (s)	7.3	50.3	19.0	25.0	18.9	31.0	50.0
g/C Ratio	-0.01	NA	NA	NA	-0.01	NA	NA
Cycles Skipped (%)	52	0	0	0	3	0	0
Cycles @ Minimum (%)	48	0	0	100	0	0	0
Cycles Maxed Out (%)	48	100	100	100	68	100	100
Cycles with Peds (%)	0	14	0	0	0	11	14
























Controller Summary













Average Cycle Length (s): NA
Number of Complete Cycles : 0

MUN Traffic Study
Elizabeth Avenue & Westerland Road

Future 2025 PM with Improvements

27/06/2016

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	146	420	86	181	459	326	29	493	105	172	545	133
Future Volume (vph)	146	420	86	181	459	326	29	493	105	172	545	133
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.7	3.5	3.7	3.7	3.5	3.7	3.0	3.4	3.4	3.0	3.4	3.4
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	55.0		0.0	55.0		0.0	55.0		35.0	125.0		0.0
Storage Lanes	1		0	1		1	1		0	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.974				0.850		0.974				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1789	1794	0	1789	1842	1601	1652	3371	0	1652	1821	1548
Flt Permitted	0.265			0.219			0.263			0.133		
Satd. Flow (perm)	499	1794	0	412	1842	1601	457	3371	0	231	1821	1548
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		11				343		21				145
Link Speed (k/h)		50			50			50				50
Link Distance (m)		456.6			391.7			82.5			486.7	
Travel Time (s)		32.9			28.2			5.9			35.0	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.97	0.97	0.97	0.95	0.95	0.95	0.90	0.90	0.90	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	151	433	89	191	483	343	32	548	117	187	592	145
Shared Lane Traffic (%)												
Lane Group Flow (vph)	151	522	0	191	483	343	32	665	0	187	592	145
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Perm	NA		pm+pt	NA	Perm
Protected Phases	5	2		1	6			4		3	8	
Permitted Phases	2			6		6	4			8		8
Total Split (s)	15.0	46.0		15.0	46.0	46.0	31.0	31.0		18.0	49.0	49.0
Total Lost Time (s)	6.0	6.0		6.0	6.0	6.0	6.0	6.0		6.0	6.0	6.0
Act Effect Green (s)	50.0	41.4		50.4	41.6	41.6	24.1	24.1		41.8	41.8	41.8
Actuated g/C Ratio	0.45	0.38		0.46	0.38	0.38	0.22	0.22		0.38	0.38	0.38
v/c Ratio	0.46	0.77		0.64	0.69	0.42	0.32	0.88		0.79	0.86	0.21
Control Delay	15.1	31.3		26.6	35.8	4.3	45.6	54.3		48.1	44.8	4.4
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	15.1	31.3		26.6	35.8	4.3	45.6	54.3		48.1	44.8	4.4
LOS	B	C		C	D	A	D	D		D	D	A
Approach Delay		27.7			23.5			53.9			39.1	
Approach LOS		C			C			D			D	
Stops (vph)	65	565		106	385	28	25	535		114	475	14
Fuel Used(l)	15	65		13	38	14	3	59		17	55	7
CO Emissions (g/hr)	273	1206		238	714	257	49	1092		314	1016	129

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	53	233		46	138	50	9	211		61	196	25
VOC Emissions (g/hr)	63	278		55	165	59	11	252		72	234	30
Dilemma Vehicles (#)	0	0		0	0	0	0	0		0	0	0
Queue Length 50th (m)	10.5	103.1		22.1	88.5	0.0	5.8	70.2		27.1	112.9	0.0
Queue Length 95th (m)	17.7	#54.0		35.7	126.7	17.9	15.5	#98.5		#57.5	#171.5	11.9
Internal Link Dist (m)		432.6			367.7			58.5			462.7	
Turn Bay Length (m)	55.0			55.0			55.0			125.0		
Base Capacity (vph)	333	681		302	695	818	103	782		242	711	693
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	0.45	0.77		0.63	0.69	0.42	0.31	0.85		0.77	0.83	0.21

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 3 (3%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 35.1

Intersection LOS: D

Intersection Capacity Utilization 94.4%

ICU Level of Service F

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue



Summary of All Intervals

Run Number	1	10	2	3	4	5	6
Start Time	4:30	4:30	4:30	4:30	4:30	4:30	4:30
End Time	6:00	6:00	6:00	6:00	6:00	6:00	6:00
Total Time (min)	90	90	90	90	90	90	90
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	5	5	5	5	5	5	5
# of Recorded Intervals	4	4	4	4	4	4	4
Vehs Entered	11191	11193	11173	11329	11194	10966	10938
Vehs Exited	11158	11135	11134	11295	11233	11016	11042
Starting Vehs	564	619	676	584	643	619	661
Ending Vehs	597	677	715	618	604	569	557
Travel Distance (km)	17590	17568	17379	17870	17553	17321	17415
Travel Time (hr)	711.8	726.8	792.0	714.9	775.1	767.6	751.3
Total Delay (hr)	398.6	413.4	481.3	396.0	461.5	458.6	442.0
Total Stops	17300	17860	18812	18459	17565	16602	16331
Fuel Used (l)	1706.6	1717.0	1747.0	1730.5	1759.5	1737.9	1738.9

Summary of All Intervals

Run Number	7	8	9	Avg
Start Time	4:30	4:30	4:30	4:30
End Time	6:00	6:00	6:00	6:00
Total Time (min)	90	90	90	90
Time Recorded (min)	60	60	60	60
# of Intervals	5	5	5	5
# of Recorded Intervals	4	4	4	4
Vehs Entered	11202	11302	11108	11161
Vehs Exited	11135	11265	10934	11134
Starting Vehs	577	540	570	606
Ending Vehs	644	577	744	629
Travel Distance (km)	17675	17711	17401	17548
Travel Time (hr)	743.5	792.7	797.3	757.3
Total Delay (hr)	429.1	475.8	487.0	444.3
Total Stops	18143	18158	18687	17790
Fuel Used (l)	1739.8	1785.1	1769.9	1743.2

Interval #0 Information Seeding

Start Time	4:30
End Time	5:00
Total Time (min)	30
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording #1

Start Time	5:00
End Time	5:15
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	2768	2679	2729	2800	2711	2755	2615
Vehs Exited	2767	2771	2828	2775	2808	2814	2774
Starting Vehs	564	619	676	584	643	619	661
Ending Vehs	565	527	577	609	546	560	502
Travel Distance (km)	4290	4320	4383	4378	4282	4359	4242
Travel Time (hr)	136.8	159.1	160.7	146.8	165.8	167.6	156.1
Total Delay (hr)	60.6	82.3	82.5	68.7	89.4	89.7	81.1
Total Stops	3747	4194	4354	3969	3967	4001	3801
Fuel Used (l)	386.1	405.8	410.7	401.6	409.1	418.0	401.3

Interval #1 Information Recording #1

Start Time	5:00
End Time	5:15
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	2663	2766	2708	2717
Vehs Exited	2736	2713	2665	2766
Starting Vehs	577	540	570	606
Ending Vehs	504	593	613	560
Travel Distance (km)	4298	4257	4258	4307
Travel Time (hr)	143.6	158.1	160.3	155.5
Total Delay (hr)	67.4	82.0	84.8	78.9
Total Stops	3736	3839	3791	3939
Fuel Used (l)	392.6	402.5	402.9	403.0

Interval #2 Information Recording #2

Start Time	5:15
End Time	5:30
Total Time (min)	15

Volumes adjusted by PHF, Growth Factors.

Run Number	1	10	2	3	4	5	6
Vehs Entered	2964	2969	2970	3042	2994	2897	2914
Vehs Exited	2841	2819	2748	2901	2798	2801	2745
Starting Vehs	565	527	577	609	546	560	502
Ending Vehs	688	677	799	750	742	656	671
Travel Distance (km)	4569	4580	4429	4717	4579	4434	4533
Travel Time (hr)	183.9	190.5	189.4	188.7	199.6	196.1	189.1
Total Delay (hr)	102.1	108.9	109.9	104.2	117.4	116.7	108.4
Total Stops	4793	4872	5098	5161	4892	4400	4341
Fuel Used (l)	441.9	445.9	432.6	455.5	456.2	441.6	442.9

Interval #2 Information Recording #2

Start Time	5:15
End Time	5:30
Total Time (min)	15

Volumes adjusted by PHF, Growth Factors.

Run Number	7	8	9	Avg
Vehs Entered	3026	3125	2878	2980
Vehs Exited	2810	2960	2759	2818
Starting Vehs	504	593	613	560
Ending Vehs	720	758	732	723
Travel Distance (km)	4570	4780	4477	4567
Travel Time (hr)	186.0	216.3	199.0	193.9
Total Delay (hr)	104.2	130.3	118.9	112.1
Total Stops	4921	5143	5028	4865
Fuel Used (l)	442.6	481.5	449.3	449.0

Interval #3 Information Recorsding #3

Start Time	5:30
End Time	5:45
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	2691	2763	2771	2738	2690	2649	2758
Vehs Exited	2765	2840	2861	2871	2861	2749	2853
Starting Vehs	688	677	799	750	742	656	671
Ending Vehs	614	600	709	617	571	556	576
Travel Distance (km)	4359	4300	4344	4460	4356	4269	4433
Travel Time (hr)	191.7	193.8	224.9	197.6	208.6	209.6	208.9
Total Delay (hr)	114.4	116.9	147.2	118.4	131.3	133.8	130.3
Total Stops	4418	4410	4951	4859	4420	4187	4363
Fuel Used (l)	437.8	434.8	459.8	449.8	451.1	446.7	460.5

Interval #3 Information Recorsding #3

Start Time	5:30
End Time	5:45
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	2736	2704	2751	2728
Vehs Exited	2819	2843	2806	2825
Starting Vehs	720	758	732	723
Ending Vehs	637	619	677	618
Travel Distance (km)	4427	4408	4384	4374
Travel Time (hr)	208.7	222.8	215.2	208.2
Total Delay (hr)	130.1	144.2	137.0	130.4
Total Stops	4913	4884	5101	4644
Fuel Used (l)	455.1	466.6	459.5	452.2

Interval #4 Information Recording #4

Start Time	5:45
End Time	6:00
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	2768	2782	2703	2749	2799	2665	2651
Vehs Exited	2785	2705	2697	2748	2766	2652	2670
Starting Vehs	614	600	709	617	571	556	576
Ending Vehs	597	677	715	618	604	569	557
Travel Distance (km)	4373	4368	4224	4314	4336	4259	4207
Travel Time (hr)	199.5	183.4	217.0	181.7	201.1	194.3	197.3
Total Delay (hr)	121.5	105.4	141.6	104.7	123.4	118.3	122.3
Total Stops	4342	4384	4409	4470	4286	4014	3826
Fuel Used (l)	440.9	430.6	443.9	423.6	443.1	431.6	434.1

Interval #4 Information Recording #4

Start Time	5:45
End Time	6:00
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	2777	2707	2771	2740
Vehs Exited	2770	2749	2704	2723
Starting Vehs	637	619	677	618
Ending Vehs	644	577	744	629
Travel Distance (km)	4381	4266	4281	4301
Travel Time (hr)	205.3	195.5	222.8	199.8
Total Delay (hr)	127.3	119.3	146.2	123.0
Total Stops	4573	4292	4767	4333
Fuel Used (l)	449.4	434.5	458.2	439.0

7: Allandale Road & Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.2	0.1	0.1	0.1	0.0	0.0	0.2	0.3	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.9	0.2	1.0	2.5	0.2	0.3	2.9	2.2	0.7	0.0	0.0	0.0
Total Delay (hr)	9.3	12.9	0.7	2.6	8.9	0.2	9.0	14.4	0.7	0.3	5.3	1.0
Total Del/Veh (s)	55.7	38.2	10.1	57.1	45.8	22.4	134.4	87.8	11.7	72.9	42.8	5.5
Stop Delay (hr)	7.6	8.1	0.0	2.3	6.8	0.2	7.6	10.8	0.2	0.2	4.6	0.3
Stop Del/Veh (s)	45.5	23.8	0.2	49.9	35.0	16.1	113.5	65.8	3.2	68.5	37.6	1.6

7: Allandale Road & Prince Philip Drive Performance by movement

Movement	All
Denied Delay (hr)	1.0
Denied Del/Veh (s)	0.7
Total Delay (hr)	65.2
Total Del/Veh (s)	46.1
Stop Delay (hr)	48.6
Stop Del/Veh (s)	34.4

9: Westerland Road/Clinch Crescent & Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.1	0.7	0.2	0.0	0.0	0.0	10.2	6.6	9.0	28.9	28.7	40.7
Denied Del/Veh (s)	3.0	2.2	3.1	0.0	0.0	0.0	146.4	147.5	154.0	353.3	356.9	354.0
Total Delay (hr)	4.3	15.3	2.3	4.6	48.2	1.7	10.1	3.3	4.0	3.6	3.5	10.5
Total Del/Veh (s)	83.5	47.1	28.2	126.0	125.6	149.1	144.6	74.7	70.4	49.8	49.3	102.6
Stop Delay (hr)	3.8	11.0	1.7	3.7	37.8	1.4	9.9	2.9	3.8	3.2	3.0	10.9
Stop Del/Veh (s)	74.5	34.0	20.9	101.2	98.5	124.4	141.4	66.8	66.5	44.0	42.6	105.8

9: Westerland Road/Clinch Crescent & Prince Philip Drive Performance by movement

Movement	All
Denied Delay (hr)	125.1
Denied Del/Veh (s)	94.5
Total Delay (hr)	111.4
Total Del/Veh (s)	85.4
Stop Delay (hr)	93.2
Stop Del/Veh (s)	71.4

10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.3	0.6	0.1	2.2	0.5	0.3	0.0	0.0	0.0	0.1	0.0	0.0
Total Delay (hr)	3.1	9.8	1.5	1.9	4.1	0.4	0.7	6.0	0.8	2.3	6.9	0.6
Total Del/Veh (s)	74.5	79.3	62.2	37.7	32.2	4.1	73.3	42.7	27.1	47.0	44.3	15.4
Stop Delay (hr)	2.5	7.8	1.2	1.6	3.1	0.0	0.6	5.3	0.7	1.6	4.5	0.4
Stop Del/Veh (s)	60.4	63.6	49.1	30.8	24.2	0.2	70.2	37.3	24.9	33.2	29.0	10.5

10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue Performance by movement

Movement	All
Denied Delay (hr)	0.3
Denied Del/Veh (s)	0.4
Total Delay (hr)	38.1
Total Del/Veh (s)	42.9
Stop Delay (hr)	29.4
Stop Del/Veh (s)	33.1

34: Elizabeth Avenue & Westerland Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.1	0.0	0.1	0.1	0.1	0.2	0.5
Denied Del/Veh (s)	1.2	0.3	0.5	1.0	0.9	3.5	1.0
Total Delay (hr)	0.8	1.0	2.2	0.5	2.7	0.3	7.5
Total Del/Veh (s)	15.4	8.1	14.4	9.2	44.6	4.2	14.6
Stop Delay (hr)	0.5	0.5	1.0	0.1	2.4	0.0	4.6
Stop Del/Veh (s)	10.7	4.1	6.2	1.7	40.0	0.3	8.8

37: Thorburn Road & Columbus Drive/Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.3	0.8
Denied Del/Veh (s)	2.3	0.3	0.3	0.0	0.0	0.0	0.1	0.2	0.7	0.6	1.9	0.5
Total Delay (hr)	8.0	6.1	0.5	0.5	13.4	1.3	5.0	1.1	8.9	1.8	3.5	50.1
Total Del/Veh (s)	78.4	28.3	6.1	29.4	38.3	7.7	46.1	26.9	63.7	24.2	23.9	34.6
Stop Delay (hr)	7.3	4.4	0.3	0.4	10.3	0.1	4.3	0.9	8.0	1.4	2.5	39.9
Stop Del/Veh (s)	71.7	20.4	3.8	25.6	29.3	0.6	39.4	24.1	56.9	18.2	16.8	27.5

51: Freshwater Road & Elizabeth Avenue Performance by movement

Movement	WBT	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.0	0.1	0.0	0.3	0.1	0.5
Denied Del/Veh (s)	0.0	0.0	0.5	0.4	3.2	1.3	0.9
Total Delay (hr)	0.1	1.4	0.3	0.0	0.9	0.4	3.1
Total Del/Veh (s)	0.9	14.1	1.9	1.1	9.0	3.7	5.3
Stop Delay (hr)	0.0	1.2	0.0	0.0	0.5	0.0	1.7
Stop Del/Veh (s)	0.0	12.0	0.0	0.1	4.8	0.2	2.9

Total Network Performance

Denied Delay (hr)	128.5
Denied Del/Veh (s)	40.8
Total Delay (hr)	315.8
Total Del/Veh (s)	96.7
Stop Delay (hr)	227.4
Stop Del/Veh (s)	69.6

Intersection: 7: Allandale Road & Prince Philip Drive

Movement	EB	EB	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB
Directions Served	L	L	T	T	R	L	T	TR	L	L	T	R
Maximum Queue (m)	89.4	97.6	154.8	140.8	97.4	67.3	111.7	109.5	52.5	72.4	327.3	244.6
Average Queue (m)	55.8	59.9	86.8	88.6	7.3	36.7	66.0	67.1	26.4	58.0	192.2	43.8
95th Queue (m)	84.5	89.8	133.3	131.9	54.3	71.6	100.3	97.5	45.8	91.6	348.1	202.6
Link Distance (m)			466.8	466.8			499.1	499.1			460.3	460.3
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	200.0	200.0			120.0	65.0			70.0	70.0		
Storage Blk Time (%)				1	0	2	8		0	0	38	
Queuing Penalty (veh)				3	0	6	12		0	2	87	

Intersection: 7: Allandale Road & Prince Philip Drive

Movement	SB	SB	SB	SB	SB	B1	B1
Directions Served	L	T	T	R	R	T	T
Maximum Queue (m)	44.3	82.5	77.6	92.0	52.5	0.9	4.0
Average Queue (m)	6.5	47.7	38.2	23.0	14.0	0.0	0.1
95th Queue (m)	27.5	74.7	67.4	75.9	52.0	0.9	1.6
Link Distance (m)		87.8	87.8	87.8		267.7	267.7
Upstream Blk Time (%)		0	0	0			
Queuing Penalty (veh)		0	0	0			
Storage Bay Dist (m)	42.0				50.0		
Storage Blk Time (%)	0	14		2	1		
Queuing Penalty (veh)	0	2		8	2		

Intersection: 9: Westerland Road/Clinch Crescent & Prince Philip Drive

Movement	EB	EB	EB	EB	EB	B35	B35	WB	WB	WB	B61	B61
Directions Served	L	L	T	T	R	T	T	L	T	TR	T	T
Maximum Queue (m)	48.6	77.4	180.1	187.6	77.5	3.2	2.5	92.4	361.2	365.6	40.9	43.5
Average Queue (m)	21.5	48.3	109.1	109.9	59.9	0.1	0.1	64.4	243.7	249.9	16.7	17.7
95th Queue (m)	42.7	90.9	168.3	173.3	102.4	2.6	2.3	119.1	436.8	441.6	126.2	130.4
Link Distance (m)			191.5	191.5		347.9	347.9		453.9	453.9	466.8	466.8
Upstream Blk Time (%)			0	0					6	7		
Queuing Penalty (veh)			2	3					44	56		
Storage Bay Dist (m)	75.0	75.0			75.0			90.0				
Storage Blk Time (%)	0	0	23	21	1			0	48			
Queuing Penalty (veh)	0	2	42	60	8			2	64			

Intersection: 9: Westerland Road/Clinch Crescent & Prince Philip Drive

Movement	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	T	R
Maximum Queue (m)	62.4	140.9	47.5	82.3	112.1	82.5
Average Queue (m)	59.3	113.7	30.6	47.7	103.1	81.4
95th Queue (m)	73.0	177.5	54.1	84.4	118.7	92.0
Link Distance (m)		126.1			98.8	
Upstream Blk Time (%)		60			57	
Queuing Penalty (veh)		0			0	
Storage Bay Dist (m)	60.0		45.0	80.0		80.0
Storage Blk Time (%)	62	4	9	2	11	63
Queuing Penalty (veh)	225	19	38	13	79	361

Intersection: 10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue

Movement	EB	EB	B33	WB	WB	WB	NB	NB	NB	B31	SB	SB
Directions Served	L	TR	T	L	T	R	L	T	TR	T	L	T
Maximum Queue (m)	57.4	281.5	2.0	57.3	145.7	46.2	57.3	80.9	77.4	50.6	102.4	193.0
Average Queue (m)	42.7	151.6	0.1	39.5	75.9	2.1	12.9	53.4	47.9	6.1	44.5	92.1
95th Queue (m)	74.4	308.6	2.5	69.2	128.4	21.5	39.8	80.3	74.1	39.6	101.0	175.5
Link Distance (m)		439.0	361.7		377.6	377.6		65.9	65.9	294.5		460.3
Upstream Blk Time (%)		0						5	2			
Queuing Penalty (veh)		2						0	0			
Storage Bay Dist (m)	55.0			55.0			55.0				100.0	
Storage Blk Time (%)	1	41		1	16		0	11			0	8
Queuing Penalty (veh)	4	60		5	28		0	3			1	15

Intersection: 10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue

Movement	SB
Directions Served	R
Maximum Queue (m)	110.5
Average Queue (m)	19.0
95th Queue (m)	60.7
Link Distance (m)	460.3
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (m)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 31: Bend

Movement	SB
Directions Served	T
Maximum Queue (m)	20.7
Average Queue (m)	1.4
95th Queue (m)	17.1
Link Distance (m)	65.9
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (m)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 34: Elizabeth Avenue & Westerland Road

Movement	EB	EB	WB	WB	SB	SB
Directions Served	L	T	T	R	L	R
Maximum Queue (m)	37.0	76.0	143.3	52.4	79.0	66.3
Average Queue (m)	20.0	30.0	47.4	11.0	40.8	3.0
95th Queue (m)	36.0	61.3	117.3	46.0	65.3	25.5
Link Distance (m)		436.6	361.7		203.6	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (m)	35.0			50.0		70.0
Storage Blk Time (%)	1	4	4	0	0	0
Queuing Penalty (veh)	3	6	9	2	1	0

Intersection: 37: Thorburn Road & Columbus Drive/Prince Philip Drive

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	L	T	T	R	L	T	T	T	R	T	TR
Maximum Queue (m)	76.8	85.4	86.4	91.9	35.1	25.6	92.2	96.6	107.8	92.4	86.4	83.2
Average Queue (m)	46.1	54.3	52.5	51.6	17.2	9.4	66.8	68.6	67.0	16.0	54.5	44.1
95th Queue (m)	72.8	79.4	76.4	77.8	28.6	19.6	88.0	89.7	94.0	72.1	78.9	73.0
Link Distance (m)			411.6	411.6	411.6		177.7	177.7	177.7		149.9	149.9
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	250.0	250.0				110.0				90.0		
Storage Blk Time (%)									0	1		
Queuing Penalty (veh)									3	3		

Intersection: 37: Thorburn Road & Columbus Drive/Prince Philip Drive

Movement	SB	SB	SB	SB
Directions Served	L	L	T	TR
Maximum Queue (m)	97.2	104.2	85.4	111.7
Average Queue (m)	56.7	62.2	34.4	63.0
95th Queue (m)	89.0	94.2	72.6	101.4
Link Distance (m)		485.5	485.5	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)	160.0			130.0
Storage Blk Time (%)			0	0
Queuing Penalty (veh)			0	0

Intersection: 51: Freshwater Road & Elizabeth Avenue

Movement	WB	B52	NB	SB	SB
Directions Served	R	T	TR	L	T
Maximum Queue (m)	73.0	318.0	12.5	32.2	64.8
Average Queue (m)	31.3	22.5	1.5	19.9	7.0
95th Queue (m)	57.5	184.2	7.6	32.4	38.0
Link Distance (m)	274.8	436.6	253.0		212.2
Upstream Blk Time (%)		1			
Queuing Penalty (veh)		7			
Storage Bay Dist (m)				30.0	
Storage Blk Time (%)				3	0
Queuing Penalty (veh)				10	1

Network Summary

Network wide Queuing Penalty: 1306

Intersection: 7: Allandale Road & Prince Philip Drive

Phase	1	2	4	5	6	7	8
Movement(s) Served	WBL	EBT	NBT	EBL	WBTL	NBL	SBTL
Maximum Green (s)	10.0	48.0	43.0	26.0	32.0	11.0	26.0
Minimum Green (s)	7.0	25.0	10.0	7.0	25.0	7.0	10.0
Recall	None	C-Max	None	None	C-Max	None	None
Avg. Green (s)	9.5	49.0	43.0	25.9	32.1	10.9	26.1
g/C Ratio	NA	NA	NA	NA	NA	NA	NA
Cycles Skipped (%)	0	0	0	0	0	0	0
Cycles @ Minimum (%)	3	0	0	0	0	0	0
Cycles Maxed Out (%)	72	100	96	97	100	90	96
Cycles with Peds (%)	0	14	14	0	18	0	0

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Intersection: 9: Westerland Road/Clinch Crescent & Prince Philip Drive

Phase	1	2	3	4	5	6	7	8
Movement(s) Served	WBL	EBT	SBL	NBTL	EBL	WBTL	NBL	SBTL
Maximum Green (s)	7.0	40.0	14.0	23.0	7.0	40.0	8.0	29.0
Minimum Green (s)	7.0	25.0	7.0	10.0	7.0	25.0	7.0	10.0
Recall	None	C-Max	None	None	None	C-Max	None	None
Avg. Green (s)	7.2	41.7	13.1	24.9	7.0	40.0	8.0	29.0
g/C Ratio	-0.01	NA	NA	NA	NA	NA	NA	NA
Cycles Skipped (%)	3	0	0	0	0	0	0	0
Cycles @ Minimum (%)	97	0	3	0	100	0	0	0
Cycles Maxed Out (%)	97	100	66	100	100	100	97	100
Cycles with Peds (%)	0	100	0	100	0	97	0	97

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Intersection: 10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue

Phase	1	2	3	4	5	6	8
Movement(s) Served	WBL	EBTL	SBL	NBTL	EBL	WBTL	SBTL
Maximum Green (s)	9.0	40.0	12.0	25.0	9.0	40.0	43.0
Minimum Green (s)	7.0	25.0	7.0	10.0	7.0	25.0	10.0
Recall	None	C-Max	None	None	None	C-Max	None
Avg. Green (s)	8.8	42.6	10.9	27.4	8.6	44.5	42.6
g/C Ratio	-0.01	NA	-0.01	NA	-0.01	NA	NA
Cycles Skipped (%)	3	0	3	0	13	0	0
Cycles @ Minimum (%)	10	0	6	0	20	0	0
Cycles Maxed Out (%)	68	100	58	94	50	100	90
Cycles with Peds (%)	0	0	0	0	0	0	0

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Intersection: 34: Elizabeth Avenue & Westerland Road

Phase	2	5	6	8
Movement(s) Served	EBTL	EBL	WBT	SBL
Maximum Green (s)	51.0	13.0	32.0	47.0
Minimum Green (s)	25.0	7.0	25.0	10.0
Recall	C-Max	None	C-Max	None
Avg. Green (s)	80.5	9.7	68.7	19.0
g/C Ratio	NA	-0.01	NA	NA
Cycles Skipped (%)	0	28	0	0
Cycles @ Minimum (%)	0	22	0	6
Cycles Maxed Out (%)	100	0	100	0
Cycles with Peds (%)	0	0	0	0

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Intersection: 37: Thorburn Road & Columbus Drive/Prince Philip Drive

Phase	1	2	3	4	5	6	8
Movement(s) Served	WBL	EBT	SBL	NBT	EBL	WBTL	SBT
Maximum Green (s)	7.0	42.0	20.0	25.0	14.0	35.0	51.0
Minimum Green (s)	7.0	25.0	7.0	25.0	7.0	25.0	25.0
Recall	None	C-Max	None	None	None	C-Max	None
Avg. Green (s)	7.3	46.3	19.9	25.2	14.0	35.0	50.9
g/C Ratio	-0.01	NA	NA	NA	NA	NA	NA
Cycles Skipped (%)	32	0	0	0	0	0	0
Cycles @ Minimum (%)	68	0	0	90	0	0	0
Cycles Maxed Out (%)	68	100	89	97	97	100	96
Cycles with Peds (%)	0	14	0	0	0	14	11

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

APPENDIX G

DETAILED ANALYSIS - ARCADY RESULTS

Junctions 8										
ARCADY 8 - Roundabout Module										
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Filename: Prince Philip-Allandale.arc8

Path: Z:\Harbourside Transportation Consultants\Projects\14322 MUN Area Traffic Study\Cad\Revised Report-6 Intersections

Report generation date: 09/05/2016 10:56:44 AM

« Prince Philip-Allandale - 2025, AM

» Intersection Network

» Legs

» Traffic Flows

» Entry Flows

» Turning Proportions

» Vehicle Mix

» Results

Summary of intersection performance

	AM						PM				
	Queue (PCE)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS	Queue (PCE)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)
Prince Philip-Allandale - 2025											
Prince Philip (Westside)	1.84	5.14	0.65	A	4.30	A	17.18	28.94	0.96	D	24.5
Allandale (Southside)	0.91	3.96	0.48	A			8.98	31.14	0.92	D	
Prince Philip (Eastside)	1.42	4.89	0.59	A			1.76	6.69	0.64	A	
Allandale (Northside)	0.55	3.47	0.36	A			0.00	0.00	0.00	A	

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

"D1 - 2025, AM" model duration: 8:00 AM - 9:30 AM

"D2 - 2025, PM" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.4.487 at 09/05/2016 10:56:44 AM

File summary

Title	Prince Philip - Allandale
Location	
Site Number	
Date	02/05/2016
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	hec45
Description	

Analysis Options

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

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCE	PCE	perHour	s	-Min	perMin

Prince Philip-Allandale - 2025, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

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

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Single Time Segment Only	Locked
2025, AM	2025	AM		ONE HOUR	08:00	09:30	90	15		

Intersection Network

Intersections

Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Intersection Delay (s)	Intersection LOS
1	Prince Philip-Allandale	Roundabout	1,2,3,4			4.30	A

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Name	Leg	Name	Description
Prince Philip (Westside)	1	Prince Philip (Westside)	
Allandale (Southside)	2	Allandale (Southside)	
Prince Philip (Eastside)	3	Prince Philip (Eastside)	
Allandale (Northside)	4	Allandale (Northside)	

Capacity Options

Name	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)
Prince Philip (Westside)	0.00	99999.00
Allandale (Southside)	0.00	99999.00
Prince Philip (Eastside)	0.00	99999.00
Allandale (Northside)	0.00	99999.00

Roundabout Geometry

Name	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Prince Philip (Westside)	7.00	8.00	25.00	75.00	70.00	30.00	
Allandale (Southside)	7.00	8.00	25.00	75.00	70.00	30.00	
Prince Philip (Eastside)	7.00	8.00	25.00	75.00	70.00	30.00	
Allandale (Northside)	7.00	8.00	25.00	75.00	70.00	30.00	

Bypass

Name	Leg Has Bypass	Bypass Utilisation (%)
Prince Philip (Westside)		
Allandale (Southside)		
Prince Philip (Eastside)		
Allandale (Northside)	✓	100

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Name	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Prince Philip (Westside)		(calculated)	(calculated)	0.636	2475.309
Allandale (Southside)		(calculated)	(calculated)	0.636	2475.309
Prince Philip (Eastside)		(calculated)	(calculated)	0.636	2475.309
Allandale (Northside)		(calculated)	(calculated)	0.636	2475.309

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

Traffic Flows

Demand Set Data Options

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

Entry Flows

General Flows Data

Name	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)
Prince Philip (Westside)	ONE HOUR	✓	1183.00	100.000
Allandale (Southside)	ONE HOUR	✓	754.00	100.000
Prince Philip (Eastside)	ONE HOUR	✓	958.00	100.000
Allandale (Northside)	ONE HOUR	✓	1578.00	100.000

Turning Proportions

Turning Counts / Proportions (PCE/hr) - Prince Philip- Allandale (for whole period)

	To				
		Prince Philip (Westside)	Allandale (Southside)	Prince Philip (Eastside)	Allandale (Northside)
From	Prince Philip (Westside)	0.000	143.000	654.000	386.000
	Allandale (Southside)	280.000	0.000	163.000	311.000
	Prince Philip (Eastside)	800.000	150.000	0.000	8.000
	Allandale (Northside)	1054.000	513.000	11.000	0.000

Turning Proportions (PCE) - Prince Philip- Allandale (for whole period)

	To				
		Prince Philip (Westside)	Allandale (Southside)	Prince Philip (Eastside)	Allandale (Northside)
From	Prince Philip (Westside)	0.00	0.12	0.55	0.33
	Allandale (Southside)	0.37	0.00	0.22	0.41
	Prince Philip (Eastside)	0.84	0.16	0.00	0.01
	Allandale (Northside)	0.67	0.33	0.01	0.00

Vehicle Mix

Average PCE Per Vehicle - Prince Philip- Allandale (for whole period)

	To				
		Prince Philip (Westside)	Allandale (Southside)	Prince Philip (Eastside)	Allandale (Northside)
From	Prince Philip (Westside)	1.000	1.000	1.000	1.000
	Allandale (Southside)	1.000	1.000	1.000	1.000
	Prince Philip (Eastside)	1.000	1.000	1.000	1.000
	Allandale (Northside)	1.000	1.000	1.000	1.000

Truck Percentages - Prince Philip- Allandale (for whole period)

	To				
		Prince Philip (Westside)	Allandale (Southside)	Prince Philip (Eastside)	Allandale (Northside)
From	Prince Philip (Westside)	0.0	0.0	0.0	0.0
	Allandale (Southside)	0.0	0.0	0.0	0.0
	Prince Philip (Eastside)	0.0	0.0	0.0	0.0
	Allandale (Northside)	0.0	0.0	0.0	0.0

Results

Results Summary for whole modelled period

Name	Max V/C Ratio	Max Delay (s)	Max Queue (PCE)	Max 95th percentile Queue (PCE)	Max LOS
Prince Philip (Westside)	0.65	5.14	1.84	2.00	A
Allandale (Southside)	0.48	3.96	0.91	1.00	A
Prince Philip (Eastside)	0.59	4.89	1.42	1.00	A
Allandale (Northside)	0.36	3.47	0.55	1.00	A



Junctions 8										
ARCADY 8 - Roundabout Module										
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Filename: Prince Philip-Clinch-Westerland.arc8

Path: Z:\Harbourside Transportation Consultants\Projects\14322 MUN Area Traffic Study\Cad\Revised Report-6 Intersections

Report generation date: 09/05/2016 10:55:17 AM

« Prince Philip-Clinch-Westerland - 2025, AM

» Intersection Network

» Legs

» Traffic Flows

» Entry Flows

» Turning Proportions

» Vehicle Mix

» Results

Summary of intersection performance

	AM						PM				
	Queue (PCE)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS	Queue (PCE)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)
Prince Philip-Clinch-Westerland - 2025											
Prince Philip (Westside)	19.61	34.49	0.97	D	21.58	C	7.78	16.57	0.89	C	11.1
Westerland	1.58	6.71	0.62	A			1.03	5.44	0.51	A	
Prince Philip (Eastside)	5.65	14.88	0.86	B			2.72	6.57	0.73	A	
Clinch Cres	0.23	2.79	0.18	A			3.51	12.17	0.78	B	

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

"D1 - 2025, AM" model duration: 8:00 AM - 9:30 AM

"D2 - 2025, PM" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.4.487 at 09/05/2016 10:55:17 AM

File summary

Title	Prince Philip-Clinch-Westerland
Location	
Site Number	
Date	02/05/2016
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	hec45
Description	

Analysis Options

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

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCE	PCE	perHour	s	-Min	perMin

Prince Philip-Clinch-Westerland - 2025, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Locked	Network Flow Scaling Factor (%)	Reason For Scaling Factors
Prince Philip-Clinch-Westerland	ARCADY			100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Single Time Segment Only	Locked
2025, AM	2025	AM		ONE HOUR	08:00	09:30	90	15		

Intersection Network

Intersections

Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Intersection Delay (s)	Intersection LOS
1	Prince Philip-Clinch-Westerland	Roundabout	1,2,3,4			21.58	C

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Name	Leg	Name	Description
Prince Philip (Westside)	1	Prince Philip (Westside)	
Westerland	2	Westerland	
Prince Philip (Eastside)	3	Prince Philip (Eastside)	
Clinch Cres	4	Clinch Cres	

Capacity Options

Name	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)
Prince Philip (Westside)	0.00	99999.00
Westerland	0.00	99999.00
Prince Philip (Eastside)	0.00	99999.00
Clinch Cres	0.00	99999.00

Roundabout Geometry

Name	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Prince Philip (Westside)	7.00	8.00	25.00	75.00	70.00	30.00	
Westerland	7.00	8.00	25.00	75.00	70.00	30.00	
Prince Philip (Eastside)	7.00	8.00	25.00	75.00	70.00	30.00	
Clinch Cres	7.00	8.00	25.00	75.00	70.00	30.00	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Name	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Prince Philip (Westside)		(calculated)	(calculated)	0.636	2475.309
Westerland		(calculated)	(calculated)	0.636	2475.309
Prince Philip (Eastside)		(calculated)	(calculated)	0.636	2475.309
Clinch Cres		(calculated)	(calculated)	0.636	2475.309

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

Traffic Flows

Demand Set Data Options

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

Entry Flows

General Flows Data

Name	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)
Prince Philip (Westside)	ONE HOUR	✓	1958.00	100.000
Westerland	ONE HOUR	✓	782.00	100.000
Prince Philip (Eastside)	ONE HOUR	✓	1294.00	100.000
Clinch Cres	ONE HOUR	✓	265.00	100.000

Turning Proportions

Turning Counts / Proportions (PCE/hr) - Prince Philip- Clinch- Westerland (for whole period)

	To				
		Prince Philip (Westside)	Westerland	Prince Philip (Eastside)	Clinch Cres
From	Prince Philip (Westside)	0.000	496.000	970.000	492.000
	Westerland	152.000	0.000	109.000	521.000
	Prince Philip (Eastside)	951.000	172.000	0.000	171.000
	Clinch Cres	79.000	98.000	88.000	0.000

Turning Proportions (PCE) - Prince Philip- Clinch- Westerland (for whole period)

	To				
		Prince Philip (Westside)	Westerland	Prince Philip (Eastside)	Clinch Cres
From	Prince Philip (Westside)	0.00	0.25	0.50	0.25
	Westerland	0.19	0.00	0.14	0.67
	Prince Philip (Eastside)	0.73	0.13	0.00	0.13
	Clinch Cres	0.30	0.37	0.33	0.00

Vehicle Mix

Average PCE Per Vehicle - Prince Philip- Clinch- Westerland (for whole period)

	To				
		Prince Philip (Westside)	Westerland	Prince Philip (Eastside)	Clinch Cres
From	Prince Philip (Westside)	1.000	1.000	1.000	1.000
	Westerland	1.000	1.000	1.000	1.000
	Prince Philip (Eastside)	1.000	1.000	1.000	1.000
	Clinch Cres	1.000	1.000	1.000	1.000

Truck Percentages - Prince Philip- Clinch- Westerland (for whole period)

	To				
		Prince Philip (Westside)	Westerland	Prince Philip (Eastside)	Clinch Cres
From	Prince Philip (Westside)	0.0	0.0	0.0	0.0
	Westerland	0.0	0.0	0.0	0.0
	Prince Philip (Eastside)	0.0	0.0	0.0	0.0
	Clinch Cres	0.0	0.0	0.0	0.0

Results

Results Summary for whole modelled period

Name	Max V/C Ratio	Max Delay (s)	Max Queue (PCE)	Max 95th percentile Queue (PCE)	Max LOS
Prince Philip (Westside)	0.97	34.49	19.61	82.00	D
Westerland	0.62	6.71	1.58	1.00	A
Prince Philip (Eastside)	0.86	14.88	5.65	19.00	B
Clinch Cres	0.18	2.79	0.23	~1	A



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ARCADY 8 - Roundabout Module											
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Filename: Prince Philip-Columbus-Thorburn.arc8

Path: Z:\Harbourside Transportation Consultants\Projects\14322 MUN Area Traffic Study\Cad\Revised Report-6 Intersections

Report generation date: 09/05/2016 10:56:10 AM

« Prince Philip-Columbus-Thorburn - 2025, AM

» Intersection Network

» Legs

» Traffic Flows

» Entry Flows

» Turning Proportions

» Vehicle Mix

» Results

Summary of intersection performance

	AM						PM				
	Queue (PCE)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS	Queue (PCE)	Delay (s)	V/C Ratio	LOS	Inter Delay
Prince Philip-Columbus-Thorburn - 2025											
Thorburn Road	3.01	7.46	0.75	A	10.45	B	9.58	26.20	0.92	D	10
Columbus Drive	8.57	15.57	0.90	C			0.98	2.87	0.50	A	
Connection to Freshwater	0.94	10.17	0.49	B			0.75	4.67	0.43	A	
Prince Philip	0.68	3.01	0.41	A			3.23	7.91	0.77	A	

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

"D1 - 2025, AM" model duration: 8:00 AM - 9:30 AM

"D2 - 2025, PM" model duration: 4:00 PM - 5:30 PM

Run using Junctions 8.0.4.487 at 09/05/2016 10:56:10 AM

File summary

Title	Prince Philip-Columbus-Thorburn
Location	
Site Number	
Date	02/05/2016
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Analyst	hec45
Description	

Analysis Options

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

Units

Distance Units	Speed Units	Traffic Units Input	Traffic Units Results	Flow Units	Average Delay Units	Total Delay Units	Rate Of Delay Units
m	kph	PCE	PCE	perHour	s	-Min	perMin

Prince Philip-Columbus-Thorburn - 2025, AM

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Locked	Network Flow Scaling Factor (%)	Reason For Scaling Factors
Prince Philip-Columbus-Thorburn	ARCADY			100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Single Time Segment Only	Locked
2025, AM	2025	AM		ONE HOUR	08:00	09:30	90	15		

Intersection Network

Intersections

Intersection	Name	Intersection Type	Leg Order	Grade Separated	Large Roundabout	Intersection Delay (s)	Intersection LOS
1	Prince Philip-Columbus-Thorburn	Roundabout	1,2,3,4			10.45	B

Intersection Network Options

Driving Side	Lighting
Right	Normal/unknown

Legs

Legs

Name	Leg	Name	Description
Thorburn Road	1	Thorburn Road	
Columbus Drive	2	Columbus Drive	
Connection to Freshwater	3	Connection to Freshwater	
Prince Philip	4	Prince Philip	

Capacity Options

Name	Minimum Capacity (PCE/hr)	Maximum Capacity (PCE/hr)
Thorburn Road	0.00	99999.00
Columbus Drive	0.00	99999.00
Connection to Freshwater	0.00	99999.00
Prince Philip	0.00	99999.00

Roundabout Geometry

Name	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit Only
Thorburn Road	7.00	8.00	25.00	75.00	70.00	30.00	
Columbus Drive	7.00	12.00	25.00	75.00	70.00	30.00	
Connection to Freshwater	7.00	8.00	25.00	75.00	70.00	30.00	
Prince Philip	7.00	8.00	25.00	75.00	70.00	30.00	

Bypass

Name	Leg Has Bypass	Bypass Utilisation (%)
Thorburn Road		
Columbus Drive	✓	100
Connection to Freshwater		
Prince Philip	✓	100

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Name	Enter slope and intercept directly	Entered slope	Entered intercept (PCE/hr)	Final Slope	Final Intercept (PCE/hr)
Thorburn Road		(calculated)	(calculated)	0.636	2475.309
Columbus Drive		(calculated)	(calculated)	0.743	3153.966
Connection to Freshwater		(calculated)	(calculated)	0.636	2475.309
Prince Philip		(calculated)	(calculated)	0.636	2475.309

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

Traffic Flows

Demand Set Data Options

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

Entry Flows

General Flows Data

Name	Profile Type	Use Turning Counts	Average Demand Flow (PCE/hr)	Flow Scaling Factor (%)
Thorburn Road	ONE HOUR	✓	1340.00	100.000
Columbus Drive	ONE HOUR	✓	2225.00	100.000
Connection to Freshwater	ONE HOUR	✓	308.00	100.000
Prince Philip	ONE HOUR	✓	981.00	100.000

Turning Proportions

Turning Counts / Proportions (PCE/hr) - Prince Philip- Columbus- Thorburn (for whole period)

	To				
		Thorburn Road	Columbus Drive	Connection to Freshwater	Prince Philip
	From Thorburn Road	0.000	354.000	329.000	657.000
	From Columbus Drive	438.000	0.000	334.000	1453.000
	From Connection to Freshwater	229.000	0.000	0.000	79.000
	From Prince Philip	241.000	688.000	52.000	0.000

Turning Proportions (PCE) - Prince Philip- Columbus- Thorburn (for whole period)

	To				
		Thorburn Road	Columbus Drive	Connection to Freshwater	Prince Philip
	From Thorburn Road	0.00	0.26	0.25	0.49
	From Columbus Drive	0.20	0.00	0.15	0.65
	From Connection to Freshwater	0.74	0.00	0.00	0.26
	From Prince Philip	0.25	0.70	0.05	0.00

Vehicle Mix

Average PCE Per Vehicle - Prince Philip- Columbus- Thorburn (for whole period)

	To				
		Thorburn Road	Columbus Drive	Connection to Freshwater	Prince Philip
	From Thorburn Road	1.000	1.000	1.000	1.000
	From Columbus Drive	1.000	1.000	1.000	1.000
	From Connection to Freshwater	1.000	1.000	1.000	1.000
	From Prince Philip	1.000	1.000	1.000	1.000

Truck Percentages - Prince Philip- Columbus- Thorburn (for whole period)

	To				
From		Thorburn Road	Columbus Drive	Connection to Freshwater	Prince Philip
	Thorburn Road	0.0	0.0	0.0	0.0
	Columbus Drive	0.0	0.0	0.0	0.0
	Connection to Freshwater	0.0	0.0	0.0	0.0
	Prince Philip	0.0	0.0	0.0	0.0

Results

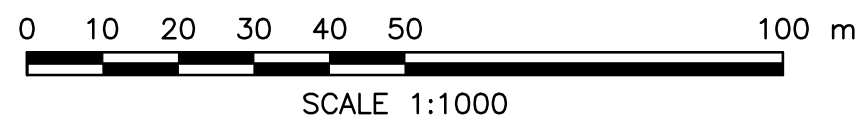
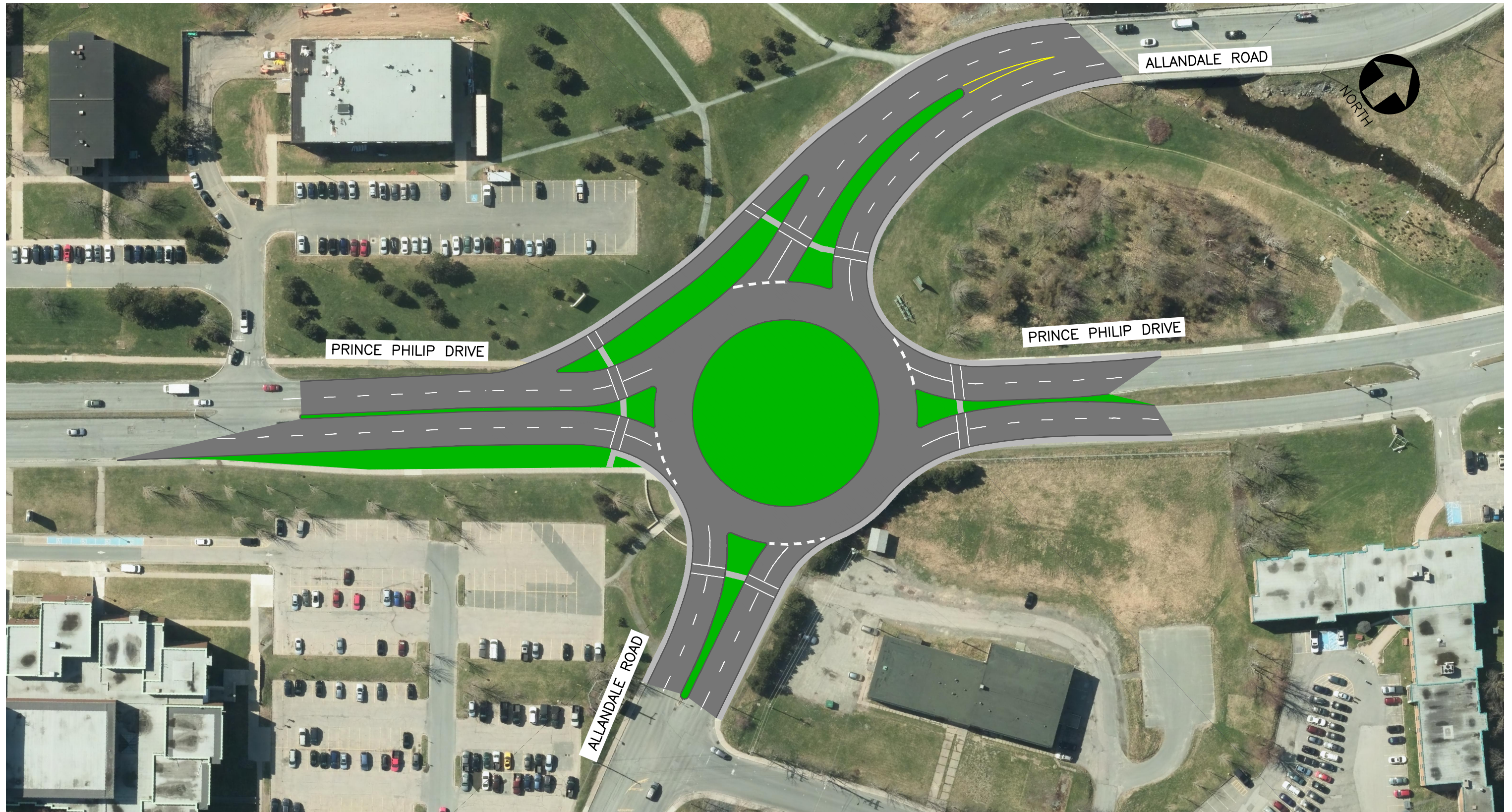
Results Summary for whole modelled period


Name	Max V/C Ratio	Max Delay (s)	Max Queue (PCE)	Max 95th percentile Queue (PCE)	Max LOS
Thorburn Road	0.75	7.46	3.01	4.00	A
Columbus Drive	0.90	15.57	8.57	31.00	C
Connection to Freshwater	0.49	10.17	0.94	2.00	B
Prince Philip	0.41	3.01	0.68	1.00	A

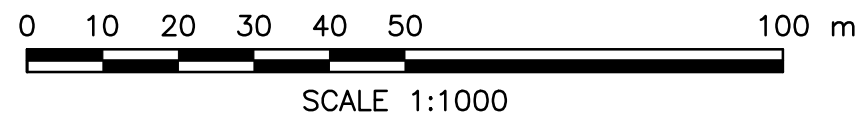
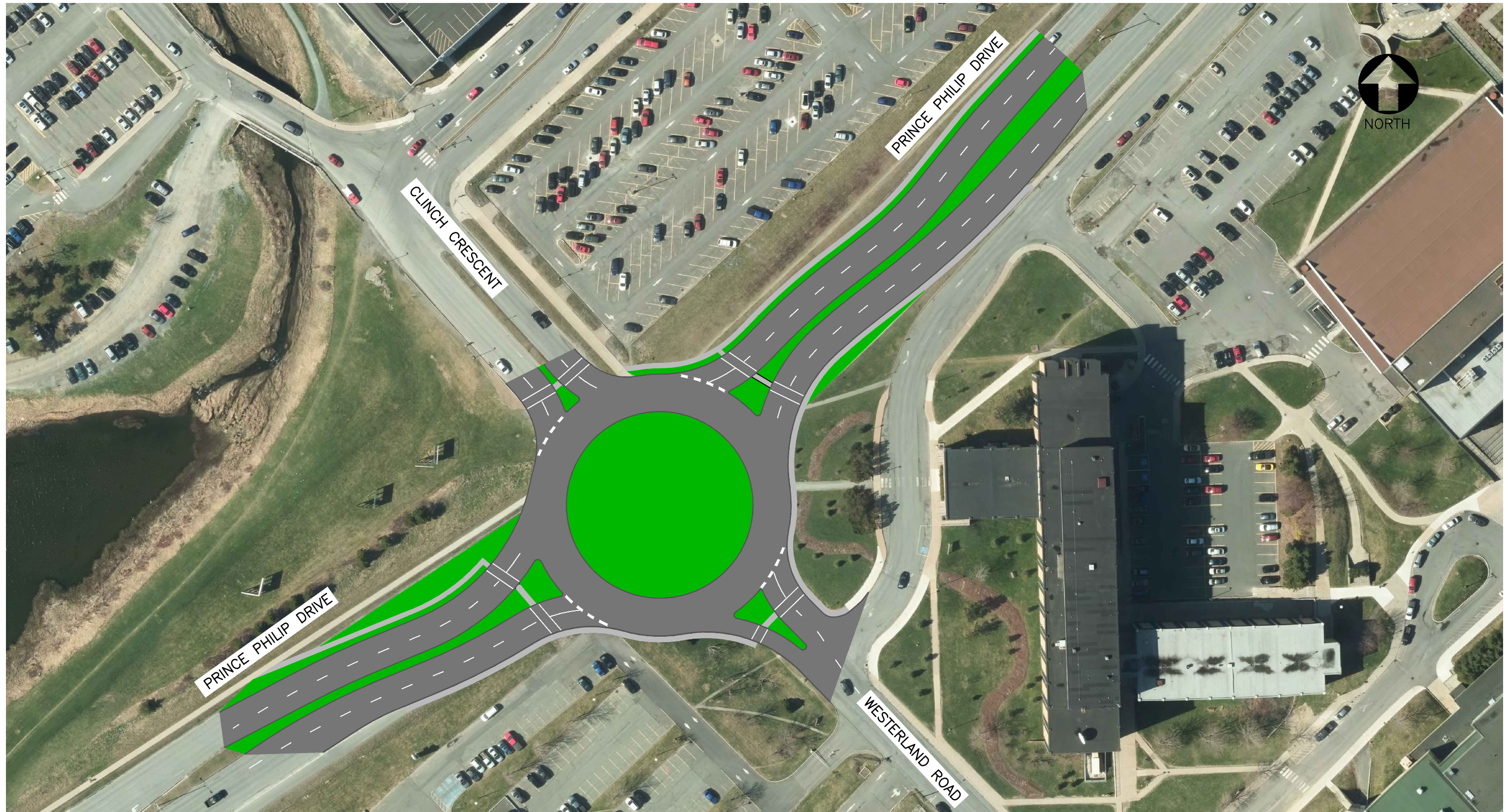



APPENDIX H

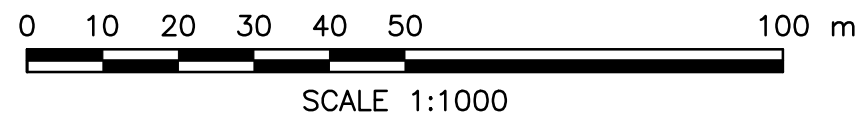
DETAILED ANALYSIS – IMPROVEMENT DRAWINGS




Scale 1:1000	Date MAY 2016	Drawn B. FORBES	Designed X. XXXX	Checked X. XXXX	Approved X. XXXX	Contract 14322
		14322 MUN AREA TRAFFIC STUDY PRINCE PHILIP DRIVE – ALLANDALE ROAD ROUNDABOUT CONCEPT PLAN			SKETCH No. SSK - 01	




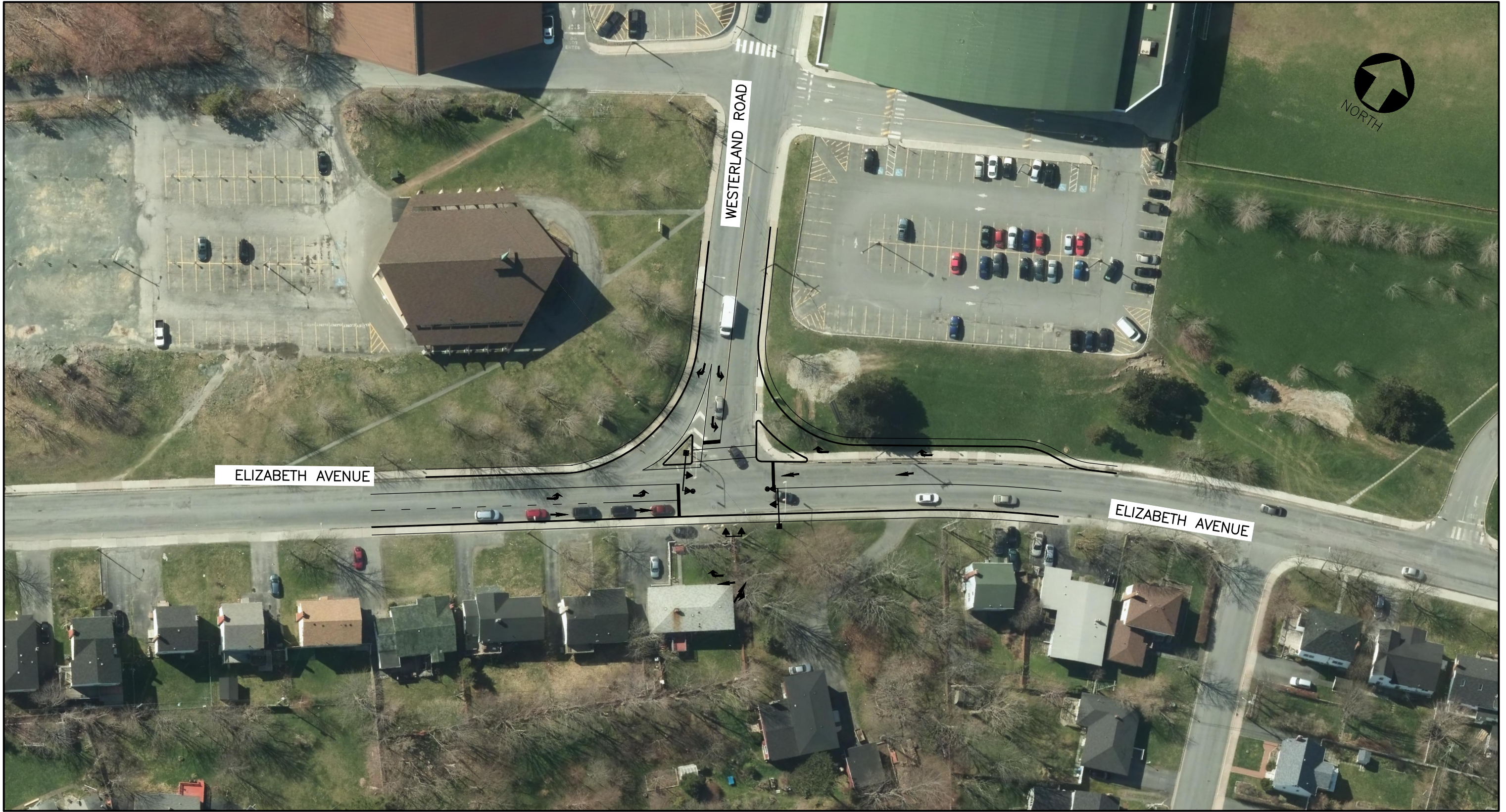
Scale 1:1000	Date MAY 2016	Drawn B. FORBES	Designed X. XXXX	Checked X. XXXX	Approved X. XXXX	Contract 14322
						SKETCH No. SSK - 02
14322 MUN AREA TRAFFIC STUDY PRINCE PHILIP DRIVE – CLINCH CRESCENT ROUNDBOUT CONCEPT PLAN						



Scale 1:1000	Date MAY 2016	Drawn K. MACDONALD	Designed X. XXXX	Checked X. XXXX	Approved X. XXXX	Contract 14322
		14322 MUN AREA TRAFFIC STUDY PRINCE PHILIP DRIVE – COLUMBUS DRIVE ROUNDBOUT CONCEPT PLAN			SKETCH No. SSK - 03	



Scale 1:750	Date MAY 2016	Drawn B. FORBES	Designed X. XXXX	Checked X. XXXX	Approved X. XXXX	Contract 14322
					14322 MUN AREA TRAFFIC STUDY ELIZABETH AVENUE – ALLENDALE ROAD INTERSECTION UPGRADE	
					SKETCH No. SSK - 04	



Scale	Date	Drawn	Designed	Checked	Approved	Contract
1:750	MAY 2016	B. FORBES	X. XXXX	X. XXXX	X. XXXX	14322



14322 MUN
AREA TRAFFIC STUDY
ELIZABETH AVENUE – WESTERLAND ROAD
INTERSECTION UPGRADE

SKETCH No.
SSK - 05

APPENDIX I

HIGH LEVEL SYNCHRO & SIMTRAFFIC ANALYSIS

		Scenario 1 - AM Peak Hour						
Intersection		Synchro				SimTraffic		
Street	Movement	Delay/Veh (s)	LOS	V/C	Queue (m) 95th%ile	Delay/Veh (s)	Equivalent LOS	Queue (m) 95th%ile
Columbus Drive/ Prince Philip Drive & Thorburn Road		50.1	D			71.1	E	
Columbus Drive/ Prince Philip Drive	Eastbound Left - Turn	27.8	C	0.73	55.9	69.3	E	236.0
	Eastbound Through	59.2	E	1.00	205.1	122.6	F	366.4
	Eastbound Right - Turn	6.6	A	0.26	18.6	14.9	B	341.0
	Westbound Left - Turn	65.2	E	0.83	45.2	35.1	D	37.7
	Westbound Through	50.2	D	0.52	58.7	31.9	C	45.6
	Westbound Right - Turn	21.0	C	0.46	44.0	3.7	A	3.6
Thorburn Road	Northbound Through	102.0	F	1.06	87.2	79.9	E	89.0
	Northbound Right - Turn					78.9	E	96.6
	Southbound Left - Turn	55.0	E	0.83	74.4	100.4	F	208.6
	Southbound Through	26.6	C	0.61	85.2	34.5	C	176.0
	Southbound Right - Turn					33.3	C	117.3
Prince Philip Drive & Wicklow Street		11.7	B			36.4	D	
Prince Philip Drive	Eastbound Left - Turn	7.4	A	0.06	1.8	54.1	D	34.6
	Eastbound Through	12.1	B	0.69	118.4	50.7	D	248.8
	Westbound Through	3.5	A	0.45	25.7	9.9	A	53.9
	Westbound Right - Turn					9.5	A	167.0
Wicklow Street	Southbound Left - Turn	57.0	E	0.70	56.3	53.2	D	56.4
	Southbound Right - Turn	11.6	B	0.18	9.2	9.3	A	36.3
Prince Philip Drive & Clinch Crescent		22.4	C			55.3	E	
Prince Philip Drive	Eastbound Left - Turn	39.1	D	0.85	194.2	52.6	D	178.6
	Eastbound Through	5.4	A	0.49	87.9	89.5	F	369.3
	Westbound Through	40.5	D	0.79	1.8	29.7	C	75.8
	Westbound Right - Turn	9.9	A	0.34	7.0	10.3	B	41.2
Clinch Crescent	Southbound Left - Turn	55.1	E	0.55	25.0	50.3	D	39.0
	Southbound Right - Turn	13.6	B	0.74	0.0	3.3	A	28.7
Prince Philip Drive & Clinch Crescent/ Westerland Road		141.5	F			191.6	F	
Prince Philip Drive	Eastbound Left - Turn	480.2	F	1.99	250.8	525.2	F	77.6
	Eastbound Through	28.5	C	0.56	60.8	115.6	F	691.0
	Eastbound Right - Turn	6.8	A	0.41	18.9	79.5	E	68.4
	Westbound Left - Turn	26.8	C	0.41	25.5	209.1	F	123.3
	Westbound Through	189.4	F	1.33	175.4	270.0	F	529.3
	Westbound Right - Turn					366.2	F	530.3
Clinch Crescent/ Westerland Road	Northbound Left - Turn	22.0	C	0.25	21.6	36.4	D	55.7
	Northbound Through	69.4	E	0.95	134.4	29.8	C	120.0
	Northbound Right - Turn	4.1	A	0.29	5.0	17.5	B	57.2
	Southbound Left - Turn	48.5	D	0.76	41.4	46.3	D	52.4
	Southbound Through	33.7	C	0.37	53.0	28.6	C	57.8
	Southbound Right - Turn	6.0	A	0.33	15.8	8.8	A	32.1
Clinch Crescent & Arctic Avenue		5.1	A			13.5	B	
Arctic Avenue	Westbound Left - Turn	48.1	E	0.55	21.7	58.8	F	74.2
	Westbound Right - Turn	14.9	B	0.01	0.1	8.3	A	2.6
Clinch Crescent	Northbound Through	0.0	-	0.51	0.0	2.6	A	33.6
	Northbound Right - Turn					9.1	A	70.5
	Southbound Left - Turn	1.8	A	0.05	1.3	30.7	D	72.5
	Southbound Through					10.6	B	
Prince Philip Drive & Morrissey Drive		7.1	A			27.8	C	
Prince Philip Drive	Eastbound Through	3.8	A	0.38	24.9	6.5	A	25.8
	Westbound Left - Turn	7.5	A	0.26	10.2	31.7	C	47.9
	Westbound Through	7.0	A	0.40	50.6	38.1	D	238.3
	Westbound Right - Turn	3.3	A	0.43	14.8	41.1	D	40.5
Morrissey Drive	Southbound Left - Turn	51.5	D	0.45	29.1	47.8	D	30.7
	Southbound Through	20.2	C	0.35	18.1	40.6	D	27.9
	Southbound Right - Turn					17.6	B	
Prince Philip Drive & Allandale Road		64.8	E			120.5	F	
Prince Philip Drive	Eastbound Left - Turn	51.2	D	0.88	103.8	28.6	C	77.8
	Eastbound Through	32.7	C	0.36	62.1	30.4	C	58.3
	Eastbound Right - Turn	16.0	B	0.42	49.7	7.2	A	45.8
	Westbound Left - Turn	26.0	C	0.58	39.5	156.2	F	87.8
	Westbound Through	71.7	E	0.99	149.4	197.8	F	449.7
	Westbound Right - Turn					202.2	F	451.6
Allandale Road	Northbound Left - Turn	326.3	F	1.61	1666.0	465.2	F	72.8
	Northbound Through	27.6	C	0.47	78.0	290.5	F	482.8
	Northbound Right - Turn	4.1	A	0.31	14.5	23.6	C	441.1
	Southbound Left - Turn	40.0	D	0.24	19.5	56.1	E	45.3
	Southbound Through	62.8	E	0.93	109.1	51.9	D	103.6

	Southbound Right - Turn	17.2	B	0.44	51.0	10.7	B	106.7
Prince Philip Drive & Confederation Building Lot		8.0	A			4.4	A	
Prince Philip Drive	Eastbound Left - Turn	37.0	D	0.15	8.1	30.5	C	12.1
	Eastbound Right - Turn	18.0	B	0.12	4.3	5.2	A	10.6
















Confederation Building Lot	Northbound Left - Turn	9.1	A	0.58	16.1	9.8	A	33.5
	Northbound Through	2.1	A	0.18	13.2	1.7	A	17.0
	Southbound Through	10.7	B	0.50	72.4	4.4	A	53.2
	Southbound Right - Turn	2.2	A	0.12	6.5	2.2	A	0.0
Bonaventure Avenue/ Allandale Road & Elizabeth Avenue		45.2	D			49.7	D	
Bonaventure Avenue/ Allandale Road	Eastbound Left - Turn	22.5	C	0.15	11.2	33.7	C	21.2
	Eastbound Through					10.5	B	
	Eastbound Right - Turn	34.5	C	0.46	68.7	6.8	A	46.4
	Westbound Left - Turn	22.7	C	0.17	14.4	22.3	C	30.4
	Westbound Through	39.6	D	0.65	101.5	28.1	C	86.5
	Westbound Right - Turn	0.3	A	0.09	0.0	1.9	A	0.0
Elizabeth Avenue	Northbound Left - Turn	44.6	D	0.64	62.8	151.5	F	73.7
	Northbound Through	92.9	F	1.08	286.9	129.0	F	249.4
	Northbound Right - Turn	1.5	A	0.13	3.3	109.1	F	43.6
	Southbound Left - Turn	22.2	C	0.32	12.7	38.3	D	32.1
	Southbound Through	26.3	C	0.62	129.1	19.1	B	164.6
	Southbound Right - Turn	3.0	A	0.31	13.6	14.7	B	200.3
Elizabeth Avenue & Westerland Road		37.6	D			11.1	B	
Elizabeth Avenue	Eastbound Left - Turn	91.3	F	1.12	92.0	16.3	B	40.9
	Eastbound Through	7.1	A	0.41	43.7	7.6	A	64.3
	Westbound Through					7.8	A	
	Westbound Right - Turn	14.7	B	0.59	78.0	11.9	B	66.9
Westerland Road	Southbound Left - Turn	45.1	D	0.65	46.0	34.2	C	43.3
	Southbound Right - Turn	9.1	A	0.41	14.3	4.1	A	10.5
Elizabeth Avenue & Anderson Avenue		5.9	A			3.7	A	
Elizabeth Avenue	Eastbound Through	0.0	-	0.52	0.0	1.2	A	
	Eastbound Right - Turn					0.5	A	
	Westbound Left - Turn	10.6	B	0.13	3.5	10.0	A	19.6
	Westbound Through	0.0	-	0.12	0.0	4.4	A	41.0
Anderson Avenue	Northbound Left - Turn	30.5	D	0.58	27.4	14.1	B	15.0
	Northbound Right - Turn					7.1	A	23.7
Elizabeth Avenue & Paton Street		1.3	A			3.0	A	
Elizabeth Avenue	Eastbound Left - Turn	8.0	A	0.03	0.6	5.6	A	10.6
	Eastbound Through	0.0	-	0.49	0.0	2.9	A	27.9
	Westbound Through					1.3	A	
	Westbound Right - Turn	0.0	-	0.17	0.0	1.0	A	14.2
Paton Street	Southbound Left - Turn	26.5	D	0.22	6.3	13.2	B	
	Southbound Right - Turn					6.0	A	14.7
Elizabeth Avenue & Freshwater Road		16.9	C			12.5	B	
Elizabeth Avenue	Westbound Right - Turn	17.6	C	0.44	16.7	6.6	A	22.4
Freshwater Road	Northbound Through	0.0	-	0.31	0.0	1.4	A	
	Northbound Right - Turn					4.1	A	8.0
	Southbound Left - Turn	34.5	D	0.92	106.8	21.3	C	37.3
	Southbound Through	0.0		0.24	0.0	13.9	B	122.2
Freshwater Road & Stamps Lane/ Oxen Pond Road		95.6	F			85.6	F	
Freshwater Road	Eastbound Through	180.0	F	1.33	385.1	153.0	F	365.8
	Eastbound Right - Turn	6.6	A	0.40	30.5	46.6	D	386.2
	Westbound Through					19.1	B	
	Westbound Right - Turn	23.3	C	0.68	130.8	15.2	B	100.8
Stamps Lane/ Oxen Pond Road	Northbound Left - Turn					25.3	C	
	Northbound Through	32.1	C	0.49	62.7	26.5	C	51.7
	Northbound Right - Turn					22.4	C	
	Southbound Left - Turn	19.8	B	0.04	4.8	25.5	C	10.3
	Southbound Through	19.0	B	0.18	18.6	19.5	B	27.3
	Southbound Right - Turn					10.6	B	
Freshwater Road & Thorburn Road		13.0	B			85.8	F	
Freshwater Road	Eastbound Through	20.2	C	0.83	71.0	213.4	F	173.5
	Westbound Through	10.4	B	0.28	16.8	10.5	B	47.1
	Westbound Right - Turn	38.0	A	0.53	12.2	9.2	A	36.7
Thorburn Road	Southbound Left - Turn	12.9	B	0.48	28.4	58.7	E	80.9
	Southbound Right - Turn	3.5	A	0.38	10.9	6.7	A	39.2
Allandale Road & Confederation Building Lot		6.6	A			4.6	A	
Confederation Building Lot	Westbound Left - Turn	30.8	C	0.04	3.1	27.1	C	10.5
	Westbound Right - Turn	13.1	B	0.10	4.3	4.9	A	10.7
Allandale Road	Northbound Through	9.7	A	0.22	49.3	5.6	A	32.8
	Northbound Right - Turn	2.5	A	0.19	13.1	3.4	A	6.6
	Southbound Left - Turn	5.1	A	0.16	17.5	5.4	A	20.2
	Southbound Through	5.8	A	0.43	100.0	4.0	A	65.8
Allandale Road & Higgins Line		10.5	B			9.1	A	
Higgins Line	Westbound Left - Turn	34.5	C	0.55	33.3	30.3	C	49.9
	Westbound Right - Turn	9.6	A	0.24	10.5	3.6	A	12.6
	Northbound Through	9.9	A	0.20	21.2	5.6	A	21.8

Allandale Road	Northbound Right - Turn	2.2	A	0.24	6.7	3.0	A	0.0
	Southbound Left - Turn	4.7	A	0.13	8.1	6.6	A	17.2
	Southbound Through	6.6	A	0.49	48.0	5.5	A	55.9
Allandale Road & Mt. Scio Road		19.5	B			15.7	B	
Allandale Road	Eastbound Left - Turn	12.2	B	0.41	24.3	16.1	B	31.6
	Eastbound Through	22.5	C	0.73	94.6	16.8	B	56.2
	Eastbound Right - Turn					9.3	A	61.8
	Westbound Left - Turn	10.1	B	0.14	5.4	20.1	C	10.3
	Westbound Through	20.3	C	0.41	31.2	20.8	C	33.8
	Westbound Right - Turn					3.9	A	31.8
Mt. Scio Road	Northbound Left - Turn	23.8	C	0.14	18.0	19.1	B	20.4
	Northbound Through					17.1	B	
	Northbound Right - Turn	1.9	A	0.08	0.7	2.1	A	9.8
	Southbound Left - Turn	26.4	C	0.36	41.7	20.0	B	41.1
	Southbound Through					19.1	B	
	Southbound Right - Turn	5.4	A	0.24	13.1	3.8	A	26.8
Outer Ring Road NB & Allandale Road		100.7	F			7.7	A	
Allandale Road	Eastbound Left - Turn	0.2	A	0.00	0.1	3.4	A	3.4
	Eastbound Through					1.2	A	
	Westbound Through	0.0	-	0.27	0.0	3.4	A	0.0
	Westbound Right - Turn	0.0	-	0.12	0.0	6.6	A	95.5
Outer Ring Road SB	Northbound Left - Turn	191.8	F	1.37	334.3	12.5	B	105.9
	Northbound Right - Turn	0.0	-	0.00	0.0	11.3	B	28.2
Outer Ring Road SB & Allandale Road		5.0	A			4.1	A	
Allandale Road	Eastbound Left - Turn	1.2	A	0.00	0.1	1.0	A	0.0
	Eastbound Through					0.4	A	0.0
	Westbound Through	0.0	-	0.22	0.0	2.5	A	0.0
	Westbound Right - Turn					3.6	A	
Outer Ring Road SB	Southbound Left - Turn	12.0	B	0.34	11.6	5.1	A	21.3
	Southbound Right - Turn	0.0	-	0.00	0.0	2.3	A	7.6

MUN Area Traffic Study
Allandale Road & Confederation Building Lot

Scenario 1 - 2025 AM

26/06/2015

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	 		 			 
Traffic Volume (vph)	13	17	485	216	108	1160
Future Volume (vph)	13	17	485	216	108	1160
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	4.0	4.8	4.0	3.5
Grade (%)	0%		0%			0%
Storage Length (m)	45.0	0.0		110.0	130.0	
Storage Lanes	1	1		1	1	
Taper Length (m)	2.5				2.5	
Lane Util. Factor	0.97	1.00	0.95	1.00	1.00	0.95
Ped Bike Factor						
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3395	1566	3697	1794	1848	3500
Flt Permitted	0.950				0.414	
Satd. Flow (perm)	3395	1566	3697	1794	805	3500
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		23		232		
Link Speed (k/h)	50		50			50
Link Distance (m)	100.1		513.4			163.6
Travel Time (s)	7.2		37.0			11.8
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.75	0.75	0.93	0.93	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Adj. Flow (vph)	17	23	522	232	115	1234
Shared Lane Traffic (%)						
Lane Group Flow (vph)	17	23	522	232	115	1234
Turn Type	Prot	Perm	NA	Perm	pm+pt	NA
Protected Phases	6		4		3	8
Permitted Phases		6		4	8	
Total Split (s)	41.0	41.0	40.0	40.0	29.0	69.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Act Effect Green (s)	11.1	11.1	55.7	55.7	68.8	71.4
Actuated g/C Ratio	0.13	0.13	0.64	0.64	0.80	0.83
v/c Ratio	0.04	0.10	0.22	0.19	0.16	0.43
Control Delay	30.8	13.1	9.7	2.5	5.1	5.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.8	13.1	9.7	2.5	5.1	5.8
LOS	C	B	A	A	A	A
Approach Delay	20.6		7.5			5.7
Approach LOS	C		A			A
Stops (vph)	12	6	203	17	28	341
Fuel Used(l)	1	0	37	14	4	43
CO Emissions (g/hr)	13	9	696	257	73	809



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
NOx Emissions (g/hr)	3	2	134	50	14	156
VOC Emissions (g/hr)	3	2	161	59	17	187
Dilemma Vehicles (#)	0	0	0	0	0	0
Queue Length 50th (m)	1.2	0.0	17.3	0.0	3.4	27.6
Queue Length 95th (m)	3.1	4.3	49.3	13.1	17.5	100.0
Internal Link Dist (m)	76.1		489.4			139.6
Turn Bay Length (m)	45.0			110.0	130.0	
Base Capacity (vph)	1392	655	2381	1238	921	2888
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	0.01	0.04	0.22	0.19	0.12	0.43

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 86.5

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.43

Intersection Signal Delay: 6.6

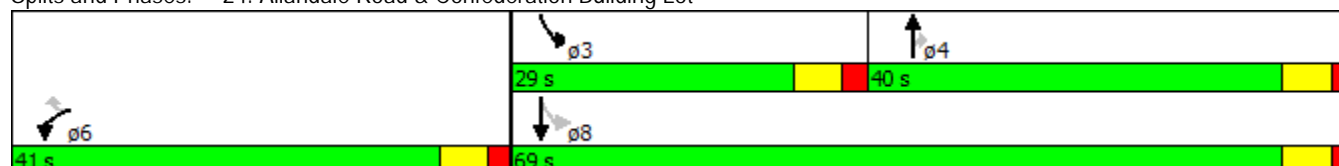
Intersection LOS: A
















Intersection Capacity Utilization 47.9%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 24: Allandale Road & Confederation Building Lot



						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	 		 			 
Traffic Volume (vph)	281	71	313	189	78	986
Future Volume (vph)	281	71	313	189	78	986
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	4.0	4.0	3.5	3.5	4.0	3.5
Grade (%)	0%		0%			0%
Storage Length (m)	0.0	40.0		80.0	80.0	
Storage Lanes	2	1		1	1	
Taper Length (m)	2.5				2.5	
Lane Util. Factor	0.97	1.00	0.95	1.00	1.00	0.95
Ped Bike Factor						
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3586	1654	3500	1566	1848	3500
Flt Permitted	0.950				0.458	
Satd. Flow (perm)	3586	1654	3500	1566	891	3500
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		77		236		
Link Speed (k/h)	50		50			60
Link Distance (m)	128.4		114.7			80.6
Travel Time (s)	9.2		8.3			4.8
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.80	0.80	0.83	0.83
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Adj. Flow (vph)	305	77	391	236	94	1188
Shared Lane Traffic (%)						
Lane Group Flow (vph)	305	77	391	236	94	1188
Turn Type	Prot	Perm	NA	Perm	pm+pt	NA
Protected Phases	6		4		3	8
Permitted Phases		6		4	8	
Total Split (s)	50.0	50.0	47.0	47.0	13.0	60.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Act Effect Green (s)	12.0	12.0	43.7	43.7	54.1	54.1
Actuated g/C Ratio	0.15	0.15	0.56	0.56	0.69	0.69
v/c Ratio	0.55	0.24	0.20	0.24	0.13	0.49
Control Delay	34.5	9.6	9.9	2.2	4.7	6.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.5	9.6	9.9	2.2	4.7	6.6
LOS	C	A	A	A	A	A
Approach Delay	29.5		7.0			6.5
Approach LOS	C		A			A
Stops (vph)	249	16	150	15	23	417
Fuel Used(l)	16	2	14	6	7	90
CO Emissions (g/hr)	306	33	261	105	124	1667



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
NOx Emissions (g/hr)	59	6	50	20	24	322
VOC Emissions (g/hr)	71	8	60	24	29	385
Dilemma Vehicles (#)	0	0	0	0	0	63
Queue Length 50th (m)	21.8	0.0	15.1	0.0	3.7	35.6
Queue Length 95th (m)	33.3	10.5	21.2	6.7	8.1	48.0
Internal Link Dist (m)	104.4		90.7			56.6
Turn Bay Length (m)		40.0		80.0	80.0	
Base Capacity (vph)	2022	966	1958	980	702	2422
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	0.15	0.08	0.20	0.24	0.13	0.49

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 78.1

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.55

Intersection Signal Delay: 10.5

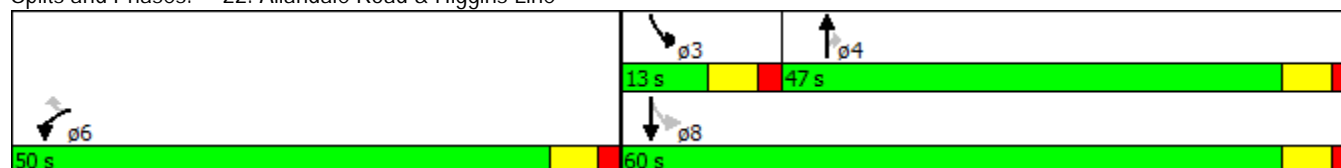
Intersection LOS: B

Intersection Capacity Utilization 45.6%

ICU Level of Service A

Analysis Period (min) 15





















Splits and Phases: 22: Allandale Road & Higgins Line















MUN Area Traffic Study
Allandale Road & Mt. Scio Road

Scenario 1 - 2025 AM

26/06/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	189	935	64	29	301	53	27	30	38	91	51	148
Future Volume (vph)	189	935	64	29	301	53	27	30	38	91	51	148
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.3	3.5	3.5	3.7	4.0	3.5	3.5	3.5	3.6	3.3	4.8
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	75.0		0.0	75.0		0.0	0.0		25.0	0.0		25.0
Storage Lanes	1		0	1		0	0		1	0		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.990			0.977				0.850			0.850
Flt Protected	0.950			0.950				0.977			0.969	
Satd. Flow (prot)	1750	3387	0	1750	3496	0	0	1800	1566	0	1745	1794
Flt Permitted	0.377			0.190				0.824			0.762	
Satd. Flow (perm)	694	3387	0	350	3496	0	0	1518	1566	0	1372	1794
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8			27				89			170
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		368.0			559.6			322.8			111.1	
Travel Time (s)		22.1			33.6			23.2			8.0	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.96	0.96	0.96	0.82	0.82	0.82	0.78	0.78	0.78	0.87	0.87	0.87
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	197	974	67	35	367	65	35	38	49	105	59	170
Shared Lane Traffic (%)												
Lane Group Flow (vph)	197	1041	0	35	432	0	0	73	49	0	164	170
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8			2		2	6		6
Total Split (s)	17.0	57.0		22.0	62.0		31.0	31.0	31.0	31.0	31.0	31.0
Total Lost Time (s)	6.0	6.0		6.0	6.0			6.0	6.0		6.0	6.0
Act Effect Green (s)	38.2	32.4		29.1	22.7			25.7	25.7		25.7	25.7
Actuated g/C Ratio	0.49	0.42		0.38	0.29			0.33	0.33		0.33	0.33
v/c Ratio	0.41	0.73		0.14	0.41			0.14	0.08		0.36	0.24
Control Delay	12.2	22.5		10.1	20.3			23.8	1.9		26.4	5.4
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	0.0
Total Delay	12.2	22.5		10.1	20.3			23.8	1.9		26.4	5.4
LOS	B	C		B	C			C	A		C	A
Approach Delay		20.9			19.6			15.0			15.7	
Approach LOS		C			B			B			B	
Stops (vph)	89	771		16	236			41	2		106	19
Fuel Used(l)	11	74		3	39			4	1		7	3
CO Emissions (g/hr)	199	1379		53	717			69	24		126	48

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	38	266		10	138			13	5		24	9
VOC Emissions (g/hr)	46	318		12	165			16	5		29	11
Dilemma Vehicles (#)	0	48		0	17			0	0		0	0
Queue Length 50th (m)	14.5	71.4		2.3	24.3			8.2	0.0		19.8	0.0
Queue Length 95th (m)	24.3	94.6		5.4	31.2			18.0	0.7		41.7	13.1
Internal Link Dist (m)		344.0			535.6			298.8			87.1	
Turn Bay Length (m)	75.0			75.0					25.0			25.0
Base Capacity (vph)	498	2306		473	2617			506	581		457	711
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	0.40	0.45		0.07	0.17			0.14	0.08		0.36	0.24

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 77.2

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 19.5







Intersection LOS: B

Intersection Capacity Utilization 60.6%

ICU Level of Service B

Analysis Period (min) 15
























Splits and Phases: 11: Mt. Scio Road & Allandale Road













		
31 s	22 s	57 s
		
31 s	17 s	62 s

MUN Area Traffic Study
Prince Philip Drive & Allandale Road

Scenario 1 - 2025 AM

26/06/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	323	428	304	193	739	59	339	318	217	43	608	521
Future Volume (vph)	323	428	304	193	739	59	339	318	217	43	608	521
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	3.8	3.8	3.0	3.7	3.7	3.5	3.5	3.5	3.0	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	200.0		120.0	65.0		25.0	70.0		0.0	42.0		35.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	0.95	0.88
Ped Bike Factor			0.98	1.00	1.00		1.00		0.98	1.00		
Frt			0.850		0.989				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1652	3618	1619	1652	3535	0	1750	1842	1566	1652	3500	2756
Flt Permitted	0.122			0.491			0.950			0.559		
Satd. Flow (perm)	212	3618	1593	852	3535	0	1747	1842	1541	970	3500	2756
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			320		7				228			99
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		455.9			851.6			464.8			121.6	
Travel Time (s)		32.8			61.3			33.5			8.8	
Confl. Peds. (#/hr)	3		2	2		2	2		2	2		2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.93	0.93	0.93	0.95	0.95	0.95	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	340	451	320	208	795	63	357	335	228	48	676	579
Shared Lane Traffic (%)												
Lane Group Flow (vph)	340	451	320	208	858	0	357	335	228	48	676	579
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Prot	NA	Perm	Perm	NA	pt+ov
Protected Phases	5	2		1	6		7	4			8	8 5
Permitted Phases	2		2	6					4	8		
Total Split (s)	30.0	45.0	45.0	16.0	31.0		20.0	49.0	49.0	29.0	29.0	
Total Lost Time (s)	6.0	7.0	7.0	6.0	7.0		6.0	6.0	6.0	6.0	6.0	
Act Effect Green (s)	54.9	38.2	38.2	37.5	26.7		14.0	43.0	43.0	23.0	23.0	50.3
Actuated g/C Ratio	0.50	0.35	0.35	0.34	0.24		0.13	0.39	0.39	0.21	0.21	0.46
v/c Ratio	0.88	0.36	0.42	0.58	0.99		1.61	0.47	0.31	0.24	0.93	0.44
Control Delay	51.2	32.7	16.0	26.0	71.7		326.3	27.6	4.1	40.0	62.8	17.2
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	51.2	32.7	16.0	26.0	71.7		326.3	27.6	4.1	40.0	62.8	17.2
LOS	D	C	B	C	E		F	C	A	D	E	B
Approach Delay		33.5			62.8			137.7			41.7	
Approach LOS		C			E			F			D	
Stops (vph)	292	357	151	147	652		245	231	20	36	550	279
Fuel Used(l)	33	37	20	28	145		106	26	11	5	78	45
CO Emissions (g/hr)	619	694	377	520	2691		1964	483	199	88	1458	830

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	119	134	73	100	519		379	93	38	17	281	160
VOC Emissions (g/hr)	143	160	87	120	621		453	111	46	20	336	191
Dilemma Vehicles (#)	0	0	0	0	0		0	0	0	0	0	0
Queue Length 50th (m)	66.8	42.5	34.0	24.6	~110.3		~110.0	52.7	0.0	8.6	75.4	36.2
Queue Length 95th (m)	#103.8	62.1	49.7	39.5	#149.4		#166.0	78.0	14.5	19.5	#109.1	51.0
Internal Link Dist (m)		431.9			827.6			440.8			97.6	
Turn Bay Length (m)	200.0		120.0	65.0			70.0			42.0		35.0
Base Capacity (vph)	420	1256	762	364	863		222	720	741	202	731	1350
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	0.81	0.36	0.42	0.57	0.99		1.61	0.47	0.31	0.24	0.92	0.43

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 8 (7%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.61

Intersection Signal Delay: 64.8

Intersection LOS: E

Intersection Capacity Utilization 96.6%

ICU Level of Service F

Analysis Period (min) 15

~ 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.


















Splits and Phases: 7: Allandale Road & Prince Philip Drive

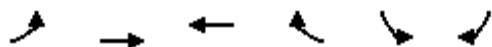






MUN Area Traffic Study
Allandale Road & TCH NB Ramp

Scenario 1 - 2025 AM

26/06/2015

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (veh/h)	5	265	0	0	334	143	3	0	923	0	0	0	
Future Volume (Veh/h)	5	265	0	0	334	143	3	0	923	0	0	0	
Sign Control		Free			Free			Stop			Stop		
Grade		0%			0%			0%			0%		
Peak Hour Factor	0.94	0.94	0.94	0.73	0.73	0.73	0.89	0.89	0.89	0.92	0.92	0.92	
Hourly flow rate (vph)	5	282	0	0	458	196	3	0	1037	0	0	0	
Pedestrians													
Lane Width (m)													
Walking Speed (m/s)													
Percent Blockage													
Right turn flare (veh)										3			
Median type	None				None								
Median storage (veh)													
Upstream signal (m)	368												
pX, platoon unblocked	0.92						0.92	0.92			0.92	0.92	0.92
vC, conflicting volume	458				282			750	750	282	750	750	458
vC1, stage 1 conf vol													
vC2, stage 2 conf vol													
vCu, unblocked vol	372				282			688	688	282	688	688	372
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 %	100				100			99	100	0	0	100	100
cM capacity (veh/h)	1096				1280			332	339	757	0	339	623
Direction, Lane #	EB 1	WB 1	WB 2	NB 1									
Volume Total	287	458	196	1040									
Volume Left	5	0	0	3									
Volume Right	0	0	196	1037									
cSH	1096	1700	1700	759									
Volume to Capacity	0.00	0.27	0.12	1.37									
Queue Length 95th (m)	0.1	0.0	0.0	334.3									
Control Delay (s)	0.2	0.0	0.0	191.8									
Lane LOS	A				F								
Approach Delay (s)	0.2	0.0			191.8								
Approach LOS					F								
Intersection Summary													
Average Delay				100.7									
Intersection Capacity Utilization				78.0%		ICU Level of Service				D			
Analysis Period (min)				15									


























Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	17	8	329	253	2
Future Volume (Veh/h)	3	17	8	329	253	2
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	0.92	0.92	0.95	0.95
Hourly flow rate (vph)	3	17	9	358	266	2
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						3
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	9				211	188
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	9				211	188
tC, single (s)	4.6				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.7				3.5	3.3
p0 queue free %	100				66	100
cM capacity (veh/h)	1347				776	854
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	20	367	268			
Volume Left	3	0	266			
Volume Right	0	358	2			
cSH	1347	1700	781			
Volume to Capacity	0.00	0.22	0.34			
Queue Length 95th (m)	0.1	0.0	11.6			
Control Delay (s)	1.2	0.0	12.0			
Lane LOS	A		B			
Approach Delay (s)	1.2	0.0	12.0			
Approach LOS			B			
Intersection Summary						
Average Delay			5.0			
Intersection Capacity Utilization			41.5%	ICU Level of Service	A	
Analysis Period (min)			15			

MUN Area Traffic Study
Bonaventure Avenue/ Allandale Road & Elizabeth Avenue

Scenario 1 - 2025 AM

27/08/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	32	189	37	46	321	44	143	701	81	44	492	251
Future Volume (vph)	32	189	37	46	321	44	143	701	81	44	492	251
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	3.5	3.7	3.0	3.5	3.7	3.0	3.4	3.4	3.0	3.4	3.4
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	55.0		0.0	55.0		0.0	55.0		35.0	40.0		0.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.975				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1652	1796	0	1652	1842	1601	1652	1821	1548	1652	1821	1548
Flt Permitted	0.301			0.449			0.362			0.078		
Satd. Flow (perm)	523	1796	0	781	1842	1601	629	1821	1548	136	1821	1548
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		9				136			136			279
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		335.6			298.1			241.6			464.8	
Travel Time (s)		24.2			21.5			17.4			33.5	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.83	0.83	0.83	0.78	0.78	0.78	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	39	228	45	59	412	56	159	779	90	49	547	279
Shared Lane Traffic (%)												
Lane Group Flow (vph)	39	273	0	59	412	56	159	779	90	49	547	279
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6			4		3	8	
Permitted Phases	2			6		6	4		4	8		8
Total Split (s)	13.5	43.0		13.0	42.5	42.5	51.0	51.0	51.0	13.0	64.0	64.0
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
Act Effect Green (s)	42.8	37.3		43.6	39.6	39.6	45.4	45.4	45.4	55.3	55.3	55.3
Actuated g/C Ratio	0.37	0.33		0.38	0.35	0.35	0.40	0.40	0.40	0.48	0.48	0.48
v/c Ratio	0.15	0.46		0.17	0.65	0.09	0.64	1.08	0.13	0.32	0.62	0.31
Control Delay	22.5	34.5		22.7	39.6	0.3	44.6	92.9	1.5	22.2	26.3	3.0
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	22.5	34.5		22.7	39.6	0.3	44.6	92.9	1.5	22.2	26.3	3.0
LOS	C	C		C	D	A	D	F	A	C	C	A
Approach Delay		33.0			33.5			77.4			18.6	
Approach LOS		C			C			E			B	
Stops (vph)	21	172		27	270	0	117	561	3	22	353	17
Fuel Used(l)	4	29		3	25	1	11	79	2	3	40	12
CO Emissions (g/hr)	70	545		50	464	23	201	1465	38	59	736	224

MUN Area Traffic Study
Bonaventure Avenue/ Allandale Road & Elizabeth Avenue

Scenario 1 - 2025 AM

27/08/2015



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	14	105		10	89	5	39	283	7	11	142	43
VOC Emissions (g/hr)	16	126		12	107	5	46	338	9	14	170	52
Dilemma Vehicles (#)	0	0		0	0	0	0	0	0	0	0	0
Queue Length 50th (m)	5.4	50.4		8.3	86.4	0.0	31.0	~214.4	0.0	6.0	92.5	0.0
Queue Length 95th (m)	11.2	68.7		14.4	101.5	0.0	#62.8	#286.9	3.3	12.7	129.1	13.6
Internal Link Dist (m)		311.6			274.1			217.6			440.8	
Turn Bay Length (m)	55.0			55.0			55.0		35.0	40.0		
Base Capacity (vph)	270	590		350	636	642	248	720	695	159	929	926
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	0.14	0.46		0.17	0.65	0.09	0.64	1.08	0.13	0.31	0.59	0.30

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 114.7

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.08

Intersection Signal Delay: 45.2

Intersection LOS: D

Intersection Capacity Utilization 80.5%

ICU Level of Service D

Analysis Period (min) 15

~ 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.

Splits and Phases: 10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue























13 s	43 s	13 s	51 s		
13.5 s	42.5 s	64 s			

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	173	2	455	771	20	315
Future Volume (Veh/h)	173	2	455	771	20	315
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	194	2	511	866	22	354
Pedestrians	97		97			97
Lane Width (m)	3.7		4.0			3.7
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	8		9			8
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)			105			
pX, platoon unblocked						
vC, conflicting volume	1103	705			1474	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1103	705			1474	
tC, single (s)	6.5	6.2			4.2	
tC, 2 stage (s)						
tF (s)	3.6	3.3			2.3	
p0 queue free %	0	99			95	
cM capacity (veh/h)	176	367			403	
Direction, Lane #	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total	97	97	2	511	866	376
Volume Left	97	97	0	0	0	22
Volume Right	0	0	2	0	866	0
cSH	176	176	367	1700	1700	403
Volume to Capacity	0.55	0.55	0.01	0.30	0.51	0.05
Queue Length 95th (m)	21.7	21.7	0.1	0.0	0.0	1.3
Control Delay (s)	48.1	48.1	14.9	0.0	0.0	1.8
Lane LOS	E	E	B			A
Approach Delay (s)	47.8			0.0		1.8
Approach LOS	E					
Intersection Summary						
Average Delay			5.1			
Intersection Capacity Utilization			78.0%		ICU Level of Service	D
Analysis Period (min)			15			













MUN Area Traffic Study
Prince Philip Drive & Thorburn Road

Scenario 1 - 2025 AM

26/06/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	276	1287	179	119	631	263	0	339	79	502	505	274
Future Volume (vph)	276	1287	179	119	631	263	0	339	79	502	505	274
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.8	4.2	3.5	3.8	4.0	2.4	3.8	4.3	3.5	3.8	3.8
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	175.0		0.0	110.0		90.0	0.0		0.0	150.0		150.0
Storage Lanes	1		1	1		0	0		0	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.95	0.95	0.97	0.95	0.95
Ped Bike Factor	1.00		0.98			0.98		1.00		1.00	0.99	
Frt			0.850			0.850		0.972			0.947	
Flt Protected	0.950			0.950						0.950		
Satd. Flow (prot)	1750	3618	1689	1750	5198	1654	0	3505	0	3395	3407	0
Flt Permitted	0.218			0.123						0.950		
Satd. Flow (perm)	401	3618	1663	227	5198	1628	0	3505	0	3386	3407	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			159			329		21			104	
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		327.2			152.5			152.8			386.6	
Travel Time (s)		16.8			7.8			11.0			27.8	
Confl. Peds. (#/hr)	2		2	2		2	2		2	2		2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.93	0.93	0.93	0.80	0.80	0.80	0.83	0.83	0.83	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	297	1384	192	149	789	329	0	408	95	528	532	288
Shared Lane Traffic (%)												
Lane Group Flow (vph)	297	1384	192	149	789	329	0	503	0	528	820	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm		NA		Prot	NA	
Protected Phases	5	2		1	6			4		3	8	
Permitted Phases	2		2	6		6						
Total Split (s)	28.0	49.0	49.0	13.0	34.0	34.0		20.0		28.0	48.0	
Total Lost Time (s)	6.0	7.0	7.0	6.0	7.0	7.0		7.0		6.0	7.0	
Act Effect Green (s)	55.7	42.0	42.0	40.4	32.4	32.4		14.4		20.6	41.0	
Actuated g/C Ratio	0.51	0.38	0.38	0.37	0.29	0.29		0.13		0.19	0.37	
v/c Ratio	0.73	1.00	0.26	0.83	0.52	0.46		1.06		0.83	0.61	
Control Delay	27.8	59.2	6.6	65.2	50.2	21.0		102.0		55.0	26.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Total Delay	27.8	59.2	6.6	65.2	50.2	21.0		102.0		55.0	26.6	
LOS	C	E	A	E	D	C		F		E	C	
Approach Delay		48.8			44.4			102.0			37.7	
Approach LOS		D			D			F			D	
Stops (vph)	160	1143	30	97	554	146		322		469	543	
Fuel Used(l)	20	143	7	16	79	23		49		50	57	
CO Emissions (g/hr)	377	2663	130	297	1473	435		908		934	1055	

Synchro 9 Report

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	73	514	25	57	284	84		175		180	204	
VOC Emissions (g/hr)	87	614	30	69	340	100		209		215	243	
Dilemma Vehicles (#)	0	55	0	0	22	0		0		0	0	
Queue Length 50th (m)	36.3	~155.0	4.4	26.6	60.8	32.7		~65.5		55.8	65.0	
Queue Length 95th (m)	55.9	#205.1	18.6	#45.2	58.7	44.0		#87.2		74.4	85.2	
Internal Link Dist (m)		303.2			128.5			128.8			362.6	
Turn Bay Length (m)	175.0			110.0		90.0				150.0		
Base Capacity (vph)	473	1381	733	180	1530	711		476		679	1335	
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	0.63	1.00	0.26	0.83	0.52	0.46		1.06		0.78	0.61	

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 28 (25%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.06

Intersection Signal Delay: 50.1

Intersection LOS: D

Intersection Capacity Utilization 90.1%

ICU Level of Service E

Analysis Period (min) 15

~ 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.





Splits and Phases: 37: Thorburn Road & Prince Philip Drive

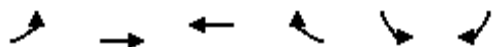


						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	690	68	88	189	39	171
Future Volume (Veh/h)	690	68	88	189	39	171
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.90	0.90	0.85	0.85
Hourly flow rate (vph)	812	80	98	210	46	201
Pedestrians				2	17	
Lane Width (m)				3.7	3.7	
Walking Speed (m/s)				1.2	1.2	
Percent Blockage				0	1	
Right turn flare (veh)						13
Median type	None			None		
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			909		1275	871
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			909		1275	871
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			87		71	42
cM capacity (veh/h)			738		157	345
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	892	98	210	247		
Volume Left	0	98	0	46		
Volume Right	80	0	0	201		
cSH	1700	738	1700	424		
Volume to Capacity	0.52	0.13	0.12	0.58		
Queue Length 95th (m)	0.0	3.5	0.0	27.4		
Control Delay (s)	0.0	10.6	0.0	30.5		
Lane LOS		B		D		
Approach Delay (s)	0.0	3.4		30.5		
Approach LOS				D		
Intersection Summary						
Average Delay			5.9			
Intersection Capacity Utilization			59.4%	ICU Level of Service	B	
Analysis Period (min)			15			

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	208	391	26	797	364
Future Volume (Veh/h)	0	208	391	26	797	364
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.94	0.94	0.80	0.80	0.91	0.91
Hourly flow rate (vph)	0	221	489	33	876	400
Pedestrians	49					
Lane Width (m)	4.5					
Walking Speed (m/s)	1.2					
Percent Blockage	5					
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)						274
pX, platoon unblocked						
vC, conflicting volume	2706	554			571	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2706	554			571	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	56			8	
cM capacity (veh/h)	2	504			950	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	221	522	876	400		
Volume Left	0	0	876	0		
Volume Right	221	33	0	0		
cSH	504	1700	950	1700		
Volume to Capacity	0.44	0.31	0.92	0.24		
Queue Length 95th (m)	16.7	0.0	106.8	0.0		
Control Delay (s)	17.6	0.0	34.5	0.0		
Lane LOS	C		D			
Approach Delay (s)	17.6	0.0	23.7			
Approach LOS	C					
Intersection Summary						
Average Delay		16.9				
Intersection Capacity Utilization		73.1%		ICU Level of Service		D
Analysis Period (min)		15				



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	28	731	190	37	27	11
Future Volume (Veh/h)	28	731	190	37	27	11
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.87	0.87	0.81	0.81	0.80	0.80
Hourly flow rate (vph)	32	840	235	46	34	14
Pedestrians		81	70		23	
Lane Width (m)		3.0	3.7		4.5	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		6	6		2	
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	304				1255	362
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	304				1255	362
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				80	98
cM capacity (veh/h)	1227				169	629
Direction, Lane #	EB 1	EB 2	WB 1	SB 1		
Volume Total	32	840	281	48		
Volume Left	32	0	0	34		
Volume Right	0	0	46	14		
cSH	1227	1700	1700	215		
Volume to Capacity	0.03	0.49	0.17	0.22		
Queue Length 95th (m)	0.6	0.0	0.0	6.3		
Control Delay (s)	8.0	0.0	0.0	26.5		
Lane LOS	A			D		
Approach Delay (s)	0.3		0.0	26.5		
Approach LOS				D		
Intersection Summary						
Average Delay			1.3			
Intersection Capacity Utilization			57.8%	ICU Level of Service		B
Analysis Period (min)			15			



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	444	394	149	327	156	136
Future Volume (vph)	444	394	149	327	156	136
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	2.8	3.0	3.6	3.7	3.4	3.4
Grade (%)		0%	0%		0%	
Storage Length (m)	35.0			0.0	0.0	70.0
Storage Lanes	1			0	1	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.907			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1612	1739	1690	0	1730	1548
Flt Permitted	0.283				0.950	
Satd. Flow (perm)	480	1739	1690	0	1730	1548
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			161			155
Link Speed (k/h)		50	50		50	
Link Distance (m)		402.3	566.1		375.0	
Travel Time (s)		29.0	40.8		27.0	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.78	0.78	0.90	0.90	0.88	0.88
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	569	505	166	363	177	155
Shared Lane Traffic (%)						
Lane Group Flow (vph)	569	505	529	0	177	155
Turn Type	pm+pt	NA	NA		Prot	Perm
Protected Phases	5	2	6		8	
Permitted Phases	2					8
Total Split (s)	19.0	66.0	47.0		24.0	24.0
Total Lost Time (s)	6.0	6.0	6.0		6.0	6.0
Act Effect Green (s)	60.1	60.1	41.1		13.6	13.6
Actuated g/C Ratio	0.70	0.70	0.48		0.16	0.16
v/c Ratio	1.12	0.41	0.59		0.65	0.41
Control Delay	91.3	7.1	14.7		45.1	9.1
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	91.3	7.1	14.7		45.1	9.1
LOS	F	A	B		D	A
Approach Delay		51.7	14.7		28.3	
Approach LOS		D	B		C	
Stops (vph)	164	157	244		140	22
Fuel Used(l)	52	21	52		14	6
CO Emissions (g/hr)	964	386	960		262	117



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
NOx Emissions (g/hr)	186	74	185		51	23
VOC Emissions (g/hr)	222	89	221		61	27
Dilemma Vehicles (#)	0	0	0		0	0
Queue Length 50th (m)	~50.5	29.9	41.1		27.5	0.0
Queue Length 95th (m)	#92.0	43.7	78.0		46.0	14.3
Internal Link Dist (m)		378.3	542.1		351.0	
Turn Bay Length (m)	35.0					70.0
Base Capacity (vph)	508	1219	893		364	447
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	1.12	0.41	0.59		0.49	0.35

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 85.7

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.12

Intersection Signal Delay: 37.6

Intersection LOS: D

Intersection Capacity Utilization 76.2%

ICU Level of Service D

Analysis Period (min) 15

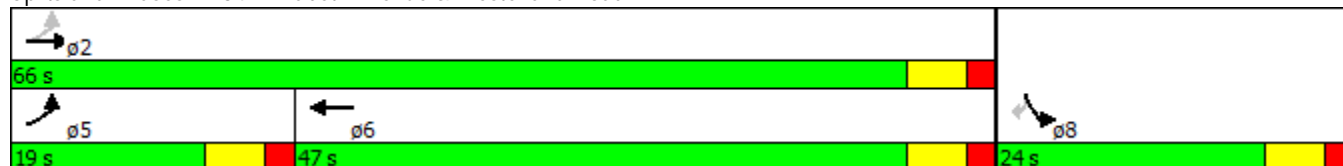
~ Volume exceeds capacity, queue is theoretically infinite.

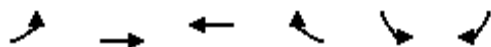
Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

Splits and Phases: 34: Elizabeth Avenue & Westerland Road





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑	↑	↑↑	↑
Traffic Volume (vph)	0	1056	328	419	540	263
Future Volume (vph)	0	1056	328	419	540	263
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.7	3.7	3.7	3.7	3.7	3.7
Grade (%)		0%	0%		0%	
Storage Length (m)	0.0			30.0	0.0	0.0
Storage Lanes	0			1	2	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Ped Bike Factor						
Frt				0.850		0.850
Flt Protected					0.950	
Satd. Flow (prot)	0	3579	3579	1601	3471	1601
Flt Permitted					0.950	
Satd. Flow (perm)	0	3579	3579	1601	3471	1601
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				476		289
Link Speed (k/h)		50	50		50	
Link Distance (m)		173.6	374.8		70.3	
Travel Time (s)		12.5	27.0		5.1	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.94	0.94	0.88	0.88	0.91	0.91
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	0	1123	373	476	593	289
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1123	373	476	593	289
Turn Type		NA	NA	Perm	Prot	Perm
Protected Phases		4	8		6	
Permitted Phases				8		6
Total Split (s)		23.0	23.0	23.0	22.0	22.0
Total Lost Time (s)		6.0	6.0	6.0	6.0	6.0
Act Effect Green (s)		17.0	17.0	17.0	16.0	16.0
Actuated g/C Ratio		0.38	0.38	0.38	0.36	0.36
v/c Ratio		0.83	0.28	0.53	0.48	0.38
Control Delay		20.2	10.4	3.8	12.9	3.5
Queue Delay		0.0	0.0	0.0	0.0	0.0
Total Delay		20.2	10.4	3.8	12.9	3.5
LOS		C	B	A	B	A
Approach Delay		20.2	6.7		9.8	
Approach LOS		C	A		A	
Stops (vph)		852	208	49	388	35
Fuel Used(l)		53	19	17	25	7
CO Emissions (g/hr)		984	353	321	474	131



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
NOx Emissions (g/hr)		190	68	62	92	25
VOC Emissions (g/hr)		227	81	74	109	30
Dilemma Vehicles (#)		0	0	0	0	0
Queue Length 50th (m)		40.1	10.1	0.0	17.9	0.0
Queue Length 95th (m)		#71.0	16.8	12.2	28.4	10.9
Internal Link Dist (m)		149.6	350.8		46.3	
Turn Bay Length (m)				30.0		
Base Capacity (vph)		1352	1352	901	1234	755
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		0.83	0.28	0.53	0.48	0.38

Intersection Summary

Area Type: Other

Cycle Length: 45

Actuated Cycle Length: 45

Offset: 22 (49%), Referenced to phase 4:EBT and 8:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 13.0

Intersection LOS: B

Intersection Capacity Utilization 54.6%

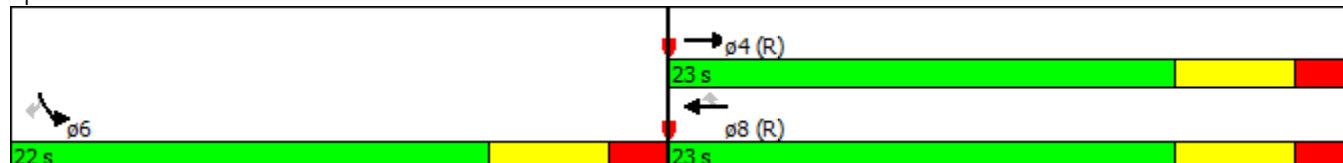
ICU Level of Service A

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.
























Splits and Phases: 47: Freshwater Road & Thorburn Road



MUN Area Traffic Study
Prince Philip Drive & Westerland Road/ Clinch Crescent

Scenario 1 - 2025 AM













26/06/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	540	696	264	84	696	300	82	385	104	137	179	171
Future Volume (vph)	540	696	264	84	696	300	82	385	104	137	179	171
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	4.0	3.5	3.5	3.5	3.5	3.0	3.0	3.5	3.3	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	75.0		185.0	90.0		0.0	60.0		45.0	0.0		80.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.89	0.97	1.00		1.00		0.72			0.98
Frt			0.850		0.955				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1750	3697	1566	1750	3327	0	1652	1739	1566	1711	1842	1566
Flt Permitted	0.105			0.306			0.583			0.165		
Satd. Flow (perm)	193	3697	1394	548	3327	0	1011	1739	1125	297	1842	1541
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			278		62				159			186
Link Speed (k/h)		70			50			50			50	
Link Distance (m)		591.3			489.3			375.0			105.3	
Travel Time (s)		30.4			35.2			27.0			7.6	
Confl. Peds. (#/hr)	2		30	30		2	2		150	150		2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.74	0.74	0.74	0.82	0.82	0.82	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	568	733	278	114	941	405	100	470	127	149	195	186
Shared Lane Traffic (%)												
Lane Group Flow (vph)	568	733	278	114	1346	0	100	470	127	149	195	186
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2		2	6			4		4	8		8
Total Split (s)	19.0	45.0	45.0	13.0	39.0		13.0	39.0	39.0	13.0	39.0	39.0
Total Lost Time (s)	6.0	7.0	7.0	6.0	7.0		6.0	7.0	7.0	6.0	7.0	7.0
Act Effect Green (s)	52.7	38.7	38.7	40.0	32.0		39.3	31.3	31.3	39.3	31.3	31.3
Actuated g/C Ratio	0.48	0.35	0.35	0.36	0.29		0.36	0.28	0.28	0.36	0.28	0.28
v/c Ratio	1.99	0.56	0.41	0.41	1.33		0.25	0.95	0.29	0.76	0.37	0.33
Control Delay	480.2	28.5	6.8	26.8	189.4		22.0	69.4	4.1	48.5	33.7	6.0
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	480.2	28.5	6.8	26.8	189.4		22.0	69.4	4.1	48.5	33.7	6.0
LOS	F	C	A	C	F		C	E	A	D	C	A
Approach Delay		187.2			176.7			50.7			28.1	
Approach LOS		F			F			D			C	
Stops (vph)	414	555	49	69	683		52	339	7	88	140	20
Fuel Used(l)	244	73	16	7	207		5	42	4	8	10	3
CO Emissions (g/hr)	4534	1361	302	134	3846		102	779	78	157	178	55

MUN Area Traffic Study
Prince Philip Drive & Westerland Road/ Clinch Crescent

Scenario 1 - 2025 AM

26/06/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	875	263	58	26	742		20	150	15	30	34	11
VOC Emissions (g/hr)	1046	314	70	31	887		23	180	18	36	41	13
Dilemma Vehicles (#)	0	11	0	0	0		0	0	0	0	0	0
Queue Length 50th (m)	~180.9	69.3	9.5	13.0	~184.0		13.0	97.9	0.0	20.0	33.2	0.0
Queue Length 95th (m)	#250.8	60.8	18.9	25.5	#175.4		21.6	#134.4	5.0	#41.4	53.0	15.8
Internal Link Dist (m)		567.3			465.3			351.0			81.3	
Turn Bay Length (m)	75.0		185.0	90.0			60.0		45.0			80.0
Base Capacity (vph)	286	1300	670	275	1011		402	505	440	195	535	580
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	1.99	0.56	0.41	0.41	1.33		0.25	0.93	0.29	0.76	0.36	0.32

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.99

Intersection Signal Delay: 141.5

Intersection LOS: F

Intersection Capacity Utilization 108.3%

ICU Level of Service G

Analysis Period (min) 15

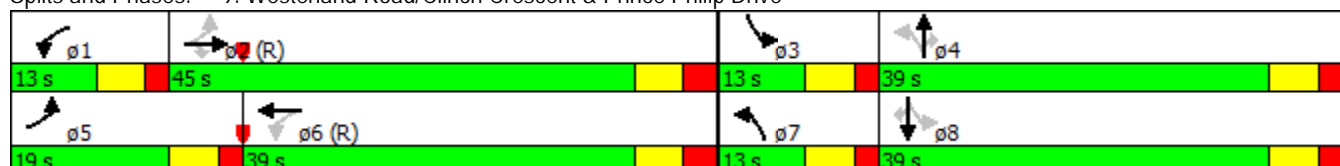
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

Splits and Phases: 9: Westerland Road/Clinch Crescent & Prince Philip Drive





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	635	1335	762	186	69	242
Future Volume (vph)	635	1335	762	186	69	242
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	4.0	4.0	3.7	3.3	3.5
Grade (%)		0%	0%		0%	
Storage Length (m)	140.0			70.0	80.0	0.0
Storage Lanes	1			1	1	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Ped Bike Factor				0.97	1.00	0.98
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1652	3697	3697	1601	1711	1566
Flt Permitted	0.119				0.950	
Satd. Flow (perm)	207	3697	3697	1559	1704	1541
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				202		390
Link Speed (k/h)		70	70		50	
Link Distance (m)		289.0	591.3		280.3	
Travel Time (s)		14.9	30.4		20.2	
Confl. Peds. (#/hr)	2			2	2	2
Confl. Bikes (#/hr)						
Peak Hour Factor	0.96	0.96	0.92	0.92	0.62	0.62
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	661	1391	828	202	111	390
Shared Lane Traffic (%)						
Lane Group Flow (vph)	661	1391	828	202	111	390
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	5	2	6		8	
Permitted Phases	2			6		8
Total Split (s)	45.0	79.0	34.0	34.0	31.0	31.0
Total Lost Time (s)	6.0	7.0	7.0	7.0	6.0	6.0
Act Effect Green (s)	85.0	84.0	31.2	31.2	13.0	13.0
Actuated g/C Ratio	0.77	0.76	0.28	0.28	0.12	0.12
v/c Ratio	0.85	0.49	0.79	0.34	0.55	0.74
Control Delay	39.1	5.4	40.5	9.9	55.1	13.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.1	5.4	40.5	9.9	55.1	13.6
LOS	D	A	D	A	E	B
Approach Delay		16.3	34.5		22.8	
Approach LOS		B	C		C	
Stops (vph)	668	550	510	93	62	28
Fuel Used(l)	63	61	83	14	6	10
CO Emissions (g/hr)	1179	1137	1541	269	114	179



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
NOx Emissions (g/hr)	228	219	297	52	22	34
VOC Emissions (g/hr)	272	262	355	62	26	41
Dilemma Vehicles (#)	0	21	89	0	0	0
Queue Length 50th (m)	124.4	54.1	59.6	8.6	22.9	0.0
Queue Length 95th (m)	#194.2	87.9	m51.8	m7.0	25.0	0.0
Internal Link Dist (m)		265.0	567.3		256.3	
Turn Bay Length (m)	140.0			70.0	80.0	
Base Capacity (vph)	775	2823	1047	586	388	651
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	0.85	0.49	0.79	0.34	0.29	0.60

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 20 (18%), Referenced to phase 2:EBTL and 6:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 22.4

Intersection LOS: C

Intersection Capacity Utilization 78.5%

ICU Level of Service D

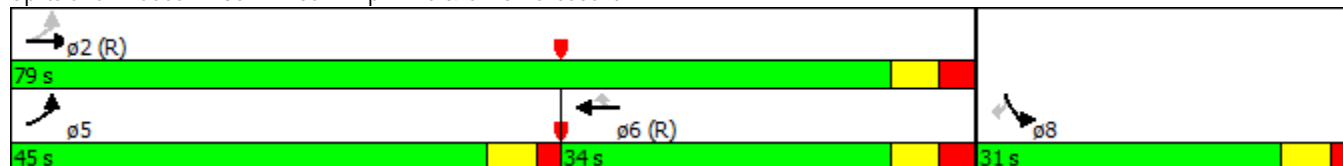
Analysis Period (min) 15

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.

Splits and Phases: 35: Prince Philip Drive & Clinch Crescent



MUN Area Traffic Study
Prince Philip Drive & Confederation Building Lot

Scenario 1 - 2025 AM

26/06/2015



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	16	13	212	476	978	112
Future Volume (vph)	16	13	212	476	978	112
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	4.0	3.5	4.0	3.7	4.0
Grade (%)	0%			0%	0%	
Storage Length (m)	0.0	0.0	75.0			100.0
Storage Lanes	1	1	1			1
Taper Length (m)	2.5		2.5			
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Ped Bike Factor						
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1750	1654	1750	3697	3579	1654
Flt Permitted	0.950		0.181			
Satd. Flow (perm)	1750	1654	333	3697	3579	1654
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		18				129
Link Speed (k/h)	50			50	50	
Link Distance (m)	119.9			283.2	155.8	
Travel Time (s)	8.6			20.4	11.2	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.74	0.74	0.81	0.81	0.87	0.87
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	22	18	262	588	1124	129
Shared Lane Traffic (%)						
Lane Group Flow (vph)	22	18	262	588	1124	129
Turn Type	Prot	Perm	pm+pt	NA	NA	Perm
Protected Phases	8		5	2	6	
Permitted Phases		8	2			6
Total Split (s)	31.0	31.0	18.0	69.0	51.0	51.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Act Effect Green (s)	6.5	6.5	64.7	67.3	48.8	48.8
Actuated g/C Ratio	0.08	0.08	0.83	0.86	0.62	0.62
v/c Ratio	0.15	0.12	0.58	0.18	0.50	0.12
Control Delay	37.0	18.0	9.1	2.1	10.7	2.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	37.0	18.0	9.1	2.1	10.7	2.2
LOS	D	B	A	A	B	A
Approach Delay	28.4			4.3	9.8	
Approach LOS	C			A	A	
Stops (vph)	17	7	51	82	520	10
Fuel Used(l)	1	0	25	54	34	2
CO Emissions (g/hr)	19	9	474	1003	636	38



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
NOx Emissions (g/hr)	4	2	92	194	123	7
VOC Emissions (g/hr)	4	2	109	231	147	9
Dilemma Vehicles (#)	0	0	0	0	0	0
Queue Length 50th (m)	3.2	0.0	8.1	9.6	54.2	0.0
Queue Length 95th (m)	8.1	4.3	16.1	13.2	72.4	6.5
Internal Link Dist (m)	95.9			259.2	131.8	
Turn Bay Length (m)			75.0			100.0
Base Capacity (vph)	561	543	493	3179	2232	1080
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	0.04	0.03	0.53	0.18	0.50	0.12

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 78.3

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.58

Intersection Signal Delay: 8.0

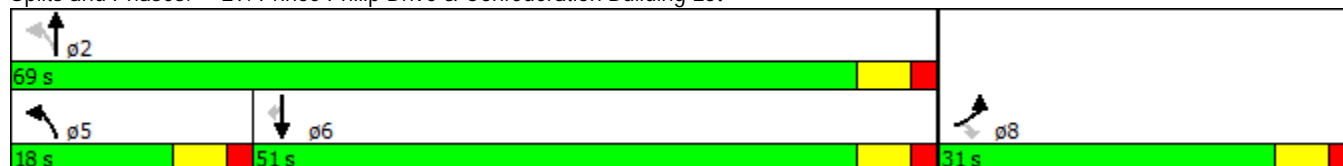
Intersection LOS: A

Intersection Capacity Utilization 57.1%

ICU Level of Service B

Analysis Period (min) 15













Splits and Phases: 29: Prince Philip Drive & Confederation Building Lot















MUN Area Traffic Study
Prince Philip Drive & Morrissey Drive

Scenario 1 - 2025 AM

26/06/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↰	↑↑	↱				↰	↱	
Traffic Volume (vph)	0	937	0	92	1026	480	0	0	0	73	30	55
Future Volume (vph)	0	937	0	92	1026	480	0	0	0	73	30	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.8	3.8	3.7	3.7	3.8	3.5	3.7	3.7	3.7	3.5	3.7	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	0.0		0.0	70.0		30.0	0.0		0.0	40.0		0.0
Storage Lanes	0		0	1		1	0		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
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	1.00
Ped Bike Factor				1.00		0.95				0.95	0.96	
Frt						0.850					0.903	
Flt Protected				0.950						0.950		
Satd. Flow (prot)	0	3618	0	1789	3618	1566	0	0	0	1750	1632	0
Flt Permitted				0.263						0.950		
Satd. Flow (perm)	0	3618	0	495	3618	1488	0	0	0	1670	1632	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						368					67	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		489.3			455.9			119.6			292.8	
Travel Time (s)		35.2			32.8			8.6			21.1	
Confl. Peds. (#/hr)	2		2	3		10				25		25
Confl. Bikes (#/hr)												
Peak Hour Factor	0.91	0.91	0.92	0.93	0.93	0.93	0.92	0.92	0.92	0.82	0.82	0.82
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	1030	0	99	1103	516	0	0	0	89	37	67
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1030	0	99	1103	516	0	0	0	89	104	0
Turn Type		NA		Perm	NA	Perm				custom	NA	
Protected Phases		2			6							4
Permitted Phases				6		6				8		
Total Split (s)		54.0		74.0	74.0	74.0				36.0	20.0	
Total Lost Time (s)		7.0		7.0	7.0	7.0				7.0	4.0	
Act Effect Green (s)		83.1		83.1	83.1	83.1				12.9	15.9	
Actuated g/C Ratio		0.76		0.76	0.76	0.76				0.12	0.14	
v/c Ratio		0.38		0.26	0.40	0.43				0.45	0.35	
Control Delay		3.8		7.5	7.0	3.3				51.5	20.2	
Queue Delay		0.0		0.0	0.0	0.0				0.0	0.0	
Total Delay		3.8		7.5	7.0	3.3				51.5	20.2	
LOS		A		A	A	A				D	C	
Approach Delay		3.8			5.9						34.6	
Approach LOS		A			A						C	
Stops (vph)		178		33	390	124				65	30	
Fuel Used(l)		50		5	59	25				6	4	
CO Emissions (g/hr)		936		98	1092	461				119	81	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)		181		19	211	89				23	16	
VOC Emissions (g/hr)		216		23	252	106				27	19	
Dilemma Vehicles (#)		0		0	0	0				0	0	
Queue Length 50th (m)		17.0		6.9	48.1	10.7				18.4	7.2	
Queue Length 95th (m)		24.9		m10.2	m50.6	m14.8				29.1	18.1	
Internal Link Dist (m)		465.3			431.9			95.6			268.8	
Turn Bay Length (m)				70.0		30.0				40.0		
Base Capacity (vph)		2732		374	2732	1214				440	522	
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		0.38		0.26	0.40	0.43				0.20	0.20	

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 8 (7%), Referenced to phase 2:EBT and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.45

Intersection Signal Delay: 7.1

Intersection LOS: A

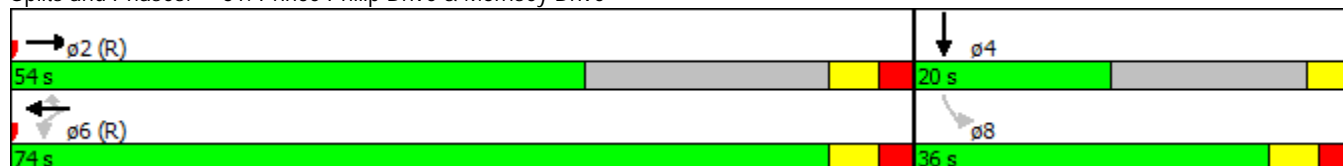
Intersection Capacity Utilization 57.9%

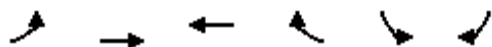
ICU Level of Service B

Analysis Period (min) 15

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

Splits and Phases: 61: Prince Philip Drive & Morrissey Drive





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	19	1806	950	53	165	44
Future Volume (vph)	19	1806	950	53	165	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	4.0	4.0	4.0	3.0	3.0
Grade (%)		0%	0%		0%	
Storage Length (m)	50.0			0.0	60.0	0.0
Storage Lanes	1			0	1	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	0.95	0.95	0.95	1.00	1.00
Ped Bike Factor			1.00		1.00	0.98
Frt			0.992			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1652	3697	3662	0	1652	1478
Flt Permitted	0.194				0.950	
Satd. Flow (perm)	337	3697	3662	0	1646	1455
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			7			50
Link Speed (k/h)		70	70		50	
Link Distance (m)		204.4	289.0		276.1	
Travel Time (s)		10.5	14.9		19.9	
Confl. Peds. (#/hr)	2			2	2	2
Confl. Bikes (#/hr)						
Peak Hour Factor	0.97	0.97	0.90	0.90	0.88	0.88
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	20	1862	1056	59	188	50
Shared Lane Traffic (%)						
Lane Group Flow (vph)	20	1862	1115	0	188	50
Turn Type	pm+pt	NA	NA		Prot	Perm
Protected Phases	5	2	6		8	
Permitted Phases	2					8
Total Split (s)	13.0	72.0	59.0		38.0	38.0
Total Lost Time (s)	6.0	6.0	6.0		6.0	6.0
Act Effect Green (s)	80.1	80.1	75.2		17.9	17.9
Actuated g/C Ratio	0.73	0.73	0.68		0.16	0.16
v/c Ratio	0.06	0.69	0.45		0.70	0.18
Control Delay	7.4	12.1	3.5		57.0	11.6
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	7.4	12.1	3.5		57.0	11.6
LOS	A	B	A		E	B
Approach Delay		12.0	3.5		47.5	
Approach LOS		B	A		D	
Stops (vph)	7	851	136		152	10
Fuel Used(l)	1	141	32		15	2
CO Emissions (g/hr)	25	2629	601		279	33



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
NOx Emissions (g/hr)	5	507	116		54	6
VOC Emissions (g/hr)	6	606	139		64	8
Dilemma Vehicles (#)	0	147	26		0	0
Queue Length 50th (m)	1.3	109.1	10.3		38.6	0.0
Queue Length 95th (m)	m1.8	m118.4	25.7		56.3	9.2
Internal Link Dist (m)		180.4	265.0		252.1	
Turn Bay Length (m)	50.0				60.0	
Base Capacity (vph)	329	2693	2505		480	458
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	0.06	0.69	0.45		0.39	0.11

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 20 (18%), Referenced to phase 2:EBTL and 6:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.70

Intersection Signal Delay: 11.7

Intersection LOS: B

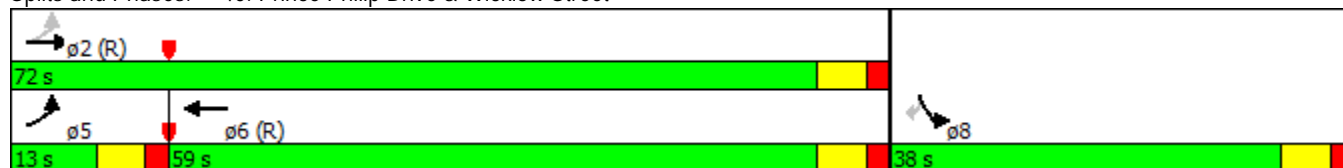
Intersection Capacity Utilization 69.4%

ICU Level of Service C

Analysis Period (min) 15

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



















Splits and Phases: 40: Prince Philip Drive & Wicklow Street



MUN Area Traffic Study
Freshwater Road & Stamps Lane/ Oxen Pond Road

Scenario 1 - 2025 AM













26/06/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1112	323	0	564	35	72	96	37	11	65	16
Future Volume (vph)	0	1112	323	0	564	35	72	96	37	11	65	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	4.0	4.0	4.0	3.0	3.0	3.0	2.6	2.9	2.9
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	0.0		0.0	0.0		0.0	0.0		0.0	30.0		0.0
Storage Lanes	0		1	0		0	0		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt			0.850		0.992			0.976			0.970	
Flt Protected								0.983		0.950		
Satd. Flow (prot)	0	1842	1566	0	1912	0	0	1660	0	1528	1559	0
Flt Permitted								0.846		0.525		
Satd. Flow (perm)	0	1842	1566	0	1912	0	0	1429	0	844	1559	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			230		4			10			14	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		374.8			273.7			376.6			148.1	
Travel Time (s)		27.0			19.7			27.1			10.7	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.91	0.91	0.91	0.92	0.92	0.92	0.88	0.88	0.88	0.73	0.73	0.73
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	3%	2%	2%	3%	2%	5%	10%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	1222	355	0	613	38	82	109	42	15	89	22
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1222	355	0	651	0	0	233	0	15	111	0
Turn Type		NA	Perm		NA		Perm	NA		pm+pt	NA	
Protected Phases		8			4			2		1	6	
Permitted Phases			8				2			6		
Total Split (s)		56.0	56.0		56.0		30.0	30.0		14.0	44.0	
Total Lost Time (s)		6.0	6.0		6.0			6.0		6.0	6.0	
Act Effect Green (s)		50.0	50.0		50.0			32.7		38.0	38.0	
Actuated g/C Ratio		0.50	0.50		0.50			0.33		0.38	0.38	
v/c Ratio		1.33	0.40		0.68			0.49		0.04	0.18	
Control Delay		180.0	6.6		23.3			32.1		19.8	19.0	
Queue Delay		0.0	0.0		0.0			0.0		0.0	0.0	
Total Delay		180.0	6.6		23.3			32.1		19.8	19.0	
LOS		F	A		C			C		B	B	
Approach Delay		140.9			23.3			32.1			19.1	
Approach LOS		F			C			C			B	
Stops (vph)		870	71		440			161		7	46	
Fuel Used(l)		213	15		36			16		0	3	
CO Emissions (g/hr)		3963	274		673			298		9	62	

MUN Area Traffic Study
Freshwater Road & Stamps Lane/ Oxen Pond Road

Scenario 1 - 2025 AM

26/06/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)		765	53		130			57		2	12	
VOC Emissions (g/hr)		914	63		155			69		2	14	
Dilemma Vehicles (#)		0	0		0			0		0	0	
Queue Length 50th (m)		~308.8	12.6		91.0			31.4		1.8	12.2	
Queue Length 95th (m)		#385.1	30.5		130.8			62.7		4.8	18.6	
Internal Link Dist (m)		350.8			249.7			352.6			124.1	
Turn Bay Length (m)										30.0		
Base Capacity (vph)		921	898		958			474		375	601	
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		1.33	0.40		0.68			0.49		0.04	0.18	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.33

Intersection Signal Delay: 95.6

Intersection LOS: F

Intersection Capacity Utilization 86.5%

ICU Level of Service E

Analysis Period (min) 15






~ 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.

Splits and Phases: 46: Stamps Lane/Oxen Pond Road & Freshwater Road

 p1	 p2	 p4
14 s	30 s	56 s
 p6	 p8	
44 s	56 s	

Summary of All Intervals

Run Number	1	10	2	3	4	5	6
Start Time	6:30	6:30	6:30	6:30	6:30	6:30	6:30
End Time	8:00	8:00	8:00	8:00	8:00	8:00	8:00
Total Time (min)	90	90	90	90	90	90	90
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	5	5	5	5	5	5	5
# of Recorded Intervals	4	4	4	4	4	4	4
Vehs Entered	10425	10803	10832	10629	10360	10717	10789
Vehs Exited	10074	10440	10503	10211	10072	10259	10339
Starting Vehs	988	919	882	870	925	903	820
Ending Vehs	1339	1282	1211	1288	1213	1361	1270
Travel Distance (km)	18791	19148	19755	19161	18798	19236	19258
Travel Time (hr)	1693.9	1651.9	1661.0	1638.2	1827.9	1709.8	1510.8
Total Delay (hr)	1321.3	1271.8	1269.9	1259.0	1455.8	1329.0	1130.0
Total Stops	30854	31854	29423	30096	31931	31531	31272
Fuel Used (l)	2644.8	2622.6	2687.8	2617.4	2760.8	2680.1	2527.2

Summary of All Intervals

Run Number	7	8	9	Avg
Start Time	6:30	6:30	6:30	6:30
End Time	8:00	8:00	8:00	8:00
Total Time (min)	90	90	90	90
Time Recorded (min)	60	60	60	60
# of Intervals	5	5	5	5
# of Recorded Intervals	4	4	4	4
Vehs Entered	10886	10610	10722	10676
Vehs Exited	10576	10341	10454	10326
Starting Vehs	938	960	857	898
Ending Vehs	1248	1229	1125	1253
Travel Distance (km)	19579	18995	19241	19196
Travel Time (hr)	1698.6	1823.9	1552.2	1676.8
Total Delay (hr)	1311.4	1446.2	1171.6	1296.6
Total Stops	31173	32277	29931	31036
Fuel Used (l)	2695.1	2770.5	2558.6	2656.5

Interval #0 Information Seeding

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

Interval #1 Information Recording #1

Start Time	7:00
End Time	7:15
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	2524	2578	2584	2578	2526	2554	2612
Vehs Exited	2552	2564	2563	2540	2426	2531	2520
Starting Vehs	988	919	882	870	925	903	820
Ending Vehs	960	933	903	908	1025	926	912
Travel Distance (km)	4822	4756	4906	4845	4739	4848	4837
Travel Time (hr)	281.1	278.9	289.3	285.2	308.7	286.2	268.0
Total Delay (hr)	186.2	184.6	192.0	189.5	215.3	190.8	172.5
Total Stops	6947	6754	6678	6536	7027	6720	6813
Fuel Used (l)	550.2	542.4	563.7	553.3	570.1	555.4	545.1

Interval #1 Information Recording #1

Start Time	7:00
End Time	7:15
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	2614	2741	2599	2589
Vehs Exited	2562	2656	2537	2544
Starting Vehs	938	960	857	898
Ending Vehs	990	1045	919	942
Travel Distance (km)	4911	4992	4820	4848
Travel Time (hr)	295.9	302.5	275.1	287.1
Total Delay (hr)	198.8	203.8	180.1	191.4
Total Stops	6757	7462	6619	6829
Fuel Used (l)	565.3	578.7	548.0	557.2

Interval #2 Information Recording #2

Start Time	7:15
End Time	7:30
Total Time (min)	15
Volumes adjusted by PHF, Growth Factors.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	3089	3144	3084	3047	3022	3147	3096
Vehs Exited	2798	2874	2801	2781	2770	2814	2872
Starting Vehs	960	933	903	908	1025	926	912
Ending Vehs	1251	1203	1186	1174	1277	1259	1136
Travel Distance (km)	5176	5110	5197	5159	4976	5173	5083
Travel Time (hr)	390.1	373.5	387.3	377.6	421.5	390.0	347.7
Total Delay (hr)	287.3	272.2	284.5	275.6	322.7	287.5	246.9
Total Stops	8428	8417	7747	7965	8529	8072	7782
Fuel Used (l)	664.7	646.6	666.5	654.9	679.6	665.6	624.0

Interval #2 Information Recording #2

Start Time	7:15
End Time	7:30
Total Time (min)	15
Volumes adjusted by PHF, Growth Factors.	

Run Number	7	8	9	Avg
Vehs Entered	3054	3086	3141	3095
Vehs Exited	2854	2834	2964	2834
Starting Vehs	990	1045	919	942
Ending Vehs	1190	1297	1096	1206
Travel Distance (km)	5116	4949	5291	5123
Travel Time (hr)	402.4	406.9	366.1	386.3
Total Delay (hr)	301.1	308.1	261.1	284.7
Total Stops	7803	8534	7745	8104
Fuel Used (l)	671.6	659.2	653.8	658.6

Interval #3 Information Recording #3

Start Time	7:30
End Time	7:45
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	2392	2622	2608	2496	2348	2535	2508
Vehs Exited	2402	2550	2667	2509	2483	2488	2495
Starting Vehs	1251	1203	1186	1174	1277	1259	1136
Ending Vehs	1241	1275	1127	1161	1142	1306	1149
Travel Distance (km)	4396	4779	4981	4587	4558	4668	4746
Travel Time (hr)	467.6	464.4	472.8	444.9	516.8	484.8	410.9
Total Delay (hr)	380.4	369.8	374.0	354.1	426.9	392.2	317.0
Total Stops	7706	8590	7574	7471	8105	8310	8335
Fuel Used (l)	676.1	695.8	723.2	669.7	729.7	706.4	651.1

Interval #3 Information Recording #3

Start Time	7:30
End Time	7:45
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	2577	2392	2501	2497
Vehs Exited	2634	2417	2519	2514
Starting Vehs	1190	1297	1096	1206
Ending Vehs	1133	1272	1078	1180
Travel Distance (km)	4834	4488	4525	4656
Travel Time (hr)	479.6	509.9	426.9	467.9
Total Delay (hr)	384.0	420.4	337.2	375.6
Total Stops	8252	8146	7462	7999
Fuel Used (l)	716.1	721.1	653.3	694.2

Interval #4 Information Recording #4

Start Time	7:45
End Time	8:00
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	2420	2459	2556	2508	2464	2481	2573
Vehs Exited	2322	2452	2472	2381	2393	2426	2452
Starting Vehs	1241	1275	1127	1161	1142	1306	1149
Ending Vehs	1339	1282	1211	1288	1213	1361	1270
Travel Distance (km)	4397	4502	4671	4570	4525	4547	4592
Travel Time (hr)	555.1	535.1	511.6	530.4	580.8	548.9	484.2
Total Delay (hr)	467.4	445.2	419.4	439.8	491.0	458.6	393.5
Total Stops	7773	8093	7424	8124	8270	8429	8342
Fuel Used (l)	753.9	737.8	734.4	739.6	781.4	752.7	707.0

Interval #4 Information Recording #4

Start Time	7:45
End Time	8:00
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	2641	2391	2481	2488
Vehs Exited	2526	2434	2434	2430
Starting Vehs	1133	1272	1078	1180
Ending Vehs	1248	1229	1125	1253
Travel Distance (km)	4719	4566	4606	4569
Travel Time (hr)	520.8	604.7	484.1	535.6
Total Delay (hr)	427.5	513.9	393.2	444.9
Total Stops	8361	8135	8105	8101
Fuel Used (l)	742.0	811.4	703.5	746.4

1: Allandale Road & TCH NB Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.9	0.9
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	2.3	3.5	1.9
Total Delay (hr)	0.0	0.1	0.3	0.2	0.0	2.9	3.5
Total Del/Veh (s)	3.4	1.2	3.4	6.6	12.5	11.3	7.7
Stop Delay (hr)	0.0	0.0	0.0	0.0	0.0	1.1	1.1
Stop Del/Veh (s)	1.5	0.2	0.3	0.8	5.5	4.1	2.5

7: Allandale Road & Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.2	0.0	22.8	21.5	15.5	0.0	0.0	0.0
Denied Del/Veh (s)	0.2	0.0	0.3	0.5	0.8	0.5	289.6	300.1	300.7	0.0	0.1	0.1
Total Delay (hr)	2.2	3.2	0.6	8.5	44.5	3.5	35.4	19.4	1.1	0.7	9.1	1.5
Total Del/Veh (s)	28.6	30.5	7.2	156.2	197.8	202.2	465.2	290.5	23.6	56.1	51.9	10.7
Stop Delay (hr)	1.8	2.5	0.1	7.4	40.6	3.3	34.2	18.4	0.7	0.6	7.9	0.9
Stop Del/Veh (s)	22.4	24.5	1.8	137.1	180.3	189.9	449.6	276.2	16.1	50.8	45.4	6.2

7: Allandale Road & Prince Philip Drive Performance by movement

Movement	All
Denied Delay (hr)	60.1
Denied Del/Veh (s)	56.3
Total Delay (hr)	129.6
Total Del/Veh (s)	120.5
Stop Delay (hr)	118.6
Stop Del/Veh (s)	110.2

9: Westerland Road/Clinch Crescent & Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	16.3	21.9	9.6	1.6	19.5	8.6	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	124.0	126.9	143.1	80.7	99.9	113.4	0.0	0.0	0.0	0.1	0.0	0.0
Total Delay (hr)	71.0	18.8	5.0	4.3	53.8	29.4	0.7	4.4	0.5	1.8	1.6	0.4
Total Del/Veh (s)	525.2	115.6	79.5	209.1	270.0	366.2	36.4	29.8	17.5	46.3	28.6	8.8
Stop Delay (hr)	70.5	8.2	2.0	3.8	49.9	29.0	0.6	3.6	0.3	1.7	1.4	0.4
Stop Del/Veh (s)	521.1	50.2	32.0	187.2	250.2	361.4	30.4	24.4	13.2	43.4	24.9	7.5

9: Westerland Road/Clinch Crescent & Prince Philip Drive Performance by movement

Movement	All
Denied Delay (hr)	77.4
Denied Del/Veh (s)	77.6
Total Delay (hr)	191.9
Total Del/Veh (s)	191.6
Stop Delay (hr)	171.5
Stop Del/Veh (s)	171.2

10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	19.1	91.1	10.8	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	3.4	0.4	0.2	449.0	453.8	456.4	0.0	0.0	0.0
Total Delay (hr)	0.3	1.2	0.1	0.3	2.5	0.0	5.1	20.4	2.0	0.5	4.2	1.0
Total Del/Veh (s)	33.7	10.5	6.8	22.3	28.1	1.9	151.5	129.0	109.1	38.3	19.1	14.7
Stop Delay (hr)	0.2	0.9	0.0	0.2	2.0	0.0	4.5	17.3	1.7	0.3	2.5	0.6
Stop Del/Veh (s)	30.0	8.2	3.8	18.2	22.6	0.0	134.2	109.5	92.0	27.5	11.3	9.1

10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue Performance by movement

Movement	All
Denied Delay (hr)	121.1
Denied Del/Veh (s)	150.1
Total Delay (hr)	37.6
Total Del/Veh (s)	49.7
Stop Delay (hr)	30.5
Stop Del/Veh (s)	40.3

11: Mt. Scio Road & Allandale Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Denied Del/Veh (s)	0.1	0.0	0.0	0.0	0.0	0.0	0.3	0.3	4.0	0.6	0.7	3.7
Total Delay (hr)	0.8	4.4	0.2	0.1	1.5	0.1	0.1	0.1	0.0	0.5	0.3	0.2
Total Del/Veh (s)	16.1	16.8	9.3	20.1	20.8	3.9	19.1	17.1	2.1	20.0	19.1	3.8
Stop Delay (hr)	0.6	2.5	0.1	0.1	1.2	0.0	0.1	0.1	0.0	0.4	0.2	0.0
Stop Del/Veh (s)	10.7	9.4	3.4	17.1	15.9	0.5	16.7	14.0	0.1	16.7	15.0	1.0

11: Mt. Scio Road & Allandale Road Performance by movement

Movement	All
Denied Delay (hr)	0.2
Denied Del/Veh (s)	0.4
Total Delay (hr)	8.4
Total Del/Veh (s)	15.7
Stop Delay (hr)	5.3
Stop Del/Veh (s)	10.0

17: Allandale Road & TCH SB Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.1	1.3	0.1
Total Delay (hr)	0.0	0.0	0.0	0.3	0.4	0.0	0.7
Total Del/Veh (s)	1.0	0.4	2.5	3.6	5.1	2.3	4.1
Stop Delay (hr)	0.0	0.0	0.0	0.0	0.2	0.0	0.2
Stop Del/Veh (s)	0.0	0.0	0.0	0.0	2.5	0.6	1.1

18: TCH SB Performance by movement

Movement	NBT	SBT	All
Denied Delay (hr)	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.2	0.1
Total Delay (hr)	0.4	0.0	0.4
Total Del/Veh (s)	4.8	0.1	3.1
Stop Delay (hr)	0.0	0.0	0.0
Stop Del/Veh (s)	0.0	0.0	0.0

22: Allandale Road & Higgins Line Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.1	0.0	0.0	0.0	0.0	0.1
Denied Del/Veh (s)	0.2	3.5	0.0	0.0	0.0	0.0	0.2
Total Delay (hr)	2.5	0.1	0.4	0.1	0.1	1.5	4.8
Total Del/Veh (s)	30.3	3.6	5.6	3.0	6.6	5.5	9.1
Stop Delay (hr)	2.2	0.0	0.3	0.0	0.1	0.8	3.4
Stop Del/Veh (s)	26.7	0.3	4.0	0.0	4.5	2.9	6.5

24: Allandale Road & Confederation Building Lot Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.2	0.1	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	0.1	0.0	0.6	0.2	0.2	1.3	2.4
Total Del/Veh (s)	27.1	4.9	5.6	3.4	5.4	4.0	4.6
Stop Delay (hr)	0.1	0.0	0.4	0.0	0.1	0.7	1.3
Stop Del/Veh (s)	25.3	4.9	3.4	0.1	3.2	2.0	2.4

29: Prince Philip Drive & Confederation Building Lot Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.1	0.1	0.2
Denied Del/Veh (s)	0.1	0.1	0.2	0.0	0.2	2.5	0.3
Total Delay (hr)	0.1	0.0	0.5	0.2	1.2	0.1	2.1
Total Del/Veh (s)	30.5	5.2	9.8	1.7	4.4	2.2	4.4
Stop Delay (hr)	0.1	0.0	0.3	0.0	0.6	0.0	1.1
Stop Del/Veh (s)	28.5	5.2	6.4	0.4	2.1	0.0	2.2

34: Elizabeth Avenue & Westerland Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	1.7	0.8	0.8	1.1	1.3	0.1	0.1	5.8
Total Del/Veh (s)	16.3	7.6	7.8	11.9	34.2	1.5	4.1	11.1
Stop Delay (hr)	1.1	0.3	0.4	0.6	1.1	0.0	0.0	3.6
Stop Del/Veh (s)	10.6	3.1	3.9	6.8	30.2	0.4	0.5	6.8

35: Prince Philip Drive & Clinch Crescent Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.1	0.0	0.1
Denied Del/Veh (s)	0.0	0.0	0.0	0.2	3.5	0.5	0.1
Total Delay (hr)	8.2	30.1	6.1	0.5	1.1	0.2	46.2
Total Del/Veh (s)	52.6	89.5	29.7	10.3	50.3	3.3	55.3
Stop Delay (hr)	5.4	24.7	4.2	0.1	1.0	0.0	35.4
Stop Del/Veh (s)	35.0	73.3	20.2	1.5	47.3	0.6	42.3

37: Thorburn Road & Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR	All
Denied Delay (hr)	3.1	12.9	1.8	0.0	0.0	0.0	0.0	0.0	1.6	1.4	0.9	21.8
Denied Del/Veh (s)	40.6	35.9	37.6	0.0	0.0	0.0	0.3	0.1	11.3	10.0	12.1	17.7
Total Delay (hr)	5.1	43.7	0.7	1.1	5.6	0.3	7.8	1.7	14.3	4.9	2.5	87.6
Total Del/Veh (s)	69.3	122.6	14.9	35.1	31.9	3.7	79.9	78.9	100.4	34.5	33.3	71.1
Stop Delay (hr)	4.0	34.6	0.5	1.0	4.8	0.0	7.2	1.6	13.5	3.8	2.0	73.0
Stop Del/Veh (s)	54.3	97.2	11.1	32.0	27.1	0.1	73.6	76.6	95.2	26.8	26.4	59.3

40: Prince Philip Drive & Wicklow Street Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.2	0.0	0.2
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	3.8	0.5	0.2
Total Delay (hr)	0.3	23.7	2.6	0.1	2.4	0.1	29.2
Total Del/Veh (s)	54.1	50.7	9.9	9.5	53.2	9.3	36.4
Stop Delay (hr)	0.2	17.7	0.7	0.0	2.3	0.1	21.1
Stop Del/Veh (s)	43.9	37.8	2.8	3.0	49.8	8.3	26.2

46: Stamps Lane/Oxen Pond Road & Freshwater Road Performance by movement

Movement	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.2	0.2	0.3	4.1	0.2	0.2	0.1
Total Delay (hr)	43.7	3.2	3.1	0.1	0.5	0.7	0.2	0.1	0.4	0.0	52.0
Total Del/Veh (s)	153.0	46.6	19.1	15.2	25.3	26.5	22.4	25.5	19.5	10.6	85.6
Stop Delay (hr)	37.2	2.2	2.1	0.1	0.4	0.6	0.2	0.1	0.3	0.0	43.3
Stop Del/Veh (s)	130.2	32.3	13.2	11.4	21.8	22.0	20.1	22.8	16.3	9.4	71.2

47: Freshwater Road & Thorburn Road Performance by movement

Movement	EBT	WBT	WBR	SBL	SBT	SBR	All
Denied Delay (hr)	279.7	0.0	0.1	0.0	0.0	0.0	279.8
Denied Del/Veh (s)	880.2	0.0	0.6	0.3	0.0	0.0	377.2
Total Delay (hr)	42.7	1.0	1.1	8.8	0.0	0.5	54.1
Total Del/Veh (s)	213.4	10.5	9.2	58.7	15.0	6.7	85.8
Stop Delay (hr)	42.8	0.6	0.5	8.5	0.0	0.4	52.8
Stop Del/Veh (s)	213.8	6.1	4.3	56.6	12.9	5.5	83.8

51: Freshwater Road & Elizabeth Avenue Performance by movement

Movement	WBT	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Denied Del/Veh (s)	0.0	0.0	0.4	0.4	0.0	0.0	0.1
Total Delay (hr)	0.0	0.4	0.2	0.0	3.7	1.1	5.4
Total Del/Veh (s)	0.5	6.6	1.4	1.1	21.3	13.9	12.5
Stop Delay (hr)	0.0	0.3	0.0	0.0	1.6	0.2	2.2
Stop Del/Veh (s)	0.0	6.3	0.0	0.5	9.2	2.4	5.0

52: Elizabeth Avenue & Paton Street Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.1	0.1	0.0
Total Delay (hr)	0.0	0.5	0.1	0.0	0.1	0.0	0.8
Total Del/Veh (s)	5.6	2.9	1.3	1.0	13.2	6.0	3.0
Stop Delay (hr)	0.0	0.1	0.0	0.0	0.1	0.0	0.3
Stop Del/Veh (s)	2.3	0.6	0.5	0.7	11.3	5.7	1.0

55: Anderson Avenue & Elizabeth Avenue Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.2	0.2
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.5	3.5	0.6
Total Delay (hr)	0.2	0.0	0.2	0.2	0.2	0.3	1.1
Total Del/Veh (s)	1.2	0.5	10.0	4.4	14.1	7.1	3.7
Stop Delay (hr)	0.0	0.0	0.1	0.0	0.1	0.3	0.6
Stop Del/Veh (s)	0.1	0.2	4.8	0.8	11.8	6.5	2.0

59: Clinch Crescent & Arctic Avenue Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.1	0.0	0.0	0.0	0.0	0.0	0.1
Denied Del/Veh (s)	1.1	0.1	0.0	0.0	0.3	0.3	0.2
Total Delay (hr)	2.8	0.0	0.3	1.6	0.2	1.0	5.8
Total Del/Veh (s)	58.8	8.3	2.6	9.1	30.7	10.6	13.5
Stop Delay (hr)	2.7	0.0	0.1	1.1	0.1	0.7	4.7
Stop Del/Veh (s)	56.3	9.0	0.9	6.2	27.9	7.8	11.0

61: Prince Philip Drive & Morrissey Drive Performance by movement

Movement	EBT	WBL	WBT	WBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1
Denied Del/Veh (s)	0.0	0.1	0.0	0.2	3.9	0.4	0.4	0.2
Total Delay (hr)	1.5	0.7	10.2	5.2	1.0	0.3	0.3	19.1
Total Del/Veh (s)	6.5	31.7	38.1	41.1	47.8	40.6	17.6	27.8
Stop Delay (hr)	0.5	0.5	7.4	3.8	0.9	0.3	0.3	13.6
Stop Del/Veh (s)	2.4	22.5	27.6	30.3	44.8	36.4	16.7	19.9

Total Network Performance

Denied Delay (hr)	562.4
Denied Del/Veh (s)	172.9
Total Delay (hr)	734.2
Total Del/Veh (s)	228.3
Stop Delay (hr)	610.0
Stop Del/Veh (s)	189.6

Intersection: 1: Allandale Road & TCH NB

Movement	EB	WB	NB	NB
Directions Served	LT	R	LT	R
Maximum Queue (m)	5.5	183.2	131.3	23.0
Average Queue (m)	0.3	7.9	41.9	20.2
95th Queue (m)	3.4	95.5	105.9	28.2
Link Distance (m)	137.0	349.0	139.4	
Upstream Blk Time (%)			1	
Queuing Penalty (veh)			0	
Storage Bay Dist (m)				20.0
Storage Blk Time (%)			3	14
Queuing Penalty (veh)			30	0

Intersection: 7: Allandale Road & Prince Philip Drive

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	TR	L	T	R	L	T
Maximum Queue (m)	85.7	63.3	67.1	63.9	67.4	353.3	359.8	72.5	448.1	442.6	44.3	111.9
Average Queue (m)	47.9	32.5	35.4	12.0	57.3	243.6	248.3	72.1	427.5	207.8	17.8	67.1
95th Queue (m)	77.8	55.3	58.3	45.8	87.8	449.7	451.6	72.8	482.8	441.1	45.3	103.6
Link Distance (m)		438.0	438.0			834.7	834.7		443.5	443.5		104.0
Upstream Blk Time (%)									13	1		1
Queuing Penalty (veh)									53	2		4
Storage Bay Dist (m)	200.0			120.0	65.0			70.0			42.0	
Storage Blk Time (%)					2	58		78	22		0	35
Queuing Penalty (veh)					6	111		249	74		0	15

Intersection: 7: Allandale Road & Prince Philip Drive

Movement	SB	SB	SB	B5	B5
Directions Served	T	R	R	T	T
Maximum Queue (m)	105.6	112.3	37.5	5.7	16.4
Average Queue (m)	63.6	45.8	17.8	0.5	1.1
95th Queue (m)	99.1	106.7	48.0	5.2	10.7
Link Distance (m)	104.0	104.0		500.7	500.7
Upstream Blk Time (%)	1	1			
Queuing Penalty (veh)	2	4			
Storage Bay Dist (m)			35.0		
Storage Blk Time (%)		14	1		
Queuing Penalty (veh)		36	3		

Intersection: 9: Westerland Road/Clinch Crescent & Prince Philip Drive

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	TR	L	T	R	L	T
Maximum Queue (m)	77.5	582.3	586.5	102.8	92.4	469.8	471.9	62.3	139.7	47.5	62.6	70.5
Average Queue (m)	77.4	540.3	522.6	22.6	57.4	375.6	386.2	21.3	69.4	24.2	26.7	30.2
95th Queue (m)	77.6	655.3	691.0	68.4	123.3	529.3	530.3	55.7	120.0	57.2	52.4	57.8
Link Distance (m)		573.0	573.0			469.8	469.8		353.9		83.2	83.2
Upstream Blk Time (%)		39	18			7	11				0	0
Queuing Penalty (veh)		276	123			39	58				1	0
Storage Bay Dist (m)	75.0			185.0	90.0			60.0		45.0		
Storage Blk Time (%)	81	48	1	0	0	64		0	24	0		0
Queuing Penalty (veh)	283	258	2	0	2	54		0	45	2		0

Intersection: 9: Westerland Road/Clinch Crescent & Prince Philip Drive

Movement	SB
Directions Served	R
Maximum Queue (m)	45.6
Average Queue (m)	16.4
95th Queue (m)	32.1
Link Distance (m)	
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (m)	80.0
Storage Blk Time (%)	0
Queuing Penalty (veh)	0

Intersection: 10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	L	T	R	L	T	R
Maximum Queue (m)	31.9	54.6	51.2	109.1	57.4	249.7	37.5	42.4	253.5	379.5
Average Queue (m)	7.0	24.6	9.3	46.2	42.0	240.2	16.0	11.7	64.4	42.1
95th Queue (m)	21.2	46.4	30.4	86.5	73.7	249.4	43.6	32.1	164.6	200.3
Link Distance (m)		321.0		286.5		234.0			443.5	443.5
Upstream Blk Time (%)						70			0	1
Queuing Penalty (veh)						0			0	4
Storage Bay Dist (m)	55.0		55.0		55.0		35.0	40.0		
Storage Blk Time (%)	0	0	0	7	4	60	0	0	18	
Queuing Penalty (veh)	0	0	0	3	30	135	4	0	8	

Intersection: 11: Mt. Scio Road & Allandale Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	LT	R	LT	R
Maximum Queue (m)	42.2	61.8	69.6	15.4	40.1	37.0	27.0	19.3	53.5	27.5
Average Queue (m)	16.8	36.5	41.0	3.6	18.3	15.3	8.3	1.3	20.2	7.4
95th Queue (m)	31.6	56.2	61.8	10.3	33.8	31.8	20.4	9.8	41.1	26.8
Link Distance (m)		349.0	349.0		545.5	545.5	310.8		98.5	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (m)	75.0			75.0				25.0		25.0
Storage Blk Time (%)		0					0	0	4	0
Queuing Penalty (veh)		0					0	0	7	1

Intersection: 17: Allandale Road & TCH SB

Movement	SB	SB
Directions Served	L	R
Maximum Queue (m)	25.7	13.2
Average Queue (m)	13.3	1.0
95th Queue (m)	21.3	7.6
Link Distance (m)	127.3	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		20.0
Storage Blk Time (%)	1	0
Queuing Penalty (veh)	0	0

Intersection: 18: TCH SB

Movement
Directions Served
Maximum Queue (m)
Average Queue (m)
95th Queue (m)
Link Distance (m)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (m)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 22: Allandale Road & Higgins Line

Movement	WB	WB	WB	NB	NB	SB	SB	SB	B3	B2
Directions Served	L	L	R	T	T	L	T	T	T	T
Maximum Queue (m)	56.9	51.4	25.0	22.2	25.0	21.5	63.1	65.6	1.2	338.8
Average Queue (m)	30.9	19.7	1.2	9.1	9.1	7.2	21.0	26.5	0.0	14.2
95th Queue (m)	49.9	41.2	12.6	20.3	21.8	17.2	49.6	55.9	0.0	159.6
Link Distance (m)	117.4	117.4		101.8	101.8		73.6	73.6	178.6	545.5
Upstream Blk Time (%)							0	0		0
Queuing Penalty (veh)							0	0		0
Storage Bay Dist (m)			40.0			80.0				
Storage Blk Time (%)		1	0				0			
Queuing Penalty (veh)		1	0				0			

Intersection: 24: Allandale Road & Confederation Building Lot

Movement	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	L	R	T	T	R	L	T	T
Maximum Queue (m)	3.0	13.5	11.6	32.0	42.5	9.7	25.3	68.5	90.0
Average Queue (m)	0.1	3.3	3.6	8.4	14.4	0.4	8.9	16.9	22.6
95th Queue (m)	1.6	10.5	10.7	23.3	32.8	6.6	20.2	51.6	65.8
Link Distance (m)		87.5	87.5	500.7	500.7			147.6	147.6
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (m)	45.0					110.0	130.0		
Storage Blk Time (%)									
Queuing Penalty (veh)									

Intersection: 29: Prince Philip Drive & Confederation Building Lot

Movement	EB	EB	NB	NB	NB	B27	SB	SB
Directions Served	L	R	L	T	T	T	T	T
Maximum Queue (m)	13.7	11.2	44.4	23.1	31.2	171.2	65.1	57.8
Average Queue (m)	4.2	3.4	17.5	2.2	4.0	6.1	28.9	13.4
95th Queue (m)	12.1	10.6	33.5	12.2	17.0	125.0	53.2	36.3
Link Distance (m)	108.9	108.9		270.6	270.6	834.7	148.3	148.3
Upstream Blk Time (%)						0		
Queuing Penalty (veh)						0		
Storage Bay Dist (m)			75.0					
Storage Blk Time (%)			0					
Queuing Penalty (veh)			0					

Intersection: 34: Elizabeth Avenue & Westerland Road

Movement	EB	EB	WB	SB	SB
Directions Served	L	T	TR	L	R
Maximum Queue (m)	37.4	87.9	75.9	52.2	19.4
Average Queue (m)	27.7	24.8	38.0	24.3	0.8
95th Queue (m)	40.9	64.3	66.9	43.3	10.5
Link Distance (m)		391.9	553.5	353.9	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (m)	35.0				70.0
Storage Blk Time (%)	6	1		0	
Queuing Penalty (veh)	26	4		0	

Intersection: 35: Prince Philip Drive & Clinch Crescent

Movement	EB	EB	EB	WB	WB	WB	SB	SB
Directions Served	L	T	T	T	T	R	L	R
Maximum Queue (m)	142.5	288.7	288.6	74.8	82.3	64.2	53.2	44.3
Average Queue (m)	102.2	168.3	162.3	46.2	51.4	10.5	18.7	7.9
95th Queue (m)	178.6	369.3	361.8	70.4	75.8	41.2	39.0	28.7
Link Distance (m)		280.6	280.6	573.0	573.0			269.1
Upstream Blk Time (%)		13	6					
Queuing Penalty (veh)		123	63					
Storage Bay Dist (m)	140.0					70.0	80.0	
Storage Blk Time (%)	1	29			2	0	0	
Queuing Penalty (veh)	10	184			3	0	0	

Intersection: 37: Thorburn Road & Prince Philip Drive

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	SB
Directions Served	L	T	T	R	L	T	T	T	R	T	TR	L
Maximum Queue (m)	177.4	307.6	301.4	270.6	45.2	53.6	54.1	52.7	7.6	93.4	98.1	122.8
Average Queue (m)	116.2	225.8	216.8	112.3	21.2	27.4	28.2	26.3	0.1	45.3	51.9	68.1
95th Queue (m)	236.0	366.4	361.8	341.0	37.7	45.2	45.6	45.0	3.6	89.0	96.6	126.4
Link Distance (m)		308.0	308.0	308.0		134.5	134.5	134.5	134.5	126.5	126.5	
Upstream Blk Time (%)		27	17	10						0	0	
Queuing Penalty (veh)		0	0	0						0	1	
Storage Bay Dist (m)	175.0				110.0							150.0
Storage Blk Time (%)	1	33										3
Queuing Penalty (veh)	4	90										9

Intersection: 37: Thorburn Road & Prince Philip Drive

Movement	SB	SB	SB
Directions Served	L	T	TR
Maximum Queue (m)	190.3	156.9	130.6
Average Queue (m)	81.5	61.5	70.8
95th Queue (m)	208.6	176.0	117.3
Link Distance (m)	372.8	372.8	
Upstream Blk Time (%)	3	3	
Queuing Penalty (veh)	0	0	
Storage Bay Dist (m)			150.0
Storage Blk Time (%)	7	0	0
Queuing Penalty (veh)	16	1	1

Intersection: 40: Prince Philip Drive & Wicklow Street

Movement	EB	EB	EB	B45	B45	B36	B36	WB	WB	SB	SB
Directions Served	L	T	T	T	T	T	T	T	TR	L	R
Maximum Queue (m)	52.3	211.0	202.5	221.8	220.4	123.5	126.7	82.1	249.6	58.7	44.0
Average Queue (m)	8.3	135.3	120.4	91.1	89.4	38.1	37.8	15.5	43.1	35.3	10.1
95th Queue (m)	34.6	248.4	248.8	275.5	273.3	134.8	134.9	53.9	167.0	56.4	36.3
Link Distance (m)		189.0	189.0	222.8	222.8	134.5	134.5	280.6	280.6		264.8
Upstream Blk Time (%)		35	24	28	22	3	2	0	1		
Queuing Penalty (veh)		321	217	255	200	24	20	0	3		
Storage Bay Dist (m)	50.0									60.0	
Storage Blk Time (%)	0	40								3	0
Queuing Penalty (veh)	0	8								1	0

Intersection: 46: Stamps Lane/Oxen Pond Road & Freshwater Road

Movement	EB	EB	WB	NB	SB	SB
Directions Served	T	R	TR	LTR	L	TR
Maximum Queue (m)	368.4	372.3	113.2	63.1	17.2	35.6
Average Queue (m)	361.9	357.3	60.5	28.3	2.6	11.7
95th Queue (m)	365.8	386.2	100.8	51.7	10.3	27.3
Link Distance (m)	357.5	357.5	256.2	366.1		137.9
Upstream Blk Time (%)	39	17				
Queuing Penalty (veh)	314	138				
Storage Bay Dist (m)					30.0	
Storage Blk Time (%)						1
Queuing Penalty (veh)						0

Intersection: 47: Freshwater Road & Thorburn Road

Movement	EB	EB	WB	WB	WB	SB	SB	SB	B43	B43
Directions Served	T	T	T	T	R	L	L	R	T	T
Maximum Queue (m)	177.4	178.3	33.2	60.8	32.5	74.2	68.9	51.2	61.5	69.1
Average Queue (m)	166.9	167.4	16.3	21.1	24.7	54.5	50.2	21.0	16.0	15.6
95th Queue (m)	172.4	173.5	27.5	47.1	36.7	80.9	76.2	39.2	57.5	63.1
Link Distance (m)	160.8	160.8	357.5	357.5		52.2	52.2	52.2	126.5	126.5
Upstream Blk Time (%)	100	99				35	21	0		0
Queuing Penalty (veh)	0	0				95	57	0		0
Storage Bay Dist (m)					30.0					
Storage Blk Time (%)				1	3					
Queuing Penalty (veh)				3	6					

Intersection: 51: Freshwater Road & Elizabeth Avenue

Movement	WB	NB	SB	SB
Directions Served	R	TR	L	T
Maximum Queue (m)	33.4	17.3	32.3	136.3
Average Queue (m)	11.8	1.6	29.8	48.1
95th Queue (m)	22.4	8.0	37.3	122.2
Link Distance (m)	266.6	206.4		256.2
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)			30.0	
Storage Blk Time (%)			16	2
Queuing Penalty (veh)			59	18

Intersection: 52: Elizabeth Avenue & Paton Street

Movement	EB	EB	WB	SB
Directions Served	L	T	TR	LR
Maximum Queue (m)	15.7	45.6	21.2	18.2
Average Queue (m)	2.7	9.1	3.9	7.0
95th Queue (m)	10.6	27.9	14.2	14.7
Link Distance (m)		266.6	45.6	410.7
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)	30.0			
Storage Blk Time (%)		0		
Queuing Penalty (veh)		0		

Intersection: 55: Anderson Avenue & Elizabeth Avenue

Movement	EB	WB	WB	NB	NB
Directions Served	TR	L	T	L	R
Maximum Queue (m)	17.7	26.2	42.8	18.5	29.5
Average Queue (m)	1.5	9.1	1.6	7.0	13.0
95th Queue (m)	9.6	19.6	41.0	15.0	23.7
Link Distance (m)	45.6		391.9	325.0	
Upstream Blk Time (%)	0		0		
Queuing Penalty (veh)	0		0		
Storage Bay Dist (m)		40.0		100.0	
Storage Blk Time (%)		0			
Queuing Penalty (veh)		0			

Intersection: 59: Clinch Crescent & Arctic Avenue

Movement	WB	WB	WB	NB	NB	SB
Directions Served	L	L	R	T	R	LT
Maximum Queue (m)	74.4	84.1	4.8	52.3	80.9	104.4
Average Queue (m)	15.2	32.7	0.4	11.9	37.8	23.7
95th Queue (m)	49.2	74.2	2.6	33.6	70.5	72.5
Link Distance (m)		205.9	205.9	83.2	83.2	188.1
Upstream Blk Time (%)				0	1	
Queuing Penalty (veh)				0	3	
Storage Bay Dist (m)	100.0					
Storage Blk Time (%)	0	1				
Queuing Penalty (veh)	0	1				

Intersection: 61: Prince Philip Drive & Morrissey Drive

Movement	EB	EB	WB	WB	WB	WB	SB	SB
Directions Served	T	T	L	T	T	R	L	TR
Maximum Queue (m)	28.9	29.1	58.4	200.3	228.0	32.5	37.4	37.5
Average Queue (m)	11.7	12.8	14.9	68.0	83.8	28.6	15.8	12.9
95th Queue (m)	25.0	25.8	47.9	214.4	238.3	40.5	30.7	27.9
Link Distance (m)	469.8	469.8		438.0	438.0			278.5
Upstream Blk Time (%)				0	0			
Queuing Penalty (veh)				3	3			
Storage Bay Dist (m)			70.0			30.0	40.0	
Storage Blk Time (%)			0	10	19	4	0	0
Queuing Penalty (veh)			0	9	90	23	0	0

Network Summary

Network wide Queuing Penalty: 4336

Intersection		Scenario 1 - PM Peak Hour						
		Synchro				SimTraffic		
		Delay/Veh (s)	LOS	V/C	Queue (m) 95th%ile	Delay/Veh (s)	Equivalent LOS	Queue (m) 95th%ile
Columbus Drive/ Prince Philip Drive & Thorburn Road		216.3	F			146.0	F	
Columbus Drive/ Prince Philip Drive	Eastbound Left - Turn	344.8	F	1.68	250.9	291.3	F	245.0
	Eastbound Through	38.1	D	0.86	152.4	112.1	F	341.1
	Eastbound Right - Turn	16.6	B	0.50	59.9	40.5	D	425.9
	Westbound Left - Turn	225.2	F	1.42	54.4	67.3	E	69.2
	Westbound Through	99.8	F	1.11	134.9	44.7	D	84.9
	Westbound Right - Turn	21.2	C	0.66	46.9	4.1	A	33.2
Thorburn Road	Northbound Through	620.2	F	2.31	268.0	203.8	F	159.4
	Northbound Right - Turn					256.1	F	156.8
	Southbound Left - Turn	75.5	E	0.96	91.4	246.1	F	392.3
	Southbound Through	255.7	F	1.50	348.2	195.0	F	384.3
	Southbound Right - Turn					254.6	F	200.4
Prince Philip Drive & Wicklow Street		40.3	D			69.4	E	
Prince Philip Drive	Eastbound Left - Turn	8.2	A	0.18	2.0	101.5	F	25.5
	Eastbound Through	10.9	B	0.66	126.9	103.8	F	241.6
	Westbound Through	54.5	D	1.08	73.4	11.5	B	63.5
	Westbound Right - Turn					12.6	B	104.2
Wicklow Street	Southbound Left - Turn	108.0	F	1.04	109.9	262.2	F	73.4
	Southbound Right - Turn	10.6	B	0.33	13.2	137.8	F	304.9
Prince Philip Drive & Clinch Crescent		100.5	F			80.3	F	
Prince Philip Drive	Eastbound Left - Turn	257.4	F	1.48	141.4	67.9	E	116.5
	Eastbound Through	16.0	B	0.70	112.4	161.6	F	349.2
	Westbound Through	128.7	F	1.24	81.4	12.0	B	49.4
	Westbound Right - Turn	5.6	A	0.16	0.4	7.1	A	1.7
Clinch Crescent	Southbound Left - Turn	38.6	D	0.38	40.9	211.2	F	87.0
	Southbound Right - Turn	167.1	F	1.28	174.6	44.4	D	268.9
Prince Philip Drive & Clinch Crescent/ Westerland Road		166.9	F			275.5	F	
Prince Philip Drive	Eastbound Left - Turn	93.7	F	1.03	82.8	239.9	F	70.9
	Eastbound Through	114.6	F	1.14	236.5	302.5	F	732.9
	Eastbound Right - Turn	17.9	B	0.41	43.5	1231.5	F	227.9
	Westbound Left - Turn	42.9	D	0.77	32.9	1873.9	F	112.5
	Westbound Through	288.1	F	1.56	313.6	42.3	D	399.0
	Westbound Right - Turn					39.4	D	381.0
Clinch Crescent/ Westerland Road	Northbound Left - Turn	480.4	F	1.98	156.9	36.1	D	32.6
	Northbound Through	36.9	D	0.52	71.0	41.9	D	100.4
	Northbound Right - Turn	22.3	C	0.67	53.5	52.9	D	30.0
	Southbound Left - Turn	104.3	F	1.08	85.7	91.8	F	36.2
	Southbound Through	63.0	E	0.93	114.7	681.2	F	90.5
	Southbound Right - Turn	138.3	F	1.21	163.7	24.7	C	92.7
Clinch Crescent & Arctic Avenue		162.5	F			477.7	F	
Arctic Avenue	Westbound Left - Turn	507.6	F	1.99	200.6	1944.8	F	210.3
	Westbound Right - Turn	11.4	B	0.04	0.9	336.8	F	296.7
Clinch Crescent	Northbound Through	0.0	-	0.23	0.0	1.1	A	5.8
	Northbound Right - Turn					2.0	A	17.7
	Southbound Left - Turn	1.6	A	0.06	1.4	651.3	F	228.9
	Southbound Through					660.5	F	
Prince Philip Drive & Morrissey Drive		23.9	C			85.2	F	
Prince Philip Drive	Eastbound Through	27.8	C	1.01	241.7	121.8	F	333.5
	Westbound Left - Turn	18.8	B	0.27	2.9	40.8	D	11.9
	Westbound Through	11.0	B	0.73	46.2	19.9	B	92.2
	Westbound Right - Turn	3.7	A	0.19	2.9	17.8	B	14.3
Morrissey Drive	Southbound Left - Turn	55.6	E	0.80	85.6	151.8	F	49.6
	Southbound Through	51.4	D	0.79	81.8	1226.7	F	
	Southbound Right - Turn					108.9	F	
Prince Philip Drive & Allandale Road		279.6	F			379.0	F	
Prince Philip Drive	Eastbound Left - Turn	320.0	F	1.66	284.7	155.6	F	256.0
	Eastbound Through	24.8	C	0.73	123.6	58.2	E	511.5
	Eastbound Right - Turn	8.7	A	0.54	52.3	457.7	F	154.1
	Westbound Left - Turn	475.1	F	1.97	164.5	1351.8	F	79.9
	Westbound Through	431.0	F	1.88	253.7	924.4	F	857.5
	Westbound Right - Turn					913.3	F	858.0
Allandale Road	Northbound Left - Turn	239.0	F	1.40	158.4	139.8	F	88.2
	Northbound Through	308.4	F	1.61	390.8	100.4	F	347.7
	Northbound Right - Turn	32.2	C	0.81	127.2	14.7	B	299.6
	Southbound Left - Turn	310.9	F	1.46	54.4	359.4	F	45.7
	Southbound Through	614.2	F	2.30	235.3	386.8	F	124.5
	Southbound Right - Turn	15.2	B	0.41	45.3	14.5	B	20.4
Prince Philip Drive & Confederation Building Lot		41.1	D			137.1	F	

Prince Philip Drive	Eastbound Left - Turn	67.1	E	0.93	84.1	65.6	E	151.5
	Eastbound Right - Turn	18.4	B	0.66	31.6	242.0	F	140.7
Confederation Building Lot	Northbound Left - Turn	210.7	F	1.36	139.9	13.5	B	42.9
	Northbound Through	12.2	B	0.61	96.9	10.2	B	59.5
	Southbound Through	29.3	C	0.83	137.6	353.1	F	163.4
	Southbound Right - Turn	3.0	A	0.31	11.9	104.5	F	147.7
Bonaventure Avenue/ Allandale Road & Elizabeth Avenue		279.0	F			442.7	F	
Bonaventure Avenue/ Allandale Road	Eastbound Left - Turn	27.0	C	0.58	36.5	18.8	B	37.4
	Eastbound Through	141.4	F	1.21	324.6	22.4	C	80.6
	Eastbound Right - Turn					10.9	B	
	Westbound Left - Turn	43.4	D	0.69	35.4	1720.1	F	26.1
	Westbound Through	34.0	C	0.62	118.3	2194.0	F	349.5
	Westbound Right - Turn	0.4	A	0.11	0.6	68.0	E	408.3
Elizabeth Avenue	Northbound Left - Turn	209.4	F	1.16	47.1	2302.9	F	69.7
	Northbound Through	601.9	F	2.27	540.2	312.9	F	242.9
	Northbound Right - Turn	13.9	B	0.37	31.4	295.1	F	28.9
	Southbound Left - Turn	78.7	E	0.90	56.3	359.2	F	33.3
	Southbound Through	357.1	F	1.72	514.9	326.5	F	540.8
	Southbound Right - Turn	16.3	B	0.44	52.5	1784.6	F	574.7
Elizabeth Avenue & Westerland Road		84.4	F			720.9	F	
Elizabeth Avenue	Eastbound Left - Turn	54.1	D	0.90	73.4	6.0	A	20.1
	Eastbound Through	8.5	A	0.44	54.6	3.9	A	25.4
	Westbound Through	121.8	F	1.19	270.2	2356.8	F	570.9
	Westbound Right - Turn					2369.7	F	
Westerland Road	Southbound Left - Turn	170.3	F	1.26	147.9	822.1	F	359.7
	Southbound Right - Turn	8.4	A	0.61	21.7	1084.3	F	74.2
Elizabeth Avenue & Anderson Avenue		1459.1	F			596.7	F	
Elizabeth Avenue	Eastbound Through	0.0	-	0.60	0.0	1.1	A	2.6
	Eastbound Right - Turn					0.4	A	
	Westbound Left - Turn	13.5	B	0.37	13.2	1400.5	F	52.4
	Westbound Through	0.0	-	0.34	0.0	1469.5	F	411.3
Anderson Avenue	Northbound Left - Turn	ERROR	F	3.66	ERROR	2502.3	F	362.1
	Northbound Right - Turn					1803.3	F	70.9
Elizabeth Avenue & Paton Street		29.1	D			369.3	F	
Elizabeth Avenue	Eastbound Left - Turn	9.4	A	0.05	1.3	4.3	A	5.1
	Eastbound Through	0.0	-	0.53	0.0	1.7	A	10.4
	Westbound Through	0.0	-	0.41	0.0	305.7	F	49.1
	Westbound Right - Turn					294.2	F	
Paton Street	Southbound Left - Turn	307.1	F	1.44	90.7	2428.6	F	482.0
	Southbound Right - Turn					2401.0	F	
Elizabeth Avenue & Freshwater Road		216.5	F			177.5	F	
Elizabeth Avenue	Westbound Right - Turn	702.4	F	2.48	477.9	1336.7	F	271.2
Freshwater Road	Northbound Through	0.0	-	0.57	0.0	88.5	F	263.6
	Northbound Right - Turn					83.3	F	
	Southbound Left - Turn	190.0	F	1.36	308.7	119.6	F	35.1
	Southbound Through	0.0		0.40	0.0	89.8	F	313.0
Freshwater Road & Stamps Lane/ Oxen Pond Road		308.2	F			173.3	F	
Freshwater Road	Eastbound Through	344.9	F	1.70	529.0	191.6	F	402.7
	Eastbound Right - Turn	11.5	B	0.61	68.6	60.2	E	425.9
	Westbound Through	328.2	F	1.67	544.4	114.3	F	260.6
	Westbound Right - Turn					108.1	F	
Stamps Lane/ Oxen Pond Road	Northbound Left - Turn	651.1	F	2.37	281.1	512.6	F	378.6
	Northbound Through					516.8	F	
	Northbound Right - Turn					507.8	F	
	Southbound Left - Turn	20.1	C	0.06	7.1	32.2	C	22.6
	Southbound Through	37.1	D	0.78	109.1	38.3	D	112.6
	Southbound Right - Turn					33.1	C	
Freshwater Road & Thorburn Road		66.6	E			108.2	F	
Freshwater Road	Eastbound Through	104.4	F	1.17	112.5	249.2	F	172.8
	Westbound Through	24.3	C	0.89	79.2	19.6	B	371.3
	Westbound Right - Turn	16.4	B	0.92	87.0	120.9	F	34.3
Thorburn Road	Southbound Left - Turn	36.6	D	0.97	71.1	100.0	F	88.4
	Southbound Right - Turn	180.3	F	1.33	119.5	14.9	B	68.0
Allandale Road & Confederation Building Lot		22.7	C			153.4	F	
Confederation Building Lot	Westbound Left - Turn	37.7	D	0.60	33.6	581.2	F	108.4
	Westbound Right - Turn	9.8	A	0.69	0.4	35.8	D	96.3
Allandale Road	Northbound Through	35.1	D	0.93	277.1	22.8	C	103.0
	Northbound Right - Turn	5.6	A	0.40	32.0	5.2	A	23.4
	Southbound Left - Turn	33.6	C	0.74	53.7	90.4	F	173.2
	Southbound Through	10.7	B	0.59	122.1	417.6	F	169.2
Allandale Road & Higgins Line		21.5	C			142.3	F	
Higgins Line	Westbound Left - Turn	35.5	D	0.70	58.9	548.8	F	144.5
	Westbound Right - Turn	11.0	B	0.44	24.2	366.5	F	52.8
	Northbound Through	22.9	C	0.77	124.4	17.5	B	76.2

Allandale Road	Northbound Right - Turn	8.2	A	0.78	48.2	6.0	A	43.9
	Southbound Left - Turn	88.0	F	1.04	80.1	60.0	E	94.0
	Southbound Through	9.5	A	0.49	68.0	291.5	F	89.2
Allandale Road & Mt. Scio Road		46.7	D			213.8	F	
Allandale Road	Eastbound Left - Turn	37.8	D	0.71	45.3	313.4	F	68.3
	Eastbound Through	34.0	C	0.83	152.5	420.5	F	457.7
	Eastbound Right - Turn					401.8	F	475.4
	Westbound Left - Turn	26.7	C	0.57	23.7	25.2	C	40.5
	Westbound Through	72.5	E	1.06	197.4	28.8	C	97.6
	Westbound Right - Turn					15.3	B	88.0
Mt. Scio Road	Northbound Left - Turn	41.3	D	0.64	56.0	322.2	F	355.1
	Northbound Through					309.3	F	
	Northbound Right - Turn	7.2	A	0.20	9.4	379.4	F	35.8
	Southbound Left - Turn	39.3	D	0.61	66.3	221.1	F	128.3
	Southbound Through					152.4	F	
	Southbound Right - Turn	10.1	B	0.49	32.1	86.6	F	34.5
Outer Ring Road NB & Allandale Road		116.7	F			69.0	F	
Allandale Road	Eastbound Left - Turn	1.1	A	0.03	0.8	138.3	F	196.8
	Eastbound Through					169.4	F	
	Westbound Through	0.0	-	0.75	0.0	6.1	A	4.6
	Westbound Right - Turn	0.0	-	0.31	0.0	7.6	A	108.3
Outer Ring Road SB	Northbound Left - Turn	402.1	F	1.84	466.4	55.6	F	189.9
	Northbound Right - Turn	0.0	-	0.00	0.0	134.1	F	24.1
Outer Ring Road SB & Allandale Road		71.9	F			59.8	F	
Allandale Road	Eastbound Left - Turn	1.2	A	0.01	0.1	505.0	F	81.8
	Eastbound Through					406.1	F	
	Westbound Through	0.0	-	0.79	0.0	8.7	A	2.4
	Westbound Right - Turn					7.2	A	
Outer Ring Road SB	Southbound Left - Turn	251.4	F	1.47	223.5	138.8	F	161.2
	Southbound Right - Turn	0.0	-	0.00	0.0	71.4	F	11.0

MUN Area Traffic Study
Allandale Road & Confederation Building Lot

Scenario 1 - 2025 PM

29/06/2015

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	←←	→	←←	→	←	→→
Traffic Volume (vph)	268	306	1619	374	211	1290
Future Volume (vph)	268	306	1619	374	211	1290
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	4.0	4.0	4.0	3.5
Grade (%)	0%		0%			0%
Storage Length (m)	45.0	0.0		110.0	130.0	
Storage Lanes	1	1		1	1	
Taper Length (m)	2.5				2.5	
Lane Util. Factor	0.97	1.00	0.95	1.00	1.00	0.95
Ped Bike Factor						
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3395	1566	3697	1654	1848	3500
Flt Permitted	0.950				0.077	
Satd. Flow (perm)	3395	1566	3697	1654	150	3500
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		440		322		
Link Speed (k/h)	50		50			50
Link Distance (m)	100.1		513.4			163.6
Travel Time (s)	7.2		37.0			11.8
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.67	0.67	0.97	0.97	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Adj. Flow (vph)	400	457	1669	386	229	1402
Shared Lane Traffic (%)						
Lane Group Flow (vph)	400	457	1669	386	229	1402
Turn Type	Prot	Perm	NA	Perm	pm+pt	NA
Protected Phases	6		4		3	8
Permitted Phases		6		4	8	
Total Split (s)	41.0	41.0	40.0	40.0	29.0	69.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Act Effect Green (s)	18.4	18.4	45.6	45.6	63.3	63.3
Actuated g/C Ratio	0.20	0.20	0.49	0.49	0.67	0.67
v/c Ratio	0.60	0.69	0.93	0.40	0.74	0.59
Control Delay	37.7	9.8	35.1	5.6	33.6	10.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	37.7	9.8	35.1	5.6	33.6	10.7
LOS	D	A	D	A	C	B
Approach Delay	22.8		29.5			13.9
Approach LOS	C		C			B
Stops (vph)	230	37	1211	56	123	667
Fuel Used(l)	15	6	169	25	14	60
CO Emissions (g/hr)	288	112	3135	473	257	1109

MUN Area Traffic Study
Allandale Road & Confederation Building Lot

Scenario 1 - 2025 PM
29/06/2015



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
NOx Emissions (g/hr)	56	22	605	91	50	214
VOC Emissions (g/hr)	66	26	723	109	59	256
Dilemma Vehicles (#)	0	0	0	0	0	0
Queue Length 50th (m)	34.0	2.5	133.6	5.6	22.6	59.2
Queue Length 95th (m)	33.6	0.4	#277.1	32.0	53.7	122.1
Internal Link Dist (m)	76.1		489.4			139.6
Turn Bay Length (m)	45.0			110.0	130.0	
Base Capacity (vph)	1272	862	1798	970	519	2361
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	0.31	0.53	0.93	0.40	0.44	0.59

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 93.8

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.93

Intersection Signal Delay: 22.7

Intersection LOS: C

Intersection Capacity Utilization 79.1%

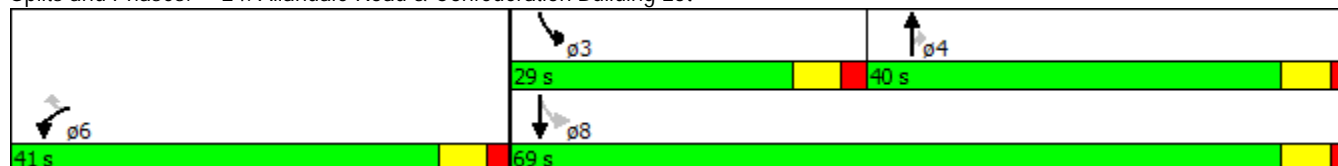
ICU Level of Service D

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 24: Allandale Road & Confederation Building Lot



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	←←	←	→→	→	←	→→
Traffic Volume (vph)	535	211	1135	790	236	966
Future Volume (vph)	535	211	1135	790	236	966
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	4.0	4.0	3.5	3.5	4.0	3.5
Grade (%)	0%		3%			-3%
Storage Length (m)	0.0	40.0		80.0	80.0	
Storage Lanes	2	1		1	1	
Taper Length (m)	2.5				2.5	
Lane Util. Factor	0.97	1.00	0.95	1.00	1.00	0.95
Ped Bike Factor						
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3586	1654	3447	1542	1876	3552
Flt Permitted	0.950				0.094	
Satd. Flow (perm)	3586	1654	3447	1542	186	3552
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		167		795		
Link Speed (k/h)	50		50			50
Link Distance (m)	128.4		114.7			80.6
Travel Time (s)	9.2		8.3			5.8
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.96	0.96	0.88	0.88	0.88	0.88
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Adj. Flow (vph)	557	220	1290	898	268	1098
Shared Lane Traffic (%)						
Lane Group Flow (vph)	557	220	1290	898	268	1098
Turn Type	Prot	Perm	NA	Perm	pm+pt	NA
Protected Phases	6		4		3	8
Permitted Phases		6		4	8	
Total Split (s)	50.0	50.0	47.0	47.0	13.0	60.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Act Effect Green (s)	18.8	18.8	41.1	41.1	54.1	54.1
Actuated g/C Ratio	0.22	0.22	0.48	0.48	0.64	0.64
v/c Ratio	0.70	0.44	0.77	0.78	1.04	0.49
Control Delay	35.5	11.0	22.9	8.2	88.0	9.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	35.5	11.0	22.9	8.2	88.0	9.5
LOS	D	B	C	A	F	A
Approach Delay	28.5		16.9			24.9
Approach LOS	C		B			C
Stops (vph)	470	52	895	150	106	477
Fuel Used(l)	32	6	70	29	37	94
CO Emissions (g/hr)	589	103	1303	544	688	1749



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
NOx Emissions (g/hr)	114	20	251	105	133	338
VOC Emissions (g/hr)	136	24	300	125	159	403
Dilemma Vehicles (#)	0	0	0	0	0	0
Queue Length 50th (m)	43.0	7.0	87.2	8.9	~29.3	44.2
Queue Length 95th (m)	58.9	24.2	124.4	48.2	#80.1	68.0
Internal Link Dist (m)	104.4		90.7			56.6
Turn Bay Length (m)		40.0		80.0	80.0	
Base Capacity (vph)	1860	938	1666	1156	258	2261
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	0.30	0.23	0.77	0.78	1.04	0.49

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 85

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.04

Intersection Signal Delay: 21.5

Intersection LOS: C

Intersection Capacity Utilization 74.7%

ICU Level of Service D

Analysis Period (min) 15

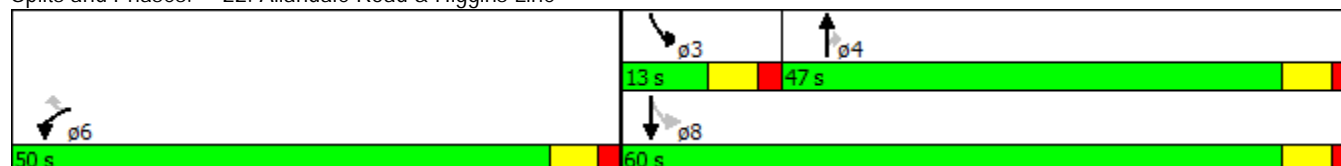
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.





















Splits and Phases: 22: Allandale Road & Higgins Line















MUN Area Traffic Study
Allandale Road & Mt. Scio Road

Scenario 1 - 2025 PM

29/06/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	171	1013	150	105	1182	59	105	69	89	99	104	287
Future Volume (vph)	171	1013	150	105	1182	59	105	69	89	99	104	287
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.6	3.6	3.6	3.5	3.5	3.5	3.6	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	75.0		0.0	75.0		0.0	0.0		25.0	0.0		25.0
Storage Lanes	1		0	1		0	0		1	0		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.981			0.993				0.850			0.850
Flt Protected	0.950			0.950				0.971			0.976	
Satd. Flow (prot)	1750	3433	0	1770	3514	0	0	1789	1566	0	1798	1566
Flt Permitted	0.088			0.091				0.589			0.644	
Satd. Flow (perm)	162	3433	0	170	3514	0	0	1085	1566	0	1186	1566
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		18			5				105			255
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		358.1			559.6			322.8			111.1	
Travel Time (s)		25.8			40.3			23.2			8.0	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.96	0.96	0.96	0.82	0.82	0.82	0.78	0.78	0.78	0.87	0.87	0.87
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	178	1055	156	128	1441	72	135	88	114	114	120	330
Shared Lane Traffic (%)												
Lane Group Flow (vph)	178	1211	0	128	1513	0	0	223	114	0	234	330
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8			2		2	6		6
Total Split (s)	19.0	50.0		19.0	50.0		41.0	41.0	41.0	41.0	41.0	41.0
Total Lost Time (s)	6.0	6.0		6.0	6.0			6.0	6.0		6.0	6.0
Act Effect Green (s)	56.8	45.6		53.6	44.0			35.0	35.0		35.0	35.0
Actuated g/C Ratio	0.52	0.42		0.50	0.41			0.32	0.32		0.32	0.32
v/c Ratio	0.71	0.83		0.57	1.06			0.64	0.20		0.61	0.49
Control Delay	37.8	34.0		26.7	72.5			41.3	7.2		39.3	10.1
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	0.0
Total Delay	37.8	34.0		26.7	72.5			41.3	7.2		39.3	10.1
LOS	D	C		C	E			D	A		D	B
Approach Delay		34.5			68.9			29.8			22.2	
Approach LOS		C			E			C			C	
Stops (vph)	103	974		58	1065			149	15		172	63
Fuel Used(l)	13	92		12	191			14	4		12	7
CO Emissions (g/hr)	244	1707		218	3553			264	66		227	124

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	47	330		42	686			51	13		44	24
VOC Emissions (g/hr)	56	394		50	820			61	15		52	29
Dilemma Vehicles (#)	0	0		0	0			0	0		0	0
Queue Length 50th (m)	20.2	114.6		11.9	~187.3			40.3	1.3		41.9	11.3
Queue Length 95th (m)	#45.3	152.5		23.7	#197.4			56.0	9.4		66.3	32.1
Internal Link Dist (m)		334.1			535.6			298.8			87.1	
Turn Bay Length (m)	75.0			75.0					25.0			25.0
Base Capacity (vph)	278	1457		281	1432			351	577		383	679
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	0.64	0.83		0.46	1.06			0.64	0.20		0.61	0.49

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 108.2

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.06

Intersection Signal Delay: 46.7

Intersection LOS: D

Intersection Capacity Utilization 76.8%

ICU Level of Service D

Analysis Period (min) 15







~ 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.
























Splits and Phases: 11: Mt. Scio Road & Allandale Road

		
ø2	ø3	ø4
41 s	19 s	50 s
		
ø6	ø7	ø8
41 s	19 s	50 s













MUN Area Traffic Study
Prince Philip Drive & Allandale Road

Scenario 1 - 2025 PM

29/06/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	874	1031	475	342	951	158	335	961	502	77	983	497
Future Volume (vph)	874	1031	475	342	951	158	335	961	502	77	983	497
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	3.8	3.8	3.0	3.7	3.7	3.5	3.5	3.5	3.0	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	200.0		120.0	65.0		25.0	70.0		0.0	42.0		35.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	0.95	0.88
Ped Bike Factor			0.98	1.00	1.00		1.00		0.98	1.00		
Frt			0.850		0.979				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1652	3618	1619	1652	3496	0	1750	1842	1566	1652	3500	2756
Flt Permitted	0.154			0.260			0.950			0.250		
Satd. Flow (perm)	268	3618	1593	452	3496	0	1749	1842	1541	434	3500	2756
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			450		15				189			99
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		455.9			851.6			464.8			121.6	
Travel Time (s)		32.8			61.3			33.5			8.8	
Confl. Peds. (#/hr)	2		2	2		2	2		2	2		2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.94	0.94	0.94	0.91	0.91	0.91	0.94	0.94	0.94	0.84	0.84	0.84
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	930	1097	505	376	1045	174	356	1022	534	92	1170	592
Shared Lane Traffic (%)												
Lane Group Flow (vph)	930	1097	505	376	1219	0	356	1022	534	92	1170	592
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Prot	NA	Perm	Perm	NA	pt+ov
Protected Phases	5	2		1	6		7	4			8	8 5
Permitted Phases	2		2	6					4	8		
Total Split (s)	39.0	53.0	53.0	13.0	27.0		22.0	44.0	44.0	22.0	22.0	
Total Lost Time (s)	6.0	7.0	7.0	6.0	7.0		6.0	6.0	6.0	6.0	6.0	
Act Effect Green (s)	60.0	46.0	46.0	28.0	20.0		16.0	38.0	38.0	16.0	16.0	55.0
Actuated g/C Ratio	0.55	0.42	0.42	0.25	0.18		0.15	0.35	0.35	0.15	0.15	0.50
v/c Ratio	1.66	0.73	0.54	1.97	1.88		1.40	1.61	0.81	1.46	2.30	0.41
Control Delay	320.0	24.8	8.7	475.1	431.0		239.0	308.4	32.2	310.9	614.2	15.2
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	320.0	24.8	8.7	475.1	431.0		239.0	308.4	32.2	310.9	614.2	15.2
LOS	F	C	A	F	F		F	F	C	F	F	B
Approach Delay		130.0			441.4			218.4			407.9	
Approach LOS		F			F			F			F	
Stops (vph)	581	922	221	206	745		252	687	307	52	657	250
Fuel Used(l)	266	85	29	167	504		82	286	41	24	539	41
CO Emissions (g/hr)	4950	1581	534	3097	9376		1526	5318	772	451	10019	770

Synchro 9 Report

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	955	305	103	598	1810		295	1027	149	87	1934	149
VOC Emissions (g/hr)	1142	365	123	714	2163		352	1227	178	104	2311	178
Dilemma Vehicles (#)	0	0	0	0	0		0	0	0	0	0	0
Queue Length 50th (m)	~274.8	116.3	37.6	~102.5	~211.9		~102.4	~315.2	70.0	~27.1	~215.7	36.0
Queue Length 95th (m)	m#284.7	m123.6	m52.3	#164.5	#253.7		#158.4	#390.8	#127.2	#54.4	#235.3	45.3
Internal Link Dist (m)		431.9			827.6			440.8			97.6	
Turn Bay Length (m)	200.0		120.0	65.0			70.0			42.0		35.0
Base Capacity (vph)	561	1512	927	191	647		254	636	656	63	509	1427
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	1.66	0.73	0.54	1.97	1.88		1.40	1.61	0.81	1.46	2.30	0.41

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 8 (7%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 2.30

Intersection Signal Delay: 279.6

Intersection LOS: F

Intersection Capacity Utilization 159.5%

ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

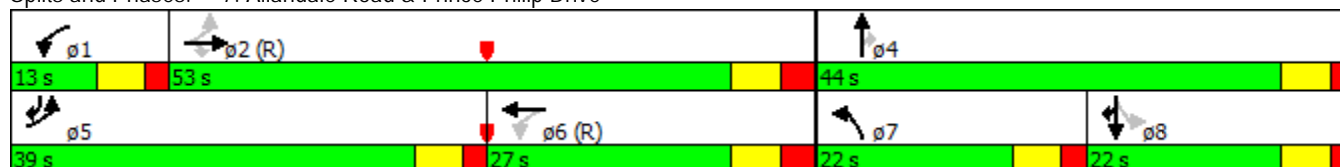
Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

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


















Splits and Phases: 7: Allandale Road & Prince Philip Drive







MUN Area Traffic Study
Allandale Road & TCH NB

Scenario 1 - 2025 PM

29/06/2015

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (veh/h)	10	484	0	0	1110	465	6	0	850	0	0	0	
Future Volume (Veh/h)	10	484	0	0	1110	465	6	0	850	0	0	0	
Sign Control		Free			Free			Stop			Stop		
Grade		0%			0%			0%			0%		
Peak Hour Factor	0.86	0.86	0.86	0.87	0.87	0.87	0.88	0.88	0.88	0.92	0.92	0.92	
Hourly flow rate (vph)	12	563	0	0	1276	534	7	0	966	0	0	0	
Pedestrians													
Lane Width (m)													
Walking Speed (m/s)													
Percent Blockage													
Right turn flare (veh)										3			
Median type	None				None								
Median storage (veh)													
Upstream signal (m)	358												
pX, platoon unblocked	0.57						0.57	0.57			0.57	0.57	0.57
vC, conflicting volume	1276				563			1863	1863	563	1863	1863	1276
vC1, stage 1 conf vol													
vC2, stage 2 conf vol													
vCu, unblocked vol	1107				563			2136	2136	563	2136	2136	1107
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 %	97				100			65	100	0	0	100	100
cM capacity (veh/h)	360				1008			20	27	526	0	27	146
Direction, Lane #	EB 1	WB 1	WB 2	NB 1									
Volume Total	575	1276	534	973									
Volume Left	12	0	0	7									
Volume Right	0	0	534	966									
cSH	360	1700	1700	530									
Volume to Capacity	0.03	0.75	0.31	1.84									
Queue Length 95th (m)	0.8	0.0	0.0	466.4									
Control Delay (s)	1.1	0.0	0.0	402.1									
Lane LOS	A	F											
Approach Delay (s)	1.1	0.0	402.1										
Approach LOS	F												
Intersection Summary													
Average Delay			116.7										
Intersection Capacity Utilization			85.3%	ICU Level of Service					E				
Analysis Period (min)			15										


























Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	26	24	1092	468	7
Future Volume (Veh/h)	5	26	24	1092	468	7
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.62	0.62	0.83	0.83	0.85	0.85
Hourly flow rate (vph)	8	42	29	1316	551	8
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						3
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	29				745	687
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	29				745	687
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				0	98
cM capacity (veh/h)	1584				380	447
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	50	1345	559			
Volume Left	8	0	551			
Volume Right	0	1316	8			
cSH	1584	1700	381			
Volume to Capacity	0.01	0.79	1.47			
Queue Length 95th (m)	0.1	0.0	223.5			
Control Delay (s)	1.2	0.0	251.4			
Lane LOS	A		F			
Approach Delay (s)	1.2	0.0	251.4			
Approach LOS			F			
Intersection Summary						
Average Delay		71.9				
Intersection Capacity Utilization		101.4%	ICU Level of Service	G		
Analysis Period (min)		15				

MUN Area Traffic Study
Bonaventure Avenue/ Allandale Road & Elizabeth Avenue

Scenario 1 - 2025 PM

27/08/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	173	750	88	101	426	72	59	1086	183	128	1153	286
Future Volume (vph)	173	750	88	101	426	72	59	1086	183	128	1153	286
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	3.5	3.7	3.0	3.5	3.7	3.0	3.4	3.4	3.0	3.4	3.4
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	55.0		0.0	55.0		0.0	55.0		35.0	40.0		0.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.984				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1652	1813	0	1652	1842	1601	1652	1821	1548	1652	1821	1548
Flt Permitted	0.309			0.085			0.114			0.098		
Satd. Flow (perm)	537	1813	0	148	1842	1601	198	1821	1548	170	1821	1548
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6				136			136			137
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		335.6			298.1			241.6			464.8	
Travel Time (s)		24.2			21.5			17.4			33.5	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.97	0.97	0.97	0.95	0.95	0.95	0.90	0.90	0.90	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	178	773	91	106	448	76	66	1207	203	139	1253	311
Shared Lane Traffic (%)												
Lane Group Flow (vph)	178	864	0	106	448	76	66	1207	203	139	1253	311
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6			4		3	8	
Permitted Phases	2			6		6	4		4	8		8
Total Split (s)	13.0	53.0		13.0	53.0	53.0	41.0	41.0	41.0	13.0	54.0	54.0
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
Act Effect Green (s)	54.0	47.0		54.0	47.0	47.0	35.0	35.0	35.0	48.0	48.0	48.0
Actuated g/C Ratio	0.45	0.39		0.45	0.39	0.39	0.29	0.29	0.29	0.40	0.40	0.40
v/c Ratio	0.58	1.21		0.69	0.62	0.11	1.16	2.27	0.37	0.90	1.72	0.44
Control Delay	27.0	141.4		43.4	34.0	0.4	209.4	601.9	13.9	78.7	357.1	16.3
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.0	141.4		43.4	34.0	0.4	209.4	601.9	13.9	78.7	357.1	16.3
LOS	C	F		D	C	A	F	F	B	E	F	B
Approach Delay		121.8			31.5			503.5			272.1	
Approach LOS		F			C			F			F	
Stops (vph)	110	679		53	337	0	41	702	53	74	790	116
Fuel Used(l)	21	178		7	31	2	12	544	7	15	385	19
CO Emissions (g/hr)	388	3314		138	572	38	219	10112	137	280	7169	350

MUN Area Traffic Study
Bonaventure Avenue/ Allandale Road & Elizabeth Avenue

Scenario 1 - 2025 PM

27/08/2015



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	75	640		27	110	7	42	1952	26	54	1384	68
VOC Emissions (g/hr)	90	764		32	132	9	51	2332	32	65	1654	81
Dilemma Vehicles (#)	0	0		0	0	0	0	0	0	0	0	0
Queue Length 50th (m)	22.8	~248.8		12.9	83.8	0.0	~18.2	~461.3	11.7	21.2	~435.5	28.2
Queue Length 95th (m)	36.5	#324.6		#35.4	118.3	0.6	#47.1	#540.2	31.4	#56.3	#514.9	52.5
Internal Link Dist (m)		311.6			274.1			217.6			440.8	
Turn Bay Length (m)	55.0			55.0			55.0		35.0	40.0		
Base Capacity (vph)	306	713		154	721	709	57	531	547	154	728	701
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	0.58	1.21		0.69	0.62	0.11	1.16	2.27	0.37	0.90	1.72	0.44

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 2.27

Intersection Signal Delay: 279.0

Intersection LOS: F

Intersection Capacity Utilization 134.7%

ICU Level of Service H

Analysis Period (min) 15

~ 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.

Splits and Phases: 10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue






















13 s	53 s	13 s	41 s
13 s	53 s	54 s	













						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	574	18	261	320	38	589
Future Volume (Veh/h)	574	18	261	320	38	589
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	692	22	314	386	46	710
Pedestrians	47		47			47
Lane Width (m)	3.7		4.0			3.7
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	4		4			4
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)			105			
pX, platoon unblocked						
vC, conflicting volume	1210	408			747	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1210	408			747	
tC, single (s)	6.4	6.3			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.4			2.3	
p0 queue free %	0	96			94	
cM capacity (veh/h)	174	585			777	
Direction, Lane #	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total	346	346	22	314	386	756
Volume Left	346	346	0	0	0	46
Volume Right	0	0	22	0	386	0
cSH	174	174	585	1700	1700	777
Volume to Capacity	1.99	1.99	0.04	0.18	0.23	0.06
Queue Length 95th (m)	200.6	200.6	0.9	0.0	0.0	1.4
Control Delay (s)	507.6	507.6	11.4	0.0	0.0	1.6
Lane LOS	F	F	B			A
Approach Delay (s)	492.3			0.0		1.6
Approach LOS	F					
Intersection Summary						
Average Delay			162.5			
Intersection Capacity Utilization			73.2%		ICU Level of Service	D
Analysis Period (min)			15			

MUN Area Traffic Study
Prince Philip Drive & Thorburn Road

Scenario 1 - 2025 PM

29/06/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	600	1164	358	243	1543	473	0	1030	73	484	1014	833
Future Volume (vph)	600	1164	358	243	1543	473	0	1030	73	484	1014	833
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.8	4.2	3.5	3.8	4.0	2.4	3.8	4.3	3.5	3.8	3.8
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	175.0		0.0	110.0		90.0	0.0		0.0	150.0		150.0
Storage Lanes	1		1	1		0	0		0	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.95	0.95	0.97	0.95	0.95
Ped Bike Factor			0.98	1.00		0.98		1.00		1.00	0.99	
Frt			0.850			0.850		0.990			0.932	
Flt Protected	0.950			0.950						0.950		
Satd. Flow (prot)	1750	3618	1689	1750	5198	1654	0	3578	0	3395	3348	0
Flt Permitted	0.108			0.129						0.950		
Satd. Flow (perm)	199	3618	1663	238	5198	1628	0	3578	0	3391	3348	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			159			420		5			212	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		327.2			152.5			152.8			386.6	
Travel Time (s)		23.6			11.0			11.0			27.8	
Confl. Peds. (#/hr)	2		2	2		2	2		2	2		2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.96	0.96	0.96	0.95	0.95	0.95	0.91	0.91	0.91	0.91	0.91	0.91
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	625	1213	373	256	1624	498	0	1132	80	532	1114	915
Shared Lane Traffic (%)												
Lane Group Flow (vph)	625	1213	373	256	1624	498	0	1212	0	532	2029	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm		NA		Prot	NA	
Protected Phases	5	2		1	6			4		3	8	
Permitted Phases	2		2	6		6						
Total Split (s)	25.0	50.0	50.0	13.0	38.0	38.0		23.0		24.0	47.0	
Total Lost Time (s)	6.0	7.0	7.0	6.0	7.0	7.0		7.0		6.0	7.0	
Act Effect Green (s)	57.0	43.0	43.0	39.0	31.0	31.0		16.0		18.0	40.0	
Actuated g/C Ratio	0.52	0.39	0.39	0.35	0.28	0.28		0.15		0.16	0.36	
v/c Ratio	1.68	0.86	0.50	1.42	1.11	0.66		2.31		0.96	1.50	
Control Delay	344.8	38.1	16.6	225.2	99.8	21.2		620.2		75.5	255.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Total Delay	344.8	38.1	16.6	225.2	99.8	21.2		620.2		75.5	255.7	
LOS	F	D	B	F	F	C		F		E	F	
Approach Delay		121.2			96.8			620.2			218.3	
Approach LOS		F			F			F			F	
Stops (vph)	359	1022	155	192	1351	258		733		433	1230	
Fuel Used(l)	186	93	19	60	236	40		566		56	459	
CO Emissions (g/hr)	3457	1734	357	1118	4385	747		10533		1034	8530	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	667	335	69	216	846	144		2033		200	1646	
VOC Emissions (g/hr)	797	400	82	258	1011	172		2429		238	1967	
Dilemma Vehicles (#)	0	0	0	0	0	0		0		0	0	
Queue Length 50th (m)	~183.0	123.6	33.0	~57.8	~151.1	52.5		~226.3		59.0	~305.3	
Queue Length 95th (m)	#250.9	152.4	59.9	m#54.4	m#134.9	m46.9		#268.0		#91.4	#348.2	
Internal Link Dist (m)		303.2			128.5			128.8			362.6	
Turn Bay Length (m)	175.0			110.0		90.0				150.0		
Base Capacity (vph)	371	1414	746	180	1464	760		524		555	1352	
Starvation Cap Reductn	0	0	0	0	0	0		0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0		0		0	0	
Storage Cap Reductn	0	0	0	0	0	0		0		0	0	
Reduced v/c Ratio	1.68	0.86	0.50	1.42	1.11	0.66		2.31		0.96	1.50	

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 28 (25%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 2.31

Intersection Signal Delay: 216.3

Intersection LOS: F

Intersection Capacity Utilization 134.6%

ICU Level of Service H

Analysis Period (min) 15

~ 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.

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





Splits and Phases: 37: Thorburn Road & Columbus Drive/Prince Philip Drive



						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	711	207	234	534	122	161
Future Volume (Veh/h)	711	207	234	534	122	161
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.93	0.93	0.90	0.90
Hourly flow rate (vph)	790	230	252	574	136	179
Pedestrians	2			2	6	
Lane Width (m)	3.7			3.7	3.7	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	0			0	1	
Right turn flare (veh)						13
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			1026		1991	913
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1026		1991	913
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			63		0	46
cM capacity (veh/h)			673		41	329
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	1020	252	574	315		
Volume Left	0	252	0	136		
Volume Right	230	0	0	179		
cSH	1700	673	1700	86		
Volume to Capacity	0.60	0.37	0.34	3.66		
Queue Length 95th (m)	0.0	13.2	0.0	Err		
Control Delay (s)	0.0	13.5	0.0	Err		
Lane LOS		B		F		
Approach Delay (s)	0.0	4.1		Err		
Approach LOS				F		
Intersection Summary						
Average Delay			1459.1			
Intersection Capacity Utilization			80.3%	ICU Level of Service		D
Analysis Period (min)			15			

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	686	831	44	881	619
Future Volume (Veh/h)	0	686	831	44	881	619
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.88	0.88	0.91	0.91	0.92	0.92
Hourly flow rate (vph)	0	780	913	48	958	673
Pedestrians	9					
Lane Width (m)	4.5					
Walking Speed (m/s)	1.2					
Percent Blockage	1					
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)						274
pX, platoon unblocked	0.58					
vC, conflicting volume	3535	946			970	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	4990	946			970	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	0			0	
cM capacity (veh/h)	0	314			704	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	780	961	958	673		
Volume Left	0	0	958	0		
Volume Right	780	48	0	0		
cSH	314	1700	704	1700		
Volume to Capacity	2.48	0.57	1.36	0.40		
Queue Length 95th (m)	477.9	0.0	308.7	0.0		
Control Delay (s)	702.4	0.0	190.0	0.0		
Lane LOS	F		F			
Approach Delay (s)	702.4	0.0	111.6			
Approach LOS	F					
Intersection Summary						
Average Delay		216.5				
Intersection Capacity Utilization		101.9%		ICU Level of Service		G
Analysis Period (min)		15				

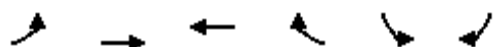


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	42	816	569	87	102	40
Future Volume (Veh/h)	42	816	569	87	102	40
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.90	0.90	0.94	0.94	0.83	0.83
Hourly flow rate (vph)	47	907	605	93	123	48
Pedestrians		18	27		17	
Lane Width (m)		3.0	3.7		4.5	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		1	2		2	
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	715				1696	686
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	715				1696	686
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	95				0	89
cM capacity (veh/h)	870				92	434
Direction, Lane #	EB 1	EB 2	WB 1	SB 1		
Volume Total	47	907	698	171		
Volume Left	47	0	0	123		
Volume Right	0	0	93	48		
cSH	870	1700	1700	119		
Volume to Capacity	0.05	0.53	0.41	1.44		
Queue Length 95th (m)	1.3	0.0	0.0	90.7		
Control Delay (s)	9.4	0.0	0.0	307.1		
Lane LOS	A			F		
Approach Delay (s)	0.5		0.0	307.1		
Approach LOS				F		
Intersection Summary						
Average Delay			29.1			
Intersection Capacity Utilization			60.3%	ICU Level of Service		B
Analysis Period (min)			15			

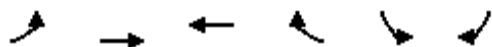
MUN Area Traffic Study
Westerland Road & Elizabeth Avenue

Scenario 1 - 2025 PM

29/06/2015



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	256	485	465	415	387	332
Future Volume (vph)	256	485	465	415	387	332
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	2.8	3.0	3.6	3.7	3.4	3.4
Grade (%)		0%	0%		0%	
Storage Length (m)	35.0			0.0	0.0	70.0
Storage Lanes	1			0	1	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.936			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1612	1739	1744	0	1730	1548
Flt Permitted	0.084				0.950	
Satd. Flow (perm)	143	1739	1744	0	1730	1548
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			66			373
Link Speed (k/h)		50	50		50	
Link Distance (m)		402.3	566.1		375.0	
Travel Time (s)		29.0	40.8		27.0	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.96	0.96	0.88	0.88	0.89	0.89
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	267	505	528	472	435	373
Shared Lane Traffic (%)						
Lane Group Flow (vph)	267	505	1000	0	435	373
Turn Type	pm+pt	NA	NA		Prot	Perm
Protected Phases	5	2	6		8	
Permitted Phases	2					8
Total Split (s)	19.0	66.0	47.0		24.0	24.0
Total Lost Time (s)	6.0	6.0	6.0		6.0	6.0
Act Effect Green (s)	60.0	60.0	41.5		18.0	18.0
Actuated g/C Ratio	0.67	0.67	0.46		0.20	0.20
v/c Ratio	0.90	0.44	1.19		1.26	0.61
Control Delay	54.1	8.5	121.8		170.3	8.4
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	54.1	8.5	121.8		170.3	8.4
LOS	D	A	F		F	A
Approach Delay		24.3	121.8		95.5	
Approach LOS		C	F		F	
Stops (vph)	152	212	667		307	40
Fuel Used(l)	24	26	173		71	15
CO Emissions (g/hr)	444	492	3214		1327	277



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
NOx Emissions (g/hr)	86	95	620		256	53
VOC Emissions (g/hr)	102	113	741		306	64
Dilemma Vehicles (#)	0	0	0		0	0
Queue Length 50th (m)	31.0	36.1	~207.1		~95.2	0.0
Queue Length 95th (m)	#73.4	54.6	#270.2		#147.9	21.7
Internal Link Dist (m)		378.3	542.1		351.0	
Turn Bay Length (m)	35.0					70.0
Base Capacity (vph)	307	1159	840		346	608
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	0.87	0.44	1.19		1.26	0.61

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 90

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.26

Intersection Signal Delay: 84.4

Intersection LOS: F

Intersection Capacity Utilization 100.5%

ICU Level of Service G

Analysis Period (min) 15

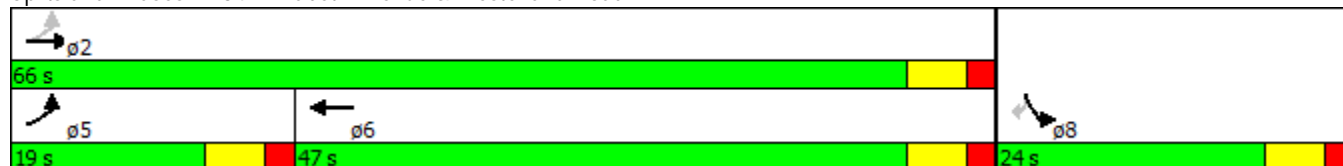
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

Splits and Phases: 34: Elizabeth Avenue & Westerland Road



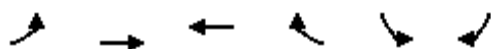
MUN Area Traffic Study
Freshwater Road & Thorburn Road

Scenario 1 - 2025 PM

29/06/2015



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑	↑	↑↑	↑
Traffic Volume (vph)	0	1395	1144	1103	992	623
Future Volume (vph)	0	1395	1144	1103	992	623
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.7	3.7	3.7	3.7	3.7	3.7
Grade (%)		0%	0%		0%	
Storage Length (m)	0.0			30.0	0.0	0.0
Storage Lanes	0			1	2	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Ped Bike Factor				0.97	0.97	0.98
Frt				0.850		0.850
Flt Protected					0.950	
Satd. Flow (prot)	0	3579	3579	1601	3471	1601
Flt Permitted					0.950	
Satd. Flow (perm)	0	3579	3579	1555	3383	1570
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				1091		12
Link Speed (k/h)		50	50		50	
Link Distance (m)		173.6	374.8		70.3	
Travel Time (s)		12.5	27.0		5.1	
Confl. Peds. (#/hr)	20			20	18	9
Confl. Bikes (#/hr)						
Peak Hour Factor	0.88	0.88	0.95	0.95	0.83	0.83
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	0	1585	1204	1161	1195	751
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1585	1204	1161	1195	751
Turn Type		NA	NA	Perm	Prot	Perm
Protected Phases		4	8		6	
Permitted Phases				8		6
Total Split (s)		23.0	23.0	23.0	22.0	22.0
Total Lost Time (s)		6.0	6.0	6.0	6.0	6.0
Act Effect Green (s)		17.0	17.0	17.0	16.0	16.0
Actuated g/C Ratio		0.38	0.38	0.38	0.36	0.36
v/c Ratio		1.17	0.89	0.92	0.97	1.33
Control Delay		104.4	24.3	16.4	36.6	180.3
Queue Delay		0.0	0.0	0.0	0.0	0.0
Total Delay		104.4	24.3	16.4	36.6	180.3
LOS		F	C	B	D	F
Approach Delay		104.4	20.4		92.1	
Approach LOS		F	C		F	
Stops (vph)		1138	928	122	804	491
Fuel Used(l)		161	83	56	67	111
CO Emissions (g/hr)		2987	1542	1040	1247	2058



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
NOx Emissions (g/hr)		576	298	201	241	397
VOC Emissions (g/hr)		689	356	240	287	475
Dilemma Vehicles (#)		0	0	0	0	0
Queue Length 50th (m)		~82.8	44.3	3.4	45.7	~81.9
Queue Length 95th (m)		#112.5	#79.2	#87.0	#71.1	#119.5
Internal Link Dist (m)		149.6	350.8		46.3	
Turn Bay Length (m)				30.0		
Base Capacity (vph)		1352	1352	1266	1234	565
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		1.17	0.89	0.92	0.97	1.33

Intersection Summary

Area Type: Other

Cycle Length: 45

Actuated Cycle Length: 45

Offset: 22 (49%), Referenced to phase 4:EBT and 8:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.33

Intersection Signal Delay: 66.6

Intersection LOS: E

Intersection Capacity Utilization 81.1%

ICU Level of Service D

Analysis Period (min) 15

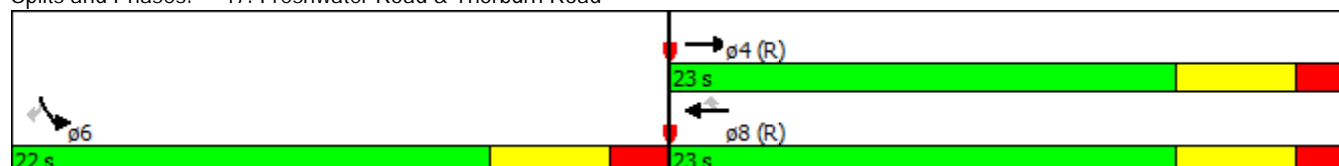
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.
























Splits and Phases: 47: Freshwater Road & Thorburn Road



MUN Area Traffic Study
Prince Philip Drive & Clinch Crescent/ Westerland Road

Scenario 1 - 2025 PM

29/06/2015













												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	208	1291	239	128	1448	140	315	232	265	270	376	516
Future Volume (vph)	208	1291	239	128	1448	140	315	232	265	270	376	516
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	4.0	3.5	3.5	3.5	3.5	3.0	3.0	3.5	3.3	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	75.0		185.0	90.0		0.0	60.0		45.0	0.0		80.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.89		1.00				0.72	0.84		0.98
Frt			0.850		0.987				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1750	3697	1566	1750	3450	0	1652	1739	1566	1711	1842	1566
Flt Permitted	0.105			0.114			0.142			0.482		
Satd. Flow (perm)	193	3697	1394	210	3450	0	247	1739	1125	731	1842	1541
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			269		10				171			159
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		591.3			489.3			375.0			105.3	
Travel Time (s)		42.6			35.2			27.0			7.6	
Confl. Peds. (#/hr)	2		30	30		2	2		150	150		2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.89	0.89	0.89	0.92	0.92	0.92	0.89	0.89	0.89	0.76	0.76	0.76
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	234	1451	269	139	1574	152	354	261	298	355	495	679
Shared Lane Traffic (%)												
Lane Group Flow (vph)	234	1451	269	139	1726	0	354	261	298	355	495	679
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2		2	6			4		4	8		8
Total Split (s)	16.0	45.0	45.0	13.0	42.0		13.0	39.0	39.0	13.0	39.0	39.0
Total Lost Time (s)	6.0	7.0	7.0	6.0	7.0		6.0	7.0	7.0	6.0	7.0	7.0
Act Effect Green (s)	49.0	38.0	38.0	43.0	35.0		40.0	32.0	32.0	40.0	32.0	32.0
Actuated g/C Ratio	0.45	0.35	0.35	0.39	0.32		0.36	0.29	0.29	0.36	0.29	0.29
v/c Ratio	1.03	1.14	0.41	0.77	1.56		1.98	0.52	0.67	1.08	0.93	1.21
Control Delay	93.7	114.6	17.9	42.9	288.1		480.4	36.9	22.3	104.3	63.0	138.3
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	93.7	114.6	17.9	42.9	288.1		480.4	36.9	22.3	104.3	63.0	138.3
LOS	F	F	B	D	F		F	D	C	F	E	F
Approach Delay		98.8			269.8			204.1			106.0	
Approach LOS		F			F			F			F	
Stops (vph)	177	1151	100	101	978		171	190	109	215	330	331
Fuel Used(l)	31	212	19	12	448		131	19	16	29	29	67
CO Emissions (g/hr)	570	3946	353	231	8329		2446	356	306	543	547	1255

Synchro 9 Report

MUN Area Traffic Study
Prince Philip Drive & Clinch Crescent/ Westerland Road

Scenario 1 - 2025 PM

29/06/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	110	762	68	45	1608		472	69	59	105	105	242
VOC Emissions (g/hr)	131	910	81	53	1921		564	82	71	125	126	290
Dilemma Vehicles (#)	0	0	0	0	0		0	0	0	0	0	0
Queue Length 50th (m)	~50.2	~197.9	25.9	20.0	~285.6		~102.7	46.7	23.4	~62.1	102.9	~153.2
Queue Length 95th (m)	m#82.8	#236.5	43.5	m#32.9	#313.6		#156.9	71.0	53.5	#85.7	114.7	#163.7
Internal Link Dist (m)		567.3			465.3			351.0			81.3	
Turn Bay Length (m)	75.0		185.0	90.0			60.0		45.0			80.0
Base Capacity (vph)	227	1277	657	180	1104		179	505	448	328	535	561
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	1.03	1.14	0.41	0.77	1.56		1.98	0.52	0.67	1.08	0.93	1.21

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.98

Intersection Signal Delay: 166.9

Intersection LOS: F

Intersection Capacity Utilization 114.9%

ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

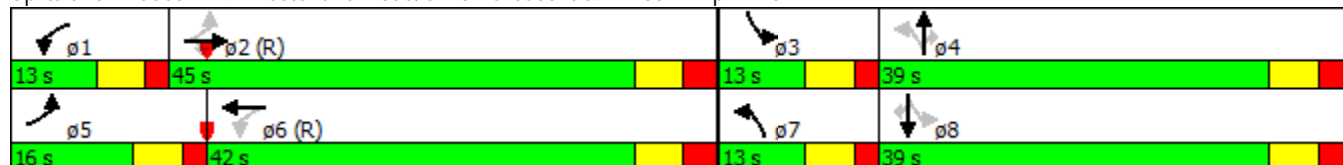
Queue shown is maximum after two cycles.

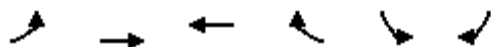
95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

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

Splits and Phases: 9: Westerland Road/Clinch Crescent & Prince Philip Drive





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	325	1507	1914	111	123	532
Future Volume (vph)	325	1507	1914	111	123	532
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	4.0	4.0	3.7	3.3	3.5
Grade (%)		0%	0%		0%	
Storage Length (m)	140.0			70.0	80.0	0.0
Storage Lanes	1			1	1	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Ped Bike Factor				0.97	1.00	0.98
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1652	3697	3697	1601	1711	1566
Flt Permitted	0.068				0.950	
Satd. Flow (perm)	118	3697	3697	1559	1704	1541
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				71		203
Link Speed (k/h)		50	50		50	
Link Distance (m)		289.0	591.3		280.3	
Travel Time (s)		20.8	42.6		20.2	
Confl. Peds. (#/hr)	2			2	2	2
Confl. Bikes (#/hr)						
Peak Hour Factor	0.90	0.90	0.87	0.87	0.80	0.80
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	361	1674	2200	128	154	665
Shared Lane Traffic (%)						
Lane Group Flow (vph)	361	1674	2200	128	154	665
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	5	2	6		8	
Permitted Phases	2			6		8
Total Split (s)	18.0	78.0	60.0	60.0	32.0	32.0
Total Lost Time (s)	6.0	7.0	7.0	7.0	6.0	6.0
Act Effect Green (s)	72.0	71.0	53.0	53.0	26.0	26.0
Actuated g/C Ratio	0.65	0.65	0.48	0.48	0.24	0.24
v/c Ratio	1.48	0.70	1.24	0.16	0.38	1.28
Control Delay	257.4	16.0	127.9	5.6	38.6	166.7
Queue Delay	0.0	0.0	0.9	0.0	0.0	0.4
Total Delay	257.4	16.0	128.7	5.6	38.6	167.1
LOS	F	B	F	A	D	F
Approach Delay		58.9	122.0		142.9	
Approach LOS		E	F		F	
Stops (vph)	257	1053	924	29	102	297
Fuel Used(l)	79	84	317	7	9	89
CO Emissions (g/hr)	1470	1555	5888	137	171	1657



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
NOx Emissions (g/hr)	284	300	1136	26	33	320
VOC Emissions (g/hr)	339	359	1358	32	40	382
Dilemma Vehicles (#)	0	0	0	0	0	0
Queue Length 50th (m)	~93.4	115.9	~301.8	4.0	27.9	~146.7
Queue Length 95th (m)	m#141.4	m112.4	m81.4	m0.4	40.9	#174.6
Internal Link Dist (m)		265.0	567.3		256.3	
Turn Bay Length (m)	140.0			70.0	80.0	
Base Capacity (vph)	244	2386	1781	787	404	519
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	414	0	0	22
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.48	0.70	1.61	0.16	0.38	1.34

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 20 (18%), Referenced to phase 2:EBTL and 6:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.48

Intersection Signal Delay: 100.5

Intersection LOS: F

Intersection Capacity Utilization 96.9%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

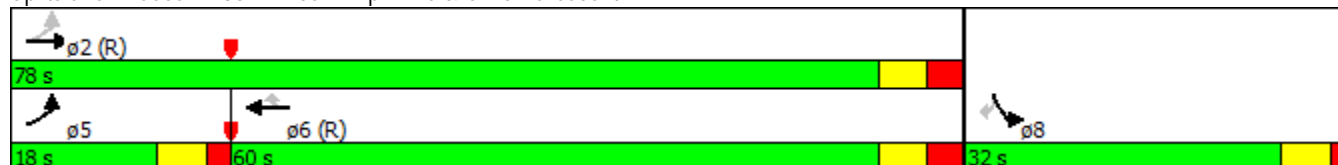
Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

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

Splits and Phases: 35: Prince Philip Drive & Clinch Crescent



MUN Area Traffic Study
Prince Philip Drive & Confederation Building Lot

Scenario 1 - 2025 PM

29/06/2015



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	290	284	346	1265	1167	240
Future Volume (vph)	290	284	346	1265	1167	240
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	4.0	3.5	4.0	3.7	4.0
Grade (%)	0%			0%	0%	
Storage Length (m)	0.0	0.0	75.0			100.0
Storage Lanes	1	1	1			1
Taper Length (m)	2.5		2.5			
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Ped Bike Factor						
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1750	1654	1750	3697	3579	1654
Flt Permitted	0.950		0.078			
Satd. Flow (perm)	1750	1654	144	3697	3579	1654
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		244				276
Link Speed (k/h)	50			50	50	
Link Distance (m)	119.9			283.2	155.8	
Travel Time (s)	8.6			20.4	11.2	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.73	0.73	0.89	0.89	0.87	0.87
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	397	389	389	1421	1341	276
Shared Lane Traffic (%)						
Lane Group Flow (vph)	397	389	389	1421	1341	276
Turn Type	Prot	Perm	pm+pt	NA	NA	Perm
Protected Phases	8		5	2	6	
Permitted Phases		8	2			6
Total Split (s)	31.0	31.0	18.0	69.0	51.0	51.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Act Effect Green (s)	24.2	24.2	63.0	63.0	45.0	45.0
Actuated g/C Ratio	0.24	0.24	0.64	0.64	0.45	0.45
v/c Ratio	0.93	0.66	1.36	0.61	0.83	0.31
Control Delay	67.1	18.4	210.7	12.2	29.3	3.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	67.1	18.4	210.7	12.2	29.3	3.0
LOS	E	B	F	B	C	A
Approach Delay	43.0			54.9	24.8	
Approach LOS	D			D	C	
Stops (vph)	254	103	197	707	984	19
Fuel Used(l)	24	10	98	164	66	5
CO Emissions (g/hr)	446	178	1820	3053	1221	84



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
NOx Emissions (g/hr)	86	34	351	589	236	16
VOC Emissions (g/hr)	103	41	420	704	282	19
Dilemma Vehicles (#)	0	0	0	0	0	0
Queue Length 50th (m)	74.9	23.6	~85.7	79.6	116.7	0.0
Queue Length 95th (m)	84.1	31.6	#139.9	96.9	137.6	11.9
Internal Link Dist (m)	95.9			259.2	131.8	
Turn Bay Length (m)			75.0			100.0
Base Capacity (vph)	440	599	285	2347	1623	901
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	0.90	0.65	1.36	0.61	0.83	0.31

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 99.2

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 1.36

Intersection Signal Delay: 41.1

Intersection LOS: D

Intersection Capacity Utilization 82.5%

ICU Level of Service E

Analysis Period (min) 15

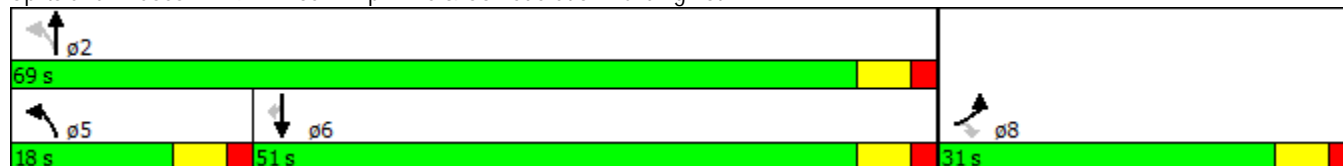
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

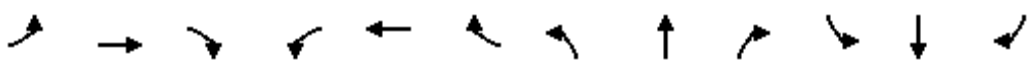
Splits and Phases: 29: Prince Philip Drive & Confederation Building Lot















MUN Area Traffic Study
Prince Philip Drive & Morrissey Drive

Scenario 1 - 2025 PM

29/06/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↰	↑↑	↱				↰	↱	
Traffic Volume (vph)	0	1828	0	42	1565	177	0	0	0	274	122	151
Future Volume (vph)	0	1828	0	42	1565	177	0	0	0	274	122	151
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.8	3.8	3.8	3.0	3.8	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	0.0		0.0	70.0		30.0	0.0		0.0	40.0		0.0
Storage Lanes	0		0	1		1	0		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
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	1.00
Ped Bike Factor						0.95				0.95	0.97	
Frt						0.850					0.917	
Flt Protected				0.950						0.950		
Satd. Flow (prot)	0	3618	0	1652	3618	1566	0	0	0	1750	1636	0
Flt Permitted				0.061						0.950		
Satd. Flow (perm)	0	3618	0	106	3618	1488	0	0	0	1670	1636	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						83					19	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		489.3			455.9			114.5			292.8	
Travel Time (s)		35.2			32.8			8.2			21.1	
Confl. Peds. (#/hr)	2		2	10		10	25		25	25		25
Confl. Bikes (#/hr)												
Peak Hour Factor	0.91	0.91	0.91	0.92	0.92	0.92	0.69	0.69	0.69	0.89	0.89	0.89
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	2009	0	46	1701	192	0	0	0	308	137	170
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	2009	0	46	1701	192	0	0	0	308	307	0
Turn Type		NA		pm+pt	NA	Perm				Perm	NA	
Protected Phases		2		1	6						8	
Permitted Phases				6		6				8		
Total Split (s)		58.0		13.0	71.0	71.0				39.0	39.0	
Total Lost Time (s)		7.0		6.0	7.0	7.0				7.0	7.0	
Act Effect Green (s)		60.3		71.7	70.7	70.7				25.3	25.3	
Actuated g/C Ratio		0.55		0.65	0.64	0.64				0.23	0.23	
v/c Ratio		1.01		0.27	0.73	0.19				0.80	0.79	
Control Delay		27.8		18.8	11.0	3.7				55.6	51.4	
Queue Delay		0.0		0.0	0.0	0.0				0.0	0.0	
Total Delay		27.8		18.8	11.0	3.7				55.6	51.4	
LOS		C		B	B	A				E	D	
Approach Delay		27.8			10.5						53.5	
Approach LOS		C			B						D	
Stops (vph)		1173		25	734	26				252	235	
Fuel Used(l)		150		3	98	9				25	24	
CO Emissions (g/hr)		2796		56	1814	163				465	440	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)		540		11	350	31				90	85	
VOC Emissions (g/hr)		645		13	418	38				107	102	
Dilemma Vehicles (#)		0		0	0	0				0	0	
Queue Length 50th (m)		~256.0		2.6	60.1	3.5				62.7	58.5	
Queue Length 95th (m)		m#241.7		m2.9	m46.2	m2.9				85.6	81.8	
Internal Link Dist (m)		465.3			431.9			90.5			268.8	
Turn Bay Length (m)				70.0		30.0				40.0		
Base Capacity (vph)		1983		168	2326	986				485	489	
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		1.01		0.27	0.73	0.19				0.64	0.63	

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 28 (25%), Referenced to phase 2:EBT and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.01

Intersection Signal Delay: 23.9

Intersection LOS: C

Intersection Capacity Utilization 79.2%

ICU Level of Service D

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

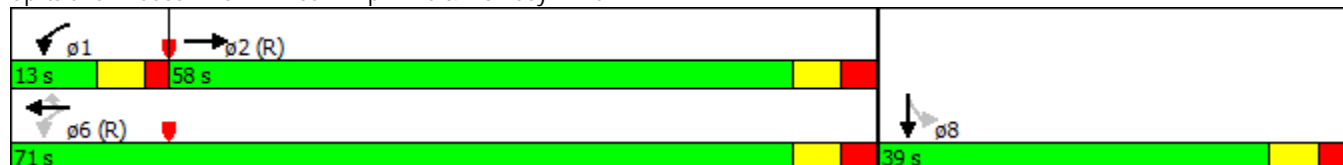
Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

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

Splits and Phases: 61: Prince Philip Drive & Morrissey Drive



MUN Area Traffic Study
Prince Philip Drive & Wicklow Street

Scenario 1 - 2025 PM

29/06/2015



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	24	1581	2061	384	251	97
Future Volume (vph)	24	1581	2061	384	251	97
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	4.0	4.0	4.0	3.0	3.0
Grade (%)		0%	0%		0%	
Storage Length (m)	50.0			0.0	60.0	0.0
Storage Lanes	1			0	1	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	0.95	0.95	0.95	1.00	1.00
Ped Bike Factor			1.00		1.00	0.98
Frt			0.976			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1652	3697	3593	0	1652	1478
Flt Permitted	0.053				0.950	
Satd. Flow (perm)	92	3697	3593	0	1646	1455
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			35			112
Link Speed (k/h)		50	50		50	
Link Distance (m)		204.4	289.0		276.1	
Travel Time (s)		14.7	20.8		19.9	
Confl. Peds. (#/hr)	2			2	2	2
Confl. Bikes (#/hr)						
Peak Hour Factor	0.90	0.90	0.96	0.96	0.85	0.85
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	27	1757	2147	400	295	114
Shared Lane Traffic (%)						
Lane Group Flow (vph)	27	1757	2547	0	295	114
Turn Type	pm+pt	NA	NA		Prot	Perm
Protected Phases	5	2	6		8	
Permitted Phases	2					8
Total Split (s)	13.0	85.0	72.0		25.0	25.0
Total Lost Time (s)	6.0	6.0	6.0		6.0	6.0
Act Effect Green (s)	79.0	79.0	71.6		19.0	19.0
Actuated g/C Ratio	0.72	0.72	0.65		0.17	0.17
v/c Ratio	0.18	0.66	1.08		1.04	0.33
Control Delay	8.2	10.9	54.5		108.0	10.6
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	8.2	10.9	54.5		108.0	10.6
LOS	A	B	D		F	B
Approach Delay		10.9	54.5		80.9	
Approach LOS		B	D		F	
Stops (vph)	11	772	739		212	17
Fuel Used(l)	2	120	186		32	4
CO Emissions (g/hr)	33	2226	3462		599	69



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
NOx Emissions (g/hr)	6	430	668		116	13
VOC Emissions (g/hr)	8	513	799		138	16
Dilemma Vehicles (#)	0	0	0		0	0
Queue Length 50th (m)	1.4	101.4	~333.1		~68.2	0.4
Queue Length 95th (m)	m2.0	m126.9	m73.4		#109.9	13.2
Internal Link Dist (m)		180.4	265.0		252.1	
Turn Bay Length (m)	50.0				60.0	
Base Capacity (vph)	165	2655	2351		285	343
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	0.16	0.66	1.08		1.04	0.33

Intersection Summary

Area Type: Other

Cycle Length: 110

Actuated Cycle Length: 110

Offset: 20 (18%), Referenced to phase 2:EBTL and 6:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.08

Intersection Signal Delay: 40.3

Intersection LOS: D

Intersection Capacity Utilization 93.2%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

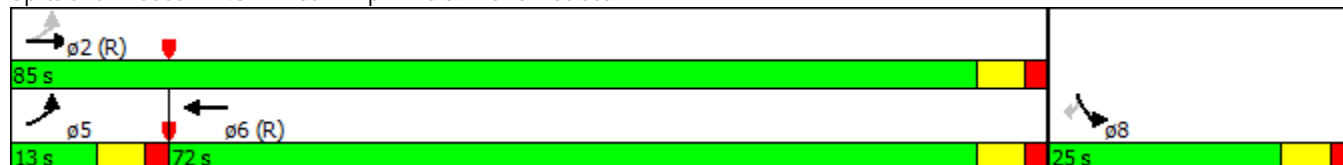
Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

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

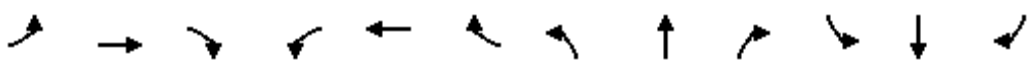
Splits and Phases: 40: Prince Philip Drive & Wicklow Street



MUN Area Traffic Study
Freshwater Road & Stamps Lane/ Oxen Pond Road













Scenario 1 - 2025 PM

29/06/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↗		↖			↕		↖	↗	
Traffic Volume (vph)	0	1429	517	0	1440	77	302	213	51	19	194	213
Future Volume (vph)	0	1429	517	0	1440	77	302	213	51	19	194	213
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	4.0	4.0	4.0	3.0	3.0	3.0	2.6	2.9	2.9
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	0.0		0.0	0.0		0.0	0.0		0.0	30.0		0.0
Storage Lanes	0		1	0		0	0		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt			0.850		0.993			0.988			0.922	
Flt Protected								0.974		0.950		
Satd. Flow (prot)	0	1842	1566	0	1932	0	0	1647	0	1573	1569	0
Flt Permitted								0.469		0.510		
Satd. Flow (perm)	0	1842	1566	0	1932	0	0	793	0	844	1569	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			287		4			5			17	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		374.8			273.7			376.6			148.1	
Travel Time (s)		27.0			19.7			27.1			10.7	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.91	0.91	0.91	0.94	0.94	0.94	0.91	0.91	0.91	0.86	0.86	0.86
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	6%	3%	2%	4%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	1570	568	0	1532	82	332	234	56	22	226	248
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1570	568	0	1614	0	0	622	0	22	474	0
Turn Type		NA	Perm		NA		Perm	NA		pm+pt	NA	
Protected Phases		8			4			2		1	6	
Permitted Phases			8				2			6		
Total Split (s)		56.0	56.0		56.0		30.0	30.0		14.0	44.0	
Total Lost Time (s)		6.0	6.0		6.0			6.0		6.0	6.0	
Act Effect Green (s)		50.0	50.0		50.0			32.6		38.0	38.0	
Actuated g/C Ratio		0.50	0.50		0.50			0.33		0.38	0.38	
v/c Ratio		1.70	0.61		1.67			2.37		0.06	0.78	
Control Delay		344.9	11.5		328.2			651.1		20.1	37.1	
Queue Delay		0.0	0.0		0.0			0.0		0.0	0.0	
Total Delay		344.9	11.5		328.2			651.1		20.1	37.1	
LOS		F	B		F			F		C	D	
Approach Delay		256.3			328.2			651.1			36.3	
Approach LOS		F			F			F			D	
Stops (vph)		1002	193		1070			389		13	337	
Fuel Used(l)		453	27		447			313		1	25	
CO Emissions (g/hr)		8419	508		8307			5814		16	464	

MUN Area Traffic Study
Freshwater Road & Stamps Lane/ Oxen Pond Road

Scenario 1 - 2025 PM
29/06/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)		1625	98		1603			1122		3	89	
VOC Emissions (g/hr)		1942	117		1916			1341		4	107	
Dilemma Vehicles (#)		0	0		0			0		0	0	
Queue Length 50th (m)		~450.0	35.2		~463.2			~192.5		2.6	77.1	
Queue Length 95th (m)		#529.0	68.6		#544.4			#281.1		7.1	109.1	
Internal Link Dist (m)		350.8			249.7			352.6			124.1	
Turn Bay Length (m)										30.0		
Base Capacity (vph)		921	926		968			262		379	606	
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		1.70	0.61		1.67			2.37		0.06	0.78	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 2.37

Intersection Signal Delay: 308.2

Intersection LOS: F

Intersection Capacity Utilization 149.7%

ICU Level of Service H

Analysis Period (min) 15






~ 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.

Splits and Phases: 46: Stamps Lane/Oxen Pond Road & Freshwater Road

 p1	 p2	 p4
14 s	30 s	56 s
 p6	 p8	
44 s	56 s	

Summary of All Intervals

Run Number	1	10	2	3	4	5	6
Start Time	6:30	6:30	6:30	6:30	6:30	6:30	6:30
End Time	8:00	8:00	8:00	8:00	8:00	8:00	8:00
Total Time (min)	90	90	90	90	90	90	90
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	5	5	5	5	5	5	5
# of Recorded Intervals	4	4	4	4	4	4	4
Vehs Entered	12648	11555	10269	8326	10666	10988	9935
Vehs Exited	11630	10580	9229	7536	9757	9902	8897
Starting Vehs	2215	2281	2345	2358	2317	2222	2249
Ending Vehs	3233	3256	3385	3148	3226	3308	3287
Travel Distance (km)	18653	17110	14325	11022	15300	15324	13625
Travel Time (hr)	8549.7	8423.1	9101.1	9633.8	8850.2	8930.0	9583.8
Total Delay (hr)	8150.8	8057.4	8794.8	9398.1	8523.3	8602.4	9292.7
Total Stops	35769	33077	28063	20774	29578	30155	25816
Fuel Used (l)	8477.5	8283.5	8716.3	8977.7	8559.1	8623.6	9073.1

Summary of All Intervals

Run Number	7	8	9	Avg
Start Time	6:30	6:30	6:30	6:30
End Time	8:00	8:00	8:00	8:00
Total Time (min)	90	90	90	90
Time Recorded (min)	60	60	60	60
# of Intervals	5	5	5	5
# of Recorded Intervals	4	4	4	4
Vehs Entered	10477	12140	10687	10764
Vehs Exited	9375	11380	9458	9774
Starting Vehs	2278	2384	2198	2278
Ending Vehs	3380	3144	3427	3279
Travel Distance (km)	14594	18591	15060	15361
Travel Time (hr)	9330.2	8606.3	8758.8	8976.7
Total Delay (hr)	9018.0	8210.0	8436.8	8648.4
Total Stops	29498	35257	28819	29681
Fuel Used (l)	8913.7	8547.1	8463.0	8663.5

Interval #0 Information Seeding

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

Interval #1 Information Recording #1

Start Time	7:00
End Time	7:15
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	3341	3410	3459	3295	3371	3644	3520
Vehs Exited	3111	3056	3137	2937	3074	3157	2969
Starting Vehs	2215	2281	2345	2358	2317	2222	2249
Ending Vehs	2445	2635	2667	2716	2614	2709	2800
Travel Distance (km)	5251	5181	5355	4721	5224	5213	4595
Travel Time (hr)	1244.7	1171.0	1211.4	1204.4	1212.3	1237.0	1235.5
Total Delay (hr)	1132.6	1060.3	1096.8	1103.5	1101.0	1125.5	1136.8
Total Stops	9606	9658	10290	9347	9720	9973	9092
Fuel Used (l)	1393.9	1321.5	1369.1	1328.5	1364.1	1380.9	1346.7

Interval #1 Information Recording #1

Start Time	7:00
End Time	7:15
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	3310	3359	3280	3399
Vehs Exited	3077	3065	2908	3045
Starting Vehs	2278	2384	2198	2278
Ending Vehs	2511	2678	2570	2632
Travel Distance (km)	5226	5180	5103	5105
Travel Time (hr)	1234.4	1247.6	1204.0	1220.2
Total Delay (hr)	1122.7	1136.9	1095.1	1111.1
Total Stops	9849	10149	9240	9693
Fuel Used (l)	1381.0	1387.0	1346.9	1362.0

Interval #2 Information Recording #2

Start Time	7:15
End Time	7:30
Total Time (min)	15
Volumes adjusted by PHF, Growth Factors.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	3424	3425	2791	2787	3251	3129	3012
Vehs Exited	3156	2921	2583	2356	3055	2983	2421
Starting Vehs	2445	2635	2667	2716	2614	2709	2800
Ending Vehs	2713	3139	2875	3147	2810	2855	3391
Travel Distance (km)	4994	4659	4093	3474	4822	4827	3835
Travel Time (hr)	1830.9	1754.6	1835.4	1871.8	1809.4	1815.8	1951.8
Total Delay (hr)	1724.2	1654.7	1747.9	1797.4	1706.3	1712.6	1870.1
Total Stops	9384	9118	7224	7110	9184	8939	7885
Fuel Used (l)	1878.9	1791.5	1831.2	1823.1	1850.2	1855.4	1910.3

Interval #2 Information Recording #2

Start Time	7:15
End Time	7:30
Total Time (min)	15
Volumes adjusted by PHF, Growth Factors.	

Run Number	7	8	9	Avg
Vehs Entered	2933	3224	3366	3134
Vehs Exited	2472	3093	3131	2819
Starting Vehs	2511	2678	2570	2632
Ending Vehs	2972	2809	2805	2945
Travel Distance (km)	3779	5001	4897	4438
Travel Time (hr)	1869.7	1854.3	1777.8	1837.1
Total Delay (hr)	1788.3	1747.7	1673.0	1742.2
Total Stops	7318	9254	9333	8472
Fuel Used (l)	1839.8	1901.4	1831.9	1851.4

Interval #3 Information Recording #3

Start Time	7:30
End Time	7:45
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	2993	2603	2140	1259	2181	2288	1495
Vehs Exited	2729	2460	1970	1266	2038	2071	1713
Starting Vehs	2713	3139	2875	3147	2810	2855	3391
Ending Vehs	2977	3282	3045	3140	2953	3072	3173
Travel Distance (km)	4469	4181	2884	1601	3179	2908	2408
Travel Time (hr)	2451.2	2425.8	2615.7	2787.4	2523.5	2536.0	2781.1
Total Delay (hr)	2355.7	2336.8	2554.3	2753.1	2455.5	2474.0	2729.9
Total Stops	8743	8077	5919	2640	6178	5424	3743
Fuel Used (l)	2374.2	2338.7	2431.5	2500.6	2367.6	2363.5	2540.6

Interval #3 Information Recording #3

Start Time	7:30
End Time	7:45
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	2015	3099	2371	2238
Vehs Exited	1709	2951	2044	2094
Starting Vehs	2972	2809	2805	2945
Ending Vehs	3278	2957	3132	3099
Travel Distance (km)	2317	4690	3277	3191
Travel Time (hr)	2706.0	2448.8	2478.7	2575.4
Total Delay (hr)	2656.6	2348.7	2408.8	2507.3
Total Stops	5410	8598	6156	6092
Fuel Used (l)	2471.3	2396.2	2335.0	2411.9

Interval #4 Information Recording #4

Start Time	7:45
End Time	8:00
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	2890	2117	1879	985	1863	1927	1908
Vehs Exited	2634	2143	1539	977	1590	1691	1794
Starting Vehs	2977	3282	3045	3140	2953	3072	3173
Ending Vehs	3233	3256	3385	3148	3226	3308	3287
Travel Distance (km)	3940	3090	1993	1227	2075	2375	2787
Travel Time (hr)	3022.9	3071.7	3438.6	3770.1	3305.0	3341.3	3615.4
Total Delay (hr)	2938.4	3005.6	3395.7	3744.0	3260.4	3290.4	3555.9
Total Stops	8036	6224	4630	1677	4496	5819	5096
Fuel Used (l)	2830.5	2831.8	3084.6	3325.5	2977.2	3023.7	3275.5

Interval #4 Information Recording #4

Start Time	7:45
End Time	8:00
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	2219	2458	1670	1987
Vehs Exited	2117	2271	1375	1815
Starting Vehs	3278	2957	3132	3099
Ending Vehs	3380	3144	3427	3279
Travel Distance (km)	3272	3720	1785	2626
Travel Time (hr)	3520.2	3055.6	3298.3	3343.9
Total Delay (hr)	3450.4	2976.7	3259.9	3287.7
Total Stops	6921	7256	4090	5418
Fuel Used (l)	3221.7	2862.4	2949.2	3038.2

1: Allandale Road & TCH NB Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBR	All
Denied Delay (hr)	0.0	0.7	0.0	0.0	0.8	154.3	155.8
Denied Del/Veh (s)	31.0	10.3	0.0	0.0	569.0	651.2	291.2
Total Delay (hr)	0.2	11.9	1.0	0.5	0.0	14.6	28.2
Total Del/Veh (s)	138.3	169.4	6.1	7.6	55.6	134.1	69.0
Stop Delay (hr)	0.2	11.7	0.1	0.1	0.0	14.1	26.2
Stop Del/Veh (s)	136.7	167.7	0.8	1.0	48.5	129.6	64.3

7: Allandale Road & Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	22.3	29.2	13.1	2.9	9.3	1.4	4.2	11.6	6.0	0.3	3.4	1.6
Denied Del/Veh (s)	194.0	209.2	214.8	80.5	86.4	74.2	99.3	94.7	94.9	54.8	44.6	44.8
Total Delay (hr)	17.2	7.2	24.7	65.3	139.7	23.3	6.4	13.0	1.0	2.4	32.3	0.5
Total Del/Veh (s)	155.6	58.2	457.7	1351.8	924.4	913.3	139.8	100.4	14.7	359.4	386.8	14.5
Stop Delay (hr)	15.3	5.9	24.3	66.4	141.8	23.8	5.7	10.9	0.6	2.4	31.8	0.3
Stop Del/Veh (s)	138.4	47.6	450.9	1374.0	938.3	931.2	124.2	83.8	8.9	356.5	380.2	9.1

7: Allandale Road & Prince Philip Drive Performance by movement

Movement	All
Denied Delay (hr)	105.2
Denied Del/Veh (s)	128.0
Total Delay (hr)	333.0
Total Del/Veh (s)	379.0
Stop Delay (hr)	329.1
Stop Del/Veh (s)	374.6

9: Westerland Road/Clinch Crescent & Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	2.2	16.9	3.1	0.0	0.0	0.0	0.3	0.1	0.2	4.0	5.6	5.9
Denied Del/Veh (s)	72.9	92.4	93.2	0.0	0.0	0.0	9.8	4.8	7.4	397.2	344.5	278.2
Total Delay (hr)	7.1	53.4	43.4	30.2	7.7	0.7	1.0	0.9	1.3	0.8	11.9	0.5
Total Del/Veh (s)	239.9	302.5	1231.5	1873.9	42.3	39.4	36.1	41.9	52.9	91.8	681.2	24.7
Stop Delay (hr)	6.5	50.2	43.7	30.2	5.4	0.5	0.9	0.8	1.3	0.8	11.9	0.4
Stop Del/Veh (s)	221.5	284.1	1239.1	1872.0	29.5	27.9	33.1	38.5	51.9	88.3	680.3	21.4

9: Westerland Road/Clinch Crescent & Prince Philip Drive Performance by movement

Movement	All
Denied Delay (hr)	38.3
Denied Del/Veh (s)	66.3
Total Delay (hr)	159.0
Total Del/Veh (s)	275.5
Stop Delay (hr)	152.6
Stop Del/Veh (s)	264.5

10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	41.7	176.1	28.6	38.2	636.2	104.4	0.0	0.0	0.0
Denied Del/Veh (s)	1.6	0.3	0.1	1442.1	1460.8	1451.8	1809.8	1716.9	1700.2	0.0	0.0	0.0
Total Delay (hr)	0.4	1.9	0.1	6.2	38.4	0.2	9.0	22.3	3.4	4.0	37.3	42.6
Total Del/Veh (s)	18.8	22.4	10.9	1720.1	2194.0	68.0	2302.9	312.9	295.1	359.2	326.5	1784.6
Stop Delay (hr)	0.3	1.4	0.1	6.2	38.4	0.1	8.9	21.0	3.2	3.7	34.6	42.6
Stop Del/Veh (s)	13.9	16.4	6.3	1719.3	2194.5	64.4	2288.4	294.1	278.4	334.3	303.1	1781.5

10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue Performance by movement

Movement	All
Denied Delay (hr)	1025.3
Denied Del/Veh (s)	1177.0
Total Delay (hr)	165.8
Total Del/Veh (s)	442.7
Stop Delay (hr)	160.5
Stop Del/Veh (s)	428.6

11: Mt. Scio Road & Allandale Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	1.0	5.1	0.6	0.0	0.0	0.0	6.4	5.0	5.9	13.5	14.7	38.7
Denied Del/Veh (s)	40.7	38.3	32.3	0.2	0.0	0.1	216.0	263.6	218.0	491.8	520.0	468.8
Total Delay (hr)	7.3	55.8	7.6	0.4	4.6	0.1	7.2	4.3	7.4	3.3	2.3	4.0
Total Del/Veh (s)	313.4	420.5	401.8	25.2	28.8	15.3	322.2	309.3	379.4	221.1	152.4	86.6
Stop Delay (hr)	7.2	55.0	7.5	0.3	3.2	0.1	7.1	4.2	7.3	3.2	2.2	3.8
Stop Del/Veh (s)	307.7	413.9	396.7	18.0	19.8	7.7	318.2	304.4	376.5	216.6	146.8	82.9

11: Mt. Scio Road & Allandale Road Performance by movement

Movement	All
Denied Delay (hr)	90.9
Denied Del/Veh (s)	160.8
Total Delay (hr)	104.2
Total Del/Veh (s)	213.7
Stop Delay (hr)	100.9
Stop Del/Veh (s)	207.0

17: Allandale Road & TCH SB Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	14.4	0.1	14.5
Denied Del/Veh (s)	0.1	0.1	0.0	0.1	170.9	98.9	56.9
Total Delay (hr)	0.6	2.8	0.0	1.1	9.9	0.1	14.6
Total Del/Veh (s)	505.0	406.1	8.7	7.2	138.8	71.4	59.8
Stop Delay (hr)	0.6	2.8	0.0	0.0	9.7	0.1	13.2
Stop Del/Veh (s)	501.8	403.6	0.0	0.0	136.2	69.5	54.1

18: TCH SB Performance by movement

Movement	NBR	SBT	All
Denied Delay (hr)	0.2	30.9	31.2
Denied Del/Veh (s)	1.0	313.6	93.6
Total Delay (hr)	1.9	10.1	11.9
Total Del/Veh (s)	7.9	164.5	40.1
Stop Delay (hr)	0.0	10.0	10.0
Stop Del/Veh (s)	0.0	164.3	33.8

22: Allandale Road & Higgins Line Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	173.8	72.7	0.0	0.0	2.2	7.1	255.8
Denied Del/Veh (s)	1137.8	1194.4	0.0	0.0	114.7	93.0	454.5
Total Delay (hr)	25.6	6.2	2.6	0.6	1.2	23.1	59.3
Total Del/Veh (s)	548.8	366.5	17.5	6.0	60.0	291.5	142.3
Stop Delay (hr)	25.6	6.2	1.9	0.1	1.1	23.0	57.8
Stop Del/Veh (s)	549.1	367.1	12.5	0.7	55.1	290.3	138.7

24: Allandale Road & Confederation Building Lot Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	76.2	86.1	0.0	0.0	0.5	1.9	164.7
Denied Del/Veh (s)	1023.4	974.9	0.0	0.1	30.6	19.9	306.9
Total Delay (hr)	17.1	1.2	5.0	0.3	1.4	45.0	70.0
Total Del/Veh (s)	581.2	35.8	22.8	5.2	90.4	417.6	153.4
Stop Delay (hr)	17.2	1.1	3.5	0.0	1.3	45.3	68.5
Stop Del/Veh (s)	583.0	34.2	16.0	0.1	84.5	420.7	150.1

29: Prince Philip Drive & Confederation Building Lot Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Delay (hr)	29.0	29.7	0.0	0.0	367.8	75.7	502.1
Denied Del/Veh (s)	355.9	372.1	0.1	0.0	1130.6	1145.6	665.1
Total Delay (hr)	3.9	13.8	0.6	1.6	40.4	2.3	62.6
Total Del/Veh (s)	65.6	242.0	13.5	10.2	353.1	104.5	137.1
Stop Delay (hr)	3.5	14.1	0.4	1.0	40.9	2.2	62.1
Stop Del/Veh (s)	59.8	246.8	9.1	6.1	357.6	102.2	136.1

34: Elizabeth Avenue & Westerland Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	36.3	34.0	0.1	0.0	0.1	70.4
Denied Del/Veh (s)	0.0	0.0	1500.7	1513.3	3.2	0.0	3.5	381.9
Total Delay (hr)	0.2	0.3	45.8	40.2	23.3	0.7	26.5	137.0
Total Del/Veh (s)	6.0	3.9	2356.8	2369.7	822.1	443.6	1084.3	720.9
Stop Delay (hr)	0.1	0.1	46.1	40.4	23.3	0.7	26.7	137.4
Stop Del/Veh (s)	2.7	1.7	2370.3	2382.4	821.8	447.7	1091.0	722.9

35: Prince Philip Drive & Clinch Crescent Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.2	0.4	0.0	0.0	5.2	23.6	29.4
Denied Del/Veh (s)	4.2	1.9	0.0	0.0	165.0	157.6	44.3
Total Delay (hr)	3.1	34.6	2.6	0.1	6.0	6.0	52.5
Total Del/Veh (s)	67.9	161.6	12.0	7.1	211.2	44.4	80.3
Stop Delay (hr)	2.8	33.8	1.4	0.0	5.8	4.9	48.7
Stop Del/Veh (s)	62.2	157.6	6.4	0.1	204.1	36.0	74.5

37: Thorburn Road & Columbus Drive/Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR	All
Denied Delay (hr)	127.7	245.8	75.0	0.0	0.1	0.0	5.1	0.4	259.0	544.5	448.3	1705.8
Denied Del/Veh (s)	723.7	711.4	713.9	0.5	0.2	0.1	31.7	36.1	1538.6	1543.4	1541.5	876.4
Total Delay (hr)	35.9	24.8	2.7	2.6	10.5	0.3	34.2	2.9	13.8	23.2	25.7	176.6
Total Del/Veh (s)	291.3	112.1	40.5	67.3	44.7	4.1	203.8	256.1	246.1	195.0	254.6	146.0
Stop Delay (hr)	35.2	21.0	2.3	2.5	9.2	0.1	32.7	2.9	13.2	20.5	23.4	162.9
Stop Del/Veh (s)	285.2	95.0	35.6	64.3	39.3	1.1	194.5	252.2	234.5	172.1	231.7	134.6

40: Prince Philip Drive & Wicklow Street Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	18.3	6.4	24.7
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	261.0	233.6	36.3
Total Delay (hr)	0.3	24.6	3.4	0.7	14.3	3.0	46.4
Total Del/Veh (s)	101.5	103.8	11.5	12.6	262.2	137.8	69.4
Stop Delay (hr)	0.3	24.0	1.7	0.4	14.0	3.0	43.3
Stop Del/Veh (s)	97.7	101.1	5.7	6.7	256.6	135.0	64.8

46: Stamps Lane/Oxen Pond Road & Freshwater Road Performance by movement

Movement	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	4.5	0.2	106.2	74.8	18.4	0.1	0.7	0.8	205.8
Denied Del/Veh (s)	0.0	0.0	20.2	15.2	1148.3	1136.6	1144.3	9.9	13.4	13.5	248.8
Total Delay (hr)	48.0	3.8	26.0	1.3	26.3	19.1	4.5	0.2	2.1	2.0	133.3
Total Del/Veh (s)	191.6	60.2	114.3	108.1	512.6	516.8	507.8	32.2	38.3	33.1	173.3
Stop Delay (hr)	44.1	2.9	20.1	1.0	26.9	19.4	4.6	0.2	1.7	1.7	122.6
Stop Del/Veh (s)	176.0	46.0	88.3	85.2	523.0	525.5	518.7	26.5	31.3	28.6	159.3

47: Freshwater Road & Thorburn Road Performance by movement

Movement	EBT	WBT	WBR	SBL	SBT	SBR	All
Denied Delay (hr)	692.3	15.6	16.0	8.5	0.0	5.1	737.6
Denied Del/Veh (s)	1496.9	76.7	82.6	62.3	0.0	56.9	676.7
Total Delay (hr)	43.5	3.8	22.3	14.0	0.1	1.3	85.1
Total Del/Veh (s)	249.2	19.6	120.9	100.0	31.1	14.9	108.2
Stop Delay (hr)	43.6	2.2	21.9	13.8	0.1	1.2	82.8
Stop Del/Veh (s)	249.5	11.3	118.7	99.0	29.3	13.4	105.4

51: Freshwater Road & Elizabeth Avenue Performance by movement

Movement	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	70.7	34.4	1.9	0.7	0.5	108.3
Denied Del/Veh (s)	1446.7	144.9	146.0	6.4	5.6	216.9
Total Delay (hr)	40.5	19.3	1.0	14.7	7.6	83.0
Total Del/Veh (s)	1336.7	88.5	83.3	119.6	89.8	177.5
Stop Delay (hr)	40.9	15.8	0.9	12.4	5.8	75.7
Stop Del/Veh (s)	1350.2	72.4	70.0	100.7	69.2	161.9

52: Elizabeth Avenue & Paton Street Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.9	0.2	27.4	11.2	39.7
Denied Del/Veh (s)	0.0	0.0	53.5	76.2	984.8	982.2	209.1
Total Delay (hr)	0.0	0.2	5.6	0.9	41.8	16.7	65.2
Total Del/Veh (s)	4.3	1.7	305.7	294.2	2428.6	2401.0	369.3
Stop Delay (hr)	0.0	0.0	5.6	0.9	41.9	16.7	65.2
Stop Del/Veh (s)	1.7	0.3	305.9	295.9	2435.4	2408.2	369.2

55: Anderson Avenue & Elizabeth Avenue Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	56.7	75.9	132.6
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	1595.7	1588.1	580.1
Total Delay (hr)	0.1	0.0	17.9	43.3	30.6	18.5	110.4
Total Del/Veh (s)	1.1	0.4	1400.5	1469.5	2502.3	1803.3	596.7
Stop Delay (hr)	0.0	0.0	18.1	43.7	30.6	18.5	111.0
Stop Del/Veh (s)	0.0	0.1	1415.0	1484.7	2507.1	1804.9	600.0

59: Clinch Crescent & Arctic Avenue Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	367.5	12.0	0.0	0.0	15.1	246.8	641.4
Denied Del/Veh (s)	1977.5	2053.4	0.0	0.1	1471.7	1483.1	1455.8
Total Delay (hr)	35.7	0.1	0.0	0.1	1.4	25.3	62.6
Total Del/Veh (s)	1944.8	336.8	1.1	2.0	651.3	660.5	477.7
Stop Delay (hr)	35.7	0.1	0.0	0.0	1.4	25.2	62.5
Stop Del/Veh (s)	1948.6	332.5	0.3	1.0	649.3	657.2	476.7

61: Prince Philip Drive & Morrissey Drive Performance by movement

Movement	EBT	WBL	WBT	WBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.6	0.0	0.0	0.0	6.4	3.3	3.8	14.1
Denied Del/Veh (s)	3.4	0.2	0.0	0.1	87.1	97.5	91.1	26.2
Total Delay (hr)	23.3	0.2	3.6	0.4	9.8	3.7	3.9	44.8
Total Del/Veh (s)	121.8	40.8	19.9	17.8	151.8	126.7	108.9	85.2
Stop Delay (hr)	22.1	0.1	2.7	0.2	9.2	3.3	3.6	41.3
Stop Del/Veh (s)	115.6	35.5	14.7	12.2	142.3	115.6	100.6	78.5

Total Network Performance

Denied Delay (hr)	6093.4
Denied Del/Veh (s)	977.9
Total Delay (hr)	2555.0
Total Del/Veh (s)	704.7
Stop Delay (hr)	2477.4
Stop Del/Veh (s)	683.3

Intersection: 1: Allandale Road & TCH NB

Movement	EB	WB	WB	NB	NB
Directions Served	LT	T	R	LT	R
Maximum Queue (m)	148.6	4.5	180.9	148.7	22.7
Average Queue (m)	82.9	0.2	10.3	116.9	20.9
95th Queue (m)	196.8	4.6	108.3	189.9	24.1
Link Distance (m)	145.7	339.1	339.1	138.9	
Upstream Blk Time (%)	49		0	67	
Queuing Penalty (veh)	233		0	0	
Storage Bay Dist (m)					20.0
Storage Blk Time (%)				21	73
Queuing Penalty (veh)				184	5

Intersection: 7: Allandale Road & Prince Philip Drive

Movement	EB	EB	EB	EB	WB	WB	WB	B27	B27	NB	NB	NB
Directions Served	L	T	T	R	L	T	TR	T	T	L	T	R
Maximum Queue (m)	202.5	422.7	426.9	115.4	67.4	860.7	861.6	281.4	280.3	72.5	302.7	253.5
Average Queue (m)	112.5	278.8	267.9	63.0	63.5	851.6	851.3	273.3	273.9	48.1	165.9	112.0
95th Queue (m)	256.0	511.5	503.0	154.1	79.9	857.5	858.0	277.7	277.9	88.2	347.7	299.6
Link Distance (m)		438.1	438.1			834.7	834.7	270.6	270.6		443.9	443.9
Upstream Blk Time (%)		20	21			100	100	44	59			
Queuing Penalty (veh)		202	213			725	724	314	422			
Storage Bay Dist (m)	200.0			120.0	65.0					70.0		
Storage Blk Time (%)	27	8	20	40	51	41				6	31	
Queuing Penalty (veh)	142	73	92	204	238	140				55	104	

Intersection: 7: Allandale Road & Prince Philip Drive

Movement	SB	SB	SB	SB	SB	B1123	B1123
Directions Served	L	T	T	R	R	T	T
Maximum Queue (m)	44.3	128.0	124.1	34.2	7.5	511.9	510.0
Average Queue (m)	14.7	119.9	117.2	2.4	0.3	502.8	503.0
95th Queue (m)	45.7	124.5	123.0	20.4	5.5	507.2	507.5
Link Distance (m)		104.4	104.4	104.4		500.7	500.7
Upstream Blk Time (%)		96	90			71	74
Queuing Penalty (veh)		500	469			550	573
Storage Bay Dist (m)	42.0				35.0		
Storage Blk Time (%)	4	93		1	0		
Queuing Penalty (veh)	17	72		3	0		

Intersection: 9: Westerland Road/Clinch Crescent & Prince Philip Drive

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	TR	L	T	R	L	T
Maximum Queue (m)	71.7	579.3	580.7	184.7	92.3	326.3	329.1	40.8	94.1	35.5	41.7	87.0
Average Queue (m)	25.3	420.2	424.0	165.3	83.9	215.5	171.2	15.0	21.6	10.8	9.1	83.5
95th Queue (m)	70.9	732.9	732.7	227.9	112.5	399.0	381.0	32.6	100.4	30.0	36.2	90.5
Link Distance (m)		573.0	573.0			470.0	470.0		353.9		83.2	83.2
Upstream Blk Time (%)		37	39			3	2				2	83
Queuing Penalty (veh)		301	312			26	21				10	485
Storage Bay Dist (m)	75.0			185.0	90.0			60.0		45.0		
Storage Blk Time (%)	0	15	37	59	81	31		0	0	7		87
Queuing Penalty (veh)	1	32	89	386	588	39		1	1	36		450

Intersection: 9: Westerland Road/Clinch Crescent & Prince Philip Drive

Movement	SB
Directions Served	R
Maximum Queue (m)	74.2
Average Queue (m)	29.7
95th Queue (m)	92.7
Link Distance (m)	
Upstream Blk Time (%)	1
Queuing Penalty (veh)	0
Storage Bay Dist (m)	80.0
Storage Blk Time (%)	1
Queuing Penalty (veh)	4

Intersection: 10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	R	L	T	R
Maximum Queue (m)	53.6	97.9	41.0	291.3	260.9	57.3	245.9	34.2	42.3	451.7	458.8
Average Queue (m)	12.6	40.4	3.8	276.1	210.8	47.9	236.0	7.0	9.8	374.5	363.1
95th Queue (m)	37.4	80.6	26.1	349.5	408.3	69.7	242.9	28.9	33.3	540.8	574.7
Link Distance (m)		321.0		286.5	286.5		234.0			443.9	443.9
Upstream Blk Time (%)				91	56		89			50	56
Queuing Penalty (veh)				0	0		0			441	499
Storage Bay Dist (m)	55.0		55.0			55.0		35.0	40.0		
Storage Blk Time (%)	0	3	0	97		66	24	0	0	24	
Queuing Penalty (veh)	0	6	0	98		840	59	2	1	31	

Intersection: 11: Mt. Scio Road & Allandale Road

Movement	EB	EB	EB	WB	WB	WB	B3	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	T	LT	R	LT	R
Maximum Queue (m)	74.6	349.5	360.0	77.2	108.6	101.9	7.1	289.2	27.4	105.6	27.5
Average Queue (m)	20.7	244.0	254.4	10.8	44.4	38.0	0.3	138.5	17.0	76.2	12.6
95th Queue (m)	68.3	457.7	475.4	40.5	97.6	88.0	7.2	355.1	35.8	128.3	34.5
Link Distance (m)		339.1	339.1		545.6	545.6	73.6	310.4		98.6	
Upstream Blk Time (%)		49	58					31		53	
Queuing Penalty (veh)		324	380					0		0	
Storage Bay Dist (m)	75.0			75.0					25.0		25.0
Storage Blk Time (%)	0	67		0	4			7	44	60	3
Queuing Penalty (veh)	1	114		0	5			6	73	171	6

Intersection: 17: Allandale Road & TCH SB

Movement	EB	WB	SB	SB
Directions Served	LT	TR	L	R
Maximum Queue (m)	78.5	4.3	125.2	17.5
Average Queue (m)	23.2	0.2	73.8	2.0
95th Queue (m)	81.8	2.4	161.2	11.0
Link Distance (m)	158.6	145.7	127.1	
Upstream Blk Time (%)	0		45	
Queuing Penalty (veh)	0		162	
Storage Bay Dist (m)				20.0
Storage Blk Time (%)			54	0
Queuing Penalty (veh)			4	0

Intersection: 18: TCH SB

Movement	SB
Directions Served	T
Maximum Queue (m)	138.3
Average Queue (m)	66.8
95th Queue (m)	187.0
Link Distance (m)	149.1
Upstream Blk Time (%)	41
Queuing Penalty (veh)	0
Storage Bay Dist (m)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 22: Allandale Road & Higgins Line

Movement	WB	WB	WB	NB	NB	NB	B4	SB	SB	SB	B3	B3
Directions Served	L	L	R	T	T	R	T	L	T	T	T	T
Maximum Queue (m)	123.7	128.1	42.5	77.8	91.8	77.6	1.9	73.5	91.8	88.4	203.6	200.1
Average Queue (m)	110.5	114.8	18.2	35.9	36.2	7.4	0.1	34.0	83.4	82.5	190.6	189.8
95th Queue (m)	144.5	142.6	52.8	75.3	76.2	43.9	1.9	94.0	89.2	86.3	217.2	217.1
Link Distance (m)	117.4	117.4		101.8	101.8		147.6		73.6	73.6	178.6	178.6
Upstream Blk Time (%)	67	81		0	0			0	91	97	95	96
Queuing Penalty (veh)	0	0		0	1			0	548	584	572	578
Storage Bay Dist (m)			40.0			80.0		80.0				
Storage Blk Time (%)		91	9		0	0		0	91			
Queuing Penalty (veh)		192	24		2	1		2	215			

Intersection: 22: Allandale Road & Higgins Line

Movement	B2	B2
Directions Served	T	T
Maximum Queue (m)	556.5	569.0
Average Queue (m)	468.9	481.1
95th Queue (m)	729.4	746.5
Link Distance (m)	545.6	545.6
Upstream Blk Time (%)	63	64
Queuing Penalty (veh)	376	383
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 24: Allandale Road & Confederation Building Lot

Movement	WB	WB	WB	NB	NB	NB	SB	SB	SB	B4	B4
Directions Served	L	L	R	T	T	R	L	T	T	T	T
Maximum Queue (m)	47.4	96.4	93.2	94.6	114.0	36.9	132.4	171.0	170.9	113.3	111.6
Average Queue (m)	37.3	84.3	33.4	44.9	60.4	1.6	64.4	161.6	160.6	104.1	104.0
95th Queue (m)	57.0	108.4	96.3	84.5	103.0	23.4	173.2	169.2	166.7	109.2	108.4
Link Distance (m)		87.5	87.5	500.7	500.7			147.6	147.6	101.8	101.8
Upstream Blk Time (%)		82	12					95	99	77	79
Queuing Penalty (veh)		0	0					710	743	575	589
Storage Bay Dist (m)	45.0					110.0	130.0				
Storage Blk Time (%)	20	89			0	0	1	93			
Queuing Penalty (veh)	25	121			1	0	3	196			

Intersection: 29: Prince Philip Drive & Confederation Building Lot

Movement	EB	EB	NB	NB	NB	B27	SB	SB	SB
Directions Served	L	R	L	T	T	T	T	T	R
Maximum Queue (m)	116.6	120.0	59.9	71.8	71.4	341.9	162.6	160.5	102.5
Average Queue (m)	87.4	103.2	17.7	21.5	25.2	12.2	152.8	152.5	67.7
95th Queue (m)	151.5	140.7	42.9	56.1	59.5	179.6	160.1	163.4	147.7
Link Distance (m)	108.9	108.9		270.6	270.6	834.7	148.3	148.3	
Upstream Blk Time (%)	34	73				0	92	96	
Queuing Penalty (veh)	0	0				0	0	0	
Storage Bay Dist (m)			75.0						100.0
Storage Blk Time (%)			0	0				93	2
Queuing Penalty (veh)			0	0				224	14

Intersection: 34: Elizabeth Avenue & Westerland Road

Movement	EB	EB	WB	B33	SB	SB
Directions Served	L	T	TR	T	L	R
Maximum Queue (m)	28.2	32.4	570.9	324.1	359.0	72.2
Average Queue (m)	6.4	8.2	566.7	320.5	356.4	71.4
95th Queue (m)	20.1	25.4	570.9	350.4	359.7	74.2
Link Distance (m)		391.9	553.5	321.0	353.9	
Upstream Blk Time (%)			100	92	82	
Queuing Penalty (veh)			771	713	613	
Storage Bay Dist (m)	35.0					70.0
Storage Blk Time (%)	0	0			20	95
Queuing Penalty (veh)	0	1			65	369

Intersection: 35: Prince Philip Drive & Clinch Crescent

Movement	EB	EB	EB	WB	WB	WB	SB	SB
Directions Served	L	T	T	T	T	R	L	R
Maximum Queue (m)	130.8	280.8	278.1	55.0	58.1	1.7	78.6	229.6
Average Queue (m)	35.2	138.8	140.7	22.1	22.7	0.1	44.3	92.4
95th Queue (m)	116.5	349.6	349.2	46.5	49.4	1.7	87.0	268.9
Link Distance (m)		280.6	280.6	573.0	573.0			269.1
Upstream Blk Time (%)		32	32					18
Queuing Penalty (veh)		288	292					0
Storage Bay Dist (m)	140.0					70.0	80.0	
Storage Blk Time (%)	0	41			0		21	2
Queuing Penalty (veh)	2	131			0		113	3

Intersection: 37: Thorburn Road & Columbus Drive/Prince Philip Drive

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	B43
Directions Served	L	T	T	R	L	T	T	T	R	T	TR	T
Maximum Queue (m)	177.5	323.7	318.6	314.7	72.9	84.1	84.0	86.6	56.3	151.2	149.0	51.9
Average Queue (m)	160.3	313.7	307.2	218.6	32.3	49.4	50.9	50.7	6.3	137.5	138.4	40.9
95th Queue (m)	245.0	320.7	341.1	425.9	69.2	80.8	83.1	84.9	33.2	159.4	156.8	73.3
Link Distance (m)		308.0	308.0	308.0		134.5	134.5	134.5	134.5	126.5	126.5	52.2
Upstream Blk Time (%)		94	33	14						71	79	3
Queuing Penalty (veh)		0	0	0						393	435	19
Storage Bay Dist (m)	175.0				110.0							
Storage Blk Time (%)	73	47			0							
Queuing Penalty (veh)	425	281			0							

Intersection: 37: Thorburn Road & Columbus Drive/Prince Philip Drive

Movement	B43	SB	SB	SB	SB
Directions Served	T	L	L	T	TR
Maximum Queue (m)	65.8	92.9	383.2	388.0	152.5
Average Queue (m)	47.6	39.3	375.5	378.7	144.0
95th Queue (m)	84.0	106.1	392.3	384.3	200.4
Link Distance (m)	52.2		372.8	372.8	
Upstream Blk Time (%)	25		40	84	
Queuing Penalty (veh)	140		0	0	
Storage Bay Dist (m)		150.0			150.0
Storage Blk Time (%)		0	10	16	58
Queuing Penalty (veh)		0	25	214	295

Intersection: 40: Prince Philip Drive & Wicklow Street

Movement	EB	EB	EB	B45	B45	B36	B36	WB	WB	SB	SB
Directions Served	L	T	T	T	T	T	T	T	TR	L	R
Maximum Queue (m)	36.8	196.6	197.4	204.2	205.5	111.9	111.6	72.9	169.4	62.4	236.9
Average Queue (m)	5.3	103.7	103.9	81.8	82.2	39.3	39.2	31.8	44.2	53.8	117.4
95th Queue (m)	25.5	241.6	241.1	262.2	263.0	139.4	139.0	63.5	104.2	73.4	304.9
Link Distance (m)		189.0	189.0	222.8	222.8	134.5	134.5	280.6	280.6		264.8
Upstream Blk Time (%)		37	37	30	30	18	19		0		31
Queuing Penalty (veh)		313	319	255	255	157	159		1		0
Storage Bay Dist (m)	50.0									60.0	
Storage Blk Time (%)	0	42								46	10
Queuing Penalty (veh)	0	10								44	24

Intersection: 46: Stamps Lane/Oxen Pond Road & Freshwater Road

Movement	EB	EB	WB	NB	SB	SB
Directions Served	T	R	TR	LTR	L	TR
Maximum Queue (m)	368.5	372.8	261.0	381.7	32.3	122.0
Average Queue (m)	357.1	353.5	258.6	372.5	6.0	61.5
95th Queue (m)	402.7	425.9	260.6	378.6	22.6	112.6
Link Distance (m)	357.5	357.5	256.2	366.1		137.9
Upstream Blk Time (%)	47	25	27	100		4
Queuing Penalty (veh)	566	301	400	0		0
Storage Bay Dist (m)					30.0	
Storage Blk Time (%)					0	32
Queuing Penalty (veh)					0	6

Intersection: 47: Freshwater Road & Thorburn Road

Movement	EB	EB	WB	WB	WB	SB	SB	SB	B43	B43
Directions Served	T	T	T	T	R	L	L	R	T	T
Maximum Queue (m)	175.7	176.2	305.9	319.7	32.5	76.0	74.5	70.0	131.5	134.8
Average Queue (m)	166.9	167.2	154.3	209.1	32.3	62.7	61.1	38.0	74.9	80.5
95th Queue (m)	172.2	172.8	322.5	371.3	34.3	88.4	87.4	68.0	159.0	168.1
Link Distance (m)	160.8	160.8	357.5	357.5		52.2	52.2	52.2	126.5	126.5
Upstream Blk Time (%)	100	99	0	6		75	61	4	4	10
Queuing Penalty (veh)	0	0	1	59		403	326	20	35	79
Storage Bay Dist (m)					30.0					
Storage Blk Time (%)				17	69					
Queuing Penalty (veh)				184	394					

Intersection: 51: Freshwater Road & Elizabeth Avenue

Movement	WB	NB	SB	SB
Directions Served	R	TR	L	T
Maximum Queue (m)	270.8	221.0	32.4	261.2
Average Queue (m)	269.0	199.0	32.0	221.4
95th Queue (m)	271.2	263.6	35.1	313.3
Link Distance (m)	266.6	206.4		256.2
Upstream Blk Time (%)	89	58		2
Queuing Penalty (veh)	542	0		36
Storage Bay Dist (m)			30.0	
Storage Blk Time (%)			63	6
Queuing Penalty (veh)			390	51

Intersection: 52: Elizabeth Avenue & Paton Street

Movement	EB	EB	WB	SB
Directions Served	L	T	TR	LR
Maximum Queue (m)	9.7	21.9	49.3	415.5
Average Queue (m)	0.8	1.5	47.3	387.5
95th Queue (m)	5.1	10.4	49.1	482.0
Link Distance (m)		266.6	45.6	410.7
Upstream Blk Time (%)			91	76
Queuing Penalty (veh)			595	0
Storage Bay Dist (m)	30.0			
Storage Blk Time (%)		0		
Queuing Penalty (veh)		0		

Intersection: 55: Anderson Avenue & Elizabeth Avenue

Movement	EB	WB	WB	NB	NB
Directions Served	TR	L	T	L	R
Maximum Queue (m)	5.1	38.2	411.7	330.4	82.0
Average Queue (m)	0.2	17.9	406.9	319.3	13.7
95th Queue (m)	2.6	52.4	411.3	362.1	70.9
Link Distance (m)	45.6		391.9	325.0	
Upstream Blk Time (%)			100	91	
Queuing Penalty (veh)			796	0	
Storage Bay Dist (m)		40.0			100.0
Storage Blk Time (%)		1	98	99	1
Queuing Penalty (veh)		3	230	159	1

Intersection: 59: Clinch Crescent & Arctic Avenue

Movement	WB	WB	WB	NB	NB	SB
Directions Served	L	L	R	T	R	LT
Maximum Queue (m)	81.9	210.5	170.7	13.4	31.3	202.9
Average Queue (m)	19.2	206.6	146.1	0.8	4.4	186.7
95th Queue (m)	78.2	210.3	296.7	5.8	17.7	228.9
Link Distance (m)		205.9	205.9	83.2	83.2	188.1
Upstream Blk Time (%)		100	58			94
Queuing Penalty (veh)		0	0			0
Storage Bay Dist (m)	100.0					
Storage Blk Time (%)	1	99				
Queuing Penalty (veh)	2	284				

Intersection: 61: Prince Philip Drive & Morrissey Drive

Movement	EB	EB	WB	WB	WB	WB	SB	SB
Directions Served	T	T	L	T	T	R	L	TR
Maximum Queue (m)	315.9	314.8	18.8	96.9	100.6	25.0	42.4	269.4
Average Queue (m)	83.3	83.7	2.6	16.8	18.9	3.7	40.0	140.4
95th Queue (m)	332.8	333.5	11.9	89.0	92.2	14.3	49.6	292.8
Link Distance (m)	470.0	470.0		438.1	438.1			278.6
Upstream Blk Time (%)	9	9		0	0			19
Queuing Penalty (veh)	75	76		4	4			0
Storage Bay Dist (m)			70.0			30.0	40.0	
Storage Blk Time (%)				2	3	0	45	14
Queuing Penalty (veh)				1	6	0	122	39

Network Summary

Network wide Queuing Penalty: 32250

		Scenario 2 - AM Peak Hour						
Intersection		Synchro				SimTraffic		
Street	Movement	Delay/Veh (s)	LOS	V/C	Queue (m) 95th%ile	Delay/Veh (s)	Equivalent LOS	Queue (m) 95th%ile
Columbus Drive/ Prince Philip Drive & Thorburn Road		49.6	D			80.8	F	
Columbus Drive/ Prince Philip Drive	Eastbound Left - Turn	33.7	C	0.76	66.0	71.4	E	239.8
	Eastbound Through	74.4	E	1.04	227.8	122.7	F	375.3
	Eastbound Right - Turn	8.7	A	0.27	22.8	15.2	B	347.8
	Westbound Left - Turn	86.7	F	0.90	51.4	53.8	D	46.3
	Westbound Through	27.8	C	0.56	72.6	24.4	C	47.6
	Westbound Right - Turn	8.6	A	0.48	33.4	3.4	A	5.6
Thorburn Road	Northbound Through	43.9	D	0.67	69.1	40.6	D	52.6
	Northbound Right - Turn					36.3	D	59.4
	Southbound Left - Turn	99.5	F	1.04	102.8	214.0	F	304.4
	Southbound Through	25.4	C	0.57	86.8	36.4	D	232.2
	Southbound Right - Turn					32.3	C	121.6
Prince Philip Drive & Wicklow Street		6.9	A			13.9	B	
Prince Philip Drive	Eastbound Left - Turn	0.6	A	0.06	0.2	19.1	B	17.0
	Eastbound Through	3.1	A	0.68	97.7	14.1	B	150.7
	Westbound Through	3.7	A	0.43	32.5	7.7	A	53.9
	Westbound Right - Turn					7.3	A	104.0
Wicklow Street	Southbound Left - Turn	63.5	E	0.73	61.6	47.8	D	56.6
	Southbound Right - Turn	12.5	B	0.19	9.7	7.9	A	27.4
Prince Philip Drive & Clinch Crescent		16.9	B			31.5	C	
Prince Philip Drive	Eastbound Left - Turn	44.9	D	0.88	175.4	39.3	D	151.9
	Eastbound Through	4.0	A	0.48	46.3	43.1	D	252.2
	Westbound Through	14.7	B	0.64	70.1	17.1	B	44.8
	Westbound Right - Turn	1.7	A	0.30	6.3	9.8	A	27.6
Clinch Crescent	Southbound Left - Turn	62.4	E	0.58	28.0	54.4	D	35.4
	Southbound Right - Turn	14.6	B	0.75	0.0	3.1	A	24.7
Prince Philip Drive & Clinch Crescent/ Westerland Road		109.2	F			190.2	F	
Prince Philip Drive	Eastbound Left - Turn	256.5	F	1.48	243.9	424.3	F	77.4
	Eastbound Through	26.6	C	0.46	80.3	130.6	F	678.4
	Eastbound Right - Turn	8.3	A	0.37	32.8	80.7	F	175.5
	Westbound Left - Turn	15.0	B	0.37	15.0	187.5	F	109.9
	Westbound Through	15.4	F	1.26	173.8	254.0	F	528.9
	Westbound Right - Turn					363.1	F	534.1
Clinch Crescent/ Westerland Road	Northbound Left - Turn	32.0	C	0.31	20.6	115.3	F	70.3
	Northbound Through	130.6	F	1.16	166.9	92.1	F	393.5
	Northbound Right - Turn	3.3	A	0.31	1.9	89.9	F	62.6
	Southbound Left - Turn	86.7	F	0.93	58.5	73.4	E	64.2
	Southbound Through	43.5	D	0.45	62.3	31.8	C	57.6
	Southbound Right - Turn	6.3	A	0.36	14.9	8.6	A	28.3
Clinch Crescent & Arctic Avenue		5.1	A			13.0	B	
Arctic Avenue	Westbound Left - Turn	48.1	E	0.55	21.7	56.9	F	66.7
	Westbound Right - Turn	14.9	B	0.01	0.1	9.8	A	2.1
Clinch Crescent	Northbound Through	0.0	-	0.30	0.0	2.7	A	33.6
	Northbound Right - Turn					9.7	A	78.5
	Southbound Left - Turn	1.8	A	0.51	1.3	31.2	D	54.4
	Southbound Through					8.1	A	
Prince Philip Drive & Morrissey Drive		4.6	A			21.6	C	
Prince Philip Drive	Eastbound Through	3.3	A	0.42	18.7	6.2	A	21.4
	Westbound Left - Turn	1.5	A	0.23	1.9	25.4	C	31.5
	Westbound Through	1.2	A	0.39	9.9	28.5	C	177.3
	Westbound Right - Turn	0.5	A	0.41	0.0	29.3	C	32.0
Morrissey Drive	Southbound Left - Turn	61.0	E	0.51	32.3	46.3	D	31.1
	Southbound Through	28.2	C	0.47	21.0	48.8	D	31.4
	Southbound Right - Turn					22.0	C	
Prince Philip Drive & Allandale Road		51.2	D			132.9	F	
Prince Philip Drive	Eastbound Left - Turn	92.8	F	1.06	129.9	35.8	D	77.9
	Eastbound Through	35.9	D	0.46	69.1	33.7	C	61.1
	Eastbound Right - Turn	16.3	B	0.48	54.3	7.9	A	46.0
	Westbound Left - Turn	19.1	B	0.55	30.8	342.8	F	87.4
	Westbound Through	89.7	F	1.07	157.7	388.2	F	770.2
	Westbound Right - Turn					404.0	F	768.9
	Northbound Left - Turn	69.9	E	1.02	107.7	132.7	F	81.9
















Allandale Road	Northbound Through	14.9	B	0.40	61.1	67.3	E	369.2
	Northbound Right - Turn	4.9	A	0.28	15.3	6.9	A	174.4
	Southbound Left - Turn	43.4	D	0.24	20.7	61.8	E	46.2
	Southbound Through	66.6	E	0.93	117.2	56.4	E	108.2
	Southbound Right - Turn	22.7	C	0.48	63.8	12.0	B	106.6
Prince Philip Drive & Confederation Building Lot		8.5	A			4.4	A	
Prince Philip Drive	Eastbound Left - Turn	53.8	D	0.15	10.6	63.6	E	13.8
	Eastbound Right - Turn	22.6	C	0.12	5.1	6.1	A	10.9
Confederation Building Lot	Northbound Left - Turn	22.4	C	0.58	37.7	10.7	B	35.8
	Northbound Through	1.5	A	0.18	12.8	1.4	A	11.8
	Southbound Through	8.7	A	0.43	85.0	3.8	A	51.0
	Southbound Right - Turn	1.7	A	0.10	6.4	2.8	A	0.0
Bonaventure Avenue/ Allandale Road & Elizabeth Avenue		32.6	C			27.7	C	
Bonaventure Avenue/ Allandale Road	Eastbound Left - Turn	26.4	C	0.22	11.5	31.6	C	28.7
	Eastbound Through	40.8	D	0.57	76.0	14.2	B	65.2
	Eastbound Right - Turn					13.2	B	
	Westbound Left - Turn	28.8	C	0.22	16.2	39.2	D	48.7
	Westbound Through	53.0	D	0.78	118.3	44.0	D	116.4
	Westbound Right - Turn	0.4	A	0.10	0.0	2.0	A	0.0
Elizabeth Avenue	Northbound Left - Turn	20.0	B	0.52	29.3	58.5	E	68.0
	Northbound Through	49.2	D	0.92	257.2	45.2	D	270.7
	Northbound Right - Turn	1.8	A	0.11	2.9	35.1	D	35.8
	Southbound Left - Turn	18.3	B	0.30	4.4	27.5	C	21.0
	Southbound Through	20.0	B	0.70	136.0	12.9	B	75.3
	Southbound Right - Turn	1.4	A	0.34	4.1	10.3	B	155.2
Elizabeth Avenue & Westerland Road		21.6	C			28.8	C	
Elizabeth Avenue	Eastbound Left - Turn	27.1	C	27.10	55.1	53.2	D	44.0
	Eastbound Through	2.3	A	2.30	12.5	35.6	D	321.3
	Westbound Through	23.3	C	23.30	138.7	13.5	B	129.5
	Westbound Right - Turn					26.6	C	
Westerland Road	Southbound Left - Turn	61.7	E	61.70	60.6	43.5	D	52.1
	Southbound Right - Turn	12.5	B	12.50	15.3	4.2	A	11.1
Elizabeth Avenue & Anderson Avenue		5.9	A			11.5	B	
Elizabeth Avenue	Eastbound Through	0.0	-	0.52	0.0	2.8	A	26.9
	Eastbound Right - Turn					1.8	A	
	Westbound Left - Turn	10.6	B	0.13	3.5	11.7	B	19.0
	Westbound Through	0.0	-	0.12	0.0	4.8	A	72.2
Anderson Avenue	Northbound Left - Turn	30.5	D	0.58	27.4	41.2	E	125.2
	Northbound Right - Turn					50.3	F	59.6
Elizabeth Avenue & Paton Street		1.3	A			6.7	A	
Elizabeth Avenue	Eastbound Left - Turn	8.0	A	0.03	0.6	7.9	A	15.3
	Eastbound Through	0.0	-	0.49	0.0	6.8	A	83.9
	Westbound Through	0.0	-	0.17	0.0	1.5	A	14.8
	Westbound Right - Turn					0.7	A	
Paton Street	Southbound Left - Turn	26.5	D	0.22	6.3	38.2	E	23.2
	Southbound Right - Turn					23.5	C	
Elizabeth Avenue & Freshwater Road		16.9	C			22.4	C	
Elizabeth Avenue	Westbound Right - Turn	17.6	C	0.44	16.7	7.2	A	24.8
Freshwater Road	Northbound Through	0.0	-	0.31	0.0	1.6	A	9.8
	Northbound Right - Turn					1.4	A	
	Southbound Left - Turn	34.5	D	0.92	106.8	35.1	E	35.3
	Southbound Through	0.0		0.24	0.0	27.8	D	237.4
Freshwater Road & Stamps Lane/ Oxen Pond Road		32.2	C			39.1	D	
Freshwater Road	Eastbound Through	44.3	D	1.01	401.9	58.5	E	432.1
	Eastbound Right - Turn	1.5	A	0.32	9.0	10.8	B	380.8
	Westbound Through	13.0	B	0.52	110.8	10.1	B	81.3
	Westbound Right - Turn					7.9	A	
Stamps Lane/ Oxen Pond Road	Northbound Left - Turn	67.2	E	0.81	102.3	53.2	D	74.0
	Northbound Through					53.4	D	
	Northbound Right - Turn					47.9	D	
	Southbound Left - Turn	33.5	C	0.07	6.5	39.5	D	12.1
	Southbound Through	34.7	C	0.29	26.4	39.9	D	34.8
	Southbound Right - Turn					19.0	B	
Freshwater Road & Thorburn Road		14.0	B			20.6	C	
Freshwater Road	Eastbound Through	18.4	B	0.56	104.5	34.2	C	147.3
	Westbound Through	10.1	B	0.13	17.5	9.7	A	30.1
	Westbound Right - Turn	1.3	A	0.43	2.1	5.3	A	28.3
Thorburn Road	Southbound Left - Turn	23.6	C	0.50	46.5	20.2	C	43.4

THROUGH ROAD	Southbound Right - Turn	2.7	A	0.39	3.1	4.1	A	27.0
Allandale Road & Confederation Building Lot		4.7	A			3.3	A	
Confederation Building Lot	Westbound Left - Turn	33.8	C	0.04	2.9	50.1	D	10.4
	Westbound Right - Turn	12.9	B	0.11	4.0	5.4	A	10.7
Allandale Road	Northbound Through	9.1	A	0.21	48.5	3.8	A	29.4
	Northbound Right - Turn	2.4	A	0.18	13.4	3.7	A	4.7
	Southbound Left - Turn	2.8	A	0.16	8.2	4.9	A	17.4
	Southbound Through	2.8	A	0.42	56.9	2.4	A	32.3
Allandale Road & Higgins Line		9.2	A			8.8	A	
Higgins Line	Westbound Left - Turn	46.0	D	0.62	40.6	38.6	D	55.6
	Westbound Right - Turn	11.0	B	0.26	12.0	3.9	A	16.4
Allandale Road	Northbound Through	4.2	A	0.18	6.1	3.8	A	20.2
	Northbound Right - Turn	1.2	A	0.22	0.0	3.2	A	0.0
	Southbound Left - Turn	1.7	A	0.12	1.9	4.4	A	15.5
	Southbound Through	3.4	A	0.46	8.3	3.8	A	44.5
Allandale Road & Mt. Scio Road		17.4	B			14.6	B	
Allandale Road	Eastbound Left - Turn	9.9	A	0.33	27.0	12.5	B	27.7
	Eastbound Through	17.3	B	0.54	102.2	12.0	B	53.6
	Eastbound Right - Turn					8.0	A	57.3
	Westbound Left - Turn	7.6	A	0.11	4.6	12.8	B	9.7
	Westbound Through	10.0	A	0.25	16.0	10.8	B	25.3
	Westbound Right - Turn					3.2	A	24.1
Mt. Scio Road	Northbound Left - Turn	29.0	C	0.17	10.5	39.7	D	14.6
	Northbound Through	23.0	C	0.34	15.9	46.9	D	
	Northbound Right - Turn					5.4	A	24.7
	Southbound Left - Turn	33.8	C	0.38	27.3	37.6	D	35.6
	Southbound Through	28.0	C	0.65	40.8	39.8	D	
	Southbound Right - Turn					16.5	B	48.9
Outer Ring Road NB & Allandale Road		100.7	F			6.5	A	
Allandale Road	Eastbound Left - Turn	0.2	A	0.00	0.1	3.7	A	3.3
	Eastbound Through					1.2	A	
	Westbound Through	0.0	-	0.27	0.0	1.7	A	0.0
	Westbound Right - Turn	0.0	-	0.12	0.0	4.4	A	0.0
Outer Ring Road SB	Northbound Left - Turn	191.8	F	1.37	334.3	12.9	B	96.2
	Northbound Right - Turn	0.0	-	0.00	0.0	10.3	B	27.9
Outer Ring Road SB & Allandale Road		5.0	A			4.0	A	
Allandale Road	Eastbound Left - Turn	1.2	A	0.00	0.1	1.4	A	0.0
	Eastbound Through					0.3	A	0.0
	Westbound Through	0.0	-	0.22	0.0	2.3	A	20.4
	Westbound Right - Turn					3.4	A	
Outer Ring Road SB	Southbound Left - Turn	12.0	B	0.34	11.6	5.1	A	0.0
	Southbound Right - Turn	0.0	-	0.00	0.0	2.2	A	9.6

MUN Area Traffic Study
Allandale Road & Confederation Building Lot

Scenario 2 - 2025 AM

29/06/2015

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	 		 			 
Traffic Volume (vph)	13	17	485	216	108	1160
Future Volume (vph)	13	17	485	216	108	1160
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	4.0	4.8	4.0	3.5
Grade (%)	0%		0%			0%
Storage Length (m)	45.0	0.0		110.0	130.0	
Storage Lanes	1	1		1	1	
Taper Length (m)	2.5				2.5	
Lane Util. Factor	0.97	1.00	0.95	1.00	1.00	0.95
Ped Bike Factor						
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3395	1566	3697	1794	1848	3500
Flt Permitted	0.950				0.419	
Satd. Flow (perm)	3395	1566	3697	1794	815	3500
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		23		232		
Link Speed (k/h)	50		60			60
Link Distance (m)	100.1		513.4			163.6
Travel Time (s)	7.2		30.8			9.8
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.75	0.75	0.93	0.93	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Adj. Flow (vph)	17	23	522	232	115	1234
Shared Lane Traffic (%)						
Lane Group Flow (vph)	17	23	522	232	115	1234
Turn Type	Prot	Perm	NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2	6	
Total Split (s)	38.0	38.0	47.0	47.0	15.0	62.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Act Effect Green (s)	12.0	12.0	67.8	67.8	81.2	83.6
Actuated g/C Ratio	0.12	0.12	0.68	0.68	0.81	0.84
v/c Ratio	0.04	0.11	0.21	0.18	0.16	0.42
Control Delay	33.8	12.9	9.1	2.4	2.8	2.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.8	12.9	9.1	2.4	2.8	2.8
LOS	C	B	A	A	A	A
Approach Delay	21.8		7.1			2.8
Approach LOS	C		A			A
Stops (vph)	11	6	187	17	15	166
Fuel Used(l)	1	0	36	13	3	36
CO Emissions (g/hr)	13	9	674	242	63	675



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
NOx Emissions (g/hr)	3	2	130	47	12	130
VOC Emissions (g/hr)	3	2	155	56	14	156
Dilemma Vehicles (#)	0	0	24	0	0	27
Queue Length 50th (m)	1.5	0.0	17.5	0.0	1.9	10.7
Queue Length 95th (m)	2.9	4.0	48.5	13.4	8.2	56.9
Internal Link Dist (m)	76.1		489.4			139.6
Turn Bay Length (m)	45.0			110.0	130.0	
Base Capacity (vph)	1086	516	2505	1290	755	2926
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	0.02	0.04	0.21	0.18	0.15	0.42

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 64 (64%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.42

Intersection Signal Delay: 4.7

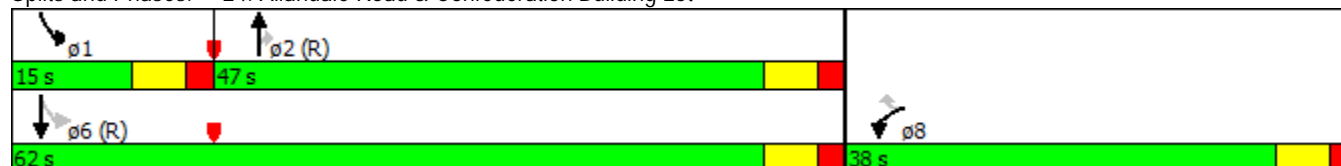
Intersection LOS: A
















Intersection Capacity Utilization 47.9%







ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 24: Allandale Road & Confederation Building Lot



						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	 		 			 
Traffic Volume (vph)	281	71	313	189	78	986
Future Volume (vph)	281	71	313	189	78	986
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	4.0	4.0	3.5	3.5	4.0	3.5
Grade (%)	0%		0%			0%
Storage Length (m)	0.0	40.0		80.0	80.0	
Storage Lanes	2	1		1	1	
Taper Length (m)	2.5				2.5	
Lane Util. Factor	0.97	1.00	0.95	1.00	1.00	0.95
Ped Bike Factor						
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3586	1654	3500	1566	1848	3500
Flt Permitted	0.950				0.475	
Satd. Flow (perm)	3586	1654	3500	1566	924	3500
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		77		236		
Link Speed (k/h)	50		60			60
Link Distance (m)	128.4		114.7			80.6
Travel Time (s)	9.2		6.9			4.8
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.80	0.80	0.83	0.83
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Adj. Flow (vph)	305	77	391	236	94	1188
Shared Lane Traffic (%)						
Lane Group Flow (vph)	305	77	391	236	94	1188
Turn Type	Prot	Perm	NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2	6	
Total Split (s)	29.0	29.0	54.0	54.0	17.0	71.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Act Effect Green (s)	13.8	13.8	63.5	63.5	74.2	74.2
Actuated g/C Ratio	0.14	0.14	0.64	0.64	0.74	0.74
v/c Ratio	0.62	0.26	0.18	0.22	0.12	0.46
Control Delay	46.0	11.0	4.2	1.2	1.7	3.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	46.0	11.0	4.2	1.2	1.7	3.4
LOS	D	B	A	A	A	A
Approach Delay	38.9		3.0			3.3
Approach LOS	D		A			A
Stops (vph)	257	15	76	18	7	197
Fuel Used(l)	19	2	11	5	6	80
CO Emissions (g/hr)	356	34	204	101	111	1489

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
NOx Emissions (g/hr)	69	6	39	20	21	287
VOC Emissions (g/hr)	82	8	47	23	26	344
Dilemma Vehicles (#)	0	0	16	0	0	38
Queue Length 50th (m)	29.1	0.0	4.1	0.0	0.8	5.3
Queue Length 95th (m)	40.6	12.0	6.1	0.0	1.9	8.3
Internal Link Dist (m)	104.4		90.7			56.6
Turn Bay Length (m)		40.0		80.0	80.0	
Base Capacity (vph)	824	439	2221	1079	787	2597
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	0.37	0.18	0.18	0.22	0.12	0.46

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 71 (71%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.62

Intersection Signal Delay: 9.2

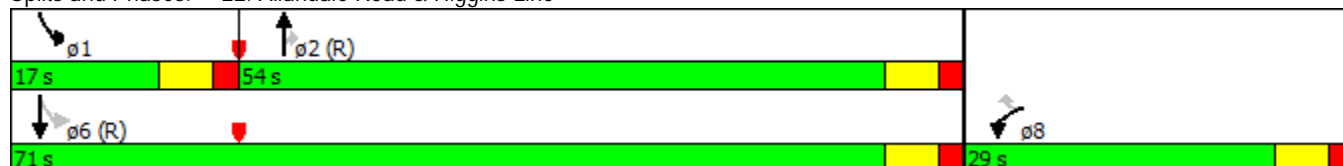
Intersection LOS: A

Intersection Capacity Utilization 50.0%

ICU Level of Service A

Analysis Period (min) 15























Splits and Phases: 22: Allandale Road & Higgins Line















MUN Area Traffic Study
Allandale Road & Mt. Scio Road

Scenario 2 - 2025 AM

29/06/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 							
Traffic Volume (vph)	189	935	64	29	301	53	27	30	38	91	51	148
Future Volume (vph)	189	935	64	29	301	53	27	30	38	91	51	148
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.3	3.5	3.5	3.7	4.0	3.5	3.5	3.5	3.6	3.3	4.8
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	75.0		0.0	75.0		0.0	60.0		25.0	60.0		25.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.990			0.977			0.916			0.889	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1750	3387	0	1750	3496	0	1750	1687	0	1770	1601	0
Flt Permitted	0.441			0.215			0.399			0.637		
Satd. Flow (perm)	812	3387	0	396	3496	0	735	1687	0	1187	1601	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8			26			49			123	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		368.0			559.6			322.8			111.1	
Travel Time (s)		22.1			33.6			23.2			8.0	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.96	0.96	0.96	0.82	0.82	0.82	0.78	0.78	0.78	0.87	0.87	0.87
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	197	974	67	35	367	65	35	38	49	105	59	170
Shared Lane Traffic (%)												
Lane Group Flow (vph)	197	1041	0	35	432	0	35	87	0	105	229	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Total Split (s)	15.0	43.0		22.0	50.0		13.0	22.0		13.0	22.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Act Effect Green (s)	62.6	56.9		57.0	49.9		18.4	12.8		19.6	15.4	
Actuated g/C Ratio	0.63	0.57		0.57	0.50		0.18	0.13		0.20	0.15	
v/c Ratio	0.33	0.54		0.11	0.25		0.17	0.34		0.38	0.65	
Control Delay	9.9	17.3		7.6	10.0		29.0	23.0		33.8	28.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	9.9	17.3		7.6	10.0		29.0	23.0		33.8	28.0	
LOS	A	B		A	A		C	C		C	C	
Approach Delay		16.1			9.8			24.8			29.8	
Approach LOS		B			A			C			C	
Stops (vph)	80	625		9	89		22	30		75	91	
Fuel Used(l)	10	65		3	31		2	4		5	8	
CO Emissions (g/hr)	187	1216		47	579		36	74		93	157	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	36	235		9	112		7	14		18	30	
VOC Emissions (g/hr)	43	280		11	134		8	17		21	36	
Dilemma Vehicles (#)	0	50		0	21		0	0		0	0	
Queue Length 50th (m)	14.8	73.5		1.7	11.3		5.2	6.7		16.2	19.5	
Queue Length 95th (m)	27.0	102.2		4.6	16.0		10.5	15.9		27.3	40.8	
Internal Link Dist (m)		344.0			535.6			298.8			87.1	
Turn Bay Length (m)	75.0			75.0			60.0			60.0		
Base Capacity (vph)	596	1931		473	1758		206	311		273	380	
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	0.33	0.54		0.07	0.25		0.17	0.28		0.38	0.60	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 10 (10%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.65

Intersection Signal Delay: 17.4

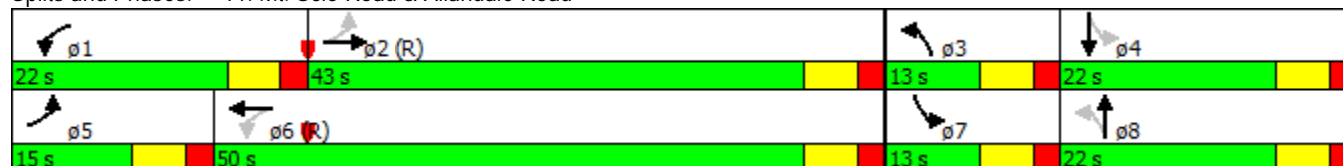
Intersection LOS: B

Intersection Capacity Utilization 71.2%

ICU Level of Service C

Analysis Period (min) 15
























Splits and Phases: 11: Mt. Scio Road & Allandale Road















MUN Area Traffic Study
Prince Philip Drive & Allandale Road

Scenario 2 - 2025 AM

29/06/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	323	428	304	193	739	59	339	318	217	43	608	521
Future Volume (vph)	323	428	304	193	739	59	339	318	217	43	608	521
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	3.8	3.8	3.0	3.7	3.7	3.5	3.5	3.5	3.0	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	200.0		120.0	65.0		25.0	70.0		0.0	42.0		35.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	0.95	0.88
Ped Bike Factor			0.98	1.00	1.00		1.00		0.98	1.00		
Frt			0.850		0.989				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1652	3618	1619	1652	3535	0	1750	1842	1566	1652	3500	2756
Flt Permitted	0.123			0.475			0.950			0.559		
Satd. Flow (perm)	214	3618	1593	824	3535	0	1748	1842	1541	969	3500	2756
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			320		6				228			92
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		455.9			851.6			464.8			121.6	
Travel Time (s)		23.4			43.8			33.5			8.8	
Confl. Peds. (#/hr)	3		2	2		2	2		2	2		2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.93	0.93	0.93	0.95	0.95	0.95	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	340	451	320	208	795	63	357	335	228	48	676	579
Shared Lane Traffic (%)												
Lane Group Flow (vph)	340	451	320	208	858	0	357	335	228	48	676	579
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Prot	NA	Perm	Perm	NA	pt+ov
Protected Phases	5	2		1	6		7	4			8	8 5
Permitted Phases	2		2	6					4	8		
Total Split (s)	25.0	38.0	38.0	21.0	34.0		30.0	61.0	61.0	31.0	31.0	
Total Lost Time (s)	6.0	7.0	7.0	6.0	7.0		6.0	6.0	6.0	6.0	6.0	
Act Effect Green (s)	51.8	32.4	32.4	41.6	27.0		24.0	55.0	55.0	25.0	25.0	50.0
Actuated g/C Ratio	0.43	0.27	0.27	0.35	0.22		0.20	0.46	0.46	0.21	0.21	0.42
v/c Ratio	1.06	0.46	0.48	0.55	1.07		1.02	0.40	0.28	0.24	0.93	0.48
Control Delay	92.8	35.9	16.3	19.1	89.7		69.9	14.9	4.9	43.4	66.6	22.7
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	92.8	35.9	16.3	19.1	89.7		69.9	14.9	4.9	43.4	66.6	22.7
LOS	F	D	B	B	F		E	B	A	D	E	C
Approach Delay		47.7			75.9			33.8			46.2	
Approach LOS		D			E			C			D	
Stops (vph)	242	375	241	130	720		280	248	68	36	553	312
Fuel Used(l)	46	44	26	26	160		39	23	12	5	80	48
CO Emissions (g/hr)	850	822	477	491	2984		735	432	222	90	1492	884

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	164	159	92	95	576		142	83	43	17	288	171
VOC Emissions (g/hr)	196	190	110	113	688		169	100	51	21	344	204
Dilemma Vehicles (#)	0	23	0	0	29		0	0	0	0	0	0
Queue Length 50th (m)	~73.7	52.5	28.4	30.6	~117.9		~79.4	52.6	12.2	9.5	82.8	46.4
Queue Length 95th (m)	#129.9	69.1	54.3	30.8	#157.7		m#107.7	m61.1	m15.3	20.7	#117.2	63.8
Internal Link Dist (m)		431.9			827.6			440.8			97.6	
Turn Bay Length (m)	200.0		120.0	65.0			70.0			42.0		35.0
Base Capacity (vph)	320	976	663	398	800		350	844	829	201	729	1202
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	1.06	0.46	0.48	0.52	1.07		1.02	0.40	0.28	0.24	0.93	0.48

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green, Master Intersection

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.07

Intersection Signal Delay: 51.2

Intersection LOS: D

Intersection Capacity Utilization 102.7%

ICU Level of Service G

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

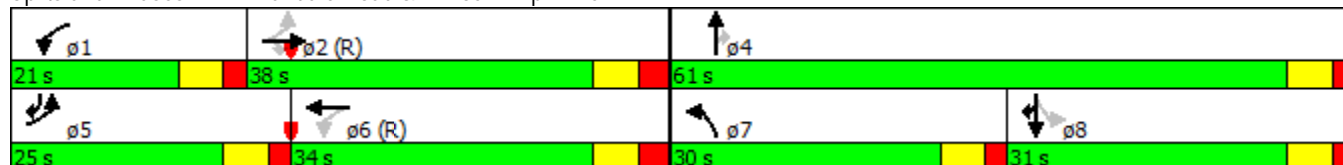
Queue shown is maximum after two cycles.


















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

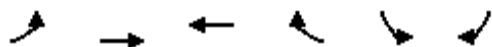
Queue shown is maximum after two cycles.





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

Splits and Phases: 7: Allandale Road & Prince Philip Drive



													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (veh/h)	5	265	0	0	334	143	3	0	923	0	0	0	
Future Volume (Veh/h)	5	265	0	0	334	143	3	0	923	0	0	0	
Sign Control		Free			Free			Stop			Stop		
Grade		0%			0%			0%			0%		
Peak Hour Factor	0.94	0.94	0.94	0.73	0.73	0.73	0.89	0.89	0.89	0.92	0.92	0.92	
Hourly flow rate (vph)	5	282	0	0	458	196	3	0	1037	0	0	0	
Pedestrians													
Lane Width (m)													
Walking Speed (m/s)													
Percent Blockage													
Right turn flare (veh)										3			
Median type	None				None								
Median storage (veh)													
Upstream signal (m)	368												
pX, platoon unblocked	0.94						0.94	0.94			0.94	0.94	0.94
vC, conflicting volume	458				282			750	750	282	750	750	458
vC1, stage 1 conf vol													
vC2, stage 2 conf vol													
vCu, unblocked vol	394				282			704	704	282	704	704	394
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 %	100				100			99	100	0	0	100	100
cM capacity (veh/h)	1097				1280			330	339	757	0	339	617
Direction, Lane #	EB 1	WB 1	WB 2	NB 1									
Volume Total	287	458	196	1040									
Volume Left	5	0	0	3									
Volume Right	0	0	196	1037									
cSH	1097	1700	1700	759									
Volume to Capacity	0.00	0.27	0.12	1.37									
Queue Length 95th (m)	0.1	0.0	0.0	334.3									
Control Delay (s)	0.2	0.0	0.0	191.8									
Lane LOS	A				F								
Approach Delay (s)	0.2	0.0			191.8								
Approach LOS				F									
Intersection Summary													
Average Delay			100.7										
Intersection Capacity Utilization			78.0%		ICU Level of Service				D				
Analysis Period (min)			15										


























Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	17	8	329	253	2
Future Volume (Veh/h)	3	17	8	329	253	2
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	0.92	0.92	0.95	0.95
Hourly flow rate (vph)	3	17	9	358	266	2
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						3
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	9				211	188
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	9				211	188
tC, single (s)	4.6				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.7				3.5	3.3
p0 queue free %	100				66	100
cM capacity (veh/h)	1347				776	854
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	20	367	268			
Volume Left	3	0	266			
Volume Right	0	358	2			
cSH	1347	1700	781			
Volume to Capacity	0.00	0.22	0.34			
Queue Length 95th (m)	0.1	0.0	11.6			
Control Delay (s)	1.2	0.0	12.0			
Lane LOS	A		B			
Approach Delay (s)	1.2	0.0	12.0			
Approach LOS			B			
Intersection Summary						
Average Delay			5.0			
Intersection Capacity Utilization			41.5%		ICU Level of Service	
Analysis Period (min)			15		A	

MUN Area Traffic Study
Bonaventure Avenue/ Allandale Road & Elizabeth Avenue

Scenario 2 - 2025 AM

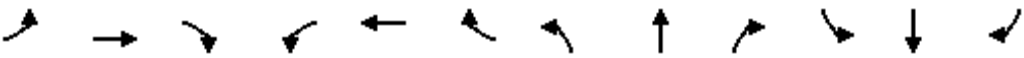
29/06/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	32	189	37	46	321	44	143	701	81	44	492	251
Future Volume (vph)	32	189	37	46	321	44	143	701	81	44	492	251
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	3.5	3.7	3.0	3.5	3.7	3.0	3.4	3.4	3.0	3.4	3.4
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	55.0		0.0	55.0		0.0	55.0		35.0	40.0		0.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.975				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1652	1796	0	1652	1842	1601	1652	1821	1548	1652	1821	1548
Flt Permitted	0.179			0.367			0.239			0.088		
Satd. Flow (perm)	311	1796	0	638	1842	1601	416	1821	1548	153	1821	1548
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8				136			136			279
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		335.6			298.1			241.6			464.8	
Travel Time (s)		24.2			21.5			17.4			33.5	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.83	0.83	0.83	0.78	0.78	0.78	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	39	228	45	59	412	56	159	779	90	49	547	279
Shared Lane Traffic (%)												
Lane Group Flow (vph)	39	273	0	59	412	56	159	779	90	49	547	279
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6		6	4		4	8		8
Total Split (s)	13.0	35.0		13.0	35.0	35.0	15.0	59.0	59.0	13.0	57.0	57.0
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
Act Effect Green (s)	37.2	31.6		38.4	34.2	34.2	62.8	55.6	55.6	58.2	51.2	51.2
Actuated g/C Ratio	0.31	0.26		0.32	0.28	0.28	0.52	0.46	0.46	0.48	0.43	0.43
v/c Ratio	0.22	0.57		0.22	0.78	0.10	0.52	0.92	0.11	0.30	0.70	0.34
Control Delay	26.4	40.8		28.8	53.0	0.4	20.0	49.2	1.2	18.3	20.0	1.4
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	26.4	40.8		28.8	53.0	0.4	20.0	49.2	1.2	18.3	20.0	1.4
LOS	C	D		C	D	A	B	D	A	B	B	A
Approach Delay		39.0			44.7			40.4			14.0	
Approach LOS		D			D			D			B	
Stops (vph)	22	304		32	270	0	70	587	2	18	370	10
Fuel Used(l)	4	33		3	28	1	7	56	2	3	38	12
CO Emissions (g/hr)	72	621		57	525	23	131	1037	37	55	699	215

MUN Area Traffic Study
Bonaventure Avenue/ Allandale Road & Elizabeth Avenue

Scenario 2 - 2025 AM

29/06/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	14	120		11	101	5	25	200	7	11	135	42
VOC Emissions (g/hr)	17	143		13	121	5	30	239	8	13	161	50
Dilemma Vehicles (#)	0	0		0	0	0	0	0	0	0	0	0
Queue Length 50th (m)	6.2	56.6		9.3	95.3	0.0	17.8	175.4	0.0	2.4	112.0	0.5
Queue Length 95th (m)	m11.5	76.0		16.2	#118.3	0.0	29.3	#257.2	2.9	m4.4	m136.0	m4.1
Internal Link Dist (m)		311.6			274.1			217.6			440.8	
Turn Bay Length (m)	55.0			55.0			55.0		35.0	40.0		
Base Capacity (vph)	174	479		263	525	553	310	843	790	161	777	821
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	0.22	0.57		0.22	0.78	0.10	0.51	0.92	0.11	0.30	0.70	0.34

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 47 (39%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 32.6

Intersection LOS: C

Intersection Capacity Utilization 89.4%

ICU Level of Service E

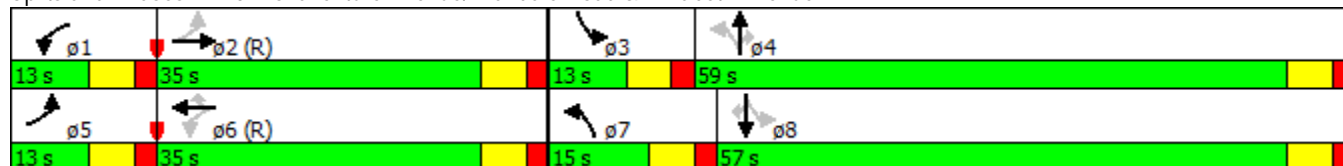
Analysis Period (min) 15












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.

Splits and Phases: 10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue





































						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	173	2	455	771	20	315
Future Volume (Veh/h)	173	2	455	771	20	315
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	194	2	511	866	22	354
Pedestrians	97		97			97
Lane Width (m)	3.7		4.0			3.7
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	8		9			8
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)			105			
pX, platoon unblocked						
vC, conflicting volume	1103	705			1474	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1103	705			1474	
tC, single (s)	6.5	6.2			4.2	
tC, 2 stage (s)						
tF (s)	3.6	3.3			2.3	
p0 queue free %	0	99			95	
cM capacity (veh/h)	176	367			403	
Direction, Lane #	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total	97	97	2	511	866	376
Volume Left	97	97	0	0	0	22
Volume Right	0	0	2	0	866	0
cSH	176	176	367	1700	1700	403
Volume to Capacity	0.55	0.55	0.01	0.30	0.51	0.05
Queue Length 95th (m)	21.7	21.7	0.1	0.0	0.0	1.3
Control Delay (s)	48.1	48.1	14.9	0.0	0.0	1.8
Lane LOS	E	E	B			A
Approach Delay (s)	47.8			0.0		1.8
Approach LOS	E					
Intersection Summary						
Average Delay			5.1			
Intersection Capacity Utilization			78.0%		ICU Level of Service	D
Analysis Period (min)			15			

MUN Area Traffic Study
Prince Philip Drive & Thorburn Road

Scenario 2 - 2025 AM

29/06/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	276	1287	179	119	631	263	0	339	79	502	505	274
Future Volume (vph)	276	1287	179	119	631	263	0	339	79	502	505	274
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.8	4.2	3.5	3.8	4.0	2.4	3.8	4.3	3.5	3.8	3.8
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	175.0		0.0	110.0		90.0	0.0		0.0	150.0		150.0
Storage Lanes	1		1	1		0	0		0	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.95	0.95	0.97	0.95	0.95
Ped Bike Factor	1.00		0.98			0.98		1.00		1.00	0.99	
Frt			0.850			0.850		0.972			0.947	
Flt Protected	0.950			0.950						0.950		
Satd. Flow (prot)	1750	3618	1689	1750	5198	1654	0	3507	0	3395	3407	0
Flt Permitted	0.202			0.123						0.950		
Satd. Flow (perm)	372	3618	1662	227	5198	1627	0	3507	0	3384	3407	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			145			329		21			101	
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		327.2			152.5			152.8			386.6	
Travel Time (s)		16.8			7.8			11.0			27.8	
Confl. Peds. (#/hr)	2		2	2		2	2		2	2		2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.93	0.93	0.93	0.80	0.80	0.80	0.83	0.83	0.83	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	297	1384	192	149	789	329	0	408	95	528	532	288
Shared Lane Traffic (%)												
Lane Group Flow (vph)	297	1384	192	149	789	329	0	503	0	528	820	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm		NA		Prot	NA	
Protected Phases	5	2		1	6			4		3	8	
Permitted Phases	2		2	6		6						
Total Split (s)	30.0	51.0	51.0	13.0	34.0	34.0		32.0		24.0	56.0	
Total Lost Time (s)	6.0	7.0	7.0	6.0	7.0	7.0		7.0		6.0	7.0	
Act Effect Green (s)	57.9	44.0	44.0	40.6	32.6	32.6		25.0		18.0	49.0	
Actuated g/C Ratio	0.48	0.37	0.37	0.34	0.27	0.27		0.21		0.15	0.41	
v/c Ratio	0.76	1.04	0.27	0.90	0.56	0.48		0.67		1.04	0.57	
Control Delay	33.7	74.4	8.7	86.7	27.8	8.6		43.9		99.5	25.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Total Delay	33.7	74.4	8.7	86.7	27.8	8.6		43.9		99.5	25.4	
LOS	C	E	A	F	C	A		D		F	C	
Approach Delay		61.2			29.7			43.9			54.4	
Approach LOS		E			C			D			D	
Stops (vph)	171	1136	36	99	585	126		369		440	514	
Fuel Used(l)	22	158	8	18	70	20		31		67	55	
CO Emissions (g/hr)	409	2935	140	335	1296	371		580		1241	1030	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	79	567	27	65	250	72		112		240	199	
VOC Emissions (g/hr)	94	677	32	77	299	86		134		286	238	
Dilemma Vehicles (#)	0	49	0	0	4	0		0		0	0	
Queue Length 50th (m)	42.3	~185.8	7.2	19.1	67.1	31.4		56.7		~69.0	67.5	
Queue Length 95th (m)	66.0	#227.8	22.8	#51.4	72.6	33.4		69.1		#102.8	86.8	
Internal Link Dist (m)		303.2			128.5			128.8			362.6	
Turn Bay Length (m)	175.0			110.0		90.0				150.0		
Base Capacity (vph)	455	1326	701	165	1413	681		747		509	1450	
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	0.65	1.04	0.27	0.90	0.56	0.48		0.67		1.04	0.57	

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 28 (23%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.04

Intersection Signal Delay: 49.6

Intersection LOS: D

Intersection Capacity Utilization 99.0%

ICU Level of Service F

Analysis Period (min) 15

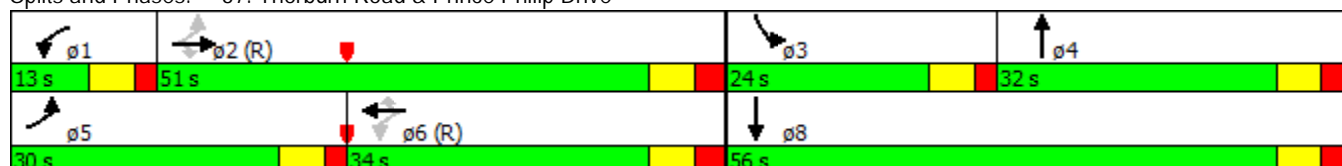
~ Volume exceeds capacity, queue is theoretically infinite.












Queue shown is maximum after two cycles.











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

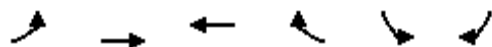
Queue shown is maximum after two cycles.





Splits and Phases: 37: Thorburn Road & Prince Philip Drive



						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	690	68	88	189	39	171
Future Volume (Veh/h)	690	68	88	189	39	171
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.90	0.90	0.85	0.85
Hourly flow rate (vph)	812	80	98	210	46	201
Pedestrians				2	17	
Lane Width (m)				3.7	3.7	
Walking Speed (m/s)				1.2	1.2	
Percent Blockage				0	1	
Right turn flare (veh)						13
Median type	None			None		
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			909		1275	871
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			909		1275	871
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			87		71	42
cM capacity (veh/h)			738		157	345
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	892	98	210	247		
Volume Left	0	98	0	46		
Volume Right	80	0	0	201		
cSH	1700	738	1700	424		
Volume to Capacity	0.52	0.13	0.12	0.58		
Queue Length 95th (m)	0.0	3.5	0.0	27.4		
Control Delay (s)	0.0	10.6	0.0	30.5		
Lane LOS		B		D		
Approach Delay (s)	0.0	3.4		30.5		
Approach LOS				D		
Intersection Summary						
Average Delay			5.9			
Intersection Capacity Utilization			59.4%	ICU Level of Service		B
Analysis Period (min)			15			

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	208	391	26	797	364
Future Volume (Veh/h)	0	208	391	26	797	364
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.94	0.94	0.80	0.80	0.91	0.91
Hourly flow rate (vph)	0	221	489	33	876	400
Pedestrians	49					
Lane Width (m)	4.5					
Walking Speed (m/s)	1.2					
Percent Blockage	5					
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (m)						274
pX, platoon unblocked						
vC, conflicting volume	2706	554			571	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2706	554			571	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	56			8	
cM capacity (veh/h)	2	504			950	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	221	522	876	400		
Volume Left	0	0	876	0		
Volume Right	221	33	0	0		
cSH	504	1700	950	1700		
Volume to Capacity	0.44	0.31	0.92	0.24		
Queue Length 95th (m)	16.7	0.0	106.8	0.0		
Control Delay (s)	17.6	0.0	34.5	0.0		
Lane LOS	C		D			
Approach Delay (s)	17.6	0.0	23.7			
Approach LOS	C					
Intersection Summary						
Average Delay		16.9				
Intersection Capacity Utilization		73.1%		ICU Level of Service		D
Analysis Period (min)		15				

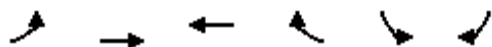


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	28	731	190	37	27	11
Future Volume (Veh/h)	28	731	190	37	27	11
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.87	0.87	0.81	0.81	0.80	0.80
Hourly flow rate (vph)	32	840	235	46	34	14
Pedestrians		81	70		23	
Lane Width (m)		3.0	3.7		4.5	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		6	6		2	
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	304				1255	362
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	304				1255	362
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				80	98
cM capacity (veh/h)	1227				169	629
Direction, Lane #	EB 1	EB 2	WB 1	SB 1		
Volume Total	32	840	281	48		
Volume Left	32	0	0	34		
Volume Right	0	0	46	14		
cSH	1227	1700	1700	215		
Volume to Capacity	0.03	0.49	0.17	0.22		
Queue Length 95th (m)	0.6	0.0	0.0	6.3		
Control Delay (s)	8.0	0.0	0.0	26.5		
Lane LOS	A			D		
Approach Delay (s)	0.3		0.0	26.5		
Approach LOS				D		
Intersection Summary						
Average Delay			1.3			
Intersection Capacity Utilization			57.8%	ICU Level of Service		B
Analysis Period (min)			15			

MUN Area Traffic Study
Westerland Road & Elizabeth Avenue

Scenario 2 - 2025 AM

29/06/2015



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	444	394	149	327	156	136
Future Volume (vph)	444	394	149	327	156	136
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	2.8	3.0	3.6	3.7	3.4	3.4
Grade (%)		0%	0%		0%	
Storage Length (m)	35.0			0.0	0.0	70.0
Storage Lanes	1			0	1	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.907			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1612	1739	1690	0	1730	1548
Flt Permitted	0.222				0.950	
Satd. Flow (perm)	377	1739	1690	0	1730	1548
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			101			155
Link Speed (k/h)		50	50		50	
Link Distance (m)		402.3	566.1		375.0	
Travel Time (s)		29.0	40.8		27.0	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.78	0.78	0.90	0.90	0.88	0.88
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	569	505	166	363	177	155
Shared Lane Traffic (%)						
Lane Group Flow (vph)	569	505	529	0	177	155
Turn Type	pm+pt	NA	NA		Prot	Perm
Protected Phases	5	2	6		8	
Permitted Phases	2					8
Total Split (s)	48.0	96.0	48.0		24.0	24.0
Total Lost Time (s)	6.0	6.0	6.0		6.0	6.0
Act Effect Green (s)	92.0	92.0	49.7		16.0	16.0
Actuated g/C Ratio	0.77	0.77	0.41		0.13	0.13
v/c Ratio	0.86	0.38	0.70		0.77	0.46
Control Delay	27.1	2.3	23.3		61.7	12.5
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	27.1	2.3	23.3		61.7	12.5
LOS	C	A	C		E	B
Approach Delay		15.4	23.3		38.7	
Approach LOS		B	C		D	
Stops (vph)	320	47	414		143	55
Fuel Used(l)	33	17	59		16	7
CO Emissions (g/hr)	621	312	1090		301	137



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
NOx Emissions (g/hr)	120	60	210		58	27
VOC Emissions (g/hr)	143	72	251		69	32
Dilemma Vehicles (#)	0	0	0		0	0
Queue Length 50th (m)	59.3	10.8	64.6		39.3	5.7
Queue Length 95th (m)	m55.1	m12.5	#138.7		#60.6	15.3
Internal Link Dist (m)		378.3	542.1		351.0	
Turn Bay Length (m)	35.0					70.0
Base Capacity (vph)	721	1333	758		259	363
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	0.79	0.38	0.70		0.68	0.43

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 113 (94%), Referenced to phase 2:EBTL and 6:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 21.6

Intersection LOS: C

Intersection Capacity Utilization 76.2%

ICU Level of Service D

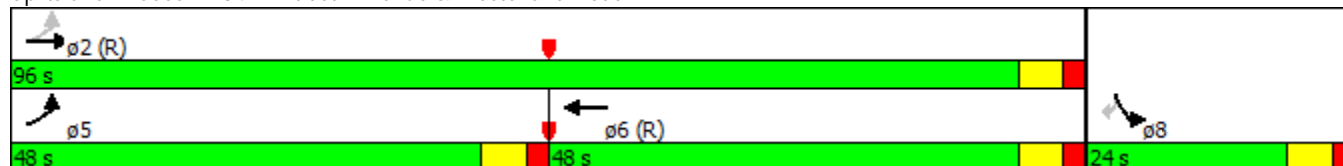
Analysis Period (min) 15

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.

Splits and Phases: 34: Elizabeth Avenue & Westerland Road





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑	↑	↑↑	↑
Traffic Volume (vph)	0	1056	328	419	540	263
Future Volume (vph)	0	1056	328	419	540	263
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.7	3.7	3.7	3.7	3.7	3.7
Grade (%)		0%	0%		0%	
Storage Length (m)	0.0			30.0	0.0	0.0
Storage Lanes	0			1	2	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Ped Bike Factor						
Frt				0.850		0.850
Flt Protected					0.950	
Satd. Flow (prot)	0	3579	3579	1601	3471	1601
Flt Permitted					0.950	
Satd. Flow (perm)	0	3579	3579	1601	3471	1601
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				476		289
Link Speed (k/h)		50	50		50	
Link Distance (m)		173.6	374.8		70.3	
Travel Time (s)		12.5	27.0		5.1	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.94	0.94	0.88	0.88	0.91	0.91
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	0	1123	373	476	593	289
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1123	373	476	593	289
Turn Type		NA	NA	Perm	Prot	Perm
Protected Phases		4	8		6	
Permitted Phases				8		6
Total Split (s)		73.0	73.0	73.0	47.0	47.0
Total Lost Time (s)		6.0	6.0	6.0	6.0	6.0
Act Effect Green (s)		67.0	67.0	67.0	41.0	41.0
Actuated g/C Ratio		0.56	0.56	0.56	0.34	0.34
v/c Ratio		0.56	0.19	0.43	0.50	0.39
Control Delay		18.4	10.1	1.3	23.6	2.7
Queue Delay		0.0	0.0	0.0	0.0	0.0
Total Delay		18.4	10.1	1.3	23.6	2.7
LOS		B	B	A	C	A
Approach Delay		18.4	5.1		16.7	
Approach LOS		B	A		B	
Stops (vph)		652	106	3	302	21
Fuel Used(l)		47	17	15	28	7
CO Emissions (g/hr)		874	309	286	521	123



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
NOx Emissions (g/hr)		169	60	55	101	24
VOC Emissions (g/hr)		202	71	66	120	28
Dilemma Vehicles (#)		0	0	0	0	0
Queue Length 50th (m)		85.5	16.8	0.0	34.6	0.0
Queue Length 95th (m)		104.5	m17.5	m2.1	m46.5	m3.1
Internal Link Dist (m)		149.6	350.8		46.3	
Turn Bay Length (m)				30.0		
Base Capacity (vph)		1998	1998	1104	1185	737
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		0.56	0.19	0.43	0.50	0.39

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 1 (1%), Referenced to phase 4:EBT and 8:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.56

Intersection Signal Delay: 14.0

Intersection LOS: B

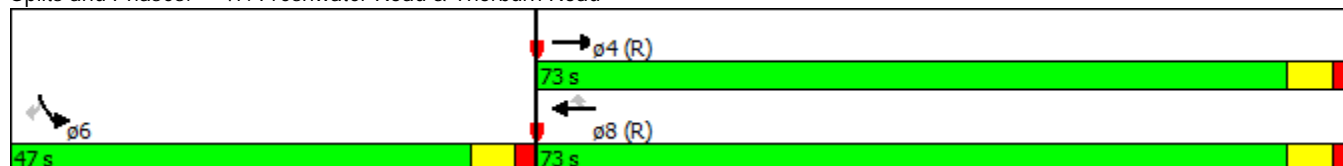
Intersection Capacity Utilization 54.6%

ICU Level of Service A

Analysis Period (min) 15

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
























Splits and Phases: 47: Freshwater Road & Thorburn Road



MUN Area Traffic Study
Prince Philip Drive & Clinch Crescent/ Westerland Road

Scenario 2 - 2025 AM













29/06/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	540	696	264	84	696	300	82	385	104	137	179	171
Future Volume (vph)	540	696	264	84	696	300	82	385	104	137	179	171
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	4.0	3.5	3.5	3.5	3.5	3.0	3.0	3.5	3.3	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	75.0		185.0	90.0		0.0	60.0		45.0	0.0		80.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.88	0.96	1.00		1.00		0.69			0.98
Frt			0.850		0.955				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1750	3697	1566	1750	3326	0	1652	1739	1566	1711	1842	1566
Flt Permitted	0.093			0.373			0.540			0.143		
Satd. Flow (perm)	171	3697	1381	662	3326	0	936	1739	1087	257	1842	1541
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			278		58				200			200
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		591.3			489.3			375.0			105.3	
Travel Time (s)		30.4			25.2			27.0			7.6	
Confl. Peds. (#/hr)	2		30	30		2	2		150	150		2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.74	0.74	0.74	0.82	0.82	0.82	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	568	733	278	114	941	405	100	470	127	149	195	186
Shared Lane Traffic (%)												
Lane Group Flow (vph)	568	733	278	114	1346	0	100	470	127	149	195	186
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2		2	6			4		4	8		8
Total Split (s)	28.0	59.0	59.0	13.0	44.0		13.0	35.0	35.0	13.0	35.0	35.0
Total Lost Time (s)	6.0	7.0	7.0	6.0	7.0		6.0	7.0	7.0	6.0	7.0	7.0
Act Effect Green (s)	66.0	52.0	52.0	45.0	37.0		36.0	28.0	28.0	36.0	28.0	28.0
Actuated g/C Ratio	0.55	0.43	0.43	0.38	0.31		0.30	0.23	0.23	0.30	0.23	0.23
v/c Ratio	1.48	0.46	0.37	0.37	1.26		0.31	1.16	0.31	0.93	0.45	0.36
Control Delay	256.5	26.6	8.3	15.0	155.4		32.0	130.6	3.3	86.7	43.5	6.3
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	256.5	26.6	8.3	15.0	155.4		32.0	130.6	3.3	86.7	43.5	6.3
LOS	F	C	A	B	F		C	F	A	F	D	A
Approach Delay		106.1			144.4			93.3			42.6	
Approach LOS		F			F			F			D	
Stops (vph)	409	517	75	41	736		44	312	7	92	151	17
Fuel Used(l)	151	70	18	6	191		6	59	4	13	11	3
CO Emissions (g/hr)	2800	1311	329	114	3554		110	1105	77	234	208	54

MUN Area Traffic Study
Prince Philip Drive & Clinch Crescent/ Westerland Road

Scenario 2 - 2025 AM

29/06/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	541	253	63	22	686		21	213	15	45	40	10
VOC Emissions (g/hr)	646	302	76	26	820		25	255	18	54	48	13
Dilemma Vehicles (#)	0	11	0	0	29		0	0	0	0	0	0
Queue Length 50th (m)	~174.9	69.2	14.6	11.9	~201.1		14.8	~132.0	0.5	24.8	39.6	0.0
Queue Length 95th (m)	#243.9	80.3	32.8	15.0	#173.8		m20.6	#166.9	m1.9	#58.5	62.3	14.9
Internal Link Dist (m)		567.3			465.3			351.0			81.3	
Turn Bay Length (m)	75.0		185.0	90.0			60.0		45.0			80.0
Base Capacity (vph)	383	1602	755	311	1065		322	405	406	161	429	512
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	1.48	0.46	0.37	0.37	1.26		0.31	1.16	0.31	0.93	0.45	0.36

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 38 (32%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.48

Intersection Signal Delay: 109.2

Intersection LOS: F

Intersection Capacity Utilization 108.9%

ICU Level of Service G

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

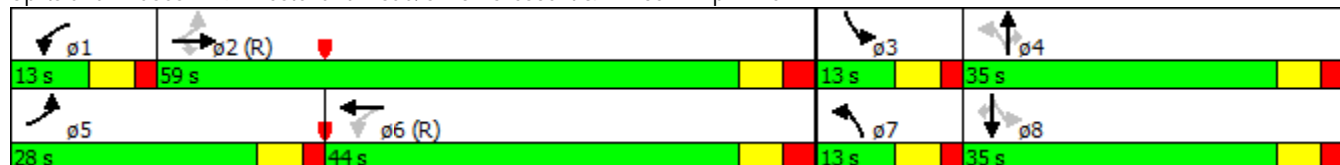
Queue shown is maximum after two cycles.

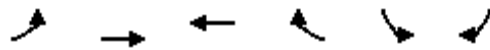
95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

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

Splits and Phases: 9: Westerland Road/Clinch Crescent & Prince Philip Drive





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	635	1335	762	186	69	242
Future Volume (vph)	635	1335	762	186	69	242
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	4.0	4.0	3.7	3.3	3.5
Grade (%)		0%	0%		0%	
Storage Length (m)	140.0			70.0	80.0	0.0
Storage Lanes	1			1	1	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Ped Bike Factor				0.97	1.00	0.98
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1652	3697	3697	1601	1711	1566
Flt Permitted	0.171				0.950	
Satd. Flow (perm)	297	3697	3697	1558	1704	1541
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				198		390
Link Speed (k/h)		70	70		50	
Link Distance (m)		289.0	591.3		280.3	
Travel Time (s)		14.9	30.4		20.2	
Confl. Peds. (#/hr)	2			2	2	2
Confl. Bikes (#/hr)						
Peak Hour Factor	0.96	0.96	0.92	0.92	0.62	0.62
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	661	1391	828	202	111	390
Shared Lane Traffic (%)						
Lane Group Flow (vph)	661	1391	828	202	111	390
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	5	2	6		8	
Permitted Phases	2			6		8
Total Split (s)	55.0	96.0	41.0	41.0	24.0	24.0
Total Lost Time (s)	6.0	7.0	7.0	7.0	6.0	6.0
Act Effect Green (s)	94.6	93.6	42.1	42.1	13.4	13.4
Actuated g/C Ratio	0.79	0.78	0.35	0.35	0.11	0.11
v/c Ratio	0.88	0.48	0.64	0.30	0.58	0.75
Control Delay	44.9	4.0	14.7	1.7	62.4	14.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.9	4.0	14.7	1.7	62.4	14.6
LOS	D	A	B	A	E	B
Approach Delay		17.2	12.2		25.2	
Approach LOS		B	B		C	
Stops (vph)	666	212	493	35	65	27
Fuel Used(l)	66	45	67	11	7	10
CO Emissions (g/hr)	1230	834	1246	200	123	182



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
NOx Emissions (g/hr)	237	161	240	39	24	35
VOC Emissions (g/hr)	284	192	287	46	28	42
Dilemma Vehicles (#)	0	95	20	0	0	0
Queue Length 50th (m)	100.4	26.2	56.2	2.9	25.3	0.0
Queue Length 95th (m)	#175.4	46.3	m70.1	m6.3	28.0	0.0
Internal Link Dist (m)		265.0	567.3		256.3	
Turn Bay Length (m)	140.0			70.0	80.0	
Base Capacity (vph)	793	2882	1296	675	256	562
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	0.83	0.48	0.64	0.30	0.43	0.69

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 83 (69%), Referenced to phase 2:EBTL and 6:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 16.9

Intersection LOS: B

Intersection Capacity Utilization 80.8%

ICU Level of Service D

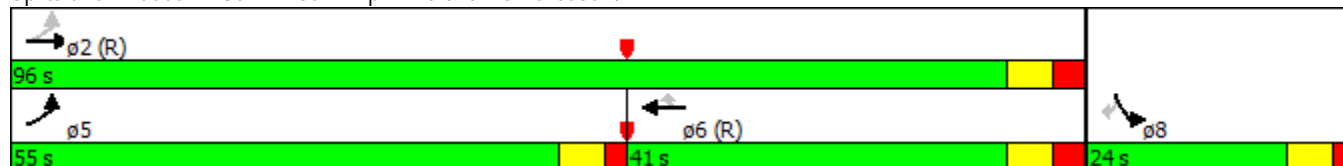
Analysis Period (min) 15

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.

Splits and Phases: 35: Prince Philip Drive & Clinch Crescent





Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	16	13	212	476	978	112
Future Volume (vph)	16	13	212	476	978	112
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	4.0	3.5	4.0	3.7	4.0
Grade (%)	0%			0%	0%	
Storage Length (m)	0.0	0.0	75.0			100.0
Storage Lanes	1	1	1			1
Taper Length (m)	2.5		2.5			
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Ped Bike Factor						
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1750	1654	1750	3697	3579	1654
Flt Permitted	0.950		0.206			
Satd. Flow (perm)	1750	1654	379	3697	3579	1654
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		18				129
Link Speed (k/h)	50			70	70	
Link Distance (m)	119.9			283.2	155.8	
Travel Time (s)	8.6			14.6	8.0	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.74	0.74	0.81	0.81	0.87	0.87
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	22	18	262	588	1124	129
Shared Lane Traffic (%)						
Lane Group Flow (vph)	22	18	262	588	1124	129
Turn Type	Prot	Perm	pm+pt	NA	NA	Perm
Protected Phases	8		5	2	6	
Permitted Phases		8	2			6
Total Split (s)	23.0	23.0	30.0	97.0	67.0	67.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Act Effect Green (s)	10.0	10.0	104.4	106.8	87.5	87.5
Actuated g/C Ratio	0.08	0.08	0.87	0.89	0.73	0.73
v/c Ratio	0.15	0.12	0.58	0.18	0.43	0.10
Control Delay	53.8	22.6	22.4	1.5	8.7	1.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	53.8	22.6	22.4	1.5	8.7	1.7
LOS	D	C	C	A	A	A
Approach Delay	39.7			7.9	7.9	
Approach LOS	D			A	A	
Stops (vph)	16	5	159	46	383	7
Fuel Used(l)	1	0	30	47	36	2
CO Emissions (g/hr)	22	9	562	866	665	35



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
NOx Emissions (g/hr)	4	2	108	167	128	7
VOC Emissions (g/hr)	5	2	130	200	153	8
Dilemma Vehicles (#)	0	0	0	17	41	0
Queue Length 50th (m)	4.9	0.0	21.5	8.3	57.0	0.0
Queue Length 95th (m)	10.6	5.1	37.7	12.8	85.0	6.4
Internal Link Dist (m)	95.9			259.2	131.8	
Turn Bay Length (m)			75.0			100.0
Base Capacity (vph)	247	249	603	3290	2610	1241
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	0.09	0.07	0.43	0.18	0.43	0.10

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 38 (32%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.58

Intersection Signal Delay: 8.5

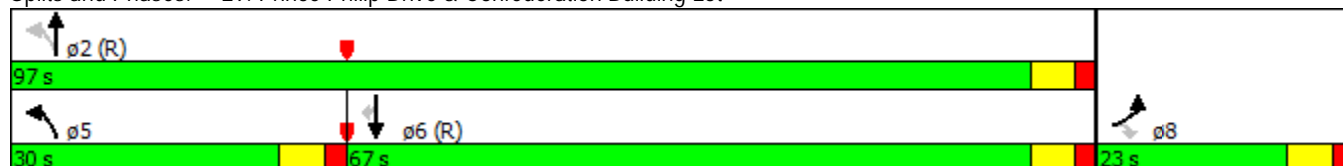
Intersection LOS: A

Intersection Capacity Utilization 62.1%

ICU Level of Service B

Analysis Period (min) 15


Splits and Phases: 29: Prince Philip Drive & Confederation Building Lot















MUN Area Traffic Study
Prince Philip Drive & Morrissey Drive

Scenario 2 - 2025 AM

29/06/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑	↗				↖	↗	
Traffic Volume (vph)	0	937	0	92	1026	480	0	0	0	73	30	55
Future Volume (vph)	0	937	0	92	1026	480	0	0	0	73	30	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.8	3.8	3.7	3.7	3.8	3.5	3.7	3.7	3.7	3.5	3.7	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	0.0		0.0	70.0		30.0	0.0		0.0	40.0		0.0
Storage Lanes	0		0	1		1	0		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
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	1.00
Ped Bike Factor						0.95				0.94	0.96	
Frt						0.850					0.903	
Flt Protected				0.950						0.950		
Satd. Flow (prot)	0	3618	0	1789	3618	1566	0	0	0	1750	1627	0
Flt Permitted				0.229						0.950		
Satd. Flow (perm)	0	3618	0	431	3618	1483	0	0	0	1652	1627	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						465					66	
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		489.3			455.9			119.6			292.8	
Travel Time (s)		25.2			23.4			8.6			21.1	
Confl. Peds. (#/hr)	2		2	3		10				25		25
Confl. Bikes (#/hr)												
Peak Hour Factor	0.91	0.91	0.92	0.93	0.93	0.93	0.92	0.92	0.92	0.82	0.82	0.82
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	1030	0	99	1103	516	0	0	0	89	37	67
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1030	0	99	1103	516	0	0	0	89	104	0
Turn Type		NA		pm+pt	NA	Perm				pm+pt	NA	
Protected Phases		2		1	6					7	4	
Permitted Phases				6		6				4		
Total Split (s)		74.0		19.0	93.0	93.0				27.0	27.0	
Total Lost Time (s)		7.0		6.0	7.0	7.0				6.0	6.0	
Act Effect Green (s)		81.6		95.9	94.9	94.9				12.1	12.1	
Actuated g/C Ratio		0.68		0.80	0.79	0.79				0.10	0.10	
v/c Ratio		0.42		0.23	0.39	0.41				0.51	0.47	
Control Delay		3.3		1.5	1.2	0.5				61.0	28.2	
Queue Delay		0.0		0.0	0.0	0.0				0.0	0.0	
Total Delay		3.3		1.5	1.2	0.5				61.0	28.2	
LOS		A		A	A	A				E	C	
Approach Delay		3.3			1.0						43.3	
Approach LOS		A			A						D	
Stops (vph)		146		6	76	0				68	34	
Fuel Used(l)		46		4	42	18				7	5	
CO Emissions (g/hr)		858		70	788	335				130	92	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)		166		14	152	65				25	18	
VOC Emissions (g/hr)		198		16	182	77				30	21	
Dilemma Vehicles (#)		24		0	15	0				0	0	
Queue Length 50th (m)		14.6		1.2	8.4	0.0				20.4	8.4	
Queue Length 95th (m)		m18.7		m1.9	m9.9	m0.0				32.3	21.0	
Internal Link Dist (m)		465.3			431.9			95.6			268.8	
Turn Bay Length (m)				70.0		30.0				40.0		
Base Capacity (vph)		2459		491	2862	1270				306	339	
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		0.42		0.20	0.39	0.41				0.29	0.31	

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 47 (39%), Referenced to phase 2:EBT and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.51

Intersection Signal Delay: 4.6

Intersection LOS: A

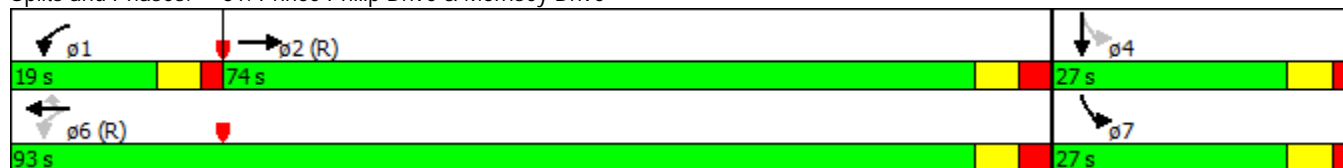
Intersection Capacity Utilization 58.7%

ICU Level of Service B

Analysis Period (min) 15

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

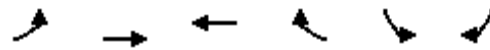
Splits and Phases: 61: Prince Philip Drive & Morrissey Drive



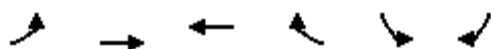
MUN Area Traffic Study
Prince Philip Drive & Wicklow Street

Scenario 2 - 2025 AM

29/06/2015



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	19	1806	950	53	165	44
Future Volume (vph)	19	1806	950	53	165	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	4.0	4.0	4.0	3.0	3.0
Grade (%)		0%	0%		0%	
Storage Length (m)	50.0			0.0	60.0	0.0
Storage Lanes	1			0	1	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	0.95	0.95	0.95	1.00	1.00
Ped Bike Factor			1.00		1.00	0.98
Frt			0.992			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1652	3697	3662	0	1652	1478
Flt Permitted	0.199				0.950	
Satd. Flow (perm)	346	3697	3662	0	1645	1454
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			8			50
Link Speed (k/h)		70	70		50	
Link Distance (m)		204.4	289.0		276.1	
Travel Time (s)		10.5	14.9		19.9	
Confl. Peds. (#/hr)	2			2	2	2
Confl. Bikes (#/hr)						
Peak Hour Factor	0.97	0.97	0.90	0.90	0.88	0.88
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	20	1862	1056	59	188	50
Shared Lane Traffic (%)						
Lane Group Flow (vph)	20	1862	1115	0	188	50
Turn Type	pm+pt	NA	NA		Prot	Perm
Protected Phases	5	2	6		8	
Permitted Phases	2					8
Total Split (s)	13.0	88.0	75.0		32.0	32.0
Total Lost Time (s)	6.0	6.0	6.0		6.0	6.0
Act Effect Green (s)	89.1	89.1	83.9		18.9	18.9
Actuated g/C Ratio	0.74	0.74	0.70		0.16	0.16
v/c Ratio	0.06	0.68	0.43		0.73	0.19
Control Delay	0.6	3.1	3.7		63.5	12.5
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	0.6	3.1	3.7		63.5	12.5
LOS	A	A	A		E	B
Approach Delay		3.0	3.7		52.8	
Approach LOS		A	A		D	
Stops (vph)	1	622	129		154	10
Fuel Used(l)	1	119	32		16	2
CO Emissions (g/hr)	18	2210	598		295	33



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
NOx Emissions (g/hr)	3	427	115		57	6
VOC Emissions (g/hr)	4	510	138		68	8
Dilemma Vehicles (#)	0	14	37		0	0
Queue Length 50th (m)	0.1	1.5	11.4		42.6	0.0
Queue Length 95th (m)	m0.2	m97.7	32.5		61.6	9.7
Internal Link Dist (m)		180.4	265.0		252.1	
Turn Bay Length (m)	50.0				60.0	
Base Capacity (vph)	333	2746	2564		357	354
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	0.06	0.68	0.43		0.53	0.14

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 62 (52%), Referenced to phase 2:EBTL and 6:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 6.9

Intersection LOS: A

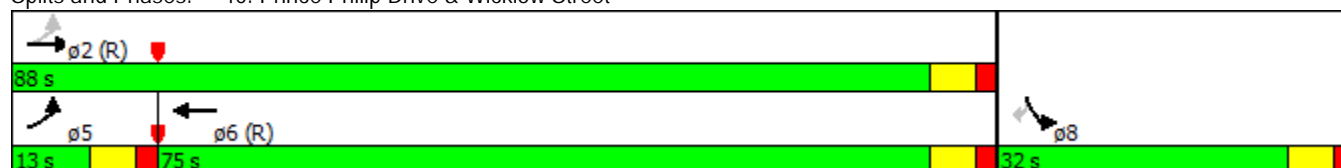
Intersection Capacity Utilization 69.4%

ICU Level of Service C

Analysis Period (min) 15

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


Splits and Phases: 40: Prince Philip Drive & Wicklow Street















MUN Area Traffic Study
Freshwater Road & Stamps Lane/ Oxen Pond Road

Scenario 2 - 2025 AM

29/06/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↗		↖			↕		↖	↗	
Traffic Volume (vph)	0	1112	323	0	564	35	72	96	37	11	65	16
Future Volume (vph)	0	1112	323	0	564	35	72	96	37	11	65	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	4.0	4.0	4.0	3.0	3.0	3.0	2.6	2.9	2.9
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	0.0		0.0	0.0		0.0	0.0		0.0	30.0		0.0
Storage Lanes	0		1	0		0	0		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt			0.850		0.992			0.976			0.970	
Flt Protected								0.983		0.950		
Satd. Flow (prot)	0	1842	1566	0	1912	0	0	1660	0	1528	1559	0
Flt Permitted								0.838		0.455		
Satd. Flow (perm)	0	1842	1566	0	1912	0	0	1415	0	732	1559	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			256		5			8			10	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		374.8			273.7			376.6			148.1	
Travel Time (s)		27.0			19.7			27.1			10.7	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.91	0.91	0.91	0.92	0.92	0.92	0.88	0.88	0.88	0.73	0.73	0.73
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	3%	2%	2%	3%	2%	5%	10%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	1222	355	0	613	38	82	109	42	15	89	22
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1222	355	0	651	0	0	233	0	15	111	0
Turn Type		NA	Perm		NA		Perm	NA		pm+pt	NA	
Protected Phases		2			6			8		7	4	
Permitted Phases			2				8			4		
Total Split (s)		81.0	81.0		81.0		25.0	25.0		14.0	39.0	
Total Lost Time (s)		6.0	6.0		6.0			6.0		6.0	6.0	
Act Effect Green (s)		78.6	78.6		78.6			23.9		29.4	29.4	
Actuated g/C Ratio		0.66	0.66		0.66			0.20		0.24	0.24	
v/c Ratio		1.01	0.32		0.52			0.81		0.07	0.29	
Control Delay		44.3	1.5		13.0			67.2		33.5	34.7	
Queue Delay		0.0	0.0		0.0			0.0		0.0	0.0	
Total Delay		44.3	1.5		13.0			67.2		33.5	34.7	
LOS		D	A		B			E		C	C	
Approach Delay		34.7			13.0			67.2			34.5	
Approach LOS		C			B			E			C	
Stops (vph)		799	35		303			159		10	58	
Fuel Used(l)		95	13		28			21		1	5	
CO Emissions (g/hr)		1775	236		528			400		12	86	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)		343	45		102			77		2	17	
VOC Emissions (g/hr)		409	54		122			92		3	20	
Dilemma Vehicles (#)		0	0		0			0		0	0	
Queue Length 50th (m)		154.1	1.9		70.8			48.6		2.7	19.5	
Queue Length 95th (m)		#401.9	9.0		110.8			#102.3		6.5	26.4	
Internal Link Dist (m)		350.8			249.7			352.6			124.1	
Turn Bay Length (m)										30.0		
Base Capacity (vph)		1207	1114		1254			287		232	435	
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		1.01	0.32		0.52			0.81		0.06	0.26	

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 113 (94%), Referenced to phase 2:EBT and 6:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.01

Intersection Signal Delay: 32.2

Intersection LOS: C

Intersection Capacity Utilization 86.5%

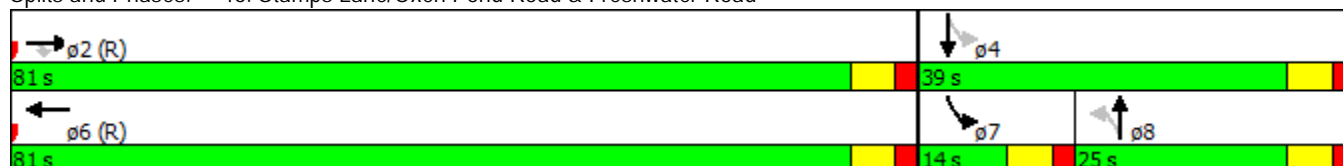
ICU Level of Service E

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 46: Stamps Lane/Oxen Pond Road & Freshwater Road



Summary of All Intervals

Run Number	1	10	2	3	4	5	6
Start Time	6:30	6:30	6:30	6:30	6:30	6:30	6:30
End Time	8:00	8:00	8:00	8:00	8:00	8:00	8:00
Total Time (min)	90	90	90	90	90	90	90
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	5	5	5	5	5	5	5
# of Recorded Intervals	4	4	4	4	4	4	4
Vehs Entered	11285	11357	11380	11410	11572	11348	11317
Vehs Exited	10890	11097	10934	11031	11158	11080	11049
Starting Vehs	835	723	793	726	747	921	900
Ending Vehs	1230	983	1239	1105	1161	1189	1168
Travel Distance (km)	20156	20476	20309	20434	20759	20404	20655
Travel Time (hr)	1119.4	1008.1	1169.7	1074.4	1062.9	1143.8	1247.1
Total Delay (hr)	742.7	626.1	790.2	692.8	675.3	764.7	860.8
Total Stops	29326	25992	28602	27880	28117	29006	29014
Fuel Used (l)	2248.3	2178.8	2304.6	2224.8	2246.9	2289.9	2388.8

Summary of All Intervals

Run Number	7	8	9	Avg
Start Time	6:30	6:30	6:30	6:30
End Time	8:00	8:00	8:00	8:00
Total Time (min)	90	90	90	90
Time Recorded (min)	60	60	60	60
# of Intervals	5	5	5	5
# of Recorded Intervals	4	4	4	4
Vehs Entered	11426	11404	11171	11362
Vehs Exited	10889	11253	10686	11002
Starting Vehs	791	848	868	807
Ending Vehs	1328	999	1353	1170
Travel Distance (km)	20203	20704	19591	20369
Travel Time (hr)	1236.0	1054.6	1289.4	1140.5
Total Delay (hr)	859.7	668.5	922.0	760.3
Total Stops	32336	29612	29976	28986
Fuel Used (l)	2351.8	2250.8	2341.4	2282.6

Interval #0 Information Seeding

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

Interval #1 Information Recording #1

Start Time	7:00
End Time	7:15
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	2655	2647	2687	2715	2722	2719	2692
Vehs Exited	2655	2605	2543	2666	2675	2763	2690
Starting Vehs	835	723	793	726	747	921	900
Ending Vehs	835	765	937	775	794	877	902
Travel Distance (km)	4924	4889	4893	5038	5085	5077	5034
Travel Time (hr)	211.3	186.0	211.9	196.4	197.2	235.9	234.7
Total Delay (hr)	119.2	95.1	121.0	102.8	102.6	141.6	140.3
Total Stops	5751	5514	5681	5631	5635	6692	6358
Fuel Used (l)	495.1	476.9	495.7	490.9	497.5	528.4	525.4

Interval #1 Information Recording #1

Start Time	7:00
End Time	7:15
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	2781	2659	2715	2694
Vehs Exited	2690	2646	2667	2660
Starting Vehs	791	848	868	807
Ending Vehs	882	861	916	849
Travel Distance (km)	5117	4975	4980	5001
Travel Time (hr)	219.9	211.7	222.0	212.7
Total Delay (hr)	125.1	119.1	129.2	119.6
Total Stops	6410	6594	6036	6025
Fuel Used (l)	521.9	504.2	506.5	504.3

Interval #2 Information Recording #2

Start Time	7:15						
End Time	7:30						
Total Time (min)	15						
Volumes adjusted by PHF, Growth Factors.							
Run Number	1	10	2	3	4	5	6
Vehs Entered	3268	3316	3289	3229	3299	3319	3295
Vehs Exited	2916	2986	3023	2816	3095	3002	2990
Starting Vehs	835	765	937	775	794	877	902
Ending Vehs	1187	1095	1203	1188	998	1194	1207
Travel Distance (km)	5343	5419	5451	5313	5480	5457	5506
Travel Time (hr)	283.1	251.3	286.4	267.2	261.8	286.6	299.7
Total Delay (hr)	183.1	149.9	184.2	167.7	158.8	185.1	196.9
Total Stops	7713	7041	7579	7702	7470	7827	7606
Fuel Used (l)	585.0	564.8	597.7	566.3	575.1	598.4	614.0

Interval #2 Information Recording #2

Start Time	7:15			
End Time	7:30			
Total Time (min)	15			
Volumes adjusted by PHF, Growth Factors.				
Run Number	7	8	9	Avg
Vehs Entered	3326	3285	3238	3287
Vehs Exited	2880	3084	2845	2963
Starting Vehs	882	861	916	849
Ending Vehs	1328	1062	1309	1177
Travel Distance (km)	5278	5534	5202	5398
Travel Time (hr)	291.9	266.9	299.2	279.4
Total Delay (hr)	193.6	163.2	201.7	178.4
Total Stops	8400	7960	7765	7705
Fuel Used (l)	588.8	589.6	589.0	586.9

Interval #3 Information Recording #3

Start Time	7:30
End Time	7:45
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	2651	2715	2756	2700	2756	2652	2644
Vehs Exited	2765	2793	2807	2824	2714	2730	2669
Starting Vehs	1187	1095	1203	1188	998	1194	1207
Ending Vehs	1073	1017	1152	1064	1040	1116	1182
Travel Distance (km)	4996	5061	5112	5018	5082	5061	4964
Travel Time (hr)	307.3	286.6	329.1	304.0	286.7	306.0	352.8
Total Delay (hr)	213.9	191.9	233.5	210.1	192.1	211.9	259.7
Total Stops	7814	6978	7646	7628	7361	7558	7518
Fuel Used (l)	585.8	569.0	610.5	583.4	575.1	589.8	616.7

Interval #3 Information Recording #3

Start Time	7:30
End Time	7:45
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	2691	2698	2579	2684
Vehs Exited	2653	2782	2602	2734
Starting Vehs	1328	1062	1309	1177
Ending Vehs	1366	978	1286	1121
Travel Distance (km)	4880	5096	4728	5000
Travel Time (hr)	353.5	281.2	367.9	317.5
Total Delay (hr)	262.3	186.3	278.9	224.1
Total Stops	9060	7325	8155	7704
Fuel Used (l)	613.0	572.4	612.1	592.8

Interval #4 Information Recording #4

Start Time	7:45
End Time	8:00
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	2711	2679	2648	2766	2795	2658	2686
Vehs Exited	2554	2713	2561	2725	2674	2585	2700
Starting Vehs	1073	1017	1152	1064	1040	1116	1182
Ending Vehs	1230	983	1239	1105	1161	1189	1168
Travel Distance (km)	4892	5106	4853	5065	5112	4809	5151
Travel Time (hr)	317.7	284.1	342.3	306.8	317.2	315.1	359.9
Total Delay (hr)	226.6	189.2	251.6	212.3	221.8	226.1	263.9
Total Stops	8048	6459	7696	6919	7651	6929	7532
Fuel Used (l)	582.3	568.0	600.6	584.1	599.3	573.3	632.7

Interval #4 Information Recording #4

Start Time	7:45
End Time	8:00
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	2628	2762	2639	2694
Vehs Exited	2666	2741	2572	2649
Starting Vehs	1366	978	1286	1121
Ending Vehs	1328	999	1353	1170
Travel Distance (km)	4928	5099	4681	4970
Travel Time (hr)	370.7	294.8	400.2	330.9
Total Delay (hr)	278.7	199.9	312.2	238.2
Total Stops	8466	7733	8020	7544
Fuel Used (l)	628.0	584.6	633.8	598.7

1: Allandale Road & TCH NB Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.9	0.9
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	1.7	3.6	1.9
Total Delay (hr)	0.0	0.1	0.2	0.2	0.0	2.6	3.1
Total Del/Veh (s)	3.7	1.2	1.7	4.4	12.9	10.3	6.5
Stop Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.9	0.9
Stop Del/Veh (s)	1.5	0.2	0.2	0.3	5.4	3.4	2.0

7: Allandale Road & Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.5	1.6	0.1	1.6	1.7	0.7	0.0	0.0	0.0
Denied Del/Veh (s)	0.2	0.0	0.2	9.1	7.7	3.1	16.6	18.6	11.4	0.0	0.2	0.1
Total Delay (hr)	3.0	3.8	0.6	19.5	87.2	7.5	13.0	6.3	0.4	0.7	9.7	1.7
Total Del/Veh (s)	35.8	33.7	7.9	342.8	388.2	404.0	132.7	67.3	6.9	61.8	56.4	12.0
Stop Delay (hr)	2.4	2.8	0.1	18.2	82.3	7.3	11.4	4.9	0.2	0.7	8.6	1.0
Stop Del/Veh (s)	28.3	25.0	1.6	319.4	366.1	390.7	115.8	52.7	3.0	56.5	49.6	7.3

7: Allandale Road & Prince Philip Drive Performance by movement

Movement	All
Denied Delay (hr)	6.2
Denied Del/Veh (s)	5.5
Total Delay (hr)	153.5
Total Del/Veh (s)	132.9
Stop Delay (hr)	139.8
Stop Del/Veh (s)	121.0

9: Westerland Road/Clinch Crescent & Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	17.0	19.4	7.2	2.7	20.4	7.9	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	123.2	104.4	105.3	121.3	102.3	102.6	0.0	0.0	0.0	0.3	0.0	0.1
Total Delay (hr)	60.2	23.5	5.3	4.2	51.6	29.7	2.7	14.8	2.8	2.8	1.8	0.4
Total Del/Veh (s)	424.3	130.6	80.7	187.5	254.0	363.1	115.3	92.1	89.9	73.4	31.8	8.6
Stop Delay (hr)	58.0	13.9	2.5	3.5	45.5	28.7	2.3	12.6	2.4	2.7	1.6	0.3
Stop Del/Veh (s)	408.5	76.9	38.3	156.5	223.8	351.4	100.4	78.7	75.9	70.9	27.9	7.3

9: Westerland Road/Clinch Crescent & Prince Philip Drive Performance by movement

Movement	All
Denied Delay (hr)	74.7
Denied Del/Veh (s)	71.8
Total Delay (hr)	199.6
Total Del/Veh (s)	190.2
Stop Delay (hr)	173.9
Stop Del/Veh (s)	165.7

10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.4	1.6	0.2	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	3.4	0.4	0.2	9.0	7.9	10.5	0.0	0.0	0.0
Total Delay (hr)	0.3	1.8	0.1	0.5	4.0	0.0	2.4	9.1	0.8	0.3	2.8	0.7
Total Del/Veh (s)	31.6	14.2	13.2	39.2	44.0	2.0	58.5	45.2	35.1	27.5	12.9	10.3
Stop Delay (hr)	0.3	1.4	0.1	0.4	3.4	0.0	1.9	6.3	0.5	0.2	1.4	0.3
Stop Del/Veh (s)	27.3	11.3	9.7	33.9	36.9	0.0	46.0	31.6	23.6	19.3	6.4	4.8

10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue Performance by movement

Movement	All
Denied Delay (hr)	2.3
Denied Del/Veh (s)	2.8
Total Delay (hr)	23.0
Total Del/Veh (s)	27.7
Stop Delay (hr)	16.3
Stop Del/Veh (s)	19.8

11: Mt. Scio Road & Allandale Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Denied Del/Veh (s)	0.1	0.0	0.0	0.0	0.0	0.0	4.1	0.2	0.2	3.7	0.6	0.5
Total Delay (hr)	0.6	3.2	0.1	0.1	0.9	0.0	0.3	0.4	0.1	1.0	0.6	0.7
Total Del/Veh (s)	12.5	12.0	8.0	12.8	10.8	3.2	39.7	46.9	5.4	37.6	39.8	16.5
Stop Delay (hr)	0.4	1.6	0.0	0.1	0.6	0.0	0.3	0.4	0.0	0.9	0.5	0.6
Stop Del/Veh (s)	7.7	6.2	2.6	9.9	7.5	0.2	37.3	42.6	3.5	34.1	35.0	14.6

11: Mt. Scio Road & Allandale Road Performance by movement

Movement	All
Denied Delay (hr)	0.2
Denied Del/Veh (s)	0.3
Total Delay (hr)	8.0
Total Del/Veh (s)	14.6
Stop Delay (hr)	5.5
Stop Del/Veh (s)	10.0

17: Allandale Road & TCH SB Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.2	0.1	0.0	0.0	0.1	1.0	0.1
Total Delay (hr)	0.0	0.0	0.0	0.3	0.4	0.0	0.7
Total Del/Veh (s)	1.4	0.3	2.3	3.4	5.1	2.2	4.0
Stop Delay (hr)	0.0	0.0	0.0	0.0	0.2	0.0	0.2
Stop Del/Veh (s)	0.1	0.0	0.0	0.0	2.5	0.5	1.0

18: TCH SB Performance by movement

Movement	NBT	SBT	All
Denied Delay (hr)	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.2	0.1
Total Delay (hr)	0.4	0.0	0.4
Total Del/Veh (s)	4.8	0.1	3.2
Stop Delay (hr)	0.0	0.0	0.0
Stop Del/Veh (s)	0.0	0.0	0.0

22: Allandale Road & Higgins Line Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.1	0.0	0.0	0.0	0.0	0.1
Denied Del/Veh (s)	0.2	3.6	0.0	0.0	0.0	0.0	0.2
Total Delay (hr)	3.0	0.1	0.3	0.2	0.1	1.1	4.8
Total Del/Veh (s)	38.6	3.9	3.8	3.2	4.4	3.8	8.8
Stop Delay (hr)	2.7	0.0	0.2	0.0	0.1	0.4	3.4
Stop Del/Veh (s)	34.7	0.5	2.4	0.0	2.4	1.5	6.3

24: Allandale Road & Confederation Building Lot Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	0.2	0.0	0.5	0.2	0.1	0.8	1.8
Total Del/Veh (s)	50.1	5.4	3.8	3.7	4.9	2.4	3.3
Stop Delay (hr)	0.2	0.0	0.2	0.0	0.1	0.3	0.8
Stop Del/Veh (s)	48.2	5.5	1.9	0.1	2.9	0.8	1.4

29: Prince Philip Drive & Confederation Building Lot Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.1	0.1	0.2
Denied Del/Veh (s)	0.1	0.1	0.2	0.0	0.3	2.5	0.3
Total Delay (hr)	0.2	0.0	0.6	0.2	1.1	0.1	2.2
Total Del/Veh (s)	63.6	6.1	10.7	1.4	3.8	2.8	4.4
Stop Delay (hr)	0.2	0.0	0.4	0.0	0.4	0.0	1.1
Stop Del/Veh (s)	61.2	6.1	7.0	0.2	1.5	0.0	2.1

34: Elizabeth Avenue & Westerland Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.2	0.4	0.0	0.0	0.0	0.0	0.0	0.5
Denied Del/Veh (s)	1.5	3.0	0.0	0.0	0.0	0.0	0.0	1.0
Total Delay (hr)	6.6	4.3	1.5	2.4	1.7	0.1	0.1	16.7
Total Del/Veh (s)	53.2	35.6	13.5	26.6	43.5	1.5	4.2	28.8
Stop Delay (hr)	5.2	3.1	1.0	1.9	1.5	0.0	0.0	12.7
Stop Del/Veh (s)	42.1	25.6	9.3	20.8	38.7	0.4	0.5	22.0

35: Prince Philip Drive & Clinch Crescent Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.1	0.0	0.1
Denied Del/Veh (s)	0.0	0.0	0.0	0.3	3.6	0.4	0.1
Total Delay (hr)	6.7	15.4	3.5	0.5	1.0	0.2	27.2
Total Del/Veh (s)	39.3	43.1	17.1	9.8	54.4	3.1	31.5
Stop Delay (hr)	4.4	11.7	1.9	0.1	1.0	0.0	19.2
Stop Del/Veh (s)	26.0	32.9	9.5	1.4	51.5	0.6	22.2

37: Thorburn Road & Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR	All
Denied Delay (hr)	2.5	10.3	1.5	0.0	0.0	0.0	0.0	0.0	0.6	0.5	0.4	15.7
Denied Del/Veh (s)	31.7	28.5	29.7	0.0	0.0	0.0	0.0	0.0	4.1	3.8	4.8	12.8
Total Delay (hr)	5.7	45.2	0.7	1.7	4.2	0.2	3.8	0.8	30.6	5.2	2.5	100.6
Total Del/Veh (s)	71.4	122.7	15.2	53.8	24.4	3.4	40.6	36.3	214.0	36.4	32.3	80.8
Stop Delay (hr)	4.3	34.7	0.5	1.6	3.2	0.0	3.4	0.8	28.9	4.0	1.9	83.3
Stop Del/Veh (s)	53.9	94.4	11.2	50.7	18.5	0.1	35.5	34.5	202.4	27.9	24.9	66.9

40: Prince Philip Drive & Wicklow Street Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.2	0.0	0.2
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	3.8	0.6	0.2
Total Delay (hr)	0.1	7.0	1.9	0.1	2.3	0.1	11.5
Total Del/Veh (s)	19.1	14.1	7.7	7.3	47.8	7.9	13.9
Stop Delay (hr)	0.1	4.8	0.7	0.0	2.1	0.1	7.8
Stop Del/Veh (s)	15.6	9.7	2.8	3.2	44.1	6.8	9.4

46: Stamps Lane/Oxen Pond Road & Freshwater Road Performance by movement

Movement	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.3	0.2	0.2	4.0	0.2	0.2	0.0
Total Delay (hr)	20.9	1.0	1.6	0.1	1.1	1.4	0.5	0.1	0.8	0.1	27.6
Total Del/Veh (s)	58.5	10.8	10.1	7.9	53.2	53.4	47.9	39.5	39.9	19.0	39.1
Stop Delay (hr)	13.2	0.4	1.0	0.1	1.0	1.3	0.4	0.1	0.7	0.1	18.2
Stop Del/Veh (s)	36.9	4.5	6.0	5.6	48.6	47.2	44.5	36.4	35.6	17.0	25.8

47: Freshwater Road & Thorburn Road Performance by movement

Movement	EBT	WBT	WBR	SBL	SBT	SBR	All
Denied Delay (hr)	1.4	0.0	0.1	0.0	0.0	0.0	1.4
Denied Del/Veh (s)	4.7	0.0	0.6	0.0	0.0	0.0	2.0
Total Delay (hr)	10.2	0.9	0.6	3.0	0.0	0.3	15.0
Total Del/Veh (s)	34.2	9.7	5.3	20.2	1.0	4.1	20.6
Stop Delay (hr)	8.1	0.7	0.2	2.8	0.0	0.2	12.0
Stop Del/Veh (s)	27.2	7.1	1.9	18.4	0.0	3.4	16.4

51: Freshwater Road & Elizabeth Avenue Performance by movement

Movement	WBT	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Denied Del/Veh (s)	0.0	0.0	0.4	0.3	0.1	0.1	0.2
Total Delay (hr)	0.0	0.4	0.2	0.0	7.8	2.8	11.2
Total Del/Veh (s)	0.8	7.2	1.6	1.4	35.1	27.8	22.4
Stop Delay (hr)	0.0	0.4	0.0	0.0	3.8	1.0	5.2
Stop Del/Veh (s)	0.1	6.7	0.0	0.6	17.0	9.7	10.3

52: Elizabeth Avenue & Paton Street Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.1	0.1	0.0
Total Delay (hr)	0.1	1.5	0.1	0.0	0.3	0.1	2.0
Total Del/Veh (s)	7.9	6.8	1.5	0.7	38.2	23.5	6.7
Stop Delay (hr)	0.0	0.8	0.0	0.0	0.3	0.1	1.2
Stop Del/Veh (s)	3.9	3.6	0.6	0.4	36.0	23.4	4.0

55: Anderson Avenue & Elizabeth Avenue Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.3	0.3
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	3.8	5.8	1.0
Total Delay (hr)	0.5	0.0	0.3	0.3	0.4	2.5	4.0
Total Del/Veh (s)	2.8	1.8	11.7	4.8	41.2	50.3	11.5
Stop Delay (hr)	0.2	0.0	0.1	0.1	0.4	2.5	3.4
Stop Del/Veh (s)	1.2	1.3	6.4	1.2	39.3	50.4	9.7

59: Clinch Crescent & Arctic Avenue Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.1	0.0	0.0	0.0	0.0	0.0	0.1
Denied Del/Veh (s)	1.2	0.1	0.0	0.1	0.3	0.3	0.2
Total Delay (hr)	2.7	0.0	0.3	1.8	0.2	0.7	5.7
Total Del/Veh (s)	56.9	9.8	2.7	9.7	31.2	8.1	13.0
Stop Delay (hr)	2.6	0.0	0.1	1.2	0.1	0.5	4.5
Stop Del/Veh (s)	54.3	10.5	0.9	6.4	28.5	5.5	10.3

61: Prince Philip Drive & Morrissey Drive Performance by movement

Movement	EBT	WBL	WBT	WBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	3.9	0.3	0.4	0.1
Total Delay (hr)	1.5	0.6	7.7	3.6	1.0	0.5	0.3	15.2
Total Del/Veh (s)	6.2	25.4	28.5	29.3	46.3	48.8	22.0	21.6
Stop Delay (hr)	0.4	0.4	4.5	2.2	0.9	0.4	0.3	9.2
Stop Del/Veh (s)	1.8	16.4	16.7	17.6	43.2	44.7	21.0	13.1

Total Network Performance

Denied Delay (hr)	103.2
Denied Del/Veh (s)	32.2
Total Delay (hr)	657.1
Total Del/Veh (s)	194.3
Stop Delay (hr)	524.7
Stop Del/Veh (s)	155.2

Intersection: 1: Allandale Road & TCH NB

Movement	EB	NB	NB
Directions Served	LT	LT	R
Maximum Queue (m)	6.4	114.7	23.2
Average Queue (m)	0.4	37.5	20.2
95th Queue (m)	3.3	96.2	27.9
Link Distance (m)	137.0	139.4	
Upstream Blk Time (%)		1	
Queuing Penalty (veh)		0	
Storage Bay Dist (m)			20.0
Storage Blk Time (%)		2	13
Queuing Penalty (veh)		23	0

Intersection: 7: Allandale Road & Prince Philip Drive

Movement	EB	EB	EB	EB	WB	WB	WB	B27	B27	NB	NB	NB
Directions Served	L	T	T	R	L	T	TR	T	T	L	T	R
Maximum Queue (m)	88.8	65.6	64.6	64.1	67.4	640.7	640.8	9.9	9.4	72.4	306.4	178.3
Average Queue (m)	45.6	37.3	38.5	11.0	56.6	446.6	449.1	0.9	0.7	69.2	189.4	41.7
95th Queue (m)	77.9	59.8	61.1	46.0	87.4	770.2	768.9	9.9	8.3	81.9	369.2	174.4
Link Distance (m)		438.0	438.0			834.7	834.7	270.6	270.6		443.5	443.5
Upstream Blk Time (%)						3	2					0
Queuing Penalty (veh)						14	11					1
Storage Bay Dist (m)	200.0			120.0	65.0					70.0		
Storage Blk Time (%)					3	65				40		7
Queuing Penalty (veh)					12	126				128		24

Intersection: 7: Allandale Road & Prince Philip Drive

Movement	SB	SB	SB	SB	SB	B5	B5
Directions Served	L	T	T	R	R	T	T
Maximum Queue (m)	44.3	109.2	107.8	110.3	37.5	11.3	20.2
Average Queue (m)	18.3	70.8	67.8	50.8	18.8	1.1	1.5
95th Queue (m)	46.2	108.2	104.4	106.6	49.3	10.6	14.0
Link Distance (m)		104.0	104.0	104.0		500.7	500.7
Upstream Blk Time (%)		3	2	1			
Queuing Penalty (veh)		13	7	3			
Storage Bay Dist (m)	42.0				35.0		
Storage Blk Time (%)	0	38		16	2		
Queuing Penalty (veh)	1	16		41	4		

Intersection: 9: Westerland Road/Clinch Crescent & Prince Philip Drive

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	TR	L	T	R	L	T
Maximum Queue (m)	77.4	577.9	575.8	187.5	92.4	470.2	471.8	62.4	302.2	47.5	74.0	67.0
Average Queue (m)	77.4	514.7	492.9	57.1	45.9	371.0	382.8	31.7	195.6	30.2	33.6	32.0
95th Queue (m)	77.4	654.8	678.4	175.5	109.9	528.9	534.1	70.3	393.5	62.6	64.2	57.6
Link Distance (m)		573.0	573.0			469.8	469.8		353.9		83.2	83.2
Upstream Blk Time (%)		22	10			5	8		5		0	0
Queuing Penalty (veh)		155	71			26	42		37		1	0
Storage Bay Dist (m)	75.0			185.0	90.0			60.0		45.0		
Storage Blk Time (%)	75	43	8	0	0	60		0	55	1		0
Queuing Penalty (veh)	261	233	22	1	1	50		1	101	3		0

Intersection: 9: Westerland Road/Clinch Crescent & Prince Philip Drive

Movement	SB
Directions Served	R
Maximum Queue (m)	38.8
Average Queue (m)	15.5
95th Queue (m)	28.3
Link Distance (m)	
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (m)	80.0
Storage Blk Time (%)	0
Queuing Penalty (veh)	0

Intersection: 10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue

Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	L	T	R	L	T	R
Maximum Queue (m)	47.9	79.6	57.3	135.6	57.4	243.5	37.5	29.8	105.4	287.0
Average Queue (m)	9.4	35.6	16.2	63.4	35.9	156.7	11.9	9.1	26.5	25.9
95th Queue (m)	28.7	65.2	48.7	116.4	68.0	270.7	35.8	21.0	75.3	155.2
Link Distance (m)		321.0		286.5		234.0			443.5	443.5
Upstream Blk Time (%)						11			0	0
Queuing Penalty (veh)						0			0	2
Storage Bay Dist (m)	55.0		55.0		55.0		35.0	40.0		
Storage Blk Time (%)	0	3	0	16	0	36	0	0	4	
Queuing Penalty (veh)	0	1	0	8	3	81	2	0	2	

Intersection: 11: Mt. Scio Road & Allandale Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	TR	L	TR
Maximum Queue (m)	33.1	60.3	64.9	13.1	30.8	30.0	18.4	35.7	51.3	63.8
Average Queue (m)	14.1	29.2	33.7	3.7	11.5	10.0	5.7	8.5	17.9	25.8
95th Queue (m)	27.7	53.6	57.3	9.7	25.3	24.1	14.6	24.7	35.6	48.9
Link Distance (m)		347.1	347.1		543.6	543.6		310.1		97.8
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (m)	75.0			75.0			60.0		60.0	
Storage Blk Time (%)									0	0
Queuing Penalty (veh)									0	0

Intersection: 17: Allandale Road & TCH SB

Movement	EB	SB	SB
Directions Served	LT	L	R
Maximum Queue (m)	1.4	23.0	17.3
Average Queue (m)	0.0	13.0	1.6
95th Queue (m)	0.0	20.4	9.6
Link Distance (m)	158.6	127.3	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			20.0
Storage Blk Time (%)		1	0
Queuing Penalty (veh)		0	0

Intersection: 18: TCH SB

Movement
Directions Served
Maximum Queue (m)
Average Queue (m)
95th Queue (m)
Link Distance (m)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (m)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 22: Allandale Road & Higgins Line

Movement	WB	WB	WB	NB	NB	SB	SB	SB	B2
Directions Served	L	L	R	T	T	L	T	T	T
Maximum Queue (m)	63.4	59.1	25.0	24.3	27.1	19.1	46.1	53.7	113.4
Average Queue (m)	34.6	23.4	1.9	8.3	7.6	6.3	15.2	20.6	4.0
95th Queue (m)	55.6	48.1	16.4	19.7	20.2	15.5	36.2	44.5	82.8
Link Distance (m)	117.4	117.4		101.8	101.8		73.6	73.6	543.6
Upstream Blk Time (%)								0	0
Queuing Penalty (veh)								0	0
Storage Bay Dist (m)			40.0			80.0			
Storage Blk Time (%)		2	0						
Queuing Penalty (veh)		2	0						

Intersection: 24: Allandale Road & Confederation Building Lot

Movement	WB	WB	NB	NB	NB	B5	SB	SB	SB
Directions Served	L	R	T	T	R	T	L	T	T
Maximum Queue (m)	12.7	10.7	28.7	37.8	5.6	11.3	19.4	35.4	47.8
Average Queue (m)	3.2	3.8	5.9	9.1	0.3	0.4	8.1	6.6	10.2
95th Queue (m)	10.4	10.7	19.9	29.4	4.7	11.5	17.4	23.1	32.3
Link Distance (m)	87.5	87.5	500.7	500.7		104.0		147.6	147.6
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (m)					110.0		130.0		
Storage Blk Time (%)									
Queuing Penalty (veh)									

Intersection: 29: Prince Philip Drive & Confederation Building Lot

Movement	EB	EB	NB	NB	NB	B27	SB	SB
Directions Served	L	R	L	T	T	T	T	T
Maximum Queue (m)	18.2	12.5	46.6	13.5	17.6	342.5	66.9	55.3
Average Queue (m)	4.5	3.6	19.3	0.9	2.8	24.4	21.2	10.8
95th Queue (m)	13.8	10.9	35.8	6.3	11.8	259.5	51.0	35.2
Link Distance (m)	108.9	108.9		270.6	270.6	834.7	148.3	148.3
Upstream Blk Time (%)						0		
Queuing Penalty (veh)						0		
Storage Bay Dist (m)			75.0					
Storage Blk Time (%)			0				0	
Queuing Penalty (veh)			0				0	

Intersection: 34: Elizabeth Avenue & Westerland Road

Movement	EB	EB	WB	SB	SB
Directions Served	L	T	TR	L	R
Maximum Queue (m)	37.4	277.9	134.5	61.3	17.7
Average Queue (m)	33.5	116.8	53.2	29.4	0.6
95th Queue (m)	44.0	321.3	129.5	52.1	11.1
Link Distance (m)		391.9	553.5	353.9	
Upstream Blk Time (%)		2			
Queuing Penalty (veh)		16			
Storage Bay Dist (m)	35.0				70.0
Storage Blk Time (%)	27	3		0	0
Queuing Penalty (veh)	108	15		0	0

Intersection: 35: Prince Philip Drive & Clinch Crescent

Movement	EB	EB	EB	WB	WB	WB	SB	SB
Directions Served	L	T	T	T	T	R	L	R
Maximum Queue (m)	138.1	215.9	193.9	50.4	54.8	39.2	45.1	39.6
Average Queue (m)	94.4	93.0	87.6	20.5	24.9	7.7	17.7	5.9
95th Queue (m)	151.9	252.2	240.8	40.2	44.8	27.6	35.4	24.7
Link Distance (m)		280.6	280.6	573.0	573.0			269.1
Upstream Blk Time (%)		3	1					
Queuing Penalty (veh)		29	10					
Storage Bay Dist (m)	140.0					70.0	80.0	
Storage Blk Time (%)	1	11					0	
Queuing Penalty (veh)	8	67					0	

Intersection: 37: Thorburn Road & Prince Philip Drive

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	SB
Directions Served	L	T	T	R	L	T	T	T	R	T	TR	L
Maximum Queue (m)	177.4	316.2	310.7	270.4	52.7	54.4	56.8	56.1	4.1	60.2	64.7	143.6
Average Queue (m)	135.8	243.4	233.6	116.3	25.8	27.4	29.3	26.7	0.3	32.0	38.5	116.2
95th Queue (m)	239.8	375.3	369.5	347.8	46.3	46.5	47.6	47.4	5.6	52.6	59.4	176.1
Link Distance (m)		308.0	308.0	308.0		134.5	134.5	134.5	134.5	126.5	126.5	
Upstream Blk Time (%)		26	18	11								
Queuing Penalty (veh)		0	0	0								
Storage Bay Dist (m)	175.0				110.0							150.0
Storage Blk Time (%)	1	34										9
Queuing Penalty (veh)	4	93										23

Intersection: 37: Thorburn Road & Prince Philip Drive

Movement	SB	SB	SB
Directions Served	L	T	TR
Maximum Queue (m)	220.4	181.8	126.9
Average Queue (m)	152.4	80.0	74.8
95th Queue (m)	304.4	232.2	121.6
Link Distance (m)	372.8	372.8	
Upstream Blk Time (%)	2	3	
Queuing Penalty (veh)	0	0	
Storage Bay Dist (m)			150.0
Storage Blk Time (%)	19	1	0
Queuing Penalty (veh)	49	3	1

Intersection: 40: Prince Philip Drive & Wicklow Street

Movement	EB	EB	EB	B45	B45	B36	B36	WB	WB	SB	SB
Directions Served	L	T	T	T	T	T	T	T	TR	L	R
Maximum Queue (m)	23.4	114.7	96.3	78.4	74.2	39.6	40.0	87.0	148.4	61.4	42.3
Average Queue (m)	4.2	37.8	31.5	22.3	21.6	5.7	5.5	12.3	26.8	35.2	9.0
95th Queue (m)	17.0	150.7	140.4	129.4	127.4	46.2	45.9	53.9	104.0	56.6	27.4
Link Distance (m)		189.0	189.0	222.8	222.8	134.5	134.5	280.6	280.6		264.8
Upstream Blk Time (%)		10	5	5	3	0	0	0	0		
Queuing Penalty (veh)		94	44	45	30	1	3	0	1		
Storage Bay Dist (m)	50.0									60.0	
Storage Blk Time (%)	0	12								1	0
Queuing Penalty (veh)	0	2								1	0

Intersection: 46: Stamps Lane/Oxen Pond Road & Freshwater Road

Movement	EB	EB	WB	NB	SB	SB
Directions Served	T	R	TR	LTR	L	TR
Maximum Queue (m)	363.4	357.6	95.7	85.7	17.8	40.8
Average Queue (m)	242.5	146.5	42.1	44.5	3.2	18.3
95th Queue (m)	432.1	380.8	81.3	74.0	12.1	34.8
Link Distance (m)	357.5	357.5	256.2	366.1		137.9
Upstream Blk Time (%)	4	1				
Queuing Penalty (veh)	34	4				
Storage Bay Dist (m)					30.0	
Storage Blk Time (%)					0	3
Queuing Penalty (veh)					0	0

Intersection: 47: Freshwater Road & Thorburn Road

Movement	EB	EB	WB	WB	WB	SB	SB	SB	B43	B43
Directions Served	T	T	T	T	R	L	L	R	T	T
Maximum Queue (m)	144.6	131.0	32.4	43.5	31.9	50.7	47.9	34.7	2.6	4.1
Average Queue (m)	93.1	78.5	15.2	12.9	16.3	25.3	23.8	14.5	0.1	0.1
95th Queue (m)	147.3	137.7	27.3	30.1	28.3	43.4	41.8	27.0	2.6	3.2
Link Distance (m)	160.8	160.8	357.5	357.5		52.2	52.2	52.2	126.5	126.5
Upstream Blk Time (%)	7	6				1	1	0		
Queuing Penalty (veh)	0	0				1	2	0		
Storage Bay Dist (m)					30.0					
Storage Blk Time (%)				0	0					
Queuing Penalty (veh)				2	1					

Intersection: 51: Freshwater Road & Elizabeth Avenue

Movement	WB	NB	SB	SB
Directions Served	R	TR	L	T
Maximum Queue (m)	30.5	16.8	32.4	250.3
Average Queue (m)	13.1	2.4	31.5	115.9
95th Queue (m)	24.8	9.8	35.3	237.4
Link Distance (m)	266.6	206.4		256.2
Upstream Blk Time (%)				0
Queuing Penalty (veh)				1
Storage Bay Dist (m)			30.0	
Storage Blk Time (%)			30	6
Queuing Penalty (veh)			109	45

Intersection: 52: Elizabeth Avenue & Paton Street

Movement	EB	EB	WB	SB
Directions Served	L	T	TR	LR
Maximum Queue (m)	17.2	73.8	21.0	25.1
Average Queue (m)	3.9	20.7	4.4	8.7
95th Queue (m)	15.3	83.9	14.8	23.2
Link Distance (m)		266.6	45.6	410.7
Upstream Blk Time (%)		0		
Queuing Penalty (veh)		1		
Storage Bay Dist (m)	30.0			
Storage Blk Time (%)	0	5		
Queuing Penalty (veh)	0	1		

Intersection: 55: Anderson Avenue & Elizabeth Avenue

Movement	EB	WB	WB	NB	NB
Directions Served	TR	L	T	L	R
Maximum Queue (m)	21.0	24.9	121.6	61.9	44.6
Average Queue (m)	4.9	9.5	4.4	22.3	20.7
95th Queue (m)	26.9	19.0	72.2	125.2	59.6
Link Distance (m)	45.6		391.9	325.0	
Upstream Blk Time (%)	2		0	2	
Queuing Penalty (veh)	15		0	0	
Storage Bay Dist (m)		40.0			100.0
Storage Blk Time (%)				2	6
Queuing Penalty (veh)				4	2

Intersection: 59: Clinch Crescent & Arctic Avenue

Movement	WB	WB	WB	NB	NB	SB
Directions Served	L	L	R	T	R	LT
Maximum Queue (m)	57.9	76.8	4.6	47.6	84.8	81.6
Average Queue (m)	13.5	30.8	0.3	12.2	43.3	21.0
95th Queue (m)	40.7	66.7	2.1	33.6	78.5	54.4
Link Distance (m)		205.9	205.9	83.2	83.2	188.1
Upstream Blk Time (%)				0	1	
Queuing Penalty (veh)				0	4	
Storage Bay Dist (m)	100.0					
Storage Blk Time (%)	0	0				
Queuing Penalty (veh)	0	0				

Intersection: 61: Prince Philip Drive & Morrissey Drive

Movement	EB	EB	WB	WB	WB	WB	SB	SB
Directions Served	T	T	L	T	T	R	L	TR
Maximum Queue (m)	28.3	26.3	36.4	117.8	131.7	31.4	37.1	38.3
Average Queue (m)	8.4	9.0	10.0	33.0	39.3	14.5	16.3	15.0
95th Queue (m)	20.8	21.4	31.5	167.4	177.3	32.0	31.1	31.4
Link Distance (m)	469.8	469.8		438.0	438.0			278.5
Upstream Blk Time (%)				1	1			
Queuing Penalty (veh)				8	5			
Storage Bay Dist (m)			70.0			30.0	40.0	
Storage Blk Time (%)			0	4	8	1	0	0
Queuing Penalty (veh)			0	4	40	5	0	0

Network Summary

Network wide Queuing Penalty: 2467

		Scenario 2 - PM Peak Hour						
Intersection		Synchro				SimTraffic		
		Delay/Veh (s)	LOS	V/C	Queue (m) 95th%ile	Delay/Veh (s)	Equivalent LOS	Queue (m) 95th%ile
Street	Movement							
Columbus Drive/ Prince Philip Drive & Thorburn Road		160.9	F			124.8	F	
Columbus Drive/ Prince Philip Drive	Eastbound Left - Turn	413.3	F	1.84	278.9	326.8	F	251.2
	Eastbound Through	51.3	D	0.94	187.1	156.8	F	348.3
	Eastbound Right - Turn	21.4	C	0.54	71.3	30.9	C	418.8
	Westbound Left - Turn	185.7	F	1.32	62.1	31.2	C	47.5
	Westbound Through	91.1	F	1.14	154.6	33.2	C	85.3
	Westbound Right - Turn	17.7	B	0.80	65.7	3.8	A	21.3
Thorburn Road	Northbound Through	187.8	F	1.35	166.7	62.7	E	128.9
	Northbound Right - Turn					176.6	F	129.5
	Southbound Left - Turn	305.9	F	1.57	125.3	267.3	F	130.4
	Southbound Through	206.9	F	1.39	363.4	154.6	F	413.6
	Southbound Right - Turn					197.1	F	190.9
Prince Philip Drive & Wicklow Street		32.0	C			89.7	F	
Prince Philip Drive	Eastbound Left - Turn	4.0	A	0.18	0.7	98.8	F	22.0
	Eastbound Through	9.4	A	0.64	123.3	140.5	F	264.0
	Westbound Through	36.1	D	1.04	57.5	10.8	B	61.6
	Westbound Right - Turn					11.4	B	131.2
Wicklow Street	Southbound Left - Turn	141.2	F	1.13	123.6	371.5	F	69.8
	Southbound Right - Turn	14.6	B	0.36	16.5	272.1	F	341.8
Prince Philip Drive & Clinch Crescent		88.3	F			108.7	F	
Prince Philip Drive	Eastbound Left - Turn	218.9	F	1.36	147.9	105.3	F	141.8
	Eastbound Through	2.8	A	0.68	28.6	247.3	F	387.9
	Westbound Through	116.1	F	1.21	82.0	12.1	B	43.1
	Westbound Right - Turn	4.5	A	0.16	1.0	7.4	A	1.7
Clinch Crescent	Southbound Left - Turn	43.3	D	0.40	44.7	265.1	F	95.7
	Southbound Right - Turn	167.4	F	1.28	182.4	65.5	E	298.9
Prince Philip Drive & Clinch Crescent/ Westerland Road		139.4	F			305.9	F	
Prince Philip Drive	Eastbound Left - Turn	197.5	F	1.31	104.4	303.2	F	65.2
	Eastbound Through	91.0	F	1.07	238.5	344.1	F	780.4
	Eastbound Right - Turn	13.2	B	0.40	31.1	1634.0	F	225.0
	Westbound Left - Turn	64.4	E	0.85	43.5	2046.1	F	107.8
	Westbound Through	204.2	F	1.39	323.9	55.2	E	450.6
	Westbound Right - Turn					49.7	D	436.1
Clinch Crescent/ Westerland Road	Northbound Left - Turn	295.8	F	1.57	99.8	21.4	C	28.1
	Northbound Through	44.5	D	0.67	52.7	21.5	C	37.9
	Northbound Right - Turn	29.8	C	0.83	25.6	14.6	B	23.5
	Southbound Left - Turn	64.7	E	0.95	77.8	68.1	E	30.6
	Southbound Through	96.3	F	1.04	142.1	1073.5	F	85.3
	Southbound Right - Turn	196.9	F	1.34	191.0	25.7	C	81.8
Clinch Crescent & Arctic Avenue		162.5	F			545.1	F	
Arctic Avenue	Westbound Left - Turn	507.6	F	1.99	200.6	2331.3	F	210.2
	Westbound Right - Turn	11.4	B	0.04	0.9	0.0	A	283.3
Clinch Crescent	Northbound Through	0.0	-	0.23	0.0	1.1	A	5.8
	Northbound Right - Turn					2.1	A	18.3
	Southbound Left - Turn	1.6	A	0.06	1.4	745.1	F	196.2
	Southbound Through					946.9	F	
Prince Philip Drive & Morrissey Drive		22.3	C			117.4	F	
Prince Philip Drive	Eastbound Through	20.5	C	0.91	120.1	99.8	F	281.6
	Westbound Left - Turn	9.8	A	0.30	0.8	22.2	C	11.0
	Westbound Through	6.8	A	0.68	39.3	16.5	B	64.5
	Westbound Right - Turn	0.2	A	0.18	0.0	16.0	B	9.8
Morrissey Drive	Southbound Left - Turn	84.4	F	0.94	121.2	410.6	F	50.4
	Southbound Through	73.0	E	0.91	111.5	376.9	F	290.0
	Southbound Right - Turn					355.9	F	
Prince Philip Drive & Allandale Road		221.5	F			385.6	F	
Prince Philip Drive	Eastbound Left - Turn	775.3	F	2.67	409.9	358.4	F	280.2
	Eastbound Through	39.0	D	0.91	153.1	75.6	E	564.7
	Eastbound Right - Turn	17.5	B	0.73	64.6	418.1	F	156.0
	Westbound Left - Turn	392.9	F	1.78	142.9	1043.2	F	78.2
	Westbound Through	197.1	F	1.38	235.3	750.6	F	860.2
	Westbound Right - Turn					432.0	F	860.5
	Northbound Left - Turn	495.7	F	2.03	101.2	299.0	F	87.4
	Northbound Through	172.8	F	1.33	206.6	138.9	F	415.3

Allandale Road	Northbound Right - Turn	2.8	A	0.67	8.8	18.6	B	327.7
	Southbound Left - Turn	374.5	F	1.61	59.3	274.4	F	52.5
	Southbound Through	160.8	F	1.25	199.9	326.6	F	125.6
	Southbound Right - Turn	17.3	B	0.42	50.7	13.6	B	37.0
Prince Philip Drive & Confederation Building Lot		31.3	C			96.2	F	
Prince Philip Drive	Eastbound Left - Turn	75.3	E	0.94	98.4	60.3	E	140.5
	Eastbound Right - Turn	8.2	A	0.57	7.8	197.2	F	151.5
Confederation Building Lot	Northbound Left - Turn	73.1	E	0.96	105.9	14.5	B	33.2
	Northbound Through	7.1	A	0.58	58.5	5.0	A	29.8
	Southbound Through	44.2	D	0.91	184.4	177.5	F	202.1
	Southbound Right - Turn	3.8	A	0.33	14.1	46.0	D	144.0
Bonaventure Avenue/ Allandale Road & Elizabeth Avenue		247.2	F			423.5	F	
Bonaventure Avenue/ Allandale Road	Eastbound Left - Turn	67.9	E	0.89	51.8	29.4	C	49.8
	Eastbound Through	283.3	F	1.54	324.5	33.8	C	121.5
	Eastbound Right - Turn					21.1	C	
	Westbound Left - Turn	45.6	D	0.68	34.0	1559.4	F	36.6
	Westbound Through	49.5	D	0.79	138.4	2131.4	F	332.9
	Westbound Right - Turn	0.5	A	0.13	0.7	147.8	F	410.4
Elizabeth Avenue	Northbound Left - Turn	26.2	C	0.43	16.0	1911.6	F	72.7
	Northbound Through	379.1	F	1.77	503.0	234.3	F	245.0
	Northbound Right - Turn	10.5	B	0.31	27.1	213.3	F	30.8
	Southbound Left - Turn	35.8	D	0.91	12.0	370.1	F	36.5
	Southbound Through	355.9	F	1.74	350.9	361.2	F	459.8
	Southbound Right - Turn	9.4	A	0.45	28.6	1664.5	F	474.0
Elizabeth Avenue & Westerland Road		59.6	E			732.2	F	
Elizabeth Avenue	Eastbound Left - Turn	66.3	E	1.03	30.5	9.9	A	31.6
	Eastbound Through	4.2	A	0.44	15.1	6.9	A	46.5
	Westbound Through	94.1	F	1.13	327.4	2087.4	F	571.5
	Westbound Right - Turn					1992.4	F	
Westerland Road	Southbound Left - Turn	86.4	F	1.08	130.7	1201.0	F	359.2
	Southbound Right - Turn	6.3	A	0.60	22.9	1620.8	F	73.6
Elizabeth Avenue & Anderson Avenue		1459.1	F			569.2	F	
Elizabeth Avenue	Eastbound Through	0.0	-	0.60	0.0	1.2	A	4.7
	Eastbound Right - Turn					0.4	A	
	Westbound Left - Turn	13.5	B	0.37	13.2	1591.6	F	49.3
	Westbound Through	0.0	-	0.34	0.0	1677.5	F	410.8
Anderson Avenue	Northbound Left - Turn	ERROR	F	3.66	ERROR	2189.0	F	363.7
	Northbound Right - Turn					1447.5	F	91.5
Elizabeth Avenue & Paton Street		29.1	D			358.3	F	
Elizabeth Avenue	Eastbound Left - Turn	9.4	A	0.05	1.3	3.3	A	4.9
	Eastbound Through	0.0	-	0.53	0.0	1.7	A	7.9
	Westbound Through	0.0	-	0.41	0.0	339.2	F	49.1
	Westbound Right - Turn					244.0	F	
Paton Street	Southbound Left - Turn	307.1	F	1.44	90.7	2465.4	F	444.4
	Southbound Right - Turn					2494.9	F	
Elizabeth Avenue & Freshwater Road		216.5	F			171.7	F	
Elizabeth Avenue	Westbound Right - Turn	702.4	F	2.48	477.9	1416.4	F	271.0
Freshwater Road	Northbound Through	0.0	-	0.57	0.0	108.2	F	218.0
	Northbound Right - Turn					105.0	F	
	Southbound Left - Turn	190.0	F	1.36	308.7	81.1	F	36.4
	Southbound Through	0.0		0.40	0.0	59.0	F	237.5
Freshwater Road & Stamps Lane/ Oxen Pond Road		334.3	F			154.6	F	
Freshwater Road	Eastbound Through	430.9	F	1.90	652.4	158.1	F	365.6
	Eastbound Right - Turn	22.1	C	0.69	74.1	54.3	D	393.3
	Westbound Through	412.8	F	1.85	664.9	124.5	F	260.5
	Westbound Right - Turn					118.2	F	
Stamps Lane/ Oxen Pond Road	Northbound Left - Turn	414.0	F	1.84	304.1	378.2	F	380.5
	Northbound Through					380.7	F	
	Northbound Right - Turn					371.9	F	
	Southbound Left - Turn	18.8	B	0.05	7.2	27.2	C	19.4
	Southbound Through	31.0	C	0.67	113.2	30.6	C	95.2
	Southbound Right - Turn					24.3	C	
Freshwater Road & Thorburn Road		43.9	D			70.6	E	
Freshwater Road	Eastbound Through	34.3	C	0.89	196.8	197.8	F	173.0
	Westbound Through	11.5	B	0.67	33.4	16.8	B	218.7
	Westbound Right - Turn	69.8	E	1.13	3.6	36.6	D	36.5
Thorburn Road	Southbound Left - Turn	26.0	C	0.86	91.0	48.5	D	84.1
	Southbound Right - Turn	104.4	F	1.17	137.7	7.2	A	40.0
Allandale Road & Confederation Building Lot		33.0	C			123.1	F	

Confederation Building Lot	Westbound Left - Turn	31.8	C	0.45	30.5	294.9	F	113.1
	Westbound Right - Turn	40.7	D	0.88	50.5	25.4	C	93.7
Allandale Road	Northbound Through	58.8	E	1.03	228.4	16.5	B	79.6
	Northbound Right - Turn	3.3	A	0.41	16.0	4.6	A	5.5
	Southbound Left - Turn	39.0	D	0.76	72.2	67.8	E	175.5
	Southbound Through	7.5	A	0.65	90.4	350.5	F	199.8
Allandale Road & Higgins Line		17.0	B			109.6	F	
Higgins Line	Westbound Left - Turn	52.5	D	0.85	77.4	789.8	F	142.8
	Westbound Right - Turn	9.0	A	0.46	19.8	554.2	F	46.3
Allandale Road	Northbound Through	13.1	B	0.72	130.8	5.3	A	47.7
	Northbound Right - Turn	11.2	B	0.78	134.2	5.7	A	46.6
	Southbound Left - Turn	43.0	D	0.79	50.7	22.7	C	88.5
	Southbound Through	3.7	A	0.44	27.6	147.8	F	112.3
Allandale Road & Mt. Scio Road		47.6	D			118.1	F	
Allandale Road	Eastbound Left - Turn	66.4	E	0.91	58.3	134.3	F	63.0
	Eastbound Through	33.6	C	0.85	136.9	159.6	F	379.2
	Eastbound Right - Turn					122.3	F	393.0
	Westbound Left - Turn	40.6	D	0.65	20.3	54.4	D	24.8
	Westbound Through	52.6	D	1.05	180.8	56.7	E	199.8
	Westbound Right - Turn					34.4	C	194.3
Mt. Scio Road	Northbound Left - Turn	44.3	D	0.69	27.8	130.1	F	41.8
	Northbound Through	29.4	C	0.51	37.2	182.3	F	
	Northbound Right - Turn					157.2	F	243.0
	Southbound Left - Turn	27.2	C	0.35	27.1	210.4	F	82.1
	Southbound Through	77.2	E	1.02	122.8	108.7	F	
	Southbound Right - Turn					80.1	F	122.9
Outer Ring Road NB & Allandale Road		116.7	F			42.6	E	
Allandale Road	Eastbound Left - Turn	1.1	A	0.03	0.8	36.4	E	150.1
	Eastbound Through					52.4	F	
	Westbound Through	0.0	-	0.75	0.0	7.0	A	0.0
	Westbound Right - Turn	0.0	-	0.31	0.0	8.9	A	4.0
Outer Ring Road SB	Northbound Left - Turn	402.1	F	1.84	466.4	87.8	F	189.1
	Northbound Right - Turn	0.0	-	0.00	0.0	86.9	F	24.8
Outer Ring Road SB & Allandale Road		71.9	F			21.9	C	
Allandale Road	Eastbound Left - Turn	1.2	A	0.01	0.1	44.4	E	20.2
	Eastbound Through					62.5	F	
	Westbound Through	0.0	-	0.79	0.0	88.7	F	0.9
	Westbound Right - Turn					6.4	A	
Outer Ring Road SB	Southbound Left - Turn	251.4	F	1.47	223.5	42.9	E	118.3
	Southbound Right - Turn	0.0	-	0.00	0.0	58.3	F	13.3

MUN Area Traffic Study
Allandale Road & Confederation Building Lot

Scenario 2 - 2025 PM

30/06/2015

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↰	↰	↕↕	↰	↰	↕↕
Traffic Volume (vph)	268	306	1619	374	211	1290
Future Volume (vph)	268	306	1619	374	211	1290
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	4.0	4.0	4.0	3.5
Grade (%)	0%		0%			0%
Storage Length (m)	45.0	0.0		110.0	130.0	
Storage Lanes	1	1		1	1	
Taper Length (m)	2.5				2.5	
Lane Util. Factor	0.97	1.00	0.95	1.00	1.00	0.95
Ped Bike Factor						
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3395	1566	3697	1654	1848	3500
Flt Permitted	0.950				0.080	
Satd. Flow (perm)	3395	1566	3697	1654	156	3500
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		157		386		
Link Speed (k/h)	50		60			60
Link Distance (m)	100.1		513.4			163.6
Travel Time (s)	7.2		30.8			9.8
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.67	0.67	0.97	0.97	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Adj. Flow (vph)	400	457	1669	386	229	1402
Shared Lane Traffic (%)						
Lane Group Flow (vph)	400	457	1669	386	229	1402
Turn Type	Prot	Perm	NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2	6	
Total Split (s)	38.0	38.0	49.0	49.0	13.0	62.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Act Effect Green (s)	26.0	26.0	43.9	43.9	62.0	62.0
Actuated g/C Ratio	0.26	0.26	0.44	0.44	0.62	0.62
v/c Ratio	0.45	0.88	1.03	0.41	0.76	0.65
Control Delay	31.8	40.7	58.8	3.3	39.0	7.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	31.8	40.7	58.8	3.3	39.0	7.5
LOS	C	D	E	A	D	A
Approach Delay	36.5		48.3			11.9
Approach LOS	D		D			B
Stops (vph)	212	199	1381	27	149	669
Fuel Used(l)	14	17	206	23	16	58
CO Emissions (g/hr)	258	315	3824	423	292	1081



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
NOx Emissions (g/hr)	50	61	738	82	56	209
VOC Emissions (g/hr)	59	73	882	97	67	249
Dilemma Vehicles (#)	0	0	74	0	0	20
Queue Length 50th (m)	32.7	56.7	~186.5	0.0	25.6	76.0
Queue Length 95th (m)	30.5	50.5	#228.4	16.0	m#72.2	90.4
Internal Link Dist (m)	76.1		489.4			139.6
Turn Bay Length (m)	45.0			110.0	130.0	
Base Capacity (vph)	1086	607	1624	943	301	2171
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	0.37	0.75	1.03	0.41	0.76	0.65

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 27 (27%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.03

Intersection Signal Delay: 33.0

Intersection LOS: C

Intersection Capacity Utilization 79.8%

ICU Level of Service D

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

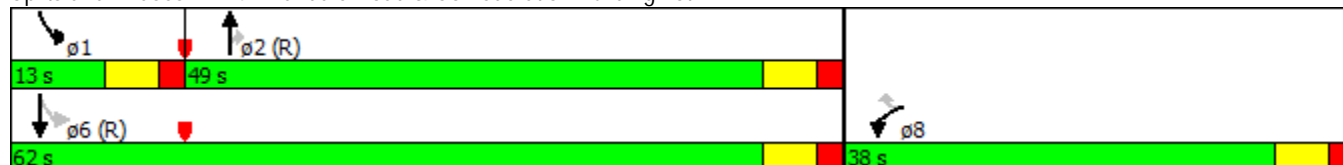
Queue shown is maximum after two cycles.
















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

Queue shown is maximum after two cycles.

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

Splits and Phases: 24: Allandale Road & Confederation Building Lot



						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	 		 			 
Traffic Volume (vph)	535	211	1135	790	236	966
Future Volume (vph)	535	211	1135	790	236	966
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	4.0	4.0	3.5	3.5	4.0	3.5
Grade (%)	0%		3%			-3%
Storage Length (m)	0.0	40.0		80.0	80.0	
Storage Lanes	2	1		1	1	
Taper Length (m)	2.5				2.5	
Lane Util. Factor	0.97	1.00	0.95	1.00	1.00	0.95
Ped Bike Factor						
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3586	1654	3447	1542	1876	3552
Flt Permitted	0.950				0.107	
Satd. Flow (perm)	3586	1654	3447	1542	211	3552
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		213		719		
Link Speed (k/h)	50		50			50
Link Distance (m)	128.4		114.7			80.6
Travel Time (s)	9.2		8.3			5.8
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.96	0.96	0.88	0.88	0.88	0.88
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Adj. Flow (vph)	557	220	1290	898	268	1098
Shared Lane Traffic (%)						
Lane Group Flow (vph)	557	220	1290	898	268	1098
Turn Type	Prot	Perm	NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2	6	
Total Split (s)	25.0	25.0	56.0	56.0	19.0	75.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Act Effect Green (s)	18.4	18.4	52.0	52.0	69.6	69.6
Actuated g/C Ratio	0.18	0.18	0.52	0.52	0.70	0.70
v/c Ratio	0.85	0.46	0.72	0.78	0.79	0.44
Control Delay	52.5	9.0	13.1	11.2	43.0	3.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	52.5	9.0	13.1	11.2	43.0	3.7
LOS	D	A	B	B	D	A
Approach Delay	40.2		12.3			11.4
Approach LOS	D		B			B
Stops (vph)	492	31	941	582	177	180
Fuel Used(l)	39	5	63	41	31	79
CO Emissions (g/hr)	728	88	1164	758	567	1463



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
NOx Emissions (g/hr)	141	17	225	146	109	282
VOC Emissions (g/hr)	168	20	268	175	131	337
Dilemma Vehicles (#)	0	0	0	0	0	0
Queue Length 50th (m)	53.8	1.1	113.9	132.2	37.4	21.5
Queue Length 95th (m)	#77.4	19.8	m130.8	m134.2	m50.7	27.6
Internal Link Dist (m)	104.4		90.7			56.6
Turn Bay Length (m)		40.0		80.0	80.0	
Base Capacity (vph)	681	486	1791	1146	363	2472
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	0.82	0.45	0.72	0.78	0.74	0.44

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 62 (62%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 17.0

Intersection LOS: B

Intersection Capacity Utilization 74.7%

ICU Level of Service D

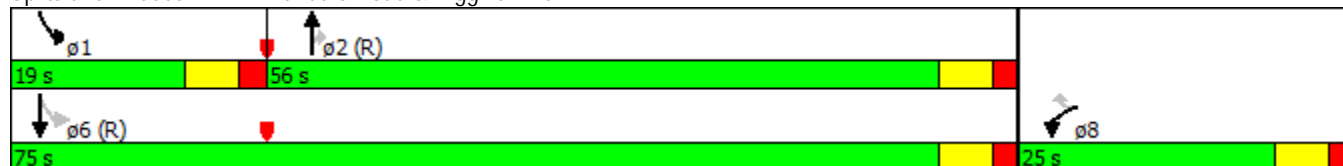
Analysis Period (min) 15

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.





















Splits and Phases: 22: Allandale Road & Higgins Line















MUN Area Traffic Study
Allandale Road & Mt. Scio Road

Scenario 2 - 2025 PM

30/06/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	171	1013	150	105	1182	59	105	69	89	99	104	287
Future Volume (vph)	171	1013	150	105	1182	59	105	69	89	99	104	287
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.6	3.6	3.6	3.5	3.5	3.5	3.6	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	75.0		0.0	75.0		0.0	60.0		25.0	60.0		25.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.981			0.993			0.915			0.890	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1750	3433	0	1770	3514	0	1750	1685	0	1770	1639	0
Flt Permitted	0.098			0.098			0.190			0.511		
Satd. Flow (perm)	181	3433	0	183	3514	0	350	1685	0	952	1639	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		20			6			59			125	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		358.1			559.6			322.8			111.1	
Travel Time (s)		21.5			33.6			23.2			8.0	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.96	0.96	0.96	0.82	0.82	0.82	0.78	0.78	0.78	0.87	0.87	0.87
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	178	1055	156	128	1441	72	135	88	114	114	120	330
Shared Lane Traffic (%)												
Lane Group Flow (vph)	178	1211	0	128	1513	0	135	202	0	114	450	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Total Split (s)	13.0	47.0		13.0	47.0		13.0	27.0		13.0	27.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Act Effect Green (s)	48.0	41.0		48.0	41.0		28.0	21.0		28.0	21.0	
Actuated g/C Ratio	0.48	0.41		0.48	0.41		0.28	0.21		0.28	0.21	
v/c Ratio	0.91	0.85		0.65	1.05		0.69	0.51		0.35	1.02	
Control Delay	66.4	33.6		40.6	52.6		44.3	29.4		27.2	77.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	66.4	33.6		40.6	52.6		44.3	29.4		27.2	77.2	
LOS	E	C		D	D		D	C		C	E	
Approach Delay		37.8			51.6			35.4			67.1	
Approach LOS		D			D			D			E	
Stops (vph)	87	994		79	1096		76	98		73	247	
Fuel Used(l)	17	98		13	174		9	11		5	33	
CO Emissions (g/hr)	314	1828		248	3234		158	197		88	613	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	61	353		48	624		31	38		17	118	
VOC Emissions (g/hr)	72	422		57	746		36	46		20	141	
Dilemma Vehicles (#)	0	58		0	22		0	0		0	0	
Queue Length 50th (m)	18.7	108.1		8.9	~170.3		18.5	24.2		15.4	~69.0	
Queue Length 95th (m)	#58.3	136.9		m20.3	#180.8		27.8	37.2		27.1	#122.8	
Internal Link Dist (m)		334.1			535.6			298.8			87.1	
Turn Bay Length (m)	75.0			75.0			60.0			60.0		
Base Capacity (vph)	196	1419		198	1444		196	400		323	442	
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	0.91	0.85		0.65	1.05		0.69	0.51		0.35	1.02	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 23 (23%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.05

Intersection Signal Delay: 47.6

Intersection LOS: D

Intersection Capacity Utilization 93.0%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

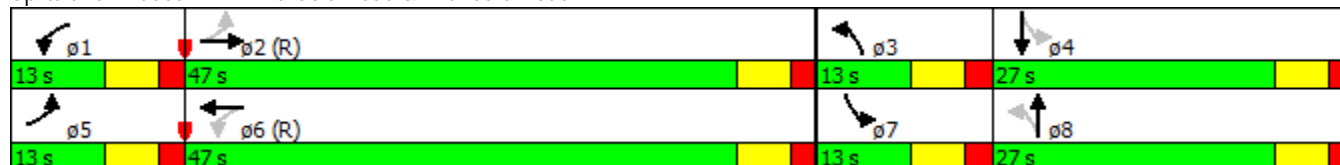
Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

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
























Splits and Phases: 11: Mt. Scio Road & Allandale Road















MUN Area Traffic Study
Allandale Road/ Prine Philip Drive

Scenario 2 - 2025 PM

27/08/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	874	1031	475	342	951	158	335	961	502	77	983	497
Future Volume (vph)	874	1031	475	342	951	158	335	961	502	77	983	497
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	3.8	3.8	3.0	3.7	3.7	3.5	3.5	3.5	3.0	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	200.0		120.0	65.0		25.0	70.0		0.0	42.0		35.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	0.95	0.88
Ped Bike Factor			0.98		1.00		1.00		0.98			
Frt			0.850		0.979				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1652	3618	1619	1652	3495	0	1750	1842	1566	1652	3500	2756
Flt Permitted	0.111			0.133			0.950			0.125		
Satd. Flow (perm)	193	3618	1593	231	3495	0	1748	1842	1541	217	3500	2756
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			243		15				276			91
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		455.9			851.6			464.8			121.6	
Travel Time (s)		23.4			43.8			33.5			8.8	
Confl. Peds. (#/hr)	2		2	2		2	2		2	2		2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.94	0.94	0.94	0.91	0.91	0.91	0.94	0.94	0.94	0.84	0.84	0.84
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	930	1097	505	376	1045	174	356	1022	534	92	1170	592
Shared Lane Traffic (%)												
Lane Group Flow (vph)	930	1097	505	376	1219	0	356	1022	534	92	1170	592
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Prot	NA	Perm	Perm	NA	pt+ov
Protected Phases	5	2		1	6		7	4			8	8 5
Permitted Phases	2		2	6					4	8		
Total Split (s)	27.0	47.0	47.0	17.0	37.0		18.0	56.0	56.0	38.0	38.0	
Total Lost Time (s)	6.0	7.0	7.0	6.0	7.0		6.0	6.0	6.0	6.0	6.0	
Act Effect Green (s)	58.0	40.0	40.0	42.0	30.0		12.0	50.0	50.0	32.0	32.0	59.0
Actuated g/C Ratio	0.48	0.33	0.33	0.35	0.25		0.10	0.42	0.42	0.27	0.27	0.49
v/c Ratio	2.67	0.91	0.73	1.78	1.38		2.03	1.33	0.67	1.61	1.25	0.42
Control Delay	775.3	39.0	17.5	392.9	197.1		495.7	172.8	2.8	374.5	160.8	17.3
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	775.3	39.0	17.5	392.9	197.1		495.7	172.8	2.8	374.5	160.8	17.3
LOS	F	D	B	F	F		F	F	A	F	F	B
Approach Delay		305.1			243.2			185.4			125.6	
Approach LOS		F			F			F			F	
Stops (vph)	561	955	275	273	849		214	761	173	50	805	260
Fuel Used(l)	579	111	36	147	308		147	187	27	28	199	42
CO Emissions (g/hr)	10761	2068	671	2734	5728		2741	3483	505	520	3701	789

Synchro 9 Report

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	2077	399	130	528	1105		529	672	97	100	714	152
VOC Emissions (g/hr)	2482	477	155	631	1321		632	803	116	120	854	182
Dilemma Vehicles (#)	0	36	0	0	7		0	0	0	0	0	0
Queue Length 50th (m)	~363.1	137.8	38.9	~114.8	~203.1		~130.4	~319.1	14.7	~30.9	~181.3	41.3
Queue Length 95th (m)	m#409.9	m153.1	m64.6	m#142.9	m#235.3		m#101.2	m#206.6	m8.8	#59.3	#199.9	50.7
Internal Link Dist (m)		431.9			827.6			440.8			97.6	
Turn Bay Length (m)	200.0		120.0	65.0			70.0			42.0		35.0
Base Capacity (vph)	348	1206	693	211	885		175	767	803	57	933	1401
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	2.67	0.91	0.73	1.78	1.38		2.03	1.33	0.67	1.61	1.25	0.42

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green, Master Intersection

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 2.67

Intersection Signal Delay: 221.5

Intersection LOS: F

Intersection Capacity Utilization 172.0%

ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

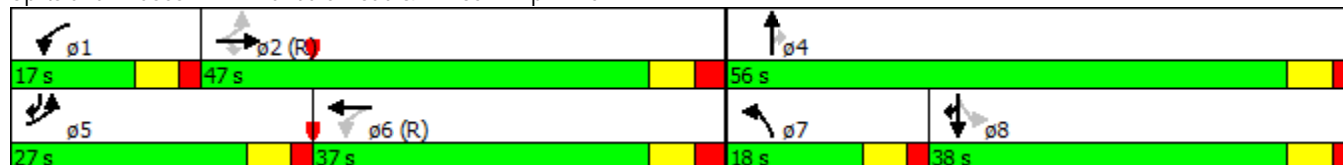
Queue shown is maximum after two cycles.


















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

Queue shown is maximum after two cycles.





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

Splits and Phases: 7: Allandale Road & Prince Philip Drive



												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	484	0	0	1110	465	6	0	850	0	0	0
Future Volume (Veh/h)	10	484	0	0	1110	465	6	0	850	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.86	0.86	0.86	0.87	0.87	0.87	0.88	0.88	0.88	0.92	0.92	0.92
Hourly flow rate (vph)	12	563	0	0	1276	534	7	0	966	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)									3			
Median type		None			None							
Median storage (veh)												
Upstream signal (m)					358							
pX, platoon unblocked	0.57						0.57	0.57		0.57	0.57	0.57
vC, conflicting volume	1276			563			1863	1863	563	1863	1863	1276
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1107			563			2137	2137	563	2137	2137	1107
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 %	97			100			65	100	0	0	100	100
cM capacity (veh/h)	360			1008			20	27	526	0	27	146
Direction, Lane #	EB 1	WB 1	WB 2	NB 1								
Volume Total	575	1276	534	973								
Volume Left	12	0	0	7								
Volume Right	0	0	534	966								
cSH	360	1700	1700	530								
Volume to Capacity	0.03	0.75	0.31	1.84								
Queue Length 95th (m)	0.8	0.0	0.0	466.4								
Control Delay (s)	1.1	0.0	0.0	402.1								
Lane LOS	A			F								
Approach Delay (s)	1.1	0.0		402.1								
Approach LOS				F								
Intersection Summary												
Average Delay			116.7									
Intersection Capacity Utilization			85.3%		ICU Level of Service				E			
Analysis Period (min)			15									


























Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	26	24	1092	468	7
Future Volume (Veh/h)	5	26	24	1092	468	7
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.62	0.62	0.83	0.83	0.85	0.85
Hourly flow rate (vph)	8	42	29	1316	551	8
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						3
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	29				745	687
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	29				745	687
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				0	98
cM capacity (veh/h)	1584				380	447
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	50	1345	559			
Volume Left	8	0	551			
Volume Right	0	1316	8			
cSH	1584	1700	381			
Volume to Capacity	0.01	0.79	1.47			
Queue Length 95th (m)	0.1	0.0	223.5			
Control Delay (s)	1.2	0.0	251.4			
Lane LOS	A		F			
Approach Delay (s)	1.2	0.0	251.4			
Approach LOS			F			
Intersection Summary						
Average Delay			71.9			
Intersection Capacity Utilization		101.4%		ICU Level of Service		G
Analysis Period (min)			15			

MUN Area Traffic Study
Bonaventure Avenue/ Allandale Road & Elizabeth Avenue

Scenario 2 - 2025 PM

30/06/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	173	750	88	101	426	72	59	1086	183	128	1153	286
Future Volume (vph)	173	750	88	101	426	72	59	1086	183	128	1153	286
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	3.5	3.7	3.0	3.5	3.7	3.0	3.4	3.4	3.0	3.4	3.4
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	55.0		0.0	55.0		0.0	55.0		35.0	40.0		0.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.984				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1652	1813	0	1652	1842	1601	1652	1821	1548	1652	1821	1548
Flt Permitted	0.196			0.112			0.087			0.084		
Satd. Flow (perm)	341	1813	0	195	1842	1601	151	1821	1548	146	1821	1548
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5				136			136			136
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		335.6			298.1			241.6			464.8	
Travel Time (s)		24.2			21.5			17.4			33.5	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.97	0.97	0.97	0.95	0.95	0.95	0.90	0.90	0.90	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	178	773	91	106	448	76	66	1207	203	139	1253	311
Shared Lane Traffic (%)												
Lane Group Flow (vph)	178	864	0	106	448	76	66	1207	203	139	1253	311
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6		6	4		4	8		8
Total Split (s)	13.0	43.0		13.0	43.0	43.0	13.0	51.0	51.0	13.0	51.0	51.0
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
Act Effect Green (s)	44.0	37.0		44.0	37.0	37.0	52.0	45.0	45.0	53.2	47.6	47.6
Actuated g/C Ratio	0.37	0.31		0.37	0.31	0.31	0.43	0.38	0.38	0.44	0.40	0.40
v/c Ratio	0.89	1.54		0.68	0.79	0.13	0.43	1.77	0.31	0.91	1.74	0.45
Control Delay	67.9	283.3		45.6	49.5	0.5	26.2	379.1	10.5	35.8	355.9	9.4
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	67.9	283.3		45.6	49.5	0.5	26.2	379.1	10.5	35.8	355.9	9.4
LOS	E	F		D	D	A	C	F	B	D	F	A
Approach Delay		246.5			42.9			312.6			266.5	
Approach LOS		F			D			F			F	
Stops (vph)	152	619		62	378	0	33	737	46	87	791	160
Fuel Used(l)	27	268		8	37	2	3	358	7	11	384	18
CO Emissions (g/hr)	507	4991		145	684	38	61	6663	125	207	7151	340

MUN Area Traffic Study
Bonaventure Avenue/ Allandale Road & Elizabeth Avenue

Scenario 2 - 2025 PM

30/06/2015



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	98	963		28	132	7	12	1286	24	40	1380	66
VOC Emissions (g/hr)	117	1151		33	158	9	14	1537	29	48	1649	78
Dilemma Vehicles (#)	0	0		0	0	0	0	0	0	0	0	0
Queue Length 50th (m)	34.4	~293.1		15.3	96.2	0.0	8.1	~424.1	10.2	15.6	~452.0	36.6
Queue Length 95th (m)	m#51.8	m#324.5		#34.0	#138.4	0.7	16.0	#503.0	27.1	m12.0	m#350.9	m28.6
Internal Link Dist (m)		311.6			274.1			217.6			440.8	
Turn Bay Length (m)	55.0			55.0			55.0		35.0	40.0		
Base Capacity (vph)	201	562		156	567	587	152	682	665	152	722	696
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	0.89	1.54		0.68	0.79	0.13	0.43	1.77	0.31	0.91	1.74	0.45

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 57 (48%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.77

Intersection Signal Delay: 247.2

Intersection LOS: F

Intersection Capacity Utilization 137.2%

ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

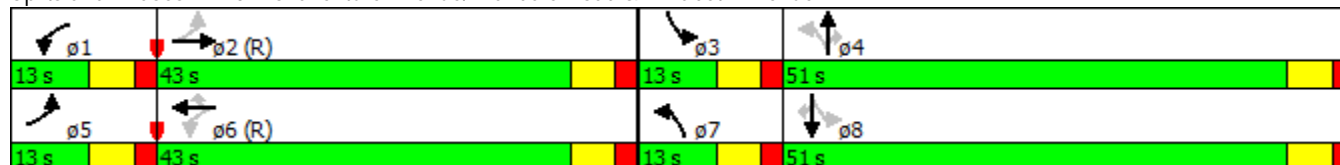
Queue shown is maximum after two cycles.












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

Queue shown is maximum after two cycles.

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

Splits and Phases: 10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue











































						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	574	18	261	320	38	589
Future Volume (Veh/h)	574	18	261	320	38	589
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	692	22	314	386	46	710
Pedestrians	47		47			47
Lane Width (m)	3.7		4.0			3.7
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	4		4			4
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)			105			
pX, platoon unblocked						
vC, conflicting volume	1210	408			747	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1210	408			747	
tC, single (s)	6.4	6.3			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.4			2.3	
p0 queue free %	0	96			94	
cM capacity (veh/h)	174	585			777	
Direction, Lane #	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total	346	346	22	314	386	756
Volume Left	346	346	0	0	0	46
Volume Right	0	0	22	0	386	0
cSH	174	174	585	1700	1700	777
Volume to Capacity	1.99	1.99	0.04	0.18	0.23	0.06
Queue Length 95th (m)	200.6	200.6	0.9	0.0	0.0	1.4
Control Delay (s)	507.6	507.6	11.4	0.0	0.0	1.6
Lane LOS	F	F	B			A
Approach Delay (s)	492.3			0.0		1.6
Approach LOS	F					
Intersection Summary						
Average Delay			162.5			
Intersection Capacity Utilization			73.2%		ICU Level of Service	D
Analysis Period (min)			15			

MUN Area Traffic Study
Prince Philip Drive & Thorburn Road

Scenario 2 - 2025 PM

30/06/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			  			 		 	 	
Traffic Volume (vph)	600	1164	358	243	1543	473	0	1030	73	484	1014	833
Future Volume (vph)	600	1164	358	243	1543	473	0	1030	73	484	1014	833
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.8	4.2	3.5	3.8	4.0	2.4	3.8	4.3	3.5	3.8	3.8
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	175.0		0.0	110.0		90.0	0.0		0.0	150.0		150.0
Storage Lanes	1		1	1		0	0		0	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.95	0.95	0.97	0.95	0.95
Ped Bike Factor			0.98			0.98		1.00		1.00	0.99	
Frt			0.850			0.850		0.990			0.932	
Flt Protected	0.950			0.950						0.950		
Satd. Flow (prot)	1750	3618	1689	1750	5198	1654	0	3578	0	3395	3348	0
Flt Permitted	0.103			0.121						0.950		
Satd. Flow (perm)	190	3618	1662	223	5198	1627	0	3578	0	3389	3348	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			145			242		6			206	
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		327.2			152.5			152.8			386.6	
Travel Time (s)		16.8			7.8			11.0			27.8	
Confl. Peds. (#/hr)	2		2	2		2	2		2	2		2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.96	0.96	0.96	0.95	0.95	0.95	0.91	0.91	0.91	0.91	0.91	0.91
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	625	1213	373	256	1624	498	0	1132	80	532	1114	915
Shared Lane Traffic (%)												
Lane Group Flow (vph)	625	1213	373	256	1624	498	0	1212	0	532	2029	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm		NA		Prot	NA	
Protected Phases	5	2		1	6			4		3	8	
Permitted Phases	2		2	6		6						
Total Split (s)	25.0	50.0	50.0	15.0	40.0	40.0		37.0		18.0	55.0	
Total Lost Time (s)	6.0	7.0	7.0	6.0	7.0	7.0		7.0		6.0	7.0	
Act Effect Green (s)	59.0	43.0	43.0	43.0	33.0	33.0		30.0		12.0	48.0	
Actuated g/C Ratio	0.49	0.36	0.36	0.36	0.28	0.28		0.25		0.10	0.40	
v/c Ratio	1.84	0.94	0.54	1.32	1.14	0.80		1.35		1.57	1.39	
Control Delay	413.3	51.3	21.4	185.7	91.1	17.7		187.8		305.9	206.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Total Delay	413.3	51.3	21.4	185.7	91.1	17.7		187.8		305.9	206.9	
LOS	F	D	C	F	F	B		F		F	F	
Approach Delay		148.6			85.9			187.8			227.5	
Approach LOS		F			F			F			F	
Stops (vph)	346	1048	176	169	1296	339		869		350	1287	
Fuel Used(l)	222	123	23	54	240	44		202		140	391	
CO Emissions (g/hr)	4129	2288	431	1002	4457	822		3762		2595	7266	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	797	442	83	193	860	159		726		501	1402	
VOC Emissions (g/hr)	952	528	99	231	1028	190		868		599	1676	
Dilemma Vehicles (#)	0	47	0	0	29	0		0		0	0	
Queue Length 50th (m)	~209.2	144.0	41.8	~61.4	~162.3	69.4		~200.0		~91.4	~320.6	
Queue Length 95th (m)	#278.9	#187.1	71.3	m#62.1	m#154.6	m65.7		m#166.7		#125.3	#363.4	
Internal Link Dist (m)		303.2			128.5			128.8			362.6	
Turn Bay Length (m)	175.0			110.0		90.0				150.0		
Base Capacity (vph)	340	1296	688	194	1429	622		899		339	1462	
Starvation Cap Reductn	0	0	0	0	0	0		0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0		0		0	0	
Storage Cap Reductn	0	0	0	0	0	0		0		0	0	
Reduced v/c Ratio	1.84	0.94	0.54	1.32	1.14	0.80		1.35		1.57	1.39	

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 14 (12%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.84

Intersection Signal Delay: 160.6

Intersection LOS: F

Intersection Capacity Utilization 134.6%

ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

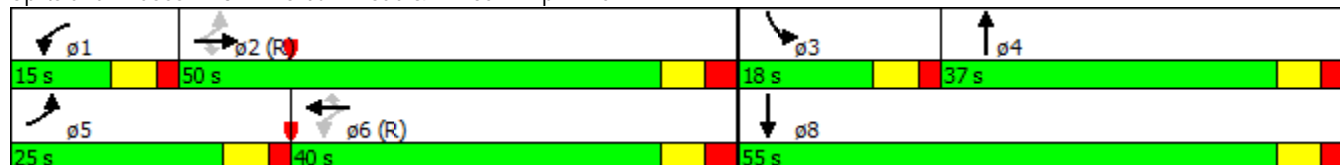
Queue shown is maximum after two cycles.












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











Queue shown is maximum after two cycles.

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





Splits and Phases: 37: Thorburn Road & Prince Philip Drive

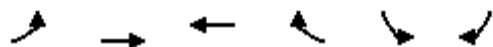


						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	711	207	234	534	122	161
Future Volume (Veh/h)	711	207	234	534	122	161
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.93	0.93	0.90	0.90
Hourly flow rate (vph)	790	230	252	574	136	179
Pedestrians	2			2	6	
Lane Width (m)	3.7			3.7	3.7	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	0			0	1	
Right turn flare (veh)						13
Median type	None			None		
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			1026		1991	913
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1026		1991	913
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			63		0	46
cM capacity (veh/h)			673		41	329
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	1020	252	574	315		
Volume Left	0	252	0	136		
Volume Right	230	0	0	179		
cSH	1700	673	1700	86		
Volume to Capacity	0.60	0.37	0.34	3.66		
Queue Length 95th (m)	0.0	13.2	0.0	Err		
Control Delay (s)	0.0	13.5	0.0	Err		
Lane LOS		B		F		
Approach Delay (s)	0.0	4.1		Err		
Approach LOS				F		
Intersection Summary						
Average Delay			1459.1			
Intersection Capacity Utilization			80.3%	ICU Level of Service		D
Analysis Period (min)			15			

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	0	686	831	44	881	619
Future Volume (Veh/h)	0	686	831	44	881	619
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.88	0.88	0.91	0.91	0.92	0.92
Hourly flow rate (vph)	0	780	913	48	958	673
Pedestrians	9					
Lane Width (m)	4.5					
Walking Speed (m/s)	1.2					
Percent Blockage	1					
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)						274
pX, platoon unblocked	0.61					
vC, conflicting volume	3535	946			970	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	4857	946			970	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	0	0			0	
cM capacity (veh/h)	0	314			704	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	780	961	958	673		
Volume Left	0	0	958	0		
Volume Right	780	48	0	0		
cSH	314	1700	704	1700		
Volume to Capacity	2.48	0.57	1.36	0.40		
Queue Length 95th (m)	477.9	0.0	308.7	0.0		
Control Delay (s)	702.4	0.0	190.0	0.0		
Lane LOS	F		F			
Approach Delay (s)	702.4	0.0	111.6			
Approach LOS	F					
Intersection Summary						
Average Delay		216.5				
Intersection Capacity Utilization		101.9%		ICU Level of Service		G
Analysis Period (min)		15				



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	42	816	569	87	102	40
Future Volume (Veh/h)	42	816	569	87	102	40
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.90	0.90	0.94	0.94	0.83	0.83
Hourly flow rate (vph)	47	907	605	93	123	48
Pedestrians		18	27		17	
Lane Width (m)		3.0	3.7		4.5	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		1	2		2	
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	715				1696	686
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	715				1696	686
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	95				0	89
cM capacity (veh/h)	870				92	434
Direction, Lane #	EB 1	EB 2	WB 1	SB 1		
Volume Total	47	907	698	171		
Volume Left	47	0	0	123		
Volume Right	0	0	93	48		
cSH	870	1700	1700	119		
Volume to Capacity	0.05	0.53	0.41	1.44		
Queue Length 95th (m)	1.3	0.0	0.0	90.7		
Control Delay (s)	9.4	0.0	0.0	307.1		
Lane LOS	A			F		
Approach Delay (s)	0.5		0.0	307.1		
Approach LOS				F		
Intersection Summary						
Average Delay			29.1			
Intersection Capacity Utilization			60.3%		ICU Level of Service	
Analysis Period (min)			15			
			B			



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	256	485	465	415	387	332
Future Volume (vph)	256	485	465	415	387	332
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	2.8	3.0	3.6	3.7	3.4	3.4
Grade (%)		0%	0%		0%	
Storage Length (m)	35.0			0.0	0.0	70.0
Storage Lanes	1			0	1	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.936			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1612	1739	1744	0	1730	1548
Flt Permitted	0.062				0.950	
Satd. Flow (perm)	105	1739	1744	0	1730	1548
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			53			343
Link Speed (k/h)		50	50		50	
Link Distance (m)		402.3	566.1		375.0	
Travel Time (s)		29.0	40.8		27.0	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.96	0.96	0.88	0.88	0.89	0.89
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	267	505	528	472	435	373
Shared Lane Traffic (%)						
Lane Group Flow (vph)	267	505	1000	0	435	373
Turn Type	pm+pt	NA	NA		Prot	Perm
Protected Phases	5	2	6		8	
Permitted Phases	2					8
Total Split (s)	21.0	86.0	65.0		34.0	34.0
Total Lost Time (s)	6.0	6.0	6.0		6.0	6.0
Act Effect Green (s)	80.0	80.0	59.0		28.0	28.0
Actuated g/C Ratio	0.67	0.67	0.49		0.23	0.23
v/c Ratio	1.03	0.44	1.13		1.08	0.60
Control Delay	66.3	4.2	94.1		86.4	6.3
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	66.3	4.2	94.1		86.4	6.3
LOS	E	A	F		F	A
Approach Delay		25.7	94.1		49.4	
Approach LOS		C	F		D	
Stops (vph)	233	154	593		320	143
Fuel Used(l)	28	24	152		47	17
CO Emissions (g/hr)	522	438	2835		869	309



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
NOx Emissions (g/hr)	101	85	547		168	60
VOC Emissions (g/hr)	120	101	654		200	71
Dilemma Vehicles (#)	0	0	0		0	0
Queue Length 50th (m)	~51.6	24.3	~270.4		~111.9	18.7
Queue Length 95th (m)	m30.5	m15.1	#327.4		m#130.7	m22.9
Internal Link Dist (m)		378.3	542.1		351.0	
Turn Bay Length (m)	35.0					70.0
Base Capacity (vph)	258	1159	884		403	624
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	1.03	0.44	1.13		1.08	0.60

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 98 (82%), Referenced to phase 2:EBTL and 6:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.13

Intersection Signal Delay: 59.6

Intersection LOS: E

Intersection Capacity Utilization 100.5%

ICU Level of Service G

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

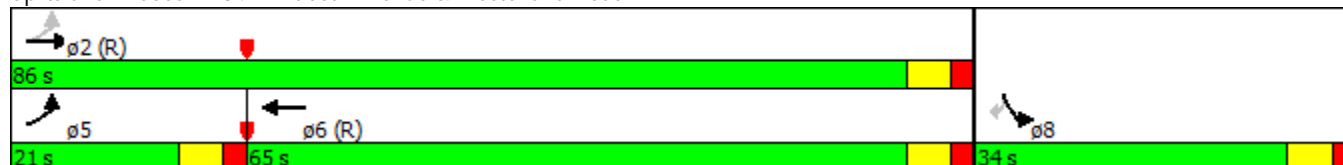
Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

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

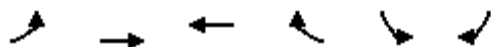
Splits and Phases: 34: Elizabeth Avenue & Westerland Road



MUN Area Traffic Study
Freshwater Road & Thorburn Road

Scenario 2 - 2025 PM

30/06/2015



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑	↑	↑↑	↑
Traffic Volume (vph)	0	1395	1144	1103	992	623
Future Volume (vph)	0	1395	1144	1103	992	623
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.7	3.7	3.7	3.7	3.7	3.7
Grade (%)		0%	0%		0%	
Storage Length (m)	0.0			30.0	0.0	0.0
Storage Lanes	0			1	2	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Ped Bike Factor				0.94	0.93	0.97
Frt				0.850		0.850
Flt Protected					0.950	
Satd. Flow (prot)	0	3579	3579	1601	3471	1601
Flt Permitted					0.950	
Satd. Flow (perm)	0	3579	3579	1511	3237	1550
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				544		38
Link Speed (k/h)		50	50		50	
Link Distance (m)		173.6	374.8		70.3	
Travel Time (s)		12.5	27.0		5.1	
Confl. Peds. (#/hr)	20			20	18	9
Confl. Bikes (#/hr)						
Peak Hour Factor	0.88	0.88	0.95	0.95	0.83	0.83
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	0	1585	1204	1161	1195	751
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1585	1204	1161	1195	751
Turn Type		NA	NA	Perm	Prot	Perm
Protected Phases		4	8		6	
Permitted Phases				8		6
Total Split (s)		66.0	66.0	66.0	54.0	54.0
Total Lost Time (s)		6.0	6.0	6.0	6.0	6.0
Act Effect Green (s)		60.0	60.0	60.0	48.0	48.0
Actuated g/C Ratio		0.50	0.50	0.50	0.40	0.40
v/c Ratio		0.89	0.67	1.13	0.86	1.17
Control Delay		34.3	11.5	69.8	26.0	104.4
Queue Delay		0.0	0.0	0.0	0.0	0.0
Total Delay		34.3	11.5	69.8	26.0	104.4
LOS		C	B	E	C	F
Approach Delay		34.3	40.2		56.2	
Approach LOS		C	D		E	
Stops (vph)		1193	478	136	851	479
Fuel Used(l)		87	62	102	60	74
CO Emissions (g/hr)		1611	1146	1890	1115	1376



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
NOx Emissions (g/hr)		311	221	365	215	266
VOC Emissions (g/hr)		372	264	436	257	317
Dilemma Vehicles (#)		0	0	0	0	0
Queue Length 50th (m)		170.7	50.7	~244.4	129.8	~203.3
Queue Length 95th (m)		196.8	m33.4	m3.6	m91.0	m137.7
Internal Link Dist (m)		149.6	350.8		46.3	
Turn Bay Length (m)				30.0		
Base Capacity (vph)		1789	1789	1027	1388	642
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		0.89	0.67	1.13	0.86	1.17

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 19 (16%), Referenced to phase 4:EBT and 8:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.17

Intersection Signal Delay: 43.9

Intersection LOS: D

Intersection Capacity Utilization 81.1%

ICU Level of Service D

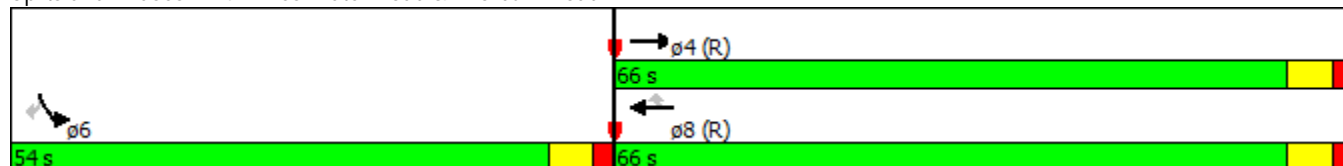
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

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
























Splits and Phases: 47: Freshwater Road & Thorburn Road



MUN Area Traffic Study
Prince Philip Drive & Clinch Crescent/ Westerland Road

Scenario 2 - 2025 PM













30/06/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	208	1291	239	128	1448	140	315	232	265	270	376	516
Future Volume (vph)	208	1291	239	128	1448	140	315	232	265	270	376	516
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	4.0	3.5	3.5	3.5	3.5	3.0	3.0	3.5	3.3	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	75.0		185.0	90.0		0.0	60.0		45.0	0.0		80.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.88		1.00				0.69	0.87		0.98
Frt			0.850		0.987				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1750	3697	1566	1750	3450	0	1652	1739	1566	1711	1842	1566
Flt Permitted	0.091			0.093			0.148			0.352		
Satd. Flow (perm)	168	3697	1381	171	3450	0	257	1739	1087	548	1842	1541
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			269		9				150			145
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		591.3			489.3			375.0			105.3	
Travel Time (s)		30.4			25.2			27.0			7.6	
Confl. Peds. (#/hr)	2		30	30		2	2		150	150		2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.89	0.89	0.89	0.92	0.92	0.92	0.89	0.89	0.89	0.76	0.76	0.76
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	234	1451	269	139	1574	152	354	261	298	355	495	679
Shared Lane Traffic (%)												
Lane Group Flow (vph)	234	1451	269	139	1726	0	354	261	298	355	495	679
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2		2	6			4		4	8		8
Total Split (s)	14.0	51.0	51.0	13.0	50.0		18.0	34.0	34.0	22.0	38.0	38.0
Total Lost Time (s)	6.0	7.0	7.0	6.0	7.0		6.0	7.0	7.0	6.0	7.0	7.0
Act Effect Green (s)	53.0	44.0	44.0	51.0	43.0		40.0	27.0	27.0	48.0	31.0	31.0
Actuated g/C Ratio	0.44	0.37	0.37	0.42	0.36		0.33	0.22	0.22	0.40	0.26	0.26
v/c Ratio	1.31	1.07	0.40	0.85	1.39		1.57	0.67	0.83	0.95	1.04	1.34
Control Delay	197.5	91.0	13.2	64.4	204.2		295.8	44.5	29.8	64.7	96.3	196.9
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	197.5	91.0	13.2	64.4	204.2		295.8	44.5	29.8	64.7	96.3	196.9
LOS	F	F	B	E	F		F	D	C	E	F	F
Approach Delay		93.1			193.8			137.1			133.6	
Approach LOS		F			F			F			F	
Stops (vph)	147	1150	69	65	1114		186	198	162	181	324	319
Fuel Used(l)	48	203	17	14	362		87	21	19	20	39	90
CO Emissions (g/hr)	894	3777	316	266	6728		1620	384	356	376	723	1683

MUN Area Traffic Study
Prince Philip Drive & Clinch Crescent/ Westerland Road

Scenario 2 - 2025 PM

30/06/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	173	729	61	51	1299		313	74	69	73	140	325
VOC Emissions (g/hr)	206	871	73	61	1552		374	89	82	87	167	388
Dilemma Vehicles (#)	0	79	0	0	80		0	0	0	0	0	0
Queue Length 50th (m)	~55.3	~199.4	17.9	19.0	~279.3		~100.8	52.5	25.8	60.6	~126.0	~183.0
Queue Length 95th (m)	#104.4	#238.5	31.1	m#43.5	#323.9		m#99.8	m52.7	m25.6	#77.8	#142.1	#191.0
Internal Link Dist (m)		567.3			465.3			351.0			81.3	
Turn Bay Length (m)	75.0		185.0	90.0			60.0		45.0			80.0
Base Capacity (vph)	179	1355	676	164	1242		225	391	360	374	475	505
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	1.31	1.07	0.40	0.85	1.39		1.57	0.67	0.83	0.95	1.04	1.34

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 52 (43%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.57

Intersection Signal Delay: 139.4

Intersection LOS: F

Intersection Capacity Utilization 116.0%

ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

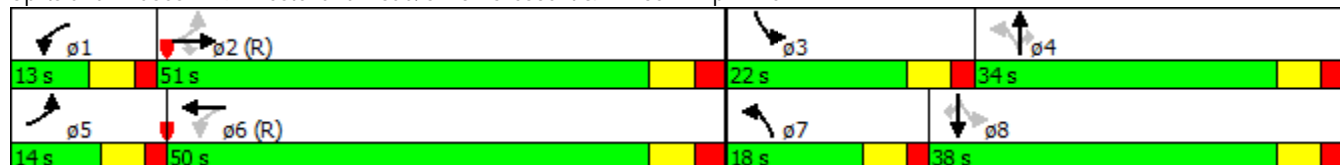
Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

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

Splits and Phases: 9: Westerland Road/Clinch Crescent & Prince Philip Drive





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	325	1507	1914	111	123	532
Future Volume (vph)	325	1507	1914	111	123	532
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	4.0	4.0	3.7	3.3	3.5
Grade (%)		0%	0%		0%	
Storage Length (m)	140.0			70.0	80.0	0.0
Storage Lanes	1			1	1	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Ped Bike Factor				0.97	1.00	0.98
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1652	3697	3697	1601	1711	1566
Flt Permitted	0.062				0.950	
Satd. Flow (perm)	108	3697	3697	1558	1704	1541
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				67		223
Link Speed (k/h)		70	70		50	
Link Distance (m)		289.0	591.3		280.3	
Travel Time (s)		14.9	30.4		20.2	
Confl. Peds. (#/hr)	2			2	2	2
Confl. Bikes (#/hr)						
Peak Hour Factor	0.90	0.90	0.87	0.87	0.80	0.80
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	361	1674	2200	128	154	665
Shared Lane Traffic (%)						
Lane Group Flow (vph)	361	1674	2200	128	154	665
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	5	2	6		8	
Permitted Phases	2			6		8
Total Split (s)	21.0	87.0	66.0	66.0	33.0	33.0
Total Lost Time (s)	6.0	7.0	7.0	7.0	6.0	6.0
Act Effect Green (s)	81.0	80.0	59.0	59.0	27.0	27.0
Actuated g/C Ratio	0.68	0.67	0.49	0.49	0.22	0.22
v/c Ratio	1.36	0.68	1.21	0.16	0.40	1.28
Control Delay	218.9	2.8	115.9	4.5	43.3	167.2
Queue Delay	0.0	0.0	0.2	0.0	0.0	0.1
Total Delay	218.9	2.8	116.1	4.5	43.3	167.4
LOS	F	A	F	A	D	F
Approach Delay		41.1	110.0		144.0	
Approach LOS		D	F		F	
Stops (vph)	366	218	1205	23	102	283
Fuel Used(l)	78	48	316	7	10	89
CO Emissions (g/hr)	1459	898	5872	125	180	1655



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
NOx Emissions (g/hr)	282	173	1133	24	35	319
VOC Emissions (g/hr)	337	207	1354	29	41	382
Dilemma Vehicles (#)	0	28	80	0	0	0
Queue Length 50th (m)	~100.1	14.3	~327.8	4.0	31.1	~156.0
Queue Length 95th (m)	m#147.9	m28.6	m82.0	m1.0	44.7	#182.4
Internal Link Dist (m)		265.0	567.3		256.3	
Turn Bay Length (m)	140.0			70.0	80.0	
Base Capacity (vph)	265	2464	1817	800	384	519
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	135	0	0	8
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.36	0.68	1.31	0.16	0.40	1.30

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 65 (54%), Referenced to phase 2:EBTL and 6:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.36

Intersection Signal Delay: 88.3

Intersection LOS: F

Intersection Capacity Utilization 96.9%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

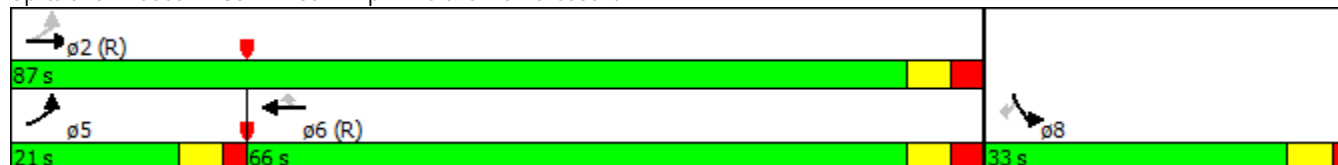
Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

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

Splits and Phases: 35: Prince Philip Drive & Clinch Crescent



MUN Area Traffic Study
Prince Philip Drive & Confederation Building Lot

Scenario 2 - 2025 PM

30/06/2015



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	290	284	346	1265	1167	240
Future Volume (vph)	290	284	346	1265	1167	240
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	4.0	3.5	4.0	3.7	4.0
Grade (%)	0%			0%	0%	
Storage Length (m)	0.0	0.0	75.0			100.0
Storage Lanes	1	1	1			1
Taper Length (m)	2.5		2.5			
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Ped Bike Factor						
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1750	1654	1750	3697	3579	1654
Flt Permitted	0.950		0.072			
Satd. Flow (perm)	1750	1654	133	3697	3579	1654
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		371				276
Link Speed (k/h)	50			70	70	
Link Distance (m)	119.9			283.2	155.8	
Travel Time (s)	8.6			14.6	8.0	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.73	0.73	0.89	0.89	0.87	0.87
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	397	389	389	1421	1341	276
Shared Lane Traffic (%)						
Lane Group Flow (vph)	397	389	389	1421	1341	276
Turn Type	Prot	Perm	pm+pt	NA	NA	Perm
Protected Phases	8		5	2	6	
Permitted Phases		8	2			6
Total Split (s)	36.0	36.0	30.0	84.0	54.0	54.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Act Effect Green (s)	29.1	29.1	78.9	78.9	49.3	49.3
Actuated g/C Ratio	0.24	0.24	0.66	0.66	0.41	0.41
v/c Ratio	0.94	0.57	0.96	0.58	0.91	0.33
Control Delay	75.3	8.2	73.1	7.1	44.2	3.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	75.3	8.2	73.1	7.1	44.2	3.8
LOS	E	A	E	A	D	A
Approach Delay	42.1			21.3	37.3	
Approach LOS	D			C	D	
Stops (vph)	261	35	479	376	1028	19
Fuel Used(l)	26	6	72	140	100	5
CO Emissions (g/hr)	483	108	1348	2609	1853	85



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
NOx Emissions (g/hr)	93	21	260	504	358	16
VOC Emissions (g/hr)	111	25	311	602	427	20
Dilemma Vehicles (#)	0	0	0	25	48	0
Queue Length 50th (m)	91.2	3.2	84.3	53.1	157.2	0.0
Queue Length 95th (m)	98.4	7.8 m#105.9	m58.5	#184.4	14.1	
Internal Link Dist (m)	95.9			259.2	131.8	
Turn Bay Length (m)			75.0			100.0
Base Capacity (vph)	437	691	410	2431	1471	842
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	0.91	0.56	0.95	0.58	0.91	0.33

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 41 (34%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.96

Intersection Signal Delay: 31.3

Intersection LOS: C

Intersection Capacity Utilization 82.5%

ICU Level of Service E

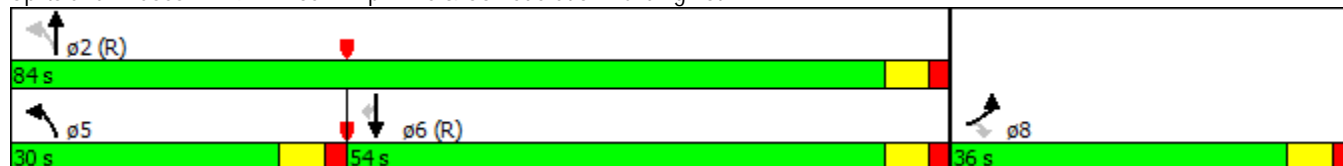
Analysis Period (min) 15

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.

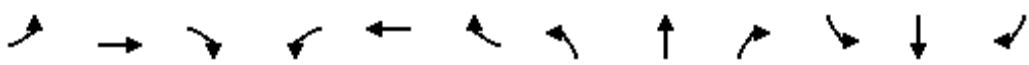
Splits and Phases: 29: Prince Philip Drive & Confederation Building Lot















MUN Area Traffic Study
Prince Philip Drive & Morrissey Drive

Scenario 2 - 2025 PM

30/06/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑	↗				↖	↗	
Traffic Volume (vph)	0	1828	0	42	1565	177	0	0	0	274	122	151
Future Volume (vph)	0	1828	0	42	1565	177	0	0	0	274	122	151
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.8	3.8	3.8	3.0	3.8	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	0.0		0.0	70.0		30.0	0.0		0.0	40.0		0.0
Storage Lanes	0		0	1		1	0		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
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	1.00
Ped Bike Factor						0.95				0.95	0.97	
Frt						0.850					0.917	
Flt Protected				0.950						0.950		
Satd. Flow (prot)	0	3618	0	1652	3618	1566	0	0	0	1750	1632	0
Flt Permitted				0.051						0.950		
Satd. Flow (perm)	0	3618	0	89	3618	1483	0	0	0	1662	1632	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						103					38	
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		489.3			455.9			114.5			292.8	
Travel Time (s)		25.2			23.4			8.2			21.1	
Confl. Peds. (#/hr)	2		2	10		10	25		25	25		25
Confl. Bikes (#/hr)												
Peak Hour Factor	0.91	0.91	0.91	0.92	0.92	0.92	0.69	0.69	0.69	0.89	0.89	0.89
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	2009	0	46	1701	192	0	0	0	308	137	170
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	2009	0	46	1701	192	0	0	0	308	307	0
Turn Type		NA		pm+pt	NA	Perm				pm+pt	NA	
Protected Phases		2		1	6					3	8	
Permitted Phases				6		6				8		
Total Split (s)		77.0		13.0	90.0	90.0				30.0	30.0	
Total Lost Time (s)		7.0		6.0	7.0	7.0				7.0	7.0	
Act Effect Green (s)		73.0		84.4	83.4	83.4				22.6	22.6	
Actuated g/C Ratio		0.61		0.70	0.70	0.70				0.19	0.19	
v/c Ratio		0.91		0.30	0.68	0.18				0.94	0.91	
Control Delay		20.5		9.8	6.8	0.2				84.4	73.0	
Queue Delay		0.0		0.0	0.0	0.0				0.0	0.0	
Total Delay		20.5		9.8	6.8	0.2				84.4	73.0	
LOS		C		A	A	A				F	E	
Approach Delay		20.5			6.2						78.7	
Approach LOS		C			A						E	
Stops (vph)		803		18	983	6				243	216	
Fuel Used(l)		137		3	109	7				31	28	
CO Emissions (g/hr)		2547		50	2036	128				574	517	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)		492		10	393	25				111	100	
VOC Emissions (g/hr)		587		11	470	29				132	119	
Dilemma Vehicles (#)		144		0	20	0				0	0	
Queue Length 50th (m)		126.6		0.8	136.1	0.0				71.8	63.0	
Queue Length 95th (m)		m120.1		m0.8	m39.3	m0.0				#121.2	#111.5	
Internal Link Dist (m)		465.3			431.9			90.5			268.8	
Turn Bay Length (m)				70.0		30.0				40.0		
Base Capacity (vph)		2202		153	2515	1062				335	343	
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		0.91		0.30	0.68	0.18				0.92	0.90	

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 41 (34%), Referenced to phase 2:EBT and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.94

Intersection Signal Delay: 22.3

Intersection LOS: C

Intersection Capacity Utilization 79.2%

ICU Level of Service D

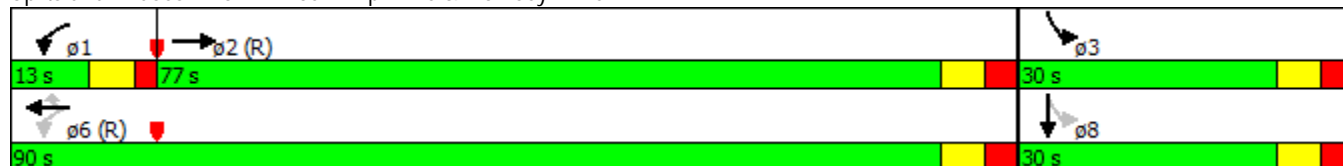
Analysis Period (min) 15

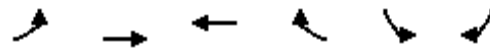
95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

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

Splits and Phases: 61: Prince Philip Drive & Morrissey Drive





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	24	1581	2061	384	251	97
Future Volume (vph)	24	1581	2061	384	251	97
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	4.0	4.0	4.0	3.0	3.0
Grade (%)		0%	0%		0%	
Storage Length (m)	50.0			0.0	60.0	0.0
Storage Lanes	1			0	1	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	0.95	0.95	0.95	1.00	1.00
Ped Bike Factor			1.00		1.00	0.98
Frt			0.976			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1652	3697	3593	0	1652	1478
Flt Permitted	0.047				0.950	
Satd. Flow (perm)	82	3697	3593	0	1645	1454
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			35			101
Link Speed (k/h)		70	70		50	
Link Distance (m)		204.4	289.0		276.1	
Travel Time (s)		10.5	14.9		19.9	
Confl. Peds. (#/hr)	2			2	2	2
Confl. Bikes (#/hr)						
Peak Hour Factor	0.90	0.90	0.96	0.96	0.85	0.85
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	27	1757	2147	400	295	114
Shared Lane Traffic (%)						
Lane Group Flow (vph)	27	1757	2547	0	295	114
Turn Type	pm+pt	NA	NA		Prot	Perm
Protected Phases	5	2	6		8	
Permitted Phases	2					8
Total Split (s)	13.0	95.0	82.0		25.0	25.0
Total Lost Time (s)	6.0	6.0	6.0		6.0	6.0
Act Effect Green (s)	89.0	89.0	81.2		19.0	19.0
Actuated g/C Ratio	0.74	0.74	0.68		0.16	0.16
v/c Ratio	0.18	0.64	1.04		1.13	0.36
Control Delay	4.0	9.4	34.7		141.2	14.6
Queue Delay	0.0	0.0	1.3		0.0	0.0
Total Delay	4.0	9.4	36.1		141.2	14.6
LOS	A	A	D		F	B
Approach Delay		9.3	36.1		105.9	
Approach LOS		A	D		F	
Stops (vph)	7	1318	584		207	22
Fuel Used(l)	2	146	149		38	4
CO Emissions (g/hr)	29	2709	2762		716	77



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
NOx Emissions (g/hr)	6	523	533		138	15
VOC Emissions (g/hr)	7	625	637		165	18
Dilemma Vehicles (#)	0	0	149		0	0
Queue Length 50th (m)	0.8	155.8	~353.9		~80.5	2.6
Queue Length 95th (m)	m0.7	m123.3	m57.5		#123.6	16.5
Internal Link Dist (m)		180.4	265.0		252.1	
Turn Bay Length (m)	50.0				60.0	
Base Capacity (vph)	152	2741	2442		261	315
Starvation Cap Reductn	0	0	8		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.18	0.64	1.05		1.13	0.36

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 60 (50%), Referenced to phase 2:EBTL and 6:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.13

Intersection Signal Delay: 32.0

Intersection LOS: C

Intersection Capacity Utilization 93.2%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

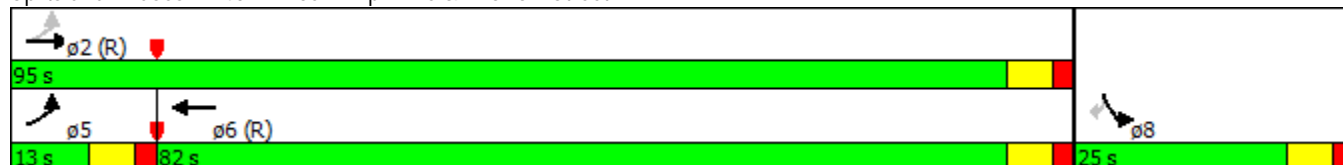
Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

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



















Splits and Phases: 40: Prince Philip Drive & Wicklow Street















MUN Area Traffic Study
Freshwater Road & Stamps Lane/ Oxen Pond Road

Scenario 2 - 2025 PM

30/06/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1429	517	0	1440	77	302	213	51	19	194	213
Future Volume (vph)	0	1429	517	0	1440	77	302	213	51	19	194	213
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	4.0	4.0	4.0	3.0	3.0	3.0	2.6	2.9	2.9
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	0.0		0.0	0.0		0.0	0.0		0.0	30.0		0.0
Storage Lanes	0		1	0		0	0		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt			0.850		0.993			0.988			0.922	
Flt Protected								0.974		0.950		
Satd. Flow (prot)	0	1842	1566	0	1932	0	0	1647	0	1573	1569	0
Flt Permitted								0.519		0.489		
Satd. Flow (perm)	0	1842	1566	0	1932	0	0	878	0	810	1569	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			217		3			4			10	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		374.8			273.7			376.6			148.1	
Travel Time (s)		27.0			19.7			27.1			10.7	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.91	0.91	0.91	0.94	0.94	0.94	0.91	0.91	0.91	0.86	0.86	0.86
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	6%	3%	2%	4%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	1570	568	0	1532	82	332	234	56	22	226	248
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1570	568	0	1614	0	0	622	0	22	474	0
Turn Type		NA	Perm		NA		Perm	NA		pm+pt	NA	
Protected Phases		2			6			8		7	4	
Permitted Phases			2				8			4		
Total Split (s)		60.0	60.0		60.0		44.0	44.0		16.0	60.0	
Total Lost Time (s)		6.0	6.0		6.0			6.0		6.0	6.0	
Act Effect Green (s)		54.0	54.0		54.0			46.0		54.0	54.0	
Actuated g/C Ratio		0.45	0.45		0.45			0.38		0.45	0.45	
v/c Ratio		1.90	0.69		1.85			1.84		0.05	0.67	
Control Delay		430.9	22.1		412.8			414.0		18.8	31.0	
Queue Delay		0.0	0.0		0.0			0.0		0.0	0.0	
Total Delay		430.9	22.1		412.8			414.0		18.8	31.0	
LOS		F	C		F			F		B	C	
Approach Delay		322.3			412.8			414.0			30.4	
Approach LOS		F			F			F			C	
Stops (vph)		958	267		1008			378		11	311	
Fuel Used(l)		546	33		544			209		1	22	
CO Emissions (g/hr)		10159	617		10117			3888		15	417	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)		1961	119		1953			750		3	81	
VOC Emissions (g/hr)		2343	142		2333			897		3	96	
Dilemma Vehicles (#)		0	0		0			0		0	0	
Queue Length 50th (m)		-568.8	53.0		-583.2			-232.6		2.8	84.0	
Queue Length 95th (m)		#652.4	m74.1		#664.9			#304.1		7.2	113.2	
Internal Link Dist (m)		350.8			249.7			352.6			124.1	
Turn Bay Length (m)										30.0		
Base Capacity (vph)		828	824		871			338		428	711	
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		1.90	0.69		1.85			1.84		0.05	0.67	

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 119 (99%), Referenced to phase 2:EBT and 6:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.90

Intersection Signal Delay: 334.3

Intersection LOS: F

Intersection Capacity Utilization 149.7%

ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

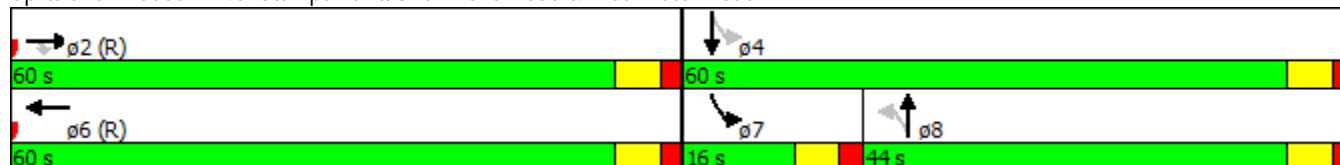
Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

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

Splits and Phases: 46: Stamps Lane/Oxen Pond Road & Freshwater Road



Summary of All Intervals

Run Number	1	10	2	3	4	5	6
Start Time	4:30	4:30	4:30	4:30	4:30	4:30	4:30
End Time	6:00	6:00	6:00	6:00	6:00	6:00	6:00
Total Time (min)	90	90	90	90	90	90	90
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	5	5	5	5	5	5	5
# of Recorded Intervals	4	4	4	4	4	4	4
Vehs Entered	9708	12551	9882	11920	12210	9913	12102
Vehs Exited	8642	11620	8819	10877	10823	8942	10826
Starting Vehs	2249	2156	2132	2108	1968	2184	2082
Ending Vehs	3315	3087	3195	3151	3355	3155	3358
Travel Distance (km)	12845	18724	12928	17067	17504	13767	16859
Travel Time (hr)	9483.2	8458.0	9335.7	8405.6	8506.8	8957.5	8484.0
Total Delay (hr)	9237.9	8108.4	9088.4	8083.8	8179.2	8697.4	8166.8
Total Stops	23380	33301	23600	30930	32084	24441	31620
Fuel Used (l)	9014.7	8488.5	8897.3	8349.5	8458.9	8612.4	8401.8

Summary of All Intervals

Run Number	7	8	9	Avg
Start Time	4:30	4:30	4:30	4:30
End Time	6:00	6:00	6:00	6:00
Total Time (min)	90	90	90	90
Time Recorded (min)	60	60	60	60
# of Intervals	5	5	5	5
# of Recorded Intervals	4	4	4	4
Vehs Entered	13142	11770	12746	11591
Vehs Exited	12047	10591	11825	10500
Starting Vehs	2068	2105	2145	2125
Ending Vehs	3163	3284	3066	3206
Travel Distance (km)	19569	16185	19117	16456
Travel Time (hr)	8021.1	8519.9	8101.9	8627.4
Total Delay (hr)	7656.4	8214.1	7744.4	8317.7
Total Stops	36290	30009	34011	29968
Fuel Used (l)	8164.6	8387.8	8215.3	8499.1

Interval #0 Information Seeding

Start Time	4:30
End Time	5:00
Total Time (min)	30
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording #1

Start Time	5:00
End Time	5:15
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	3342	3241	3319	3353	3505	3154	3458
Vehs Exited	3088	3041	2998	3086	3064	2920	3141
Starting Vehs	2249	2156	2132	2108	1968	2184	2082
Ending Vehs	2503	2356	2453	2375	2409	2418	2399
Travel Distance (km)	5255	5057	5060	5160	5249	5015	5223
Travel Time (hr)	1277.3	1203.6	1255.6	1182.5	1200.0	1202.7	1186.3
Total Delay (hr)	1179.4	1109.7	1161.7	1086.1	1102.3	1109.5	1089.0
Total Stops	9456	8603	9069	8898	9291	8754	9228
Fuel Used (l)	1445.1	1366.6	1418.9	1359.8	1380.7	1363.6	1365.5

Interval #1 Information Recording #1

Start Time	5:00
End Time	5:15
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	3434	3473	3339	3359
Vehs Exited	3173	3156	3174	3084
Starting Vehs	2068	2105	2145	2125
Ending Vehs	2329	2422	2310	2399
Travel Distance (km)	5402	5251	5203	5187
Travel Time (hr)	1186.9	1187.1	1147.4	1202.9
Total Delay (hr)	1086.7	1089.3	1050.4	1106.4
Total Stops	9428	9561	8930	9122
Fuel Used (l)	1376.3	1366.3	1325.2	1376.8

Interval #2 Information Recording #2

Start Time	5:15
End Time	5:30
Total Time (min)	15
Volumes adjusted by PHF, Growth Factors.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	3201	3433	3187	3330	3168	3296	3362
Vehs Exited	2670	3038	2755	2909	2878	2922	2949
Starting Vehs	2503	2356	2453	2375	2409	2418	2399
Ending Vehs	3034	2751	2885	2796	2699	2792	2812
Travel Distance (km)	3848	5016	4019	4607	4530	4606	4583
Travel Time (hr)	1906.1	1833.4	1893.6	1758.2	1790.3	1812.2	1805.8
Total Delay (hr)	1832.5	1739.2	1817.2	1671.2	1705.6	1725.8	1719.1
Total Stops	6787	9121	7330	8288	8155	8264	8612
Fuel Used (l)	1898.5	1902.5	1895.0	1813.6	1836.2	1860.7	1850.5

Interval #2 Information Recording #2

Start Time	5:15
End Time	5:30
Total Time (min)	15
Volumes adjusted by PHF, Growth Factors.	

Run Number	7	8	9	Avg
Vehs Entered	3424	3277	3288	3292
Vehs Exited	3083	2858	3025	2908
Starting Vehs	2329	2422	2310	2399
Ending Vehs	2670	2841	2573	2784
Travel Distance (km)	4897	4349	4893	4535
Travel Time (hr)	1729.4	1775.4	1733.7	1803.8
Total Delay (hr)	1637.4	1692.7	1641.5	1718.2
Total Stops	9069	7889	8577	8206
Fuel Used (l)	1805.0	1812.1	1809.1	1848.3

Interval #3 Information Recording #3

Start Time	5:30
End Time	5:45
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	1858	3207	2157	2843	3063	2497	3107
Vehs Exited	1637	3041	1887	2421	2565	2113	2868
Starting Vehs	3034	2751	2885	2796	2699	2792	2812
Ending Vehs	3255	2917	3155	3218	3197	3176	3051
Travel Distance (km)	2087	4759	2446	3718	4159	2866	4602
Travel Time (hr)	2713.3	2420.1	2671.3	2423.0	2474.1	2533.2	2423.6
Total Delay (hr)	2672.3	2331.0	2622.7	2352.5	2395.7	2477.8	2338.0
Total Stops	4181	8607	4531	7201	8019	5520	8615
Fuel Used (l)	2476.0	2388.2	2464.7	2327.5	2392.5	2370.0	2385.4

Interval #3 Information Recording #3

Start Time	5:30
End Time	5:45
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	3265	2614	3145	2772
Vehs Exited	3056	2274	2943	2477
Starting Vehs	2670	2841	2573	2784
Ending Vehs	2879	3181	2775	3076
Travel Distance (km)	4927	3336	4711	3761
Travel Time (hr)	2315.2	2470.1	2331.9	2477.6
Total Delay (hr)	2223.6	2406.5	2244.3	2406.4
Total Stops	9490	5901	8229	7028
Fuel Used (l)	2308.4	2342.8	2319.9	2377.5

Interval #4 Information Recording #4

Start Time	5:45
End Time	6:00
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	1307	2670	1219	2394	2474	966	2175
Vehs Exited	1247	2500	1179	2461	2316	987	1868
Starting Vehs	3255	2917	3155	3218	3197	3176	3051
Ending Vehs	3315	3087	3195	3151	3355	3155	3358
Travel Distance (km)	1655	3891	1403	3582	3566	1280	2450
Travel Time (hr)	3586.6	3000.9	3515.2	3042.0	3042.5	3409.3	3068.3
Total Delay (hr)	3553.8	2928.6	3486.9	2974.1	2975.7	3384.4	3020.6
Total Stops	2956	6970	2670	6543	6619	1903	5165
Fuel Used (l)	3195.1	2831.2	3118.8	2848.6	2849.5	3018.1	2800.5

Interval #4 Information Recording #4

Start Time	5:45
End Time	6:00
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	3019	2406	2974	2162
Vehs Exited	2735	2303	2683	2025
Starting Vehs	2879	3181	2775	3076
Ending Vehs	3163	3284	3066	3206
Travel Distance (km)	4343	3250	4310	2973
Travel Time (hr)	2789.6	3087.4	2888.9	3143.1
Total Delay (hr)	2708.7	3025.6	2808.2	3086.6
Total Stops	8303	6658	8275	5592
Fuel Used (l)	2674.9	2866.5	2761.1	2896.4

1: Allandale Road & TCH NB Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBR	All
Denied Delay (hr)	0.0	0.2	0.0	0.0	0.5	71.5	72.2
Denied Del/Veh (s)	0.0	1.9	0.0	0.0	279.0	297.2	120.6
Total Delay (hr)	0.1	6.0	1.2	0.6	0.1	14.4	22.4
Total Del/Veh (s)	36.4	52.4	7.0	8.9	87.8	86.9	42.6
Stop Delay (hr)	0.1	5.7	0.5	0.2	0.1	13.9	20.4
Stop Del/Veh (s)	33.6	50.4	2.6	2.7	81.9	83.7	38.9

7: Allandale Road & Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	76.3	89.1	39.9	2.9	7.3	1.3	27.8	76.9	39.9	0.5	3.0	1.3
Denied Del/Veh (s)	619.8	628.7	658.5	56.5	50.1	52.6	547.7	562.8	541.9	62.0	33.2	29.7
Total Delay (hr)	38.1	8.1	18.5	66.1	140.7	22.6	15.6	18.6	1.3	2.2	31.8	0.6
Total Del/Veh (s)	358.4	75.6	418.1	1043.2	750.6	732.0	299.0	138.9	18.6	274.4	326.6	13.6
Stop Delay (hr)	36.8	5.4	17.8	66.4	139.7	22.5	14.6	16.1	0.8	2.2	31.4	0.4
Stop Del/Veh (s)	346.3	51.0	401.9	1049.1	744.9	729.5	279.7	120.2	11.6	272.9	322.9	8.2

7: Allandale Road & Prince Philip Drive Performance by movement

Movement	All
Denied Delay (hr)	366.1
Denied Del/Veh (s)	385.6
Total Delay (hr)	364.1
Total Del/Veh (s)	385.6
Stop Delay (hr)	354.1
Stop Del/Veh (s)	375.0

9: Westerland Road/Clinch Crescent & Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	3.3	21.3	4.1	0.0	0.0	0.0	0.1	0.0	0.1	3.6	5.9	7.5
Denied Del/Veh (s)	128.2	133.5	142.9	2.1	0.0	1.8	2.1	0.3	2.0	438.0	546.1	508.0
Total Delay (hr)	7.5	50.9	47.2	36.9	11.4	0.9	0.7	0.5	0.4	0.5	12.5	0.3
Total Del/Veh (s)	303.2	344.1	1634.0	2046.1	55.2	49.7	21.4	21.5	14.6	68.1	1073.5	25.7
Stop Delay (hr)	7.0	47.5	47.3	36.8	6.4	0.5	0.6	0.4	0.4	0.4	12.5	0.3
Stop Del/Veh (s)	282.7	320.8	1638.6	2040.3	30.9	29.4	18.4	18.3	13.6	64.0	1074.1	22.2

9: Westerland Road/Clinch Crescent & Prince Philip Drive Performance by movement

Movement	All
Denied Delay (hr)	46.0
Denied Del/Veh (s)	81.1
Total Delay (hr)	169.7
Total Del/Veh (s)	305.9
Stop Delay (hr)	160.1
Stop Del/Veh (s)	288.7

10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.1	0.0	41.1	170.7	29.3	29.0	546.1	95.0	0.0	0.0	0.0
Denied Del/Veh (s)	2.1	1.1	1.7	1494.4	1445.9	1466.9	1468.6	1533.5	1533.1	0.0	0.0	0.0
Total Delay (hr)	0.6	2.9	0.2	6.5	37.9	0.4	9.0	21.0	3.3	4.5	49.6	44.4
Total Del/Veh (s)	29.4	33.8	21.1	1559.4	2131.4	147.8	1911.6	234.3	213.3	370.1	361.2	1664.5
Stop Delay (hr)	0.5	2.2	0.2	6.5	37.9	0.4	8.9	19.3	3.0	4.2	46.2	44.3
Stop Del/Veh (s)	23.6	26.2	15.5	1560.5	2133.7	144.6	1895.2	215.0	196.1	344.7	336.7	1659.8

10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue Performance by movement

Movement	All
Denied Delay (hr)	911.3
Denied Del/Veh (s)	1048.5
Total Delay (hr)	180.2
Total Del/Veh (s)	423.5
Stop Delay (hr)	173.6
Stop Del/Veh (s)	407.9

11: Mt. Scio Road & Allandale Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.4	2.1	0.4	0.0	0.0	0.0	1.3	0.9	1.0	5.3	6.0	17.5
Denied Del/Veh (s)	10.4	9.9	14.3	0.2	0.0	0.0	46.4	46.7	41.0	196.6	200.3	212.4
Total Delay (hr)	4.7	33.9	3.6	0.7	8.9	0.3	3.4	3.3	3.4	4.6	2.6	5.3
Total Del/Veh (s)	134.3	159.6	122.3	54.4	56.7	34.4	130.1	182.3	157.2	210.4	108.7	80.1
Stop Delay (hr)	4.5	32.3	3.4	0.6	7.6	0.2	3.3	3.2	3.4	4.5	2.4	4.9
Stop Del/Veh (s)	128.1	152.1	116.3	47.8	48.4	28.3	126.3	177.1	153.9	204.4	99.6	74.1

11: Mt. Scio Road & Allandale Road Performance by movement

Movement	All
Denied Delay (hr)	34.9
Denied Del/Veh (s)	52.8
Total Delay (hr)	74.9
Total Del/Veh (s)	118.1
Stop Delay (hr)	70.4
Stop Del/Veh (s)	111.1

17: Allandale Road & TCH SB Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	2.8	0.1	3.0
Denied Del/Veh (s)	0.1	0.1	0.0	0.1	24.3	80.4	9.8
Total Delay (hr)	0.0	0.5	0.0	1.1	4.8	0.1	6.6
Total Del/Veh (s)	44.4	62.5	8.7	6.4	42.9	58.3	21.9
Stop Delay (hr)	0.0	0.5	0.0	0.0	4.5	0.1	5.1
Stop Del/Veh (s)	42.2	61.4	0.0	0.0	39.8	56.0	16.9

18: TCH SB Performance by movement

Movement	NBR	SBT	All
Denied Delay (hr)	0.2	3.5	3.7
Denied Del/Veh (s)	0.7	35.1	10.6
Total Delay (hr)	1.9	3.3	5.2
Total Del/Veh (s)	7.5	36.0	15.2
Stop Delay (hr)	0.0	3.3	3.3
Stop Del/Veh (s)	0.0	35.5	9.6

22: Allandale Road & Higgins Line Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	184.4	76.2	0.0	0.0	2.3	7.9	270.7
Denied Del/Veh (s)	1220.5	1287.6	0.0	0.0	70.3	60.2	419.8
Total Delay (hr)	25.0	5.8	0.8	0.7	0.7	18.9	52.0
Total Del/Veh (s)	789.8	554.2	5.3	5.7	22.7	147.8	109.6
Stop Delay (hr)	24.9	5.8	0.4	0.1	0.6	18.8	50.6
Stop Del/Veh (s)	786.4	551.2	2.6	1.2	18.8	147.0	106.8

24: Allandale Road & Confederation Building Lot Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	34.3	40.3	0.0	0.0	0.3	2.1	77.0
Denied Del/Veh (s)	467.5	459.5	0.0	0.1	12.6	18.3	137.1
Total Delay (hr)	13.7	1.4	3.6	0.2	1.5	42.6	63.0
Total Del/Veh (s)	294.9	25.4	16.5	4.6	67.8	350.5	123.1
Stop Delay (hr)	13.6	1.3	2.3	0.0	1.4	42.6	61.1
Stop Del/Veh (s)	292.5	23.1	10.7	0.1	61.7	350.0	119.3

29: Prince Philip Drive & Confederation Building Lot Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Delay (hr)	25.0	26.7	0.0	0.0	183.7	37.2	272.7
Denied Del/Veh (s)	312.4	329.5	0.2	0.0	570.0	558.7	369.6
Total Delay (hr)	3.7	11.8	0.6	0.7	32.4	1.7	51.0
Total Del/Veh (s)	60.3	197.2	14.5	5.0	177.5	46.0	96.2
Stop Delay (hr)	3.3	12.1	0.5	0.4	31.6	1.5	49.5
Stop Del/Veh (s)	54.8	201.7	11.2	2.9	173.0	40.6	93.3

34: Elizabeth Avenue & Westerland Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	39.1	35.9	0.1	0.0	0.1	75.2
Denied Del/Veh (s)	0.0	0.0	1367.8	1468.4	5.1	0.0	13.1	407.2
Total Delay (hr)	0.3	0.5	49.3	36.0	20.7	0.7	30.2	137.7
Total Del/Veh (s)	9.9	6.9	2087.4	1992.4	1201.0	1293.6	1620.8	732.2
Stop Delay (hr)	0.2	0.3	49.6	36.2	20.8	0.7	30.3	138.2
Stop Del/Veh (s)	5.6	3.9	2101.8	2007.6	1205.6	1300.3	1630.5	734.8

35: Prince Philip Drive & Clinch Crescent Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.1	0.6	0.0	0.0	6.8	29.9	37.4
Denied Del/Veh (s)	3.3	3.2	0.0	0.0	195.7	205.4	58.0
Total Delay (hr)	4.2	44.5	2.9	0.1	7.9	7.9	67.4
Total Del/Veh (s)	105.3	247.3	12.1	7.4	265.1	65.5	108.7
Stop Delay (hr)	3.9	43.4	1.3	0.0	7.7	6.9	63.1
Stop Del/Veh (s)	96.8	241.3	5.3	0.1	257.6	57.5	101.8

37: Thorburn Road & Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR	All
Denied Delay (hr)	168.5	318.2	98.6	0.0	0.0	0.0	0.0	0.0	224.9	495.6	395.1	1701.0
Denied Del/Veh (s)	912.3	908.4	915.0	0.0	0.0	0.0	0.0	0.0	1400.9	1419.4	1411.1	868.7
Total Delay (hr)	34.8	29.9	1.8	1.1	7.9	0.3	11.4	2.1	17.3	22.0	23.1	151.5
Total Del/Veh (s)	326.8	156.8	30.9	31.2	33.2	3.8	62.7	176.6	267.3	154.6	197.1	124.8
Stop Delay (hr)	33.4	26.0	1.4	1.0	6.1	0.0	10.1	2.0	16.6	18.2	19.6	134.5
Stop Del/Veh (s)	314.0	136.5	24.5	27.4	25.7	0.4	55.7	173.4	256.6	128.4	167.2	110.8

40: Prince Philip Drive & Wicklow Street Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	22.7	7.8	30.5
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	327.3	292.5	46.7
Total Delay (hr)	0.3	29.0	3.2	0.6	18.4	5.0	56.6
Total Del/Veh (s)	98.8	140.5	10.8	11.4	371.5	272.1	89.7
Stop Delay (hr)	0.3	28.0	1.2	0.3	18.1	4.9	52.8
Stop Del/Veh (s)	94.6	135.7	4.1	5.2	365.1	268.0	83.8

46: Stamps Lane/Oxen Pond Road & Freshwater Road Performance by movement

Movement	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	5.1	0.4	73.2	48.1	12.7	0.1	0.4	0.4	140.5
Denied Del/Veh (s)	0.0	0.0	24.7	37.8	781.5	770.0	801.7	17.8	8.6	7.2	165.0
Total Delay (hr)	45.3	4.3	26.7	1.4	25.7	17.6	4.1	0.1	1.5	1.4	128.2
Total Del/Veh (s)	158.1	54.3	124.5	118.2	378.2	380.7	371.9	27.2	30.6	24.3	154.6
Stop Delay (hr)	38.6	3.2	21.2	1.1	26.0	17.7	4.2	0.1	1.2	1.2	114.4
Stop Del/Veh (s)	134.8	40.3	98.6	95.3	382.0	383.1	376.2	21.9	24.3	20.4	138.0

47: Freshwater Road & Thorburn Road Performance by movement

Movement	EBT	WBT	WBR	SBL	SBT	SBR	All
Denied Delay (hr)	625.5	1.5	2.4	0.9	0.0	0.8	631.1
Denied Del/Veh (s)	1368.9	7.4	12.0	6.3	0.0	8.2	573.3
Total Delay (hr)	42.0	3.4	7.2	7.2	0.0	0.7	60.5
Total Del/Veh (s)	197.8	16.8	36.6	48.5	8.4	7.2	70.6
Stop Delay (hr)	41.5	2.3	5.8	6.8	0.0	0.5	56.9
Stop Del/Veh (s)	195.5	11.4	29.5	45.6	6.2	5.9	66.5

51: Freshwater Road & Elizabeth Avenue Performance by movement

Movement	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	75.6	81.6	4.0	0.2	0.1	161.4
Denied Del/Veh (s)	1537.8	349.8	332.0	1.2	0.6	311.7
Total Delay (hr)	41.3	22.0	1.1	10.9	5.6	80.9
Total Del/Veh (s)	1416.4	108.2	105.0	81.1	59.0	171.7
Stop Delay (hr)	41.7	18.3	1.0	8.4	3.8	73.2
Stop Del/Veh (s)	1429.5	90.2	90.0	62.8	40.0	155.4

52: Elizabeth Avenue & Paton Street Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.9	0.2	31.3	11.7	44.1
Denied Del/Veh (s)	0.0	0.0	53.3	94.9	1149.5	1006.5	221.2
Total Delay (hr)	0.0	0.2	5.9	0.6	42.5	18.0	67.3
Total Del/Veh (s)	3.3	1.7	339.2	244.0	2465.4	2494.9	358.3
Stop Delay (hr)	0.0	0.0	5.9	0.6	42.6	18.1	67.2
Stop Del/Veh (s)	0.6	0.2	339.7	246.2	2472.6	2502.4	358.1

55: Anderson Avenue & Elizabeth Avenue Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	57.5	77.5	135.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	1555.6	1567.7	567.0
Total Delay (hr)	0.1	0.0	18.1	43.8	29.8	19.3	111.2
Total Del/Veh (s)	1.2	0.4	1591.6	1677.5	2189.0	1447.5	569.2
Stop Delay (hr)	0.0	0.0	18.3	44.2	29.9	19.4	111.7
Stop Del/Veh (s)	0.0	0.1	1603.7	1691.2	2196.3	1451.9	571.9

59: Clinch Crescent & Arctic Avenue Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	382.7	13.4	0.0	0.0	17.8	268.8	682.7
Denied Del/Veh (s)	2065.4	2097.5	0.0	0.0	1682.1	1632.0	1560.3
Total Delay (hr)	35.0	0.0	0.0	0.1	1.4	26.6	63.1
Total Del/Veh (s)	2331.3		1.1	2.1	745.1	946.9	545.1
Stop Delay (hr)	35.0	0.0	0.0	0.0	1.4	26.6	63.1
Stop Del/Veh (s)	2334.0		0.3	1.2	745.6	946.7	544.8

61: Prince Philip Drive & Morrissey Drive Performance by movement

Movement	EBT	WBL	WBT	WBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.3	0.0	0.0	0.0	94.4	42.5	53.0	190.2
Denied Del/Veh (s)	1.8	0.1	0.0	0.1	1147.7	1124.8	1164.2	328.7
Total Delay (hr)	18.3	0.1	3.6	0.4	21.3	8.7	10.3	62.7
Total Del/Veh (s)	99.8	22.2	16.5	16.0	410.6	376.9	355.9	117.4
Stop Delay (hr)	15.6	0.1	1.7	0.2	20.7	8.4	10.0	56.7
Stop Del/Veh (s)	85.4	15.0	8.0	8.0	398.4	363.1	344.6	106.2

Total Network Performance

Denied Delay (hr)	5886.6
Denied Del/Veh (s)	943.9
Total Delay (hr)	2431.1
Total Del/Veh (s)	638.6
Stop Delay (hr)	2324.5
Stop Del/Veh (s)	610.5

Intersection: 1: Allandale Road & TCH NB

Movement	EB	WB	NB	NB
Directions Served	LT	T	LT	R
Maximum Queue (m)	147.9	4.0	154.8	22.8
Average Queue (m)	44.4	0.1	129.7	21.5
95th Queue (m)	150.1	4.0	189.1	24.8
Link Distance (m)	145.7	337.2	138.9	
Upstream Blk Time (%)	22		73	
Queuing Penalty (veh)	102		0	
Storage Bay Dist (m)				20.0
Storage Blk Time (%)			34	66
Queuing Penalty (veh)			285	4

Intersection: 7: Allandale Road & Prince Philip Drive

Movement	EB	EB	EB	EB	WB	WB	WB	B27	B27	NB	NB	NB
Directions Served	L	T	T	R	L	T	TR	T	T	L	T	R
Maximum Queue (m)	202.5	450.5	451.4	121.8	67.4	861.4	862.3	281.4	282.9	72.4	406.0	265.8
Average Queue (m)	170.5	340.2	315.8	65.4	64.1	851.3	851.7	254.5	254.3	68.7	278.5	170.9
95th Queue (m)	280.2	564.7	547.2	156.0	78.2	860.2	860.5	346.7	350.5	87.4	415.3	327.7
Link Distance (m)		438.1	438.1			834.7	834.7	270.6	270.6		443.9	443.9
Upstream Blk Time (%)		29	13			98	97	34	43		0	
Queuing Penalty (veh)		309	131			710	708	241	309		2	
Storage Bay Dist (m)	200.0			120.0	65.0					70.0		
Storage Blk Time (%)	64	22	4	41	55	34				57	17	
Queuing Penalty (veh)	335	193	20	206	259	117				554	56	

Intersection: 7: Allandale Road & Prince Philip Drive

Movement	SB	SB	SB	SB	SB	B1123	B1123
Directions Served	L	T	T	R	R	T	T
Maximum Queue (m)	44.4	129.0	124.5	66.8	18.6	511.2	511.8
Average Queue (m)	18.8	120.3	118.4	6.5	1.3	501.4	501.8
95th Queue (m)	52.5	125.6	123.3	37.0	12.7	524.6	523.9
Link Distance (m)		104.4	104.4	104.4		500.7	500.7
Upstream Blk Time (%)		96	89	0		61	66
Queuing Penalty (veh)		500	462	0		476	515
Storage Bay Dist (m)	42.0				35.0		
Storage Blk Time (%)	1	95		3	0		
Queuing Penalty (veh)	3	73		8	0		

Intersection: 9: Westerland Road/Clinch Crescent & Prince Philip Drive

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	TR	L	T	R	L	T
Maximum Queue (m)	77.4	581.4	580.0	182.7	91.7	394.4	395.2	37.5	51.4	28.6	37.6	85.4
Average Queue (m)	21.3	447.7	453.3	164.5	86.6	255.3	224.4	13.5	11.5	9.2	6.6	83.8
95th Queue (m)	65.2	780.4	773.0	225.0	107.8	450.6	436.1	28.1	37.9	23.5	30.6	85.3
Link Distance (m)		573.0	573.0			470.0	470.0		353.9		83.2	83.2
Upstream Blk Time (%)		49	50			3	0				1	90
Queuing Penalty (veh)		403	412			28	3				5	526
Storage Bay Dist (m)	75.0			185.0	90.0			60.0		45.0		
Storage Blk Time (%)	0	6	29	61	87	15		0	0	1		93
Queuing Penalty (veh)	1	13	70	395	633	19		0	1	6		482

Intersection: 9: Westerland Road/Clinch Crescent & Prince Philip Drive

Movement	SB
Directions Served	R
Maximum Queue (m)	75.9
Average Queue (m)	23.2
95th Queue (m)	81.8
Link Distance (m)	
Upstream Blk Time (%)	1
Queuing Penalty (veh)	0
Storage Bay Dist (m)	80.0
Storage Blk Time (%)	1
Queuing Penalty (veh)	3

Intersection: 10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	R	L	T	R
Maximum Queue (m)	55.4	151.3	48.0	291.2	260.5	57.1	246.8	37.4	42.3	455.4	463.5
Average Queue (m)	18.0	61.3	6.8	280.1	217.3	48.2	237.2	8.2	12.0	444.8	451.8
95th Queue (m)	49.8	121.5	36.6	332.9	410.4	72.7	245.0	30.8	36.5	459.8	474.0
Link Distance (m)		321.0		286.5	286.5		234.0			443.9	443.9
Upstream Blk Time (%)				93	53		84			48	68
Queuing Penalty (veh)				0	0		0			427	608
Storage Bay Dist (m)	55.0		55.0			55.0		35.0	40.0		
Storage Blk Time (%)	0	11	0	99		67	23	0	0	35	
Queuing Penalty (veh)	1	18	1	99		848	57	2	2	45	

Intersection: 11: Mt. Scio Road & Allandale Road

Movement	EB	EB	EB	WB	WB	WB	B2	B2	B3	B3	NB	NB
Directions Served	L	T	TR	L	T	TR	T	T	T	T	L	TR
Maximum Queue (m)	74.2	346.4	357.1	38.7	168.9	167.8	5.6	5.4	6.7	9.6	48.6	242.2
Average Queue (m)	22.6	155.0	161.7	6.9	54.6	47.4	0.2	0.2	0.5	0.7	16.6	76.2
95th Queue (m)	63.0	379.2	393.0	24.8	199.8	194.3	5.3	3.7	9.8	14.0	41.8	243.0
Link Distance (m)		337.2	337.2		543.7	543.7	178.6	178.6	73.6	73.6		309.7
Upstream Blk Time (%)		28	30		1	1				0		10
Queuing Penalty (veh)		177	192		6	6				0		0
Storage Bay Dist (m)	75.0			75.0							60.0	
Storage Blk Time (%)	0	38		0	9						0	25
Queuing Penalty (veh)	1	64		0	9						0	24

Intersection: 11: Mt. Scio Road & Allandale Road

Movement	SB	SB
Directions Served	L	TR
Maximum Queue (m)	62.4	111.3
Average Queue (m)	50.0	97.1
95th Queue (m)	82.1	122.9
Link Distance (m)		98.0
Upstream Blk Time (%)		64
Queuing Penalty (veh)		0
Storage Bay Dist (m)	60.0	
Storage Blk Time (%)	22	51
Queuing Penalty (veh)	81	51

Intersection: 17: Allandale Road & TCH SB

Movement	EB	WB	SB	SB
Directions Served	LT	TR	L	R
Maximum Queue (m)	29.8	0.9	120.3	20.1
Average Queue (m)	3.9	0.0	46.3	2.6
95th Queue (m)	20.2	0.9	118.3	13.3
Link Distance (m)	158.6	145.7	127.1	
Upstream Blk Time (%)			17	
Queuing Penalty (veh)			61	
Storage Bay Dist (m)				20.0
Storage Blk Time (%)			29	0
Queuing Penalty (veh)			2	0

Intersection: 18: TCH SB

Movement	SB
Directions Served	T
Maximum Queue (m)	125.2
Average Queue (m)	23.6
95th Queue (m)	109.0
Link Distance (m)	149.1
Upstream Blk Time (%)	12
Queuing Penalty (veh)	0
Storage Bay Dist (m)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 22: Allandale Road & Higgins Line

Movement	WB	WB	WB	NB	NB	NB	B4	SB	SB	SB	B3	B3
Directions Served	L	L	R	T	T	R	T	L	T	T	T	T
Maximum Queue (m)	122.4	124.8	42.5	51.0	72.5	69.8	5.6	73.5	90.4	89.0	200.2	196.5
Average Queue (m)	105.3	112.0	13.7	15.1	16.4	8.7	0.2	33.6	71.3	71.1	135.5	134.7
95th Queue (m)	134.6	142.8	46.3	36.5	47.7	46.6	5.7	88.5	112.3	110.3	272.2	269.7
Link Distance (m)	117.4	117.4		101.8	101.8		147.6		73.6	73.6	178.6	178.6
Upstream Blk Time (%)	45	84			0			1	70	75	62	62
Queuing Penalty (veh)	0	0			2			0	420	452	370	373
Storage Bay Dist (m)			40.0			80.0		80.0				
Storage Blk Time (%)		91	13		0	1		1	70			
Queuing Penalty (veh)		191	35		1	3		3	165			

Intersection: 22: Allandale Road & Higgins Line

Movement	B2	B2
Directions Served	T	T
Maximum Queue (m)	552.2	566.2
Average Queue (m)	279.7	290.4
95th Queue (m)	696.3	715.4
Link Distance (m)	543.7	543.7
Upstream Blk Time (%)	36	37
Queuing Penalty (veh)	210	219
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 24: Allandale Road & Confederation Building Lot

Movement	WB	WB	WB	NB	NB	NB	B1123	SB	SB	SB	B4	B4
Directions Served	L	L	R	T	T	R	T	L	T	T	T	T
Maximum Queue (m)	47.4	95.2	92.4	65.9	87.7	9.2	11.1	132.5	169.8	169.1	113.0	112.6
Average Queue (m)	34.8	77.6	34.7	33.2	46.9	0.3	0.4	69.9	155.0	154.7	94.6	94.7
95th Queue (m)	59.0	113.1	93.7	59.2	79.6	5.5	11.4	175.5	199.8	198.4	143.3	142.9
Link Distance (m)		87.5	87.5	500.7	500.7		104.4		147.6	147.6	101.8	101.8
Upstream Blk Time (%)		63	7				0		87	91	67	70
Queuing Penalty (veh)		0	0				0		655	685	501	530
Storage Bay Dist (m)	45.0					110.0		130.0				
Storage Blk Time (%)	8	74			0			1	86			
Queuing Penalty (veh)	10	100			0			5	182			

Intersection: 29: Prince Philip Drive & Confederation Building Lot

Movement	EB	EB	NB	NB	NB	B27	SB	SB	SB
Directions Served	L	R	L	T	T	T	T	T	R
Maximum Queue (m)	114.9	123.1	41.6	38.3	41.0	342.9	162.2	162.8	102.5
Average Queue (m)	73.3	90.3	15.2	9.4	11.9	15.3	136.0	132.3	61.2
95th Queue (m)	140.5	151.5	33.2	27.2	29.8	202.5	194.9	202.1	144.0
Link Distance (m)	108.9	108.9		270.6	270.6	834.7	148.3	148.3	
Upstream Blk Time (%)	19	60				0	70	71	
Queuing Penalty (veh)	0	0				0	0	0	
Storage Bay Dist (m)			75.0						100.0
Storage Blk Time (%)								69	2
Queuing Penalty (veh)								167	13

Intersection: 34: Elizabeth Avenue & Westerland Road

Movement	EB	EB	WB	B33	SB	SB
Directions Served	L	T	TR	T	L	R
Maximum Queue (m)	34.5	60.7	573.1	324.9	358.7	72.2
Average Queue (m)	12.4	19.2	567.6	322.6	356.0	71.3
95th Queue (m)	31.6	46.5	571.5	325.7	359.2	73.6
Link Distance (m)		391.9	553.5	321.0	353.9	
Upstream Blk Time (%)			100	91	90	
Queuing Penalty (veh)			771	700	674	
Storage Bay Dist (m)	35.0					70.0
Storage Blk Time (%)	0	2			20	99
Queuing Penalty (veh)	2	4			65	382

Intersection: 35: Prince Philip Drive & Clinch Crescent

Movement	EB	EB	EB	WB	WB	WB	SB	SB
Directions Served	L	T	T	T	T	R	L	R
Maximum Queue (m)	130.3	286.5	287.6	50.2	50.9	1.7	80.7	233.0
Average Queue (m)	47.5	169.4	169.8	20.1	21.3	0.1	53.8	117.2
95th Queue (m)	141.8	387.9	387.1	42.1	43.1	1.7	95.7	298.9
Link Distance (m)		280.6	280.6	573.0	573.0			269.1
Upstream Blk Time (%)		42	41					27
Queuing Penalty (veh)		376	370					0
Storage Bay Dist (m)	140.0					70.0	80.0	
Storage Blk Time (%)	0	53			0		30	2
Queuing Penalty (veh)	3	172			0		158	3

Intersection: 37: Thorburn Road & Prince Philip Drive

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	B36	B36	NB
Directions Served	L	T	T	R	L	T	T	T	R	T	T	T
Maximum Queue (m)	177.5	322.4	316.3	315.7	59.9	95.0	93.4	88.8	47.9	2.8	5.8	123.8
Average Queue (m)	153.1	313.3	300.0	194.6	20.7	46.2	45.8	41.3	2.8	0.2	0.3	69.3
95th Queue (m)	251.2	319.5	348.3	418.8	47.5	85.1	85.3	81.3	21.3	3.7	6.3	128.9
Link Distance (m)		308.0	308.0	308.0		134.5	134.5	134.5	134.5	222.8	222.8	126.5
Upstream Blk Time (%)		94	22	10		0	0	0				14
Queuing Penalty (veh)		0	0	0		1	1	1				76
Storage Bay Dist (m)	175.0				110.0							
Storage Blk Time (%)	66	48			0	0						
Queuing Penalty (veh)	387	286			0	1						

Intersection: 37: Thorburn Road & Prince Philip Drive

Movement	NB	B43	B43	SB	SB	SB	SB
Directions Served	TR	T	T	L	L	T	TR
Maximum Queue (m)	121.4	24.4	30.4	131.5	386.8	387.4	152.5
Average Queue (m)	73.1	7.6	9.4	54.7	375.0	378.5	147.4
95th Queue (m)	129.5	36.7	44.9	130.4	413.6	383.6	190.9
Link Distance (m)	126.5	52.2	52.2		372.8	372.8	
Upstream Blk Time (%)	16	1	8		37	77	
Queuing Penalty (veh)	85	3	41		0	0	
Storage Bay Dist (m)				150.0			150.0
Storage Blk Time (%)				10	14	11	50
Queuing Penalty (veh)				23	32	149	254

Intersection: 40: Prince Philip Drive & Wicklow Street

Movement	EB	EB	EB	B45	B45	B36	B36	WB	WB	SB	SB
Directions Served	L	T	T	T	T	T	T	T	TR	L	R
Maximum Queue (m)	27.5	213.0	210.3	229.7	229.4	121.2	122.5	84.7	204.2	62.4	271.5
Average Queue (m)	4.1	107.5	107.3	94.9	94.7	41.1	41.5	23.3	41.2	57.1	163.6
95th Queue (m)	22.0	263.3	264.0	279.4	278.6	140.1	141.1	61.6	131.2	69.8	341.8
Link Distance (m)		189.0	189.0	222.8	222.8	134.5	134.5	280.6	280.6		264.8
Upstream Blk Time (%)		43	43	33	33	23	23		0		44
Queuing Penalty (veh)		363	363	281	279	191	196		3		0
Storage Bay Dist (m)	50.0									60.0	
Storage Blk Time (%)	0	50								63	17
Queuing Penalty (veh)	0	12								61	42

Intersection: 46: Stamps Lane/Oxen Pond Road & Freshwater Road

Movement	EB	EB	WB	NB	SB	SB
Directions Served	T	R	TR	LTR	L	TR
Maximum Queue (m)	367.4	368.3	260.8	382.5	30.3	102.2
Average Queue (m)	360.6	348.9	258.5	373.8	4.7	53.9
95th Queue (m)	365.6	393.3	260.5	380.5	19.4	95.2
Link Distance (m)	357.5	357.5	256.2	366.1		137.9
Upstream Blk Time (%)	38	12	34	98		2
Queuing Penalty (veh)	453	151	513	0		0
Storage Bay Dist (m)					30.0	
Storage Blk Time (%)					0	24
Queuing Penalty (veh)					0	5

Intersection: 47: Freshwater Road & Thorburn Road

Movement	EB	EB	WB	WB	WB	SB	SB	SB	B43	B43
Directions Served	T	T	T	T	R	L	L	R	T	T
Maximum Queue (m)	176.6	177.6	162.2	212.7	32.5	71.0	68.3	54.7	83.0	93.0
Average Queue (m)	166.8	167.1	55.4	82.6	31.3	49.4	45.8	19.0	21.3	22.3
95th Queue (m)	172.0	173.0	148.5	218.7	36.5	84.1	78.7	40.0	77.4	84.1
Link Distance (m)	160.8	160.8	357.5	357.5		52.2	52.2	52.2	126.5	126.5
Upstream Blk Time (%)	98	93	0	3		27	19	1	0	1
Queuing Penalty (veh)	0	0	0	28		148	105	3	4	7
Storage Bay Dist (m)					30.0					
Storage Blk Time (%)				10	26					
Queuing Penalty (veh)				115	148					

Intersection: 51: Freshwater Road & Elizabeth Avenue

Movement	WB	NB	SB	SB
Directions Served	R	TR	L	T
Maximum Queue (m)	270.7	221.6	32.4	234.4
Average Queue (m)	269.1	212.5	31.9	169.5
95th Queue (m)	271.0	218.0	36.4	237.5
Link Distance (m)	266.6	206.4		256.2
Upstream Blk Time (%)	90	73		0
Queuing Penalty (veh)	550	0		3
Storage Bay Dist (m)			30.0	
Storage Blk Time (%)			54	4
Queuing Penalty (veh)			333	34

Intersection: 52: Elizabeth Avenue & Paton Street

Movement	EB	EB	WB	SB
Directions Served	L	T	TR	LR
Maximum Queue (m)	9.7	15.4	49.7	413.9
Average Queue (m)	0.7	1.4	47.2	397.9
95th Queue (m)	4.9	7.9	49.1	444.4
Link Distance (m)		266.6	45.6	410.7
Upstream Blk Time (%)			91	79
Queuing Penalty (veh)			599	0
Storage Bay Dist (m)	30.0			
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 55: Anderson Avenue & Elizabeth Avenue

Movement	EB	WB	WB	NB	NB
Directions Served	TR	L	T	L	R
Maximum Queue (m)	10.9	38.2	409.4	331.0	71.7
Average Queue (m)	0.5	15.7	406.3	323.8	22.2
95th Queue (m)	4.7	49.3	410.8	363.7	91.5
Link Distance (m)	45.6		391.9	325.0	
Upstream Blk Time (%)			100	97	
Queuing Penalty (veh)			797	0	
Storage Bay Dist (m)		40.0			100.0
Storage Blk Time (%)		1	99	98	1
Queuing Penalty (veh)		3	231	158	1

Intersection: 59: Clinch Crescent & Arctic Avenue

Movement	WB	WB	WB	NB	NB	SB
Directions Served	L	L	R	T	R	LT
Maximum Queue (m)	71.7	210.6	205.5	9.2	27.4	197.1
Average Queue (m)	16.1	205.8	178.0	0.9	5.5	190.5
95th Queue (m)	71.9	210.2	283.3	5.8	18.3	196.2
Link Distance (m)		205.9	205.9	83.2	83.2	188.1
Upstream Blk Time (%)		100	63			98
Queuing Penalty (veh)		0	0			0
Storage Bay Dist (m)	100.0					
Storage Blk Time (%)	0	100				
Queuing Penalty (veh)	0	286				

Intersection: 61: Prince Philip Drive & Morrisey Drive

Movement	EB	EB	WB	WB	WB	WB	SB	SB
Directions Served	T	T	L	T	T	R	L	TR
Maximum Queue (m)	282.4	275.5	18.1	59.6	65.5	14.4	42.4	295.1
Average Queue (m)	94.4	86.1	2.4	12.7	13.6	2.3	41.1	284.2
95th Queue (m)	281.6	272.9	11.0	61.9	64.5	9.8	50.4	290.0
Link Distance (m)	470.0	470.0		438.1	438.1			278.6
Upstream Blk Time (%)	2	2						93
Queuing Penalty (veh)	18	18						0
Storage Bay Dist (m)			70.0			30.0	40.0	
Storage Blk Time (%)				2	2	0	66	29
Queuing Penalty (veh)				1	4	0	182	77

Network Summary

Network wide Queuing Penalty: 29436

		Scenario 3 - AM Peak Hour						
Intersection		Synchro				SimTraffic		
Street	Movement	Delay/Veh (s)	LOS	V/C	Queue (m) 95th%ile	Delay/Veh (s)	Equivalent LOS	Queue (m) 95th%ile
Columbus Drive/ Prince Philip Drive & Thorburn Road		59.6	E			188.6	F	
Columbus Drive/ Prince Philip Drive	Eastbound Left - Turn	36.7	D	0.78	68.6	168.5	F	245.2
	Eastbound Through	97.6	F	1.11	246.2	303.3	F	335.6
	Eastbound Right - Turn	9.1	A	0.28	23.5	37.7	D	424.5
	Westbound Left - Turn	101.2	F	0.97	56.9	29.5	C	32.7
	Westbound Through	26.5	C	0.61	71.4	19.1	B	41.1
	Westbound Right - Turn	8.0	A	0.51	27.5	3.3	A	0.0
Thorburn Road	Northbound Through	32.4	C	0.73	63.8	28.5	C	44.5
	Northbound Right - Turn					33.7	C	51.7
	Southbound Left - Turn	131.4	F	1.15	123.0	679.5	F	157.0
	Southbound Through					115.5	F	522.0
	Southbound Right - Turn	24.2	C	0.55	83.6	106.9	F	145.8
Prince Philip Drive & Wicklow Street		8.5	A			69.3	E	
Prince Philip Drive	Eastbound Left - Turn	0.7	A	0.06	0.2	157.4	F	36.4
	Eastbound Through	4.7	A	0.74	117.3	123.4	F	257.7
	Westbound Through	5.7	A	0.46	43.6	6.9	A	23.5
	Westbound Right - Turn					6.8	A	132.2
Wicklow Street	Southbound Left - Turn	65.6	E	0.75	63.8	54.9	D	60.7
	Southbound Right - Turn	12.8	B	0.18	9.9	8.0	A	38.3
Prince Philip Drive & Clinch Crescent		17.5	B			95.8	F	
Prince Philip Drive	Eastbound Left - Turn	47.3	D	0.91	191.6	112.7	F	144.6
	Eastbound Through	3.7	A	0.54	57.2	188.4	F	323.5
	Westbound Through	17.8	B	0.72	75.7	13.0	B	38.8
	Westbound Right - Turn	2.0	A	0.32	6.3	7.6	A	16.0
Clinch Crescent	Southbound Left - Turn	62.8	E	0.60	28.8	105.5	F	58.6
	Southbound Right - Turn	14.5	B	0.75	0.0	3.5	A	39.9
Prince Philip Drive & Clinch Crescent/ Westerland Road		204.4	F			255.5	F	
Prince Philip Drive	Eastbound Left - Turn	526.4	F	2.10	370.2	545.5	F	77.4
	Eastbound Through	29.5	C	0.47	82.6	149.6	F	654.2
	Eastbound Right - Turn	8.1	A	0.37	29.2	94.7	F	143.7
	Westbound Left - Turn	17.6	B	0.36	16.8	225.2	F	104.5
	Westbound Through					318.8	F	504.2
	Westbound Right - Turn	246.2	F	1.47	203.8	537.3	F	494.3
Clinch Crescent/ Westerland Road	Northbound Left - Turn	28.5	C	0.27	17.4	191.0	F	75.1
	Northbound Through	225.3	F	1.41	220.7	163.9	F	438.0
	Northbound Right - Turn	3.6	A	0.25	0.0	161.3	F	60.7
	Southbound Left - Turn	123.4	F	1.07	74.4	79.3	E	75.0
	Southbound Through	40.7	D	0.44	64.0	30.5	C	62.8
	Southbound Right - Turn	6.7	A	0.43	19.6	9.3	A	38.3
Clinch Crescent & Arctic Avenue		14.8	B			57.9	F	
Arctic Avenue	Westbound Left - Turn	114.8	F	0.95	54.7	291.8	F	277.6
	Westbound Right - Turn	14.6	B	0.01	0.2	36.5	E	274.1
Clinch Crescent	Northbound Through					2.4	A	40.7
	Northbound Right - Turn					13.7	B	94.2
	Southbound Left - Turn	5.2	A	0.14	3.5	52.6	F	101.8
	Southbound Through					24.5	C	
Prince Philip Drive & Morrissey Drive		7.2	A			128.0	F	
Prince Philip Drive	Eastbound Through	3.7	A	0.44	17.8	7.0	A	23.7
	Westbound Left - Turn	2.6	A	0.26	3.9	133.2	F	89.2
	Westbound Through	3.1	A	0.42	39.2	185.7	F	610.2
	Westbound Right - Turn	1.6	A	0.62	1.9	224.5	F	39.8
Morrissey Drive	Southbound Left - Turn	63.9	E	0.71	55.3	56.1	E	49.5
	Southbound Through					71.8	E	
	Southbound Right - Turn	22.1	C	0.55	27.0	62.9	E	106.7
Prince Philip Drive & Allandale Road		71.9	E			257.5	F	
Prince Philip Drive	Eastbound Left - Turn	216.0	F	1.38	159.4	41.3	D	82.5
	Eastbound Through	38.4	D	0.52	70.8	37.8	D	57.6
	Eastbound Right - Turn	14.8	B	0.52	49.8	6.8	A	32.8
	Westbound Left - Turn	23.8	C	0.62	46.7	612.9	F	89.4
















	Westbound Through					707.5	F	1011.3
	Westbound Right - Turn	83.2	F	1.06	158.6	741.5	F	1010.3
Allandale Road	Northbound Left - Turn	186.1	F	1.32	158.8	462.2	F	73.7
	Northbound Through	5.3	A	0.40	13.7	297.6	F	467.4
	Northbound Right - Turn	0.6	D	0.27	0.3	35.5	D	528.0
	Southbound Left - Turn	43.8	D	0.25	21.7	57.6	E	45.0
	Southbound Through	64.1	E	0.91	113.8	54.3	D	117.7
	Southbound Right - Turn	28.7	C	0.62	86.6	40.9	D	152.9
Prince Philip Drive & Confederation Building Lot		8.2	A			28.3	C	
Prince Philip Drive	Eastbound Left - Turn	53.9	D	0.16	11.1	65.1	E	13.3
	Eastbound Right - Turn	22.6	C	0.12	5.1	15.6	B	10.2
Confederation Building Lot	Northbound Left - Turn	20.1	C	0.58	33.1	8.6	A	30.2
	Northbound Through	1.2	A	0.19	9.2	1.2	A	7.2
	Southbound Through	8.9	A	0.44	87.9	44.2	D	156.4
	Southbound Right - Turn	1.7	A	0.10	6.4	13.2	B	84.8
Bonaventure Avenue/ Allandale Road & Elizabeth Avenue		43.5	D			54.3	D	
Bonaventure Avenue/ Allandale Road	Eastbound Left - Turn	22.9	C	0.27	9.8	91.1	F	25.1
	Eastbound Through					14.4	B	
	Eastbound Right - Turn	34.5	C	0.59	71.7	8.6	A	52.0
	Westbound Left - Turn	30.6	C	0.25	17.3	37.9	D	42.7
	Westbound Through	73.5	E	0.93	130.2	46.5	D	113.4
	Westbound Right - Turn	1.6	A	0.16	0.0	5.8	A	17.4
Elizabeth Avenue	Northbound Left - Turn	19.1	B	0.53	28.6	131.6	F	66.8
	Northbound Through	73.6	E	1.04	316.4	153.9	F	255.1
	Northbound Right - Turn	0.6	A	0.10	1.1	125.7	F	36.0
	Southbound Left - Turn	18.0	B	0.32	4.0	29.8	C	22.8
	Southbound Through	19.8	B	0.71	133.2	12.4	B	120.0
	Southbound Right - Turn	4.6	A	0.32	26.2	8.4	A	192.0
Elizabeth Avenue & Westerland Road		32.2	C			74.4	E	
Elizabeth Avenue	Eastbound Left - Turn	32.4	C	0.97	78.6	141.4	F	43.2
	Eastbound Through	2.4	A	0.35	14.7	107.5	F	514.8
	Westbound Through					27.8	C	
	Westbound Right - Turn	45.8	D	0.94	161.8	56.1	E	191.4
Westerland Road	Southbound Left - Turn	78.0	E	0.75	61.8	66.3	E	50.6
	Southbound Right - Turn	24.5	C	0.49	25.3	4.2	A	10.5
Elizabeth Avenue & Anderson Avenue		7.8	A			34.6	D	
Elizabeth Avenue	Eastbound Through					9.2	A	
	Eastbound Right - Turn	0.0	-	0.55	0.0	5.8	A	56.6
	Westbound Left - Turn	11.0	B	0.16	4.2	14.0	B	22.4
	Westbound Through	0.0	-	0.13	0.0	4.7	A	0.9
Anderson Avenue	Northbound Left - Turn	39.5	E	0.68	37.6	66.9	F	216.7
	Northbound Right - Turn					152.7	F	102.8
Elizabeth Avenue & Paton Street		1.4	A			18.6	C	
Elizabeth Avenue	Eastbound Left - Turn	8.1	A	0.03	0.8	21.2	C	21.3
	Eastbound Through	0.0	-	0.52	0.0	21.7	C	166.6
	Westbound Through					1.3	A	
	Westbound Right - Turn	0.0	-	0.17	0.0	0.8	A	12.8
Paton Street	Southbound Left - Turn	29.9	D	0.25	7.1	64.4	F	28.9
	Southbound Right - Turn					38.3	E	
Elizabeth Avenue & Freshwater Road		69.2	E			50.1	D	
Elizabeth Avenue	Westbound Right - Turn	0.7	A	0.26	0.0	0.4	A	35.4
Freshwater Road	Northbound Through					13.5	B	
	Northbound Right - Turn	110.3	F	1.09	169.5	44.2	D	142.0
	Southbound Left - Turn	90.5	F	1.16	202.7	36.1	D	32.5
	Southbound Through	3.6	A	0.29	21.9	62.9	E	305.7
Freshwater Road & Stamps Lane/ Oxen Pond Road		51.1	D			5.0	A	
Freshwater Road	Eastbound Through	83.5	F	1.11	418.8	131.6	F	365.9
	Eastbound Right - Turn	2.7	A	0.32	15.7	36.9	D	391.4
	Westbound Through					14.0	B	
	Westbound Right - Turn	10.7	B	0.55	153.2	11.5	B	99.9
Stamps Lane/ Oxen Pond Road	Northbound Left - Turn					45.0	D	
	Northbound Through	65.7	E	0.83	128.5	45.5	D	79.4
	Northbound Right - Turn					45.5	D	
	Southbound Left - Turn	32.6	C	0.06	6.5	32.0	C	8.4
	Southbound Through	32.1	C	0.25	25.5	33.6	C	31.1

	Southbound Right - Turn	32.1	C	0.23	23.9	17.5	B	31.1
Freshwater Road & Thorburn Road		15.5	B			70.9	E	
Freshwater Road	Eastbound Through	17.8	B	0.59	111.1	139.8	F	176.0
	Westbound Through	5.5	A	0.18	12.8	6.3	A	19.7
	Westbound Right - Turn	1.2	A	0.45	0.3	5.5	A	23.1
Thorburn Road	Southbound Left - Turn	32.1	C	0.53	72.8	43.0	D	74.1
	Southbound Right - Turn	9.1	A	0.40	29.9	5.6	A	
Allandale Road & Confederation Building Lot		5.1	A			3.4	A	
Confederation Building Lot	Westbound Left - Turn	32.4	C	0.03	2.9	46.9	D	10.5
	Westbound Right - Turn	12.3	B	0.09	4.0	5.1	A	10.5
Allandale Road	Northbound Through	9.4	A	0.23	50.8	3.7	A	27.5
	Northbound Right - Turn	2.4	A	0.18	12.7	3.2	A	5.5
	Southbound Left - Turn	3.3	A	0.17	8.2	4.9	A	17.4
	Southbound Through	3.4	A	0.46	65.7	2.8	A	46.4
Allandale Road & Higgins Line		9.7	A			9.6	A	
Higgins Line	Westbound Left - Turn	45.7	D	0.65	45.1	37.7	D	59.8
	Westbound Right - Turn	10.2	B	0.27	12.3	4.2	A	18.2
Allandale Road	Northbound Through	4.5	A	0.19	7.7	4.7	A	19.6
	Northbound Right - Turn	0.9	A	0.24	0.3	2.9	A	0.0
	Southbound Left - Turn	1.9	A	0.14	2.0	4.8	A	17.6
	Southbound Through	3.8	A	0.49	8.7	4.2	A	49.2
Allandale Road & Mt. Scio Road		17.7	B			15.0	B	
Allandale Road	Eastbound Left - Turn	10.1	B	0.34	26.6	11.9	B	26.7
	Eastbound Through					12.1	B	54.7
	Eastbound Right - Turn	18.1	B	0.58	112.4	8.8	A	59.4
	Westbound Left - Turn	7.8	A	0.12	4.6	14.5	B	8.3
	Westbound Through					10.5	B	22.4
Mt. Scio Road	Westbound Right - Turn	10.3	B	0.27	18.1	2.9	A	19.7
	Northbound Left - Turn	29.0	C	0.17	10.5	38.0	D	
	Northbound Through					53.6	D	15.5
	Northbound Right - Turn	22.7	C	0.33	15.7	6.4	A	22.8
	Southbound Left - Turn	33.2	C	0.36	26.3	36.6	D	
	Southbound Through					42.7	D	38.6
	Southbound Right - Turn	28.4	C	0.66	41.5	20.5	C	60.1
Outer Ring Road NB & Allandale Road		124.7	F			10.7	B	
Allandale Road	Eastbound Left - Turn					3.6	A	
	Eastbound Through	0.2	A	0.00	0.1	1.3	A	3.6
	Westbound Through	0.0	-	0.29	0.0	1.6	A	0.0
	Westbound Right - Turn	0.0	-	0.12	0.0	4.3	A	0.0
Outer Ring Road SB	Northbound Left - Turn	237.4	F	1.48	396.9	18.5	C	151.2
	Northbound Right - Turn	0.0	-	0.00	0.0	17.4	C	26.5
Outer Ring Road SB & Allandale Road		5.1	A			4.1	A	
Allandale Road	Eastbound Left - Turn					1.2	A	
	Eastbound Through	1.1	A	0.00	0.1	0.5	A	0.0
	Westbound Through					2.3	A	
	Westbound Right - Turn	0.0	-	0.23	0.0	3.4	A	0.0
Outer Ring Road SB	Southbound Left - Turn	12.4	B	0.37	12.9	5.3	A	22.4
	Southbound Right - Turn	0.0	-	0.00	0.0	3.0	A	6.0

MUN Area Traffic Study
Allandale Road & Confederation Building Lot

Scenario 3 - 2025 AM

02/07/2015

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	 		 			 
Traffic Volume (vph)	13	17	526	213	109	1254
Future Volume (vph)	13	17	526	213	109	1254
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	4.0	4.8	4.0	3.5
Grade (%)	0%		0%			0%
Storage Length (m)	45.0	0.0		110.0	130.0	
Storage Lanes	1	1		1	1	
Taper Length (m)	2.5				2.5	
Lane Util. Factor	0.97	1.00	0.95	1.00	1.00	0.95
Ped Bike Factor						
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3395	1566	3697	1794	1848	3500
Flt Permitted	0.950				0.396	
Satd. Flow (perm)	3395	1566	3697	1794	770	3500
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		23		229		
Link Speed (k/h)	50		50			50
Link Distance (m)	100.1		513.4			163.6
Travel Time (s)	7.2		37.0			11.8
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.75	0.75	0.93	0.93	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Adj. Flow (vph)	17	23	566	229	116	1334
Shared Lane Traffic (%)						
Lane Group Flow (vph)	17	23	566	229	116	1334
Turn Type	Prot	Perm	NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2	6	
Total Split (s)	38.0	38.0	49.0	49.0	13.0	62.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Act Effect Green (s)	14.4	14.4	66.9	66.9	80.0	82.4
Actuated g/C Ratio	0.14	0.14	0.67	0.67	0.80	0.82
v/c Ratio	0.03	0.09	0.23	0.18	0.17	0.46
Control Delay	32.4	12.3	9.4	2.4	3.3	3.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.4	12.3	9.4	2.4	3.3	3.4
LOS	C	B	A	A	A	A
Approach Delay	20.8		7.4			3.3
Approach LOS	C		A			A
Stops (vph)	11	6	211	16	16	194
Fuel Used(l)	1	0	40	14	4	41
CO Emissions (g/hr)	13	8	749	253	65	758



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
NOx Emissions (g/hr)	2	2	145	49	13	146
VOC Emissions (g/hr)	3	2	173	58	15	175
Dilemma Vehicles (#)	0	0	0	0	0	0
Queue Length 50th (m)	1.5	0.0	21.5	0.0	2.1	19.8
Queue Length 95th (m)	2.9	4.0	50.8	12.7	8.2	65.7
Internal Link Dist (m)	76.1		489.4			139.6
Turn Bay Length (m)	45.0			110.0	130.0	
Base Capacity (vph)	1086	516	2474	1276	692	2884
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	0.02	0.04	0.23	0.18	0.17	0.46

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 53 (53%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.46

Intersection Signal Delay: 5.1

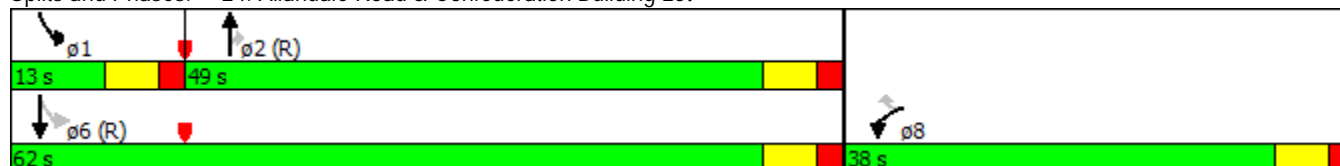
Intersection LOS: A

Intersection Capacity Utilization 53.0%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 24: Allandale Road & Confederation Building Lot



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	319	79	336	207	85	1044
Future Volume (vph)	319	79	336	207	85	1044
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	4.0	4.0	3.5	3.5	4.0	3.5
Grade (%)	0%		0%			0%
Storage Length (m)	0.0	40.0		80.0	80.0	
Storage Lanes	2	1		1	1	
Taper Length (m)	2.5				2.5	
Lane Util. Factor	0.97	1.00	0.95	1.00	1.00	0.95
Ped Bike Factor						
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3586	1654	3500	1566	1848	3500
Flt Permitted	0.950				0.461	
Satd. Flow (perm)	3586	1654	3500	1566	897	3500
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		86		259		
Link Speed (k/h)	50		50			60
Link Distance (m)	128.4		114.7			80.6
Travel Time (s)	9.2		8.3			4.8
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.80	0.80	0.83	0.83
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Adj. Flow (vph)	347	86	420	259	102	1258
Shared Lane Traffic (%)						
Lane Group Flow (vph)	347	86	420	259	102	1258
Turn Type	Prot	Perm	NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2	6	
Total Split (s)	29.0	29.0	54.0	54.0	17.0	71.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Act Effect Green (s)	14.9	14.9	62.2	62.2	73.1	73.1
Actuated g/C Ratio	0.15	0.15	0.62	0.62	0.73	0.73
v/c Ratio	0.65	0.27	0.19	0.24	0.14	0.49
Control Delay	45.7	10.2	4.5	0.9	1.9	3.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.7	10.2	4.5	0.9	1.9	3.8
LOS	D	B	A	A	A	A
Approach Delay	38.7		3.1			3.7
Approach LOS	D		A			A
Stops (vph)	291	16	62	6	8	231
Fuel Used(l)	22	2	11	6	7	86
CO Emissions (g/hr)	402	36	213	107	121	1597



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
NOx Emissions (g/hr)	78	7	41	21	23	308
VOC Emissions (g/hr)	93	8	49	25	28	368
Dilemma Vehicles (#)	0	0	0	0	0	37
Queue Length 50th (m)	33.0	0.0	5.5	0.0	0.8	5.7
Queue Length 95th (m)	45.1	12.3	7.7	0.3	2.0	8.7
Internal Link Dist (m)	104.4		90.7			56.6
Turn Bay Length (m)		40.0		80.0	80.0	
Base Capacity (vph)	824	446	2177	1072	760	2558
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	0.42	0.19	0.19	0.24	0.13	0.49

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 61 (61%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.65

Intersection Signal Delay: 9.7

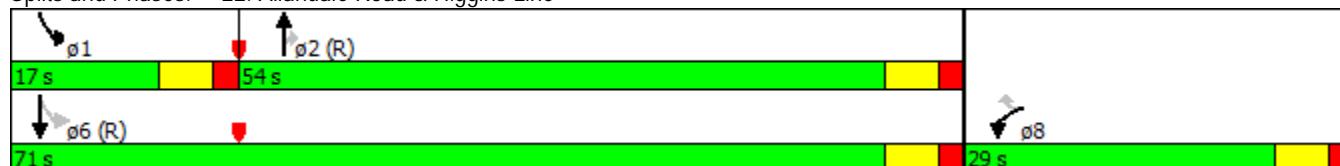
Intersection LOS: A

Intersection Capacity Utilization 50.8%

ICU Level of Service A

Analysis Period (min) 15





















Splits and Phases: 22: Allandale Road & Higgins Line















MUN Area Traffic Study
Allandale Road & Mt. Scio Road

Scenario 3 - 2025 AM

02/07/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	186	1004	64	29	329	57	27	29	38	87	52	149
Future Volume (vph)	186	1004	64	29	329	57	27	29	38	87	52	149
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.3	3.5	3.5	3.7	4.0	3.5	3.5	3.5	3.6	3.3	4.8
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	75.0		0.0	75.0		0.0	60.0		25.0	60.0		25.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.991			0.978			0.915			0.889	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1750	3390	0	1750	3500	0	1750	1685	0	1770	1601	0
Flt Permitted	0.418			0.188			0.395			0.638		
Satd. Flow (perm)	770	3390	0	346	3500	0	728	1685	0	1188	1601	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		7			25			49			122	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		368.0			559.6			322.8			111.1	
Travel Time (s)		22.1			33.6			23.2			8.0	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.96	0.96	0.96	0.82	0.82	0.82	0.78	0.78	0.78	0.87	0.87	0.87
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	194	1046	67	35	401	70	35	37	49	100	60	171
Shared Lane Traffic (%)												
Lane Group Flow (vph)	194	1113	0	35	471	0	35	86	0	100	231	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Total Split (s)	15.0	43.0		22.0	50.0		13.0	22.0		13.0	22.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Act Effect Green (s)	62.5	56.8		57.0	49.9		18.5	12.9		19.7	15.5	
Actuated g/C Ratio	0.62	0.57		0.57	0.50		0.18	0.13		0.20	0.16	
v/c Ratio	0.34	0.58		0.12	0.27		0.17	0.33		0.36	0.66	
Control Delay	10.1	18.1		7.8	10.3		29.0	22.7		33.2	28.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	10.1	18.1		7.8	10.3		29.0	22.7		33.2	28.4	
LOS	B	B		A	B		C	C		C	C	
Approach Delay		16.9			10.1			24.5			29.9	
Approach LOS		B			B			C			C	
Stops (vph)	77	691		9	100		22	29		70	94	
Fuel Used(l)	10	71		3	34		2	4		5	9	
CO Emissions (g/hr)	184	1326		48	635		36	72		88	160	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	35	256		9	123		7	14		17	31	
VOC Emissions (g/hr)	42	306		11	146		8	17		20	37	
Dilemma Vehicles (#)	0	53		0	25		0	0		0	0	
Queue Length 50th (m)	14.6	81.5		1.8	12.6		5.2	6.5		15.3	20.1	
Queue Length 95th (m)	26.6	112.4		4.6	18.1		10.5	15.7		26.3	41.5	
Internal Link Dist (m)		344.0			535.6			298.8			87.1	
Turn Bay Length (m)	75.0			75.0			60.0			60.0		
Base Capacity (vph)	571	1929		448	1759		206	310		274	379	
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	0.34	0.58		0.08	0.27		0.17	0.28		0.36	0.61	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.66

Intersection Signal Delay: 17.7

Intersection LOS: B

Intersection Capacity Utilization 73.1%

ICU Level of Service D

Analysis Period (min) 15
























Splits and Phases: 11: Mt. Scio Road & Allandale Road















MUN Area Traffic Study
Prince Philip Drive & Allandale Road

Scenario 3 - 2025 AM

02/07/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	349	452	324	195	760	55	493	335	218	45	597	625
Future Volume (vph)	349	452	324	195	760	55	493	335	218	45	597	625
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	3.8	3.8	3.0	3.7	3.7	3.5	3.5	3.5	3.0	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	200.0		120.0	65.0		25.0	70.0		0.0	42.0		35.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	0.95	0.88
Ped Bike Factor			0.98	1.00	1.00		1.00		0.98	1.00		
Frt			0.850		0.990				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1652	3618	1619	1652	3539	0	1750	1842	1566	1652	3500	2756
Flt Permitted	0.131			0.395			0.950			0.550		
Satd. Flow (perm)	228	3618	1593	686	3539	0	1748	1842	1541	954	3500	2756
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			341		6				229			91
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		455.9			851.6			464.8			121.6	
Travel Time (s)		23.4			43.8			33.5			8.8	
Confl. Peds. (#/hr)	3		2	2		2	2		2	2		2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.93	0.93	0.93	0.95	0.95	0.95	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	367	476	341	210	817	59	519	353	229	50	663	694
Shared Lane Traffic (%)												
Lane Group Flow (vph)	367	476	341	210	876	0	519	353	229	50	663	694
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Prot	NA	Perm	Perm	NA	pt+ov
Protected Phases	5	2		1	6		7	4			8	8 5
Permitted Phases	2		2	6					4	8		
Total Split (s)	21.0	37.0	37.0	19.0	35.0		33.0	64.0	64.0	31.0	31.0	
Total Lost Time (s)	6.0	7.0	7.0	6.0	7.0		6.0	6.0	6.0	6.0	6.0	
Act Effect Green (s)	46.5	30.5	30.5	41.5	28.0		27.0	58.0	58.0	25.0	25.0	46.0
Actuated g/C Ratio	0.39	0.25	0.25	0.35	0.23		0.22	0.48	0.48	0.21	0.21	0.38
v/c Ratio	1.38	0.52	0.52	0.62	1.06		1.32	0.40	0.27	0.25	0.91	0.62
Control Delay	216.0	38.4	14.8	23.8	83.2		186.1	5.3	0.6	43.8	64.1	28.7
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	216.0	38.4	14.8	23.8	83.2		186.1	5.3	0.6	43.8	64.1	28.7
LOS	F	D	B	C	F		F	A	A	D	E	C
Approach Delay		86.7			71.7			89.5			45.9	
Approach LOS		F			E			F			D	
Stops (vph)	231	394	229	145	728		368	94	10	38	547	435
Fuel Used(l)	81	47	26	28	159		101	18	10	5	78	61
CO Emissions (g/hr)	1509	883	479	520	2965		1871	340	185	95	1446	1139

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	291	170	93	100	572		361	66	36	18	279	220
VOC Emissions (g/hr)	348	204	111	120	684		432	78	43	22	333	263
Dilemma Vehicles (#)	0	28	0	0	31		0	0	0	0	0	0
Queue Length 50th (m)	~99.7	54.4	27.0	32.5	~118.5		~155.4	12.8	0.3	9.9	80.9	64.8
Queue Length 95th (m)	#159.4	70.8	49.8	46.7	#158.6		m#158.8	m13.7	m0.3	21.7	#113.8	86.6
Internal Link Dist (m)		431.9			827.6			440.8			97.6	
Turn Bay Length (m)	200.0		120.0	65.0			70.0			42.0		35.0
Base Capacity (vph)	266	920	660	344	830		393	890	863	198	729	1112
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	1.38	0.52	0.52	0.61	1.06		1.32	0.40	0.27	0.25	0.91	0.62

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green, Master Intersection

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.38

Intersection Signal Delay: 71.9

Intersection LOS: E

Intersection Capacity Utilization 111.1%

ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

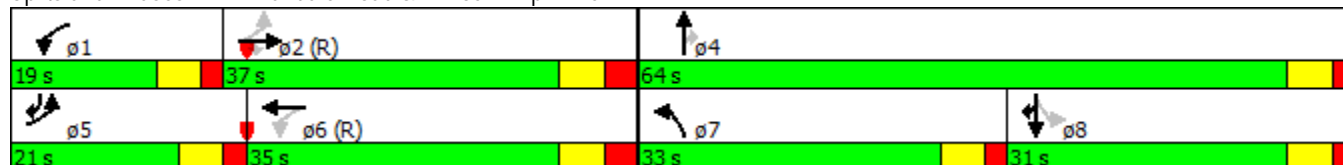
Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

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


















Splits and Phases: 7: Allandale Road & Prince Philip Drive







MUN Area Traffic Study
Allandale Road & TCH NB

Scenario 3 - 2025 AM

02/07/2015

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	278	0	0	357	149	3	0	976	0	0	0
Future Volume (Veh/h)	5	278	0	0	357	149	3	0	976	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.73	0.73	0.73	0.89	0.89	0.89	0.92	0.92	0.92
Hourly flow rate (vph)	5	296	0	0	489	204	3	0	1097	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)										3		
Median type	None				None							
Median storage (veh)												
Upstream signal (m)	368											
pX, platoon unblocked	0.93						0.93	0.93				
vC, conflicting volume	489				296			795	795	296	795	795
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	411				296			740	740	296	740	740
tC, single (s)	4.1				4.1			7.1	6.5	6.2	7.1	6.5
tC, 2 stage (s)												
tF (s)	2.2				2.2			3.5	4.0	3.3	3.5	4.0
p0 queue free %	100				100			99	100	0	0	100
cM capacity (veh/h)	1066				1265			307	318	743	0	318
Direction, Lane #	EB 1	WB 1	WB 2	NB 1								
Volume Total	301	489	204	1100								
Volume Left	5	0	0	3								
Volume Right	0	0	204	1097								
cSH	1066	1700	1700	745								
Volume to Capacity	0.00	0.29	0.12	1.48								
Queue Length 95th (m)	0.1	0.0	0.0	396.9								
Control Delay (s)	0.2	0.0	0.0	237.4								
Lane LOS	A				F							
Approach Delay (s)	0.2	0.0			237.4							
Approach LOS					F							
Intersection Summary												
Average Delay				124.7								
Intersection Capacity Utilization				82.0%	ICU Level of Service				E			
Analysis Period (min)				15								


























Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	18	8	352	266	1
Future Volume (Veh/h)	3	18	8	352	266	1
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	0.92	0.92	0.95	0.95
Hourly flow rate (vph)	3	18	9	383	280	1
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						3
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	9				224	200
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	9				224	200
tC, single (s)	4.6				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.7				3.5	3.3
p0 queue free %	100				63	100
cM capacity (veh/h)	1347				762	840
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	21	392	281			
Volume Left	3	0	280			
Volume Right	0	383	1			
cSH	1347	1700	765			
Volume to Capacity	0.00	0.23	0.37			
Queue Length 95th (m)	0.1	0.0	12.9			
Control Delay (s)	1.1	0.0	12.4			
Lane LOS	A		B			
Approach Delay (s)	1.1	0.0	12.4			
Approach LOS			B			
Intersection Summary						
Average Delay			5.1			
Intersection Capacity Utilization			43.6%	ICU Level of Service	A	
Analysis Period (min)			15			

MUN Area Traffic Study
Bonaventure Avenue/ Allandale Road & Elizabeth Avenue

Scenario 3 - 2025 AM

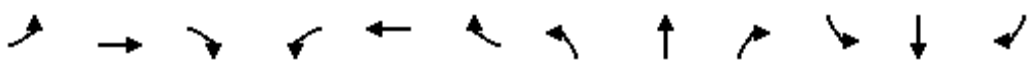
02/07/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	181	37	48	329	64	147	818	72	44	514	243
Future Volume (vph)	35	181	37	48	329	64	147	818	72	44	514	243
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	3.5	3.7	3.0	3.5	3.7	3.0	3.4	3.4	3.0	3.4	3.4
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	55.0		0.0	55.0		0.0	55.0		35.0	40.0		0.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.974				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1652	1794	0	1652	1842	1601	1652	1821	1548	1652	1821	1548
Flt Permitted	0.147			0.380			0.234			0.074		
Satd. Flow (perm)	256	1794	0	661	1842	1601	407	1821	1548	129	1821	1548
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8				136			136			270
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		335.6			298.1			241.6			464.8	
Travel Time (s)		24.2			21.5			17.4			33.5	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.83	0.83	0.83	0.78	0.78	0.78	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	42	218	45	62	422	82	163	909	80	49	571	270
Shared Lane Traffic (%)												
Lane Group Flow (vph)	42	263	0	62	422	82	163	909	80	49	571	270
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6		6	4		4	8		8
Total Split (s)	13.0	33.0		13.0	33.0	33.0	15.0	61.0	61.0	13.0	59.0	59.0
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
Act Effect Green (s)	35.2	29.6		35.2	29.6	29.6	64.8	57.6	57.6	60.2	53.2	53.2
Actuated g/C Ratio	0.29	0.25		0.29	0.25	0.25	0.54	0.48	0.48	0.50	0.44	0.44
v/c Ratio	0.27	0.59		0.25	0.93	0.16	0.53	1.04	0.10	0.32	0.71	0.32
Control Delay	22.9	34.5		30.6	73.5	1.6	19.1	73.6	0.6	18.0	19.8	4.6
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	22.9	34.5		30.6	73.5	1.6	19.1	73.6	0.6	18.0	19.8	4.6
LOS	C	C		C	E	A	B	E	A	B	B	A
Approach Delay		32.9			58.4			60.9			15.1	
Approach LOS		C			E			E			B	
Stops (vph)	21	287		34	276	2	70	666	1	18	426	103
Fuel Used(l)	4	31		3	34	2	7	80	2	3	40	14
CO Emissions (g/hr)	76	575		60	634	36	132	1489	32	55	745	258

MUN Area Traffic Study
Bonaventure Avenue/ Allandale Road & Elizabeth Avenue

Scenario 3 - 2025 AM

02/07/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	15	111		12	122	7	26	287	6	11	144	50
VOC Emissions (g/hr)	18	133		14	146	8	30	343	7	13	172	60
Dilemma Vehicles (#)	0	0		0	0	0	0	0	0	0	0	0
Queue Length 50th (m)	5.3	51.6		10.1	~105.3	0.0	17.6	~240.9	0.0	2.7	120.0	18.4
Queue Length 95th (m)	m9.8	71.7		17.3	#130.2	0.0	28.6	#316.4	1.1	m4.0	m133.2	m26.2
Internal Link Dist (m)		311.6			274.1			217.6			440.8	
Turn Bay Length (m)	55.0			55.0			55.0		35.0	40.0		
Base Capacity (vph)	156	448		252	454	497	313	873	814	153	807	836
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	0.27	0.59		0.25	0.93	0.16	0.52	1.04	0.10	0.32	0.71	0.32

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 69 (58%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.04

Intersection Signal Delay: 43.5

Intersection LOS: D

Intersection Capacity Utilization 95.6%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

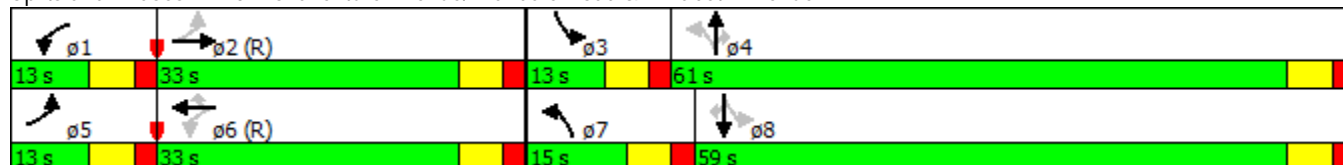
Queue shown is maximum after two cycles.












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

Queue shown is maximum after two cycles.

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

Splits and Phases: 10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue











































						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	278	4	432	1232	31	305
Future Volume (Veh/h)	278	4	432	1232	31	305
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	312	4	485	1384	35	343
Pedestrians	97		97			97
Lane Width (m)	3.7		4.0			3.7
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	8		9			8
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)			105			
pX, platoon unblocked						
vC, conflicting volume	1092	679			1966	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1092	679			1966	
tC, single (s)	6.5	6.2			4.2	
tC, 2 stage (s)						
tF (s)	3.6	3.3			2.3	
p0 queue free %	0	99			86	
cM capacity (veh/h)	163	380			259	
Direction, Lane #	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total	156	156	4	485	1384	378
Volume Left	156	156	0	0	0	35
Volume Right	0	0	4	0	1384	0
cSH	163	163	380	1700	1700	259
Volume to Capacity	0.95	0.95	0.01	0.29	0.81	0.14
Queue Length 95th (m)	54.7	54.7	0.2	0.0	0.0	3.5
Control Delay (s)	114.8	114.8	14.6	0.0	0.0	5.2
Lane LOS	F	F	B			A
Approach Delay (s)	113.5			0.0		5.2
Approach LOS	F					
Intersection Summary						
Average Delay			14.8			
Intersection Capacity Utilization			106.6%		ICU Level of Service	G
Analysis Period (min)			15			

MUN Area Traffic Study
Prince Philip Drive & Thorburn Road

Scenario 3 - 2025 AM

02/07/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			  			 		 	 	
Traffic Volume (vph)	270	1338	180	128	665	280	0	358	92	585	497	275
Future Volume (vph)	270	1338	180	128	665	280	0	358	92	585	497	275
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.8	4.2	3.5	3.8	4.0	2.4	3.8	4.3	3.5	3.8	3.8
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	175.0		0.0	110.0		90.0	0.0		0.0	150.0		150.0
Storage Lanes	1		1	1		0	0		0	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.95	0.95	0.97	0.95	0.95
Ped Bike Factor	1.00		0.98			0.98		1.00		1.00	0.99	
Frt			0.850			0.850		0.969			0.947	
Flt Protected	0.950			0.950						0.950		
Satd. Flow (prot)	1750	3618	1689	1750	5198	1654	0	3495	0	3395	3407	0
Flt Permitted	0.180			0.126						0.950		
Satd. Flow (perm)	331	3618	1662	232	5198	1627	0	3495	0	3385	3407	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			145			350		24			108	
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		327.2			152.5			152.8			386.6	
Travel Time (s)		16.8			7.8			11.0			27.8	
Confl. Peds. (#/hr)	2		2	2		2	2		2	2		2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.93	0.93	0.93	0.80	0.80	0.80	0.83	0.83	0.83	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	290	1439	194	160	831	350	0	431	111	616	523	289
Shared Lane Traffic (%)												
Lane Group Flow (vph)	290	1439	194	160	831	350	0	542	0	616	812	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm		NA		Prot	NA	
Protected Phases	5	2		1	6			4		3	8	
Permitted Phases	2		2	6		6						
Total Split (s)	29.0	50.0	50.0	13.0	34.0	34.0		32.0		25.0	57.0	
Total Lost Time (s)	6.0	7.0	7.0	6.0	7.0	7.0		7.0		6.0	7.0	
Act Effect Green (s)	56.8	43.0	43.0	39.7	31.7	31.7		25.0		19.0	50.0	
Actuated g/C Ratio	0.47	0.36	0.36	0.33	0.26	0.26		0.21		0.16	0.42	
v/c Ratio	0.78	1.11	0.28	0.97	0.61	0.51		0.73		1.15	0.55	
Control Delay	36.7	97.6	9.1	101.2	26.5	8.0		32.4		131.4	24.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Total Delay	36.7	97.6	9.1	101.2	26.5	8.0		32.4		131.4	24.2	
LOS	D	F	A	F	C	A		C		F	C	
Approach Delay		79.5			30.6			32.4			70.5	
Approach LOS		E			C			C			E	
Stops (vph)	173	1159	37	106	603	126		410		494	494	
Fuel Used(l)	22	187	8	21	72	21		30		92	54	
CO Emissions (g/hr)	417	3480	143	387	1342	387		557		1706	1000	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	80	672	28	75	259	75		108		329	193	
VOC Emissions (g/hr)	96	803	33	89	310	89		129		393	231	
Dilemma Vehicles (#)	0	49	0	0	5	0		0		0	0	
Queue Length 50th (m)	41.9	~203.9	7.6	23.8	63.3	14.7		64.6		~87.6	64.8	
Queue Length 95th (m)	68.6	#246.2	23.5	#56.9	71.4	27.5		63.8		#123.0	83.6	
Internal Link Dist (m)		303.2			128.5			128.8			362.6	
Turn Bay Length (m)	175.0			110.0		90.0				150.0		
Base Capacity (vph)	429	1296	688	165	1373	687		747		537	1482	
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	0.68	1.11	0.28	0.97	0.61	0.51		0.73		1.15	0.55	

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 25 (21%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.15

Intersection Signal Delay: 59.6

Intersection LOS: E

Intersection Capacity Utilization 103.3%

ICU Level of Service G

Analysis Period (min) 15

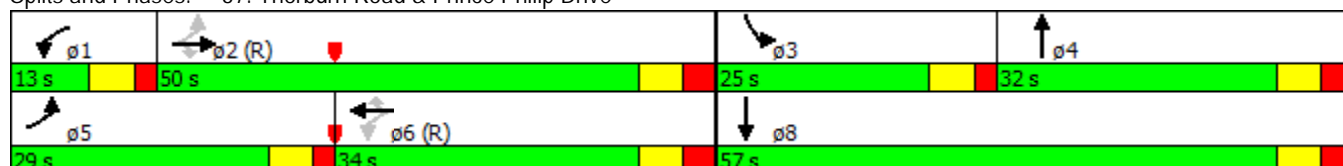
~ Volume exceeds capacity, queue is theoretically infinite.












Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

Splits and Phases: 37: Thorburn Road & Prince Philip Drive



						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	741	60	99	194	46	186
Future Volume (Veh/h)	741	60	99	194	46	186
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.90	0.90	0.85	0.85
Hourly flow rate (vph)	872	71	110	216	54	219
Pedestrians				2	17	
Lane Width (m)				3.7	3.7	
Walking Speed (m/s)				1.2	1.2	
Percent Blockage				0	1	
Right turn flare (veh)						13
Median type	None			None		
Median storage veh						
Upstream signal (m)	343					
pX, platoon unblocked						
vC, conflicting volume			960		1360	926
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			960		1360	926
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			84		60	32
cM capacity (veh/h)			706		136	320
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	943	110	216	273		
Volume Left	0	110	0	54		
Volume Right	71	0	0	219		
cSH	1700	706	1700	399		
Volume to Capacity	0.55	0.16	0.13	0.68		
Queue Length 95th (m)	0.0	4.2	0.0	37.6		
Control Delay (s)	0.0	11.0	0.0	39.5		
Lane LOS		B		E		
Approach Delay (s)	0.0	3.7		39.5		
Approach LOS				E		
Intersection Summary						
Average Delay			7.8			
Intersection Capacity Utilization			62.2%	ICU Level of Service		B
Analysis Period (min)			15			

MUN Area Traffic Study
Freshwater Road & Elizabeth Avenue

Scenario 3 - 2025 AM

02/07/2015

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	210	396	25	849	363
Future Volume (vph)	0	210	396	25	849	363
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.7	4.5	3.4	3.7	3.0	3.4
Grade (%)	0%		0%			0%
Storage Length (m)	0.0	0.0		0.0	30.0	
Storage Lanes	0	1		0	1	
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.99			
Frt		0.865	0.992			
Flt Protected					0.950	
Satd. Flow (prot)	0	1772	1798	0	1652	1821
Flt Permitted					0.105	
Satd. Flow (perm)	0	1772	1798	0	183	1821
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		714	3			
Link Speed (k/h)	50		50			50
Link Distance (m)	279.7		216.7			273.7
Travel Time (s)	20.1		15.6			19.7
Confl. Peds. (#/hr)				18	49	
Confl. Bikes (#/hr)						
Peak Hour Factor	0.94	0.94	0.80	0.80	0.91	0.91
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Adj. Flow (vph)	0	223	495	31	933	399
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	223	526	0	933	399
Turn Type		Perm	NA		pm+pt	NA
Protected Phases			2		1	6
Permitted Phases		8			6	
Total Split (s)		22.0	38.0		60.0	98.0
Total Lost Time (s)		6.0	6.0		6.0	6.0
Act Effect Green (s)		16.0	32.0		92.0	92.0
Actuated g/C Ratio		0.13	0.27		0.77	0.77
v/c Ratio		0.26	1.09		1.16	0.29
Control Delay		0.7	110.3		90.5	3.6
Queue Delay		0.0	0.0		0.0	0.0
Total Delay		0.7	110.3		90.5	3.6
LOS		A	F		F	A
Approach Delay			110.3			64.5
Approach LOS			F			E
Stops (vph)		1	355		581	121
Fuel Used(l)		6	52		94	13
CO Emissions (g/hr)		106	974		1752	245



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
NOx Emissions (g/hr)		21	188		338	47
VOC Emissions (g/hr)		25	225		404	56
Dilemma Vehicles (#)		0	0		0	0
Queue Length 50th (m)		0.0	~139.6		~243.6	24.3
Queue Length 95th (m)		m0.0	#169.5		m#202.7	m21.9
Internal Link Dist (m)	255.7		192.7			249.7
Turn Bay Length (m)					30.0	
Base Capacity (vph)		855	481		801	1396
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		0.26	1.09		1.16	0.29

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 113 (94%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.16

Intersection Signal Delay: 69.2

Intersection LOS: E

Intersection Capacity Utilization 79.5%

ICU Level of Service D

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

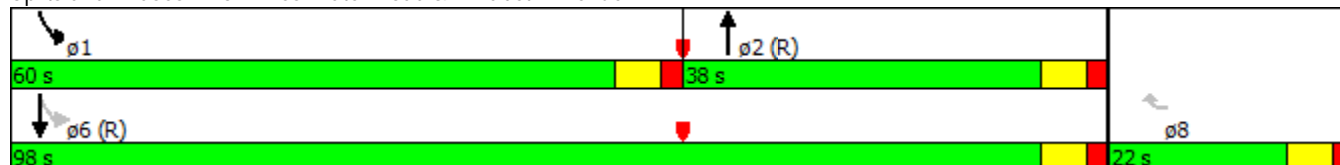
Queue shown is maximum after two cycles.

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





Queue shown is maximum after two cycles.

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

Splits and Phases: 51: Freshwater Road & Elizabeth Avenue



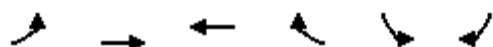


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	35	774	196	43	27	10
Future Volume (Veh/h)	35	774	196	43	27	10
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.87	0.87	0.81	0.81	0.80	0.80
Hourly flow rate (vph)	40	890	242	53	34	13
Pedestrians		81	70		23	
Lane Width (m)		3.0	3.7		4.5	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		6	6		2	
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)		280				
pX, platoon unblocked						
vC, conflicting volume	318				1332	372
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	318				1332	372
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				77	98
cM capacity (veh/h)	1212				151	620
Direction, Lane #	EB 1	EB 2	WB 1	SB 1		
Volume Total	40	890	295	47		
Volume Left	40	0	0	34		
Volume Right	0	0	53	13		
cSH	1212	1700	1700	191		
Volume to Capacity	0.03	0.52	0.17	0.25		
Queue Length 95th (m)	0.8	0.0	0.0	7.1		
Control Delay (s)	8.1	0.0	0.0	29.9		
Lane LOS	A			D		
Approach Delay (s)	0.3		0.0	29.9		
Approach LOS				D		
Intersection Summary						
Average Delay			1.4			
Intersection Capacity Utilization			60.1%	ICU Level of Service		B
Analysis Period (min)			15			

MUN Area Traffic Study
Westerland Road & Elizabeth Avenue

Scenario 3 - 2025 AM

02/07/2015



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	539	369	153	352	148	149
Future Volume (vph)	539	369	153	352	148	149
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	2.8	3.0	3.6	3.7	3.4	3.4
Grade (%)		0%	0%		0%	
Storage Length (m)	35.0			0.0	0.0	70.0
Storage Lanes	1			0	1	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.906			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1612	1739	1688	0	1730	1548
Flt Permitted	0.092				0.950	
Satd. Flow (perm)	156	1739	1688	0	1730	1548
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			100			169
Link Speed (k/h)		50	50		50	
Link Distance (m)		402.3	566.1		375.0	
Travel Time (s)		29.0	40.8		27.0	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.78	0.78	0.90	0.90	0.88	0.88
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	691	473	170	391	168	169
Shared Lane Traffic (%)						
Lane Group Flow (vph)	691	473	561	0	168	169
Turn Type	pm+pt	NA	NA		Prot	Perm
Protected Phases	5	2	6		8	
Permitted Phases	2					8
Total Split (s)	53.0	96.0	43.0		24.0	24.0
Total Lost Time (s)	6.0	6.0	6.0		6.0	6.0
Act Effect Green (s)	92.4	92.4	37.5		15.6	15.6
Actuated g/C Ratio	0.77	0.77	0.31		0.13	0.13
v/c Ratio	0.97	0.35	0.94		0.75	0.49
Control Delay	32.4	2.4	45.8		78.0	24.5
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	32.4	2.4	45.8		78.0	24.5
LOS	C	A	D		E	C
Approach Delay		20.2	45.8		51.2	
Approach LOS		C	D		D	
Stops (vph)	318	74	388		146	150
Fuel Used(l)	41	16	70		17	11
CO Emissions (g/hr)	766	306	1297		324	213



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
NOx Emissions (g/hr)	148	59	250		63	41
VOC Emissions (g/hr)	177	70	299		75	49
Dilemma Vehicles (#)	0	0	0		0	0
Queue Length 50th (m)	99.4	12.9	94.5		40.9	7.4
Queue Length 95th (m)	m78.6	m14.7	m#161.8		61.8	25.3
Internal Link Dist (m)		378.3	542.1		351.0	
Turn Bay Length (m)	35.0					70.0
Base Capacity (vph)	714	1339	595		259	375
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	0.97	0.35	0.94		0.65	0.45

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 47 (39%), Referenced to phase 2:EBTL and 6:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.97

Intersection Signal Delay: 32.2

Intersection LOS: C

Intersection Capacity Utilization 82.9%

ICU Level of Service E

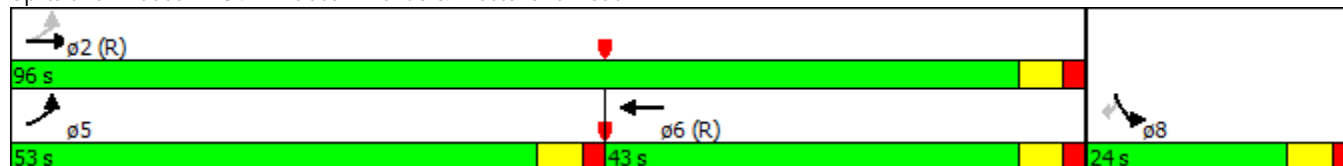
Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

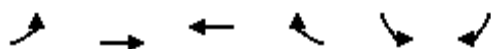
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 34: Elizabeth Avenue & Westerland Road





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑	↗	↖↗	↗
Traffic Volume (vph)	0	1137	325	451	547	258
Future Volume (vph)	0	1137	325	451	547	258
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.7	3.7	3.7	3.7	3.7	3.7
Grade (%)		0%	0%		0%	
Storage Length (m)	0.0			30.0	0.0	0.0
Storage Lanes	0			1	2	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Ped Bike Factor						
Frt				0.850		0.850
Flt Protected					0.950	
Satd. Flow (prot)	0	3579	3579	1601	3471	1601
Flt Permitted					0.950	
Satd. Flow (perm)	0	3579	3579	1601	3471	1601
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				513		284
Link Speed (k/h)		50	50		50	
Link Distance (m)		173.6	374.8		70.3	
Travel Time (s)		12.5	27.0		5.1	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.94	0.94	0.88	0.88	0.91	0.91
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	0	1210	369	513	601	284
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1210	369	513	601	284
Turn Type		NA	NA	Perm	Prot	Perm
Protected Phases		4	8		6	
Permitted Phases				8		6
Total Split (s)		75.0	75.0	75.0	45.0	45.0
Total Lost Time (s)		6.0	6.0	6.0	6.0	6.0
Act Effect Green (s)		69.0	69.0	69.0	39.0	39.0
Actuated g/C Ratio		0.58	0.58	0.58	0.32	0.32
v/c Ratio		0.59	0.18	0.45	0.53	0.40
Control Delay		17.8	5.5	1.2	32.1	9.1
Queue Delay		0.0	0.0	0.0	0.0	0.0
Total Delay		17.8	5.5	1.2	32.1	9.1
LOS		B	A	A	C	A
Approach Delay		17.8	3.0		24.7	
Approach LOS		B	A		C	
Stops (vph)		699	69	1	440	76
Fuel Used(l)		50	14	16	35	9
CO Emissions (g/hr)		931	270	307	650	167



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
NOx Emissions (g/hr)		180	52	59	125	32
VOC Emissions (g/hr)		215	62	71	150	39
Dilemma Vehicles (#)		0	0	0	0	0
Queue Length 50th (m)		91.4	10.1	0.0	61.5	18.2
Queue Length 95th (m)		111.1	m12.8	m0.3	m72.8	m29.9
Internal Link Dist (m)		149.6	350.8		46.3	
Turn Bay Length (m)				30.0		
Base Capacity (vph)		2057	2057	1138	1128	712
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		0.59	0.18	0.45	0.53	0.40

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 38 (32%), Referenced to phase 4:EBT and 8:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.59

Intersection Signal Delay: 15.5

Intersection LOS: B

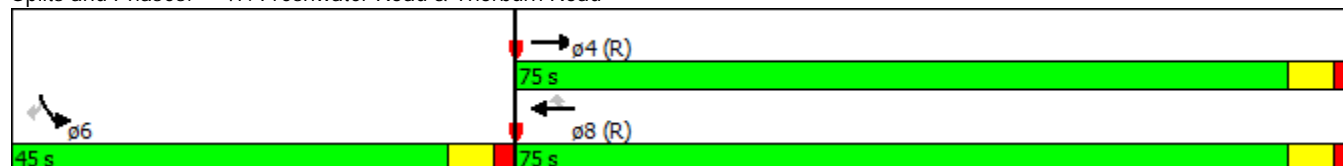
Intersection Capacity Utilization 57.0%

ICU Level of Service B

Analysis Period (min) 15

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
























Splits and Phases: 47: Freshwater Road & Thorburn Road



MUN Area Traffic Study
Prince Philip Drive & Westerland Road/ Clinch Crescent

Scenario 3 - 2025 AM

02/07/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	766	680	253	80	702	380	77	518	89	159	192	231
Future Volume (vph)	766	680	253	80	702	380	77	518	89	159	192	231
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	4.0	3.5	3.5	3.5	3.5	3.0	3.0	3.5	3.3	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	75.0		185.0	90.0		0.0	60.0		45.0	0.0		80.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.88	0.96	0.99		1.00		0.69			0.98
Frt			0.850		0.947				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1750	3697	1566	1750	3296	0	1652	1739	1566	1711	1842	1566
Flt Permitted	0.100			0.379			0.532			0.129		
Satd. Flow (perm)	184	3697	1381	672	3296	0	923	1739	1087	232	1842	1541
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			266		84				200			251
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		591.3			489.3			375.0			105.3	
Travel Time (s)		30.4			25.2			27.0			7.6	
Confl. Peds. (#/hr)	2		30	30		2	2		150	150		2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.74	0.74	0.74	0.82	0.82	0.82	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	806	716	266	108	949	514	94	632	109	173	209	251
Shared Lane Traffic (%)												
Lane Group Flow (vph)	806	716	266	108	1463	0	94	632	109	173	209	251
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2		2	6			4		4	8		8
Total Split (s)	28.0	56.0	56.0	13.0	41.0		13.0	38.0	38.0	13.0	38.0	38.0
Total Lost Time (s)	6.0	7.0	7.0	6.0	7.0		6.0	7.0	7.0	6.0	7.0	7.0
Act Effect Green (s)	63.0	49.0	49.0	42.0	34.0		39.0	31.0	31.0	39.0	31.0	31.0
Actuated g/C Ratio	0.52	0.41	0.41	0.35	0.28		0.32	0.26	0.26	0.32	0.26	0.26
v/c Ratio	2.10	0.47	0.37	0.36	1.47		0.27	1.41	0.25	1.07	0.44	0.43
Control Delay	526.4	29.5	8.1	17.6	246.2		28.5	225.3	3.6	123.4	40.7	6.7
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	526.4	29.5	8.1	17.6	246.2		28.5	225.3	3.6	123.4	40.7	6.7
LOS	F	C	A	B	F		C	F	A	F	D	A
Approach Delay		250.3			230.5			174.2			49.9	
Approach LOS		F			F			F			D	
Stops (vph)	491	533	70	42	725		63	405	11	98	158	24
Fuel Used(l)	369	72	17	6	280		6	117	4	19	11	4
CO Emissions (g/hr)	6858	1331	313	114	5211		109	2183	68	351	214	75

Synchro 9 Report

MUN Area Traffic Study
Prince Philip Drive & Westerland Road/ Clinch Crescent

Scenario 3 - 2025 AM

02/07/2015



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	1324	257	60	22	1006		21	421	13	68	41	15
VOC Emissions (g/hr)	1582	307	72	26	1202		25	503	16	81	49	17
Dilemma Vehicles (#)	0	19	0	0	36		0	0	0	0	0	0
Queue Length 50th (m)	~295.4	73.4	12.2	11.7	~239.9		16.7	~206.4	0.0	~29.5	41.3	0.0
Queue Length 95th (m)	#370.2	82.6	29.2	16.8	#203.8		m17.4 m#220.7	m0.0	m0.0	#74.4	64.0	19.6
Internal Link Dist (m)		567.3			465.3			351.0			81.3	
Turn Bay Length (m)	75.0		185.0	90.0			60.0		45.0			80.0
Base Capacity (vph)	383	1509	721	298	994		342	449	429	161	475	584
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	2.10	0.47	0.37	0.36	1.47		0.27	1.41	0.25	1.07	0.44	0.43

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 41 (34%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 2.10

Intersection Signal Delay: 204.4

Intersection LOS: F

Intersection Capacity Utilization 131.8%

ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

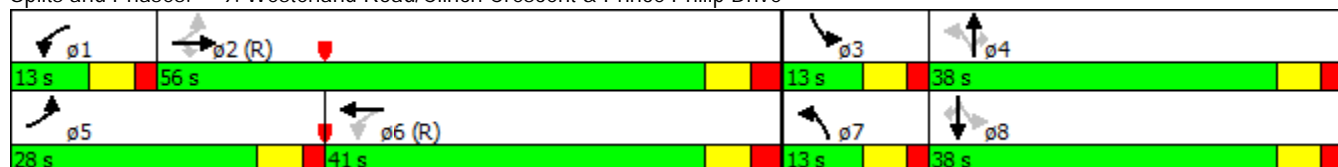
Queue shown is maximum after two cycles.

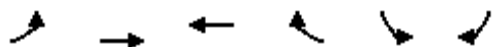
95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

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

Splits and Phases: 9: Westerland Road/Clinch Crescent & Prince Philip Drive





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	648	1483	819	188	71	242
Future Volume (vph)	648	1483	819	188	71	242
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	4.0	4.0	3.7	3.3	3.5
Grade (%)		0%	0%		0%	
Storage Length (m)	140.0			70.0	80.0	0.0
Storage Lanes	1			1	1	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Ped Bike Factor				0.97	1.00	0.98
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1652	3697	3697	1601	1711	1566
Flt Permitted	0.132				0.950	
Satd. Flow (perm)	229	3697	3697	1558	1704	1541
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				184		390
Link Speed (k/h)		70	70		50	
Link Distance (m)		289.0	591.3		280.3	
Travel Time (s)		14.9	30.4		20.2	
Confl. Peds. (#/hr)	2			2	2	2
Confl. Bikes (#/hr)						
Peak Hour Factor	0.96	0.96	0.92	0.92	0.62	0.62
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	675	1545	890	204	115	390
Shared Lane Traffic (%)						
Lane Group Flow (vph)	675	1545	890	204	115	390
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	5	2	6		8	
Permitted Phases	2			6		8
Total Split (s)	56.0	96.0	40.0	40.0	24.0	24.0
Total Lost Time (s)	6.0	7.0	7.0	7.0	6.0	6.0
Act Effect Green (s)	94.4	93.4	40.2	40.2	13.6	13.6
Actuated g/C Ratio	0.79	0.78	0.34	0.34	0.11	0.11
v/c Ratio	0.91	0.54	0.72	0.32	0.60	0.75
Control Delay	47.3	3.7	17.8	2.0	62.8	14.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	47.3	3.7	17.8	2.0	62.8	14.5
LOS	D	A	B	A	E	B
Approach Delay		17.0	14.9		25.5	
Approach LOS		B	B		C	
Stops (vph)	602	214	576	41	66	27
Fuel Used(l)	65	48	76	11	7	10
CO Emissions (g/hr)	1214	902	1413	207	127	181



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
NOx Emissions (g/hr)	234	174	273	40	24	35
VOC Emissions (g/hr)	280	208	326	48	29	42
Dilemma Vehicles (#)	0	93	16	0	0	0
Queue Length 50th (m)	104.4	20.2	88.2	4.4	26.2	0.0
Queue Length 95th (m)	#191.6	57.2	m75.7	m6.3	28.8	0.0
Internal Link Dist (m)		265.0	567.3		256.3	
Turn Bay Length (m)	140.0			70.0	80.0	
Base Capacity (vph)	780	2877	1238	644	256	562
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	0.87	0.54	0.72	0.32	0.45	0.69

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 86 (72%), Referenced to phase 2:EBTL and 6:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.91

Intersection Signal Delay: 17.5

Intersection LOS: B

Intersection Capacity Utilization 83.1%

ICU Level of Service E

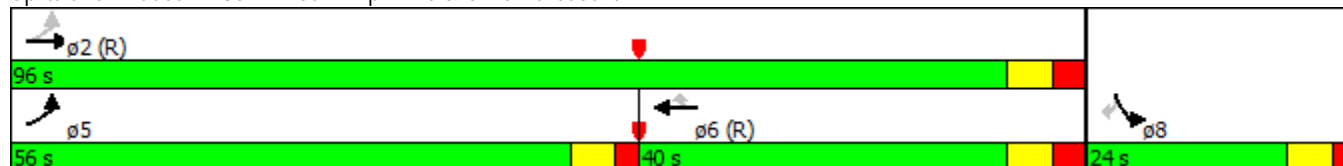
Analysis Period (min) 15

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.

Splits and Phases: 35: Prince Philip Drive & Clinch Crescent





Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	17	13	210	505	998	112
Future Volume (vph)	17	13	210	505	998	112
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	4.0	3.5	4.0	3.7	4.0
Grade (%)	0%			0%	0%	
Storage Length (m)	0.0	0.0	75.0			100.0
Storage Lanes	1	1	1			1
Taper Length (m)	2.5		2.5			
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Ped Bike Factor						
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1750	1654	1750	3697	3579	1654
Flt Permitted	0.950		0.199			
Satd. Flow (perm)	1750	1654	367	3697	3579	1654
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		18				129
Link Speed (k/h)	50			70	70	
Link Distance (m)	119.9			283.2	155.8	
Travel Time (s)	8.6			14.6	8.0	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.74	0.74	0.81	0.81	0.87	0.87
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	23	18	259	623	1147	129
Shared Lane Traffic (%)						
Lane Group Flow (vph)	23	18	259	623	1147	129
Turn Type	Prot	Perm	pm+pt	NA	NA	Perm
Protected Phases	8		5	2	6	
Permitted Phases		8	2			6
Total Split (s)	23.0	23.0	30.0	97.0	67.0	67.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Act Effect Green (s)	10.0	10.0	104.4	106.8	87.3	87.3
Actuated g/C Ratio	0.08	0.08	0.87	0.89	0.73	0.73
v/c Ratio	0.16	0.12	0.58	0.19	0.44	0.10
Control Delay	53.9	22.6	20.1	1.2	8.9	1.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	53.9	22.6	20.1	1.2	8.9	1.7
LOS	D	C	C	A	A	A
Approach Delay	40.2			6.7	8.2	
Approach LOS	D			A	A	
Stops (vph)	18	5	149	41	398	7
Fuel Used(l)	1	0	29	49	37	2
CO Emissions (g/hr)	24	9	543	910	687	35

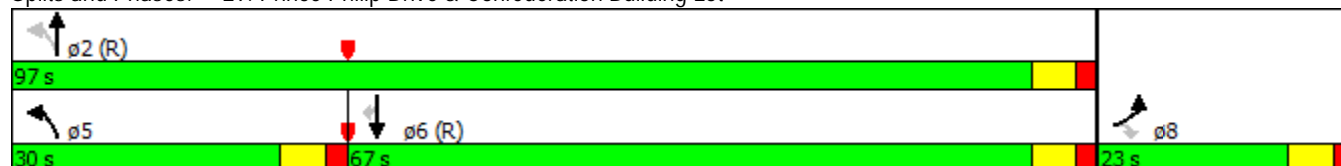


Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
NOx Emissions (g/hr)	5	2	105	176	133	7
VOC Emissions (g/hr)	6	2	125	210	159	8
Dilemma Vehicles (#)	0	0	0	13	42	0
Queue Length 50th (m)	5.1	0.0	21.7	8.1	59.3	0.0
Queue Length 95th (m)	11.1	5.1	33.1	9.2	87.9	6.4
Internal Link Dist (m)	95.9			259.2	131.8	
Turn Bay Length (m)			75.0			100.0
Base Capacity (vph)	247	249	596	3290	2605	1239
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	0.09	0.07	0.43	0.19	0.44	0.10

Intersection Summary

Area Type: Other
 Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 35 (29%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.58
 Intersection Signal Delay: 8.2
 Intersection LOS: A
 Intersection Capacity Utilization 62.6%
 ICU Level of Service B
 Analysis Period (min) 15

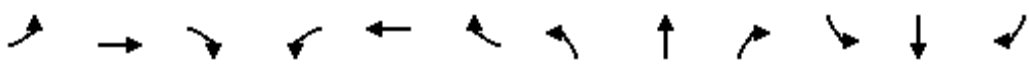
Splits and Phases: 29: Prince Philip Drive & Confederation Building Lot















MUN Area Traffic Study
Prince Philip Drive & Morrissey Drive

Scenario 3 - 2025 AM

02/07/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑	↗				↖	↗	
Traffic Volume (vph)	0	929	0	95	1043	740	0	0	0	148	33	119
Future Volume (vph)	0	929	0	95	1043	740	0	0	0	148	33	119
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.8	3.8	3.7	3.7	3.8	3.5	3.7	3.7	3.7	3.5	3.7	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	0.0		0.0	70.0		30.0	0.0		0.0	40.0		0.0
Storage Lanes	0		0	1		1	0		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
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	1.00
Ped Bike Factor						0.95				0.94	0.95	
Frt						0.850					0.882	
Flt Protected				0.950						0.950		
Satd. Flow (prot)	0	3618	0	1789	3618	1566	0	0	0	1750	1574	0
Flt Permitted				0.221						0.950		
Satd. Flow (perm)	0	3618	0	416	3618	1483	0	0	0	1652	1574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						666					127	
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		489.3			455.9			119.6			292.8	
Travel Time (s)		25.2			23.4			8.6			21.1	
Confl. Peds. (#/hr)	2		2	3		10				25		25
Confl. Bikes (#/hr)												
Peak Hour Factor	0.91	0.91	0.92	0.93	0.93	0.93	0.92	0.92	0.92	0.82	0.82	0.82
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	1021	0	102	1122	796	0	0	0	180	40	145
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1021	0	102	1122	796	0	0	0	180	185	0
Turn Type		NA		pm+pt	NA	Perm				pm+pt	NA	
Protected Phases		2		1	6					7	4	
Permitted Phases				6		6				4		
Total Split (s)		78.0		13.0	91.0	91.0				29.0	29.0	
Total Lost Time (s)		7.0		6.0	7.0	7.0				6.0	6.0	
Act Effect Green (s)		76.4		90.6	89.6	89.6				17.4	17.4	
Actuated g/C Ratio		0.64		0.76	0.75	0.75				0.14	0.14	
v/c Ratio		0.44		0.26	0.42	0.62				0.71	0.55	
Control Delay		3.7		2.6	3.1	1.6				63.9	22.1	
Queue Delay		0.0		0.0	0.0	0.0				0.0	0.0	
Total Delay		3.7		2.6	3.1	1.6				63.9	22.1	
LOS		A		A	A	A				E	C	
Approach Delay		3.7			2.5						42.7	
Approach LOS		A			A						D	
Stops (vph)		125		11	230	110				137	49	
Fuel Used(l)		45		4	51	33				14	8	
CO Emissions (g/hr)		840		78	954	617				269	147	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)		162		15	184	119				52	28	
VOC Emissions (g/hr)		194		18	220	142				62	34	
Dilemma Vehicles (#)		32		0	33	0				0	0	
Queue Length 50th (m)		13.5		1.7	10.2	0.0				40.8	12.3	
Queue Length 95th (m)		m17.8		m3.9	m39.2	m1.9				55.3	27.0	
Internal Link Dist (m)		465.3			431.9			95.6			268.8	
Turn Bay Length (m)				70.0		30.0				40.0		
Base Capacity (vph)		2302		396	2702	1275				335	404	
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		0.44		0.26	0.42	0.62				0.54	0.46	

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 43 (36%), Referenced to phase 2:EBT and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.71

Intersection Signal Delay: 7.2

Intersection LOS: A

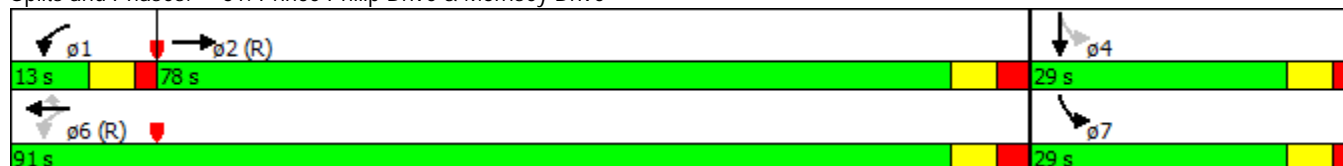
Intersection Capacity Utilization 59.6%

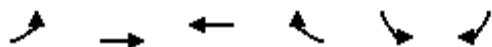
ICU Level of Service B

Analysis Period (min) 15

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

Splits and Phases: 61: Prince Philip Drive & Morrissey Drive





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	17	1961	1007	54	169	43
Future Volume (vph)	17	1961	1007	54	169	43
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	4.0	4.0	4.0	3.0	3.0
Grade (%)		0%	0%		0%	
Storage Length (m)	50.0			0.0	60.0	0.0
Storage Lanes	1			0	1	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	0.95	0.95	0.95	1.00	1.00
Ped Bike Factor			1.00		1.00	0.98
Frt			0.992			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1652	3697	3662	0	1652	1478
Flt Permitted	0.182				0.950	
Satd. Flow (perm)	316	3697	3662	0	1645	1454
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			8			49
Link Speed (k/h)		70	70		50	
Link Distance (m)		204.4	289.0		276.1	
Travel Time (s)		10.5	14.9		19.9	
Confl. Peds. (#/hr)	2			2	2	2
Confl. Bikes (#/hr)						
Peak Hour Factor	0.97	0.97	0.90	0.90	0.88	0.88
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	18	2022	1119	60	192	49
Shared Lane Traffic (%)						
Lane Group Flow (vph)	18	2022	1179	0	192	49
Turn Type	pm+pt	NA	NA		Prot	Perm
Protected Phases	5	2	6		8	
Permitted Phases	2					8
Total Split (s)	13.0	90.0	77.0		30.0	30.0
Total Lost Time (s)	6.0	6.0	6.0		6.0	6.0
Act Effect Green (s)	89.3	89.3	84.1		18.7	18.7
Actuated g/C Ratio	0.74	0.74	0.70		0.16	0.16
v/c Ratio	0.06	0.74	0.46		0.75	0.18
Control Delay	0.7	4.7	5.7		65.6	12.8
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	0.7	4.7	5.7		65.6	12.8
LOS	A	A	A		E	B
Approach Delay		4.7	5.7		54.9	
Approach LOS		A	A		D	
Stops (vph)	2	969	173		158	10
Fuel Used(l)	1	144	37		17	2
CO Emissions (g/hr)	17	2686	692		307	33



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
NOx Emissions (g/hr)	3	518	134		59	6
VOC Emissions (g/hr)	4	620	160		71	8
Dilemma Vehicles (#)	0	15	71		0	0
Queue Length 50th (m)	0.2	1.1	13.6		43.5	0.0
Queue Length 95th (m)	m0.2	m117.3	43.6		63.8	9.9
Internal Link Dist (m)		180.4	265.0		252.1	
Turn Bay Length (m)	50.0				60.0	
Base Capacity (vph)	313	2750	2568		330	330
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	0.06	0.74	0.46		0.58	0.15

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 60 (50%), Referenced to phase 2:EBTL and 6:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.75

Intersection Signal Delay: 8.5

Intersection LOS: A

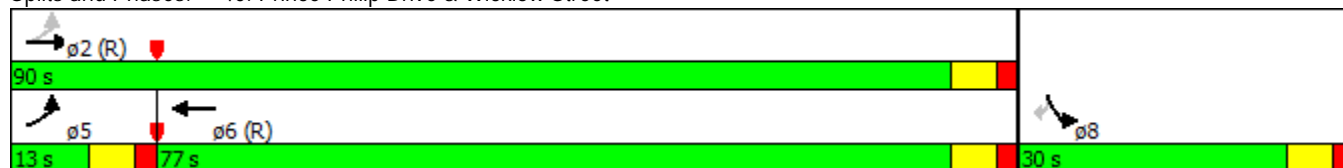
Intersection Capacity Utilization 73.9%

ICU Level of Service D

Analysis Period (min) 15

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

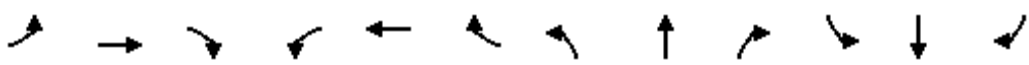
Splits and Phases: 40: Prince Philip Drive & Wicklow Street

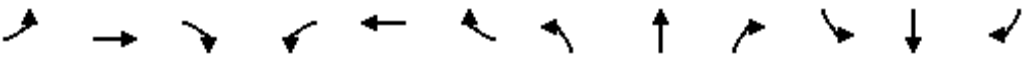


MUN Area Traffic Study
Freshwater Road & Stamps Lane/ Oxen Pond Road

Scenario 3 - 2025 AM

02/07/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↗		↖			↕		↖	↗	
Traffic Volume (vph)	0	1164	312	0	567	40	78	133	36	11	62	17
Future Volume (vph)	0	1164	312	0	567	40	78	133	36	11	62	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	4.0	4.0	4.0	3.0	3.0	3.0	2.6	2.9	2.9
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	0.0		0.0	0.0		0.0	0.0		0.0	30.0		0.0
Storage Lanes	0		1	0		0	0		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt			0.850		0.991			0.980			0.968	
Flt Protected								0.984		0.950		
Satd. Flow (prot)	0	1842	1566	0	1911	0	0	1668	0	1528	1557	0
Flt Permitted								0.853		0.425		
Satd. Flow (perm)	0	1842	1566	0	1911	0	0	1446	0	684	1557	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			236		6			6			11	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		374.8			273.7			376.6			148.1	
Travel Time (s)		27.0			19.7			27.1			10.7	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.91	0.91	0.91	0.92	0.92	0.92	0.88	0.88	0.88	0.73	0.73	0.73
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	3%	2%	2%	3%	2%	5%	10%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	1279	343	0	616	43	89	151	41	15	85	23
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1279	343	0	659	0	0	281	0	15	108	0
Turn Type		NA	Perm		NA		Perm	NA		pm+pt	NA	
Protected Phases		2			6			8		7	4	
Permitted Phases			2				8			4		
Total Split (s)		81.0	81.0		81.0		25.0	25.0		14.0	39.0	
Total Lost Time (s)		6.0	6.0		6.0			6.0		6.0	6.0	
Act Effect Green (s)		75.0	75.0		75.0			27.6		33.0	33.0	
Actuated g/C Ratio		0.62	0.62		0.62			0.23		0.28	0.28	
v/c Ratio		1.11	0.32		0.55			0.83		0.06	0.25	
Control Delay		83.5	2.7		10.7			65.7		32.6	32.1	
Queue Delay		0.0	0.0		0.0			0.0		0.0	0.0	
Total Delay		83.5	2.7		10.7			65.7		32.6	32.1	
LOS		F	A		B			E		C	C	
Approach Delay		66.4			10.7			65.7			32.2	
Approach LOS		E			B			E			C	
Stops (vph)		763	16		488			180		10	54	
Fuel Used(l)		133	12		32			25		1	4	
CO Emissions (g/hr)		2480	225		590			472		12	80	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)		479	43		114			91		2	15	
VOC Emissions (g/hr)		572	52		136			109		3	18	
Dilemma Vehicles (#)		0	0		0			0		0	0	
Queue Length 50th (m)		~335.6	0.0		154.6			58.3		2.6	17.7	
Queue Length 95th (m)		#418.8	15.7		m153.2			#128.5		6.5	25.5	
Internal Link Dist (m)		350.8			249.7			352.6			124.1	
Turn Bay Length (m)										30.0		
Base Capacity (vph)		1151	1067		1196			337		244	436	
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		1.11	0.32		0.55			0.83		0.06	0.25	

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 15 (13%), Referenced to phase 2:EBT and 6:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.11

Intersection Signal Delay: 51.1

Intersection LOS: D

Intersection Capacity Utilization 91.4%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

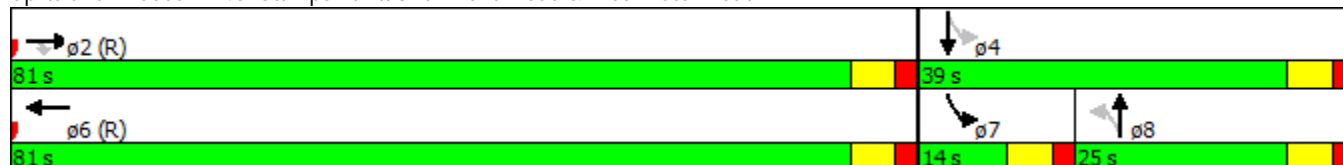
Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

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

Splits and Phases: 46: Stamps Lane/Oxen Pond Road & Freshwater Road



Summary of All Intervals

Run Number	1	10	2	3	4	5	6
Start Time	6:30	6:30	6:30	6:30	6:30	6:30	6:30
End Time	8:00	8:00	8:00	8:00	8:00	8:00	8:00
Total Time (min)	90	90	90	90	90	90	90
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	5	5	5	5	5	5	5
# of Recorded Intervals	4	4	4	4	4	4	4
Vehs Entered	9456	10433	10338	10043	10688	10143	10078
Vehs Exited	9054	9751	10073	9456	10152	9676	9569
Starting Vehs	1415	1249	1346	1221	1096	1324	1264
Ending Vehs	1817	1931	1611	1808	1632	1791	1773
Travel Distance (km)	16480	17776	18331	17180	18435	17519	17429
Travel Time (hr)	3143.7	2756.1	2641.7	2822.6	2324.2	2772.6	2812.4
Total Delay (hr)	2831.4	2419.0	2295.5	2496.2	1975.6	2441.1	2481.2
Total Stops	32709	35091	35151	33179	33316	34363	33557
Fuel Used (l)	3713.1	3472.2	3418.8	3502.5	3160.2	3478.5	3509.7

Summary of All Intervals

Run Number	7	8	9	Avg
Start Time	6:30	6:30	6:30	6:30
End Time	8:00	8:00	8:00	8:00
Total Time (min)	90	90	90	90
Time Recorded (min)	60	60	60	60
# of Intervals	5	5	5	5
# of Recorded Intervals	4	4	4	4
Vehs Entered	10171	10038	9728	10106
Vehs Exited	9669	9596	9270	9628
Starting Vehs	1191	1208	1328	1257
Ending Vehs	1693	1650	1786	1743
Travel Distance (km)	17455	17405	16713	17472
Travel Time (hr)	2655.4	2808.4	3202.7	2794.0
Total Delay (hr)	2323.3	2478.8	2885.7	2462.8
Total Stops	32260	32345	31952	33394
Fuel Used (l)	3372.4	3498.7	3779.2	3490.5

Interval #0 Information Seeding

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

Interval #1 Information Recording #1

Start Time	7:00
End Time	7:15
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	2587	2746	2521	2741	2696	2571	2609
Vehs Exited	2360	2562	2478	2522	2523	2415	2487
Starting Vehs	1415	1249	1346	1221	1096	1324	1264
Ending Vehs	1642	1433	1389	1440	1269	1480	1386
Travel Distance (km)	4463	4765	4595	4699	4787	4562	4702
Travel Time (hr)	445.7	401.3	418.6	404.6	359.5	415.9	394.2
Total Delay (hr)	361.5	311.5	331.8	316.0	269.3	329.6	305.5
Total Stops	8485	8722	8310	8913	8406	8511	9099
Fuel Used (l)	655.4	645.4	650.4	645.4	615.0	646.5	635.8

Interval #1 Information Recording #1

Start Time	7:00
End Time	7:15
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	2700	2581	2530	2630
Vehs Exited	2442	2458	2274	2452
Starting Vehs	1191	1208	1328	1257
Ending Vehs	1449	1331	1584	1431
Travel Distance (km)	4576	4573	4312	4603
Travel Time (hr)	393.3	417.4	457.9	410.8
Total Delay (hr)	306.3	331.2	376.4	323.9
Total Stops	8204	8253	8138	8501
Fuel Used (l)	626.6	647.4	656.6	642.5

Interval #2 Information Recording #2

Start Time	7:15
End Time	7:30
Total Time (min)	15
Volumes adjusted by PHF, Growth Factors.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	2626	2830	2990	2838	3084	2830	2800
Vehs Exited	2342	2461	2697	2522	2809	2497	2481
Starting Vehs	1642	1433	1389	1440	1269	1480	1386
Ending Vehs	1926	1802	1682	1756	1544	1813	1705
Travel Distance (km)	4121	4399	4793	4523	4954	4359	4343
Travel Time (hr)	674.2	599.3	581.3	593.3	502.3	604.5	589.3
Total Delay (hr)	595.6	515.6	490.7	507.4	408.4	521.9	506.3
Total Stops	8316	8582	9339	8735	9121	8612	8052
Fuel Used (l)	832.8	787.9	800.9	790.4	743.8	790.3	778.0

Interval #2 Information Recording #2

Start Time	7:15
End Time	7:30
Total Time (min)	15
Volumes adjusted by PHF, Growth Factors.	

Run Number	7	8	9	Avg
Vehs Entered	2868	2734	2698	2827
Vehs Exited	2646	2534	2466	2544
Starting Vehs	1449	1331	1584	1431
Ending Vehs	1671	1531	1816	1718
Travel Distance (km)	4705	4504	4228	4493
Travel Time (hr)	569.7	612.9	690.1	601.7
Total Delay (hr)	480.8	527.3	609.6	516.4
Total Stops	8383	8050	7837	8499
Fuel Used (l)	782.4	809.0	851.3	796.7

Interval #3 Information Recording #3

Start Time	7:30
End Time	7:45
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	2185	2476	2422	2181	2379	2271	2247
Vehs Exited	2259	2417	2480	2174	2454	2374	2250
Starting Vehs	1926	1802	1682	1756	1544	1813	1705
Ending Vehs	1852	1861	1624	1763	1469	1710	1702
Travel Distance (km)	4131	4349	4506	3846	4295	4182	4025
Travel Time (hr)	912.7	804.2	755.9	823.4	660.3	806.2	837.3
Total Delay (hr)	834.9	721.7	670.4	750.0	578.9	726.6	760.6
Total Stops	8422	8874	8806	7325	7730	8195	7671
Fuel Used (l)	1036.9	960.0	932.5	951.3	836.7	953.1	971.3

Interval #3 Information Recording #3

Start Time	7:30
End Time	7:45
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	2429	2383	2301	2326
Vehs Exited	2324	2305	2317	2339
Starting Vehs	1671	1531	1816	1718
Ending Vehs	1776	1609	1800	1716
Travel Distance (km)	4227	4157	4190	4191
Travel Time (hr)	772.5	804.9	941.7	811.9
Total Delay (hr)	691.7	726.1	861.9	732.3
Total Stops	8086	8022	8176	8130
Fuel Used (l)	926.0	950.5	1068.2	958.7

Interval #4 Information Recording #4

Start Time	7:45
End Time	8:00
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	2058	2381	2405	2283	2529	2471	2422
Vehs Exited	2093	2311	2418	2238	2366	2390	2351
Starting Vehs	1852	1861	1624	1763	1469	1710	1702
Ending Vehs	1817	1931	1611	1808	1632	1791	1773
Travel Distance (km)	3765	4262	4438	4111	4399	4417	4359
Travel Time (hr)	1111.1	951.2	885.9	1001.3	802.0	946.1	991.7
Total Delay (hr)	1039.3	870.2	802.5	922.8	719.0	863.0	908.8
Total Stops	7486	8913	8696	8206	8059	9045	8735
Fuel Used (l)	1187.9	1078.9	1035.0	1115.4	964.7	1088.5	1124.5

Interval #4 Information Recording #4

Start Time	7:45
End Time	8:00
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	2174	2340	2199	2325
Vehs Exited	2257	2299	2213	2292
Starting Vehs	1776	1609	1800	1716
Ending Vehs	1693	1650	1786	1743
Travel Distance (km)	3947	4170	3984	4185
Travel Time (hr)	919.8	973.2	1112.9	969.5
Total Delay (hr)	844.6	894.2	1037.7	890.2
Total Stops	7587	8020	7801	8255
Fuel Used (l)	1037.4	1091.8	1203.0	1092.7

1: Allandale Road & TCH NB Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	1.9	1.9
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	5.4	7.1	4.0
Total Delay (hr)	0.0	0.1	0.2	0.2	0.0	4.8	5.2
Total Del/Veh (s)	3.6	1.3	1.6	4.3	18.5	17.4	10.7
Stop Delay (hr)	0.0	0.0	0.0	0.0	0.0	2.5	2.6
Stop Del/Veh (s)	1.3	0.2	0.3	0.3	9.4	9.2	5.3

7: Allandale Road & Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.5	2.2	0.1	39.6	28.6	16.8	0.0	1.4	1.4
Denied Del/Veh (s)	0.3	0.0	0.3	11.1	12.2	8.2	409.4	434.6	396.1	0.2	8.2	8.2
Total Delay (hr)	3.0	3.6	0.5	28.3	142.5	11.5	40.4	16.9	1.2	0.7	9.3	6.9
Total Del/Veh (s)	41.3	37.8	6.8	612.9	707.5	741.5	462.2	297.6	35.5	57.6	54.3	40.9
Stop Delay (hr)	2.5	2.9	0.1	27.6	140.3	11.5	38.5	15.8	1.0	0.6	8.1	5.9
Stop Del/Veh (s)	34.3	29.9	1.3	598.5	696.6	739.7	440.1	278.1	27.7	52.0	47.5	35.1

7: Allandale Road & Prince Philip Drive Performance by movement

Movement	All
Denied Delay (hr)	90.6
Denied Del/Veh (s)	88.6
Total Delay (hr)	264.8
Total Del/Veh (s)	257.5
Stop Delay (hr)	254.8
Stop Del/Veh (s)	247.8

9: Westerland Road/Clinch Crescent & Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	51.8	44.0	17.2	2.0	19.0	10.8	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	381.0	340.7	360.2	115.6	119.2	133.9	0.0	0.0	0.0	0.4	0.2	0.0
Total Delay (hr)	74.1	17.5	4.0	4.0	52.9	47.8	3.6	27.9	3.6	3.3	1.9	0.6
Total Del/Veh (s)	545.5	149.6	94.7	225.2	318.8	537.3	191.0	163.9	161.3	79.3	30.5	9.3
Stop Delay (hr)	73.1	11.0	2.2	3.4	47.4	47.4	3.1	24.2	3.1	3.1	1.6	0.5
Stop Del/Veh (s)	538.3	93.6	52.2	189.1	285.2	533.6	167.0	142.0	139.0	76.6	26.5	7.8

9: Westerland Road/Clinch Crescent & Prince Philip Drive Performance by movement

Movement	All
Denied Delay (hr)	144.8
Denied Del/Veh (s)	154.7
Total Delay (hr)	241.1
Total Del/Veh (s)	255.5
Stop Delay (hr)	220.1
Stop Del/Veh (s)	233.2

10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	24.6	138.6	11.7	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	3.4	0.4	0.2	603.2	602.0	576.5	0.0	0.0	0.0
Total Delay (hr)	0.7	1.4	0.1	0.5	4.2	0.1	3.3	22.4	1.6	0.3	2.5	0.5
Total Del/Veh (s)	91.1	14.4	8.6	37.9	46.5	5.8	131.5	153.9	125.7	29.8	12.4	8.4
Stop Delay (hr)	0.7	1.2	0.0	0.4	3.6	0.1	2.8	19.6	1.4	0.2	1.0	0.2
Stop Del/Veh (s)	87.8	11.9	5.4	32.7	39.2	3.8	112.8	134.7	108.4	20.5	5.1	2.9

10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue Performance by movement

Movement	All
Denied Delay (hr)	175.0
Denied Del/Veh (s)	220.5
Total Delay (hr)	37.7
Total Del/Veh (s)	54.3
Stop Delay (hr)	31.2
Stop Del/Veh (s)	45.0

11: Mt. Scio Road & Allandale Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Denied Del/Veh (s)	0.1	0.0	0.0	0.0	0.0	0.0	3.9	0.3	0.2	3.6	0.6	0.6
Total Delay (hr)	0.6	3.5	0.2	0.1	0.7	0.0	0.3	0.4	0.1	0.9	0.7	0.9
Total Del/Veh (s)	11.9	12.1	8.8	14.5	10.5	2.8	38.0	53.6	6.4	36.6	42.7	20.5
Stop Delay (hr)	0.4	1.7	0.1	0.1	0.5	0.0	0.3	0.4	0.0	0.8	0.6	0.8
Stop Del/Veh (s)	7.0	6.0	3.3	12.1	7.3	0.0	35.7	49.4	4.4	33.1	37.3	18.2

11: Mt. Scio Road & Allandale Road Performance by movement

Movement	All
Denied Delay (hr)	0.2
Denied Del/Veh (s)	0.3
Total Delay (hr)	8.4
Total Del/Veh (s)	15.0
Stop Delay (hr)	5.7
Stop Del/Veh (s)	10.1

17: Allandale Road & TCH SB Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.1	0.8	0.1
Total Delay (hr)	0.0	0.0	0.0	0.3	0.4	0.0	0.7
Total Del/Veh (s)	1.2	0.5	2.3	3.4	5.3	3.0	4.1
Stop Delay (hr)	0.0	0.0	0.0	0.0	0.2	0.0	0.2
Stop Del/Veh (s)	0.0	0.0	0.0	0.0	2.7	0.7	1.1

18: TCH SB Performance by movement

Movement	NBT	SBT	All
Denied Delay (hr)	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.2	0.1
Total Delay (hr)	0.4	0.0	0.4
Total Del/Veh (s)	4.8	0.1	3.2
Stop Delay (hr)	0.0	0.0	0.0
Stop Del/Veh (s)	0.0	0.0	0.0

22: Allandale Road & Higgins Line Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.1	0.0	0.0	0.0	0.0	0.1
Denied Del/Veh (s)	0.2	3.5	0.0	0.0	0.0	0.0	0.2
Total Delay (hr)	3.3	0.1	0.3	0.1	0.1	1.3	5.3
Total Del/Veh (s)	37.7	4.2	4.7	2.9	4.8	4.2	9.6
Stop Delay (hr)	3.0	0.0	0.2	0.0	0.1	0.5	3.8
Stop Del/Veh (s)	33.7	0.6	3.5	0.0	2.6	1.6	7.0

24: Allandale Road & Confederation Building Lot Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.2	0.1	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	0.2	0.0	0.4	0.1	0.1	1.0	1.8
Total Del/Veh (s)	46.9	5.1	3.7	3.2	4.9	2.8	3.4
Stop Delay (hr)	0.1	0.0	0.2	0.0	0.1	0.5	0.9
Stop Del/Veh (s)	45.0	5.1	2.2	0.1	2.6	1.3	1.7

29: Prince Philip Drive & Confederation Building Lot Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	14.7	1.9	16.6
Denied Del/Veh (s)	0.1	0.1	0.2	0.0	53.7	61.6	36.1
Total Delay (hr)	0.3	0.1	0.3	0.1	11.2	0.4	12.4
Total Del/Veh (s)	65.1	15.6	8.6	1.2	44.2	13.2	28.3
Stop Delay (hr)	0.2	0.1	0.2	0.0	10.9	0.3	11.7
Stop Del/Veh (s)	62.9	15.5	5.4	0.1	42.9	10.2	26.8

34: Elizabeth Avenue & Westerland Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBT	SBR	All
Denied Delay (hr)	2.1	1.3	0.0	0.0	0.0	0.0	0.0	3.4
Denied Del/Veh (s)	16.9	13.6	0.0	0.0	0.0	0.0	0.0	6.7
Total Delay (hr)	17.8	10.2	2.4	4.9	2.1	0.1	0.1	37.7
Total Del/Veh (s)	141.4	107.5	27.8	56.1	66.3	1.7	4.2	74.4
Stop Delay (hr)	16.6	9.2	1.9	4.1	2.0	0.0	0.0	33.7
Stop Del/Veh (s)	131.7	96.9	21.7	46.7	61.7	0.4	0.4	66.6

35: Prince Philip Drive & Clinch Crescent Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.1	0.0	0.0	0.0	0.1	0.0	0.2
Denied Del/Veh (s)	1.1	0.0	0.0	0.2	3.6	0.5	0.4
Total Delay (hr)	12.1	48.1	2.5	0.3	2.2	0.2	65.4
Total Del/Veh (s)	112.7	188.4	13.0	7.6	105.5	3.5	95.8
Stop Delay (hr)	10.1	43.0	1.3	0.0	2.1	0.0	56.6
Stop Del/Veh (s)	94.2	168.5	6.7	0.6	102.5	0.7	82.9

37: Thorburn Road & Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR	All
Denied Delay (hr)	49.2	246.7	33.0	0.0	0.0	0.0	0.0	0.0	105.5	86.6	50.0	571.1
Denied Del/Veh (s)	673.1	662.4	668.3	0.0	0.0	0.0	0.0	0.0	653.8	641.8	647.0	456.9
Total Delay (hr)	7.8	74.2	1.1	0.9	3.2	0.2	2.8	0.9	71.5	9.2	4.9	176.6
Total Del/Veh (s)	168.5	303.3	37.7	29.5	19.1	3.3	28.5	33.7	679.5	115.5	106.9	188.6
Stop Delay (hr)	7.1	68.9	0.9	0.8	2.4	0.0	2.3	0.8	71.0	8.0	4.2	166.5
Stop Del/Veh (s)	153.8	281.6	30.1	26.8	14.5	0.0	23.9	32.3	674.5	100.6	92.4	177.8

40: Prince Philip Drive & Wicklow Street Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.2	0.0	0.2
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	3.8	0.6	0.3
Total Delay (hr)	0.3	39.2	1.7	0.1	2.7	0.1	44.1
Total Del/Veh (s)	157.4	123.4	6.9	6.8	54.9	8.0	69.3
Stop Delay (hr)	0.3	34.8	0.6	0.0	2.5	0.1	38.4
Stop Del/Veh (s)	152.0	109.4	2.7	3.0	51.1	6.7	60.3

46: Stamps Lane/Oxen Pond Road & Freshwater Road Performance by movement

Movement	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.2	0.2	0.3	3.9	0.2	0.2	0.1
Total Delay (hr)	41.0	2.6	2.2	0.1	1.0	1.6	0.5	0.1	0.6	0.1	49.8
Total Del/Veh (s)	131.6	36.9	14.0	11.5	45.0	45.5	45.5	32.0	33.6	17.5	77.6
Stop Delay (hr)	33.5	1.6	1.0	0.1	0.9	1.4	0.5	0.1	0.5	0.1	39.6
Stop Del/Veh (s)	107.3	23.4	6.3	5.9	40.2	39.5	41.9	28.7	29.6	16.0	61.7

47: Freshwater Road & Thorburn Road Performance by movement

Movement	EBT	WBT	WBR	SBL	SBT	SBR	All
Denied Delay (hr)	157.2	0.0	0.1	0.0	0.0	0.0	157.3
Denied Del/Veh (s)	479.6	0.0	0.6	0.0	0.0	0.0	232.8
Total Delay (hr)	39.0	0.6	0.7	4.3	0.0	0.2	44.7
Total Del/Veh (s)	139.8	6.3	5.5	43.0	11.2	5.6	70.9
Stop Delay (hr)	37.8	0.3	0.1	4.0	0.0	0.2	42.4
Stop Del/Veh (s)	135.4	3.9	1.1	40.4	9.5	4.8	67.3

51: Freshwater Road & Elizabeth Avenue Performance by movement

Movement	WBT	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.0	0.1	0.0	0.0	0.0	0.1
Denied Del/Veh (s)	0.0	0.0	0.5	0.5	0.1	0.1	0.2
Total Delay (hr)	0.0	0.7	4.9	0.3	12.1	4.3	22.2
Total Del/Veh (s)	0.4	13.5	44.2	36.1	62.9	52.8	50.1
Stop Delay (hr)	0.0	0.7	4.0	0.2	8.2	2.6	15.7
Stop Del/Veh (s)	0.1	13.1	36.0	30.4	43.0	32.2	35.5

52: Elizabeth Avenue & Paton Street Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.1	0.1	0.0
Total Delay (hr)	0.2	4.1	0.1	0.0	0.5	0.1	4.9
Total Del/Veh (s)	21.2	21.7	1.3	0.8	64.4	38.3	18.6
Stop Delay (hr)	0.1	3.2	0.0	0.0	0.5	0.1	3.9
Stop Del/Veh (s)	15.7	16.9	0.5	0.6	62.4	37.9	14.8

55: Anderson Avenue & Elizabeth Avenue Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.1	0.4	0.5
Denied Del/Veh (s)	0.1	0.3	0.0	0.0	5.8	8.4	1.7
Total Delay (hr)	1.6	0.1	0.3	0.2	0.9	7.8	10.9
Total Del/Veh (s)	9.2	5.8	14.0	4.7	66.9	152.7	34.6
Stop Delay (hr)	1.1	0.1	0.2	0.0	0.8	7.9	10.2
Stop Del/Veh (s)	6.8	5.0	8.6	0.9	64.3	154.0	32.4

59: Clinch Crescent & Arctic Avenue Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	23.3	0.4	0.0	0.0	0.0	0.1	23.8
Denied Del/Veh (s)	298.2	383.9	0.0	0.2	0.6	1.0	49.8
Total Delay (hr)	21.8	0.0	0.2	3.1	0.5	2.1	27.7
Total Del/Veh (s)	291.8	36.5	2.4	13.7	52.6	24.5	57.9
Stop Delay (hr)	21.9	0.0	0.1	2.1	0.5	1.7	26.3
Stop Del/Veh (s)	292.7	35.2	0.8	9.3	49.1	20.6	54.9

61: Prince Philip Drive & Morrissey Drive Performance by movement

Movement	EBT	WBL	WBT	WBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.3	0.6	0.2	0.0	0.0	1.0
Denied Del/Veh (s)	0.0	0.0	1.2	4.0	3.6	0.6	0.7	1.6
Total Delay (hr)	1.2	2.7	40.3	34.1	2.4	0.7	2.2	83.7
Total Del/Veh (s)	7.0	133.2	185.7	224.5	56.1	71.8	62.9	128.0
Stop Delay (hr)	0.5	2.1	33.5	32.1	2.2	0.7	2.1	73.2
Stop Del/Veh (s)	3.0	105.2	154.2	211.0	50.9	65.3	59.7	111.9

Total Network Performance

Denied Delay (hr)	1187.0
Denied Del/Veh (s)	340.7
Total Delay (hr)	1275.8
Total Del/Veh (s)	403.9
Stop Delay (hr)	1148.7
Stop Del/Veh (s)	363.7

Intersection: 1: Allandale Road & TCH NB

Movement	EB	NB	NB
Directions Served	LT	LT	R
Maximum Queue (m)	8.8	146.1	22.9
Average Queue (m)	0.3	68.4	21.4
95th Queue (m)	3.6	151.2	26.5
Link Distance (m)	137.0	139.4	
Upstream Blk Time (%)		9	
Queuing Penalty (veh)		0	
Storage Bay Dist (m)			20.0
Storage Blk Time (%)		6	20
Queuing Penalty (veh)		54	1

Intersection: 7: Allandale Road & Prince Philip Drive

Movement	EB	EB	EB	EB	WB	WB	WB	B27	B27	NB	NB	NB
Directions Served	L	T	T	R	L	T	TR	T	T	L	T	R
Maximum Queue (m)	98.1	69.7	70.2	57.1	67.4	858.8	858.3	253.8	251.0	72.5	449.0	456.9
Average Queue (m)	46.4	34.2	33.9	6.1	48.1	667.8	669.4	103.2	101.8	72.0	437.6	262.4
95th Queue (m)	82.5	57.6	56.9	32.8	89.4	1011.3	1010.3	308.6	306.2	73.7	467.4	528.0
Link Distance (m)		438.0	438.0			834.7	834.7	270.6	270.6		443.5	443.5
Upstream Blk Time (%)						45	45	16	16		40	6
Queuing Penalty (veh)						221	221	79	79		182	28
Storage Bay Dist (m)	200.0			120.0	65.0					70.0		
Storage Blk Time (%)					1	69				77	27	
Queuing Penalty (veh)					5	135				259	133	

Intersection: 7: Allandale Road & Prince Philip Drive

Movement	SB	SB	SB	SB	SB	B5	B5
Directions Served	L	T	T	R	R	T	T
Maximum Queue (m)	44.3	115.8	109.6	127.5	37.5	261.3	286.8
Average Queue (m)	18.0	70.5	76.0	94.3	32.7	86.2	109.7
95th Queue (m)	45.0	106.5	117.7	152.9	52.7	326.4	358.7
Link Distance (m)		104.0	104.0	104.0		500.7	500.7
Upstream Blk Time (%)		2	2	36		1	1
Queuing Penalty (veh)		7	9	151		3	4
Storage Bay Dist (m)	42.0				35.0		
Storage Blk Time (%)	0	37		36	15		
Queuing Penalty (veh)	0	16		113	48		

Intersection: 9: Westerland Road/Clinch Crescent & Prince Philip Drive

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	TR	L	T	R	L	T
Maximum Queue (m)	77.5	583.5	585.4	187.5	92.4	484.5	483.2	62.4	359.0	47.5	80.9	77.0
Average Queue (m)	77.4	577.5	569.2	40.7	40.0	468.3	470.4	31.5	320.6	25.4	39.5	32.5
95th Queue (m)	77.4	580.9	654.2	143.7	104.5	504.2	494.3	75.1	438.0	60.7	75.0	62.8
Link Distance (m)		573.0	573.0			469.8	469.8		353.9		83.2	83.2
Upstream Blk Time (%)		61	21			30	45		17		1	0
Queuing Penalty (veh)		475	162			173	262		148		4	0
Storage Bay Dist (m)	75.0			185.0	90.0			60.0		45.0		
Storage Blk Time (%)	78	45	4	0	0	45		0	69	1		0
Queuing Penalty (veh)	264	347	10	1	1	36		1	114	3		1

Intersection: 9: Westerland Road/Clinch Crescent & Prince Philip Drive

Movement	SB
Directions Served	R
Maximum Queue (m)	53.5
Average Queue (m)	19.5
95th Queue (m)	38.3
Link Distance (m)	
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (m)	80.0
Storage Blk Time (%)	0
Queuing Penalty (veh)	0

Intersection: 10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	R	L	T	R
Maximum Queue (m)	37.6	62.2	56.9	130.6	24.0	57.4	248.6	37.5	36.1	226.7	413.0
Average Queue (m)	9.3	28.8	14.0	66.0	1.7	27.4	237.7	10.2	8.0	32.5	30.6
95th Queue (m)	25.1	52.0	42.7	113.4	17.4	66.8	255.1	36.0	22.8	120.0	192.0
Link Distance (m)		321.0		286.5	286.5		234.0			443.5	443.5
Upstream Blk Time (%)							70			0	0
Queuing Penalty (veh)							0			0	2
Storage Bay Dist (m)	55.0		55.0			55.0		35.0	40.0		
Storage Blk Time (%)	0	1	0	17		0	66	0	0	3	
Queuing Penalty (veh)	0	0	0	9		2	144	3	0	1	

Intersection: 11: Mt. Scio Road & Allandale Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	TR	L	TR
Maximum Queue (m)	35.0	60.8	62.7	10.2	28.5	25.0	20.2	31.5	57.2	77.0
Average Queue (m)	12.6	31.6	35.1	2.8	9.6	7.6	6.0	8.2	18.6	29.3
95th Queue (m)	26.7	54.7	59.4	8.3	22.4	19.7	15.5	22.8	38.6	60.1
Link Distance (m)		347.1	347.1		543.6	543.6		310.1		97.8
Upstream Blk Time (%)										0
Queuing Penalty (veh)										0
Storage Bay Dist (m)	75.0			75.0			60.0		60.0	
Storage Blk Time (%)		0							0	2
Queuing Penalty (veh)		0							0	2

Intersection: 17: Allandale Road & TCH SB

Movement	SB	SB
Directions Served	L	R
Maximum Queue (m)	28.3	14.4
Average Queue (m)	14.0	0.7
95th Queue (m)	22.4	6.0
Link Distance (m)	127.3	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		20.0
Storage Blk Time (%)	1	0
Queuing Penalty (veh)	0	0

Intersection: 18: TCH SB

Movement
Directions Served
Maximum Queue (m)
Average Queue (m)
95th Queue (m)
Link Distance (m)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (m)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 22: Allandale Road & Higgins Line

Movement	WB	WB	WB	NB	NB	SB	SB	SB	B2
Directions Served	L	L	R	T	T	L	T	T	T
Maximum Queue (m)	69.6	62.9	29.4	25.4	24.4	22.4	53.8	54.7	113.8
Average Queue (m)	36.9	29.1	2.4	7.6	6.5	6.9	18.8	23.4	4.1
95th Queue (m)	59.8	55.0	18.2	19.6	18.8	17.6	42.4	49.2	83.1
Link Distance (m)	117.4	117.4		101.8	101.8		73.6	73.6	543.6
Upstream Blk Time (%)									0
Queuing Penalty (veh)									0
Storage Bay Dist (m)			40.0			80.0			
Storage Blk Time (%)		4	0						
Queuing Penalty (veh)		3	0						

Intersection: 24: Allandale Road & Confederation Building Lot

Movement	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	L	R	T	T	R	L	T	T
Maximum Queue (m)	2.3	14.1	10.7	26.0	40.0	9.1	20.4	42.8	55.8
Average Queue (m)	0.1	3.1	3.6	4.7	8.2	0.3	7.6	9.6	15.5
95th Queue (m)	1.0	10.5	10.5	17.0	27.5	5.5	17.4	33.1	46.4
Link Distance (m)		87.5	87.5	500.7	500.7			147.6	147.6
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (m)	45.0					110.0	130.0		
Storage Blk Time (%)									
Queuing Penalty (veh)									

Intersection: 29: Prince Philip Drive & Confederation Building Lot

Movement	EB	EB	NB	NB	NB	B27	SB	SB	SB
Directions Served	L	R	L	T	T	T	T	T	R
Maximum Queue (m)	17.0	12.9	43.1	7.0	12.4	170.1	129.0	125.6	71.8
Average Queue (m)	4.5	3.1	13.1	0.4	1.2	6.1	53.7	48.7	19.0
95th Queue (m)	13.3	10.2	30.2	3.5	7.2	124.2	156.4	153.7	84.8
Link Distance (m)	108.9	108.9		270.6	270.6	834.7	148.3	148.3	
Upstream Blk Time (%)							23	23	
Queuing Penalty (veh)							0	0	
Storage Bay Dist (m)			75.0						100.0
Storage Blk Time (%)								24	1
Queuing Penalty (veh)								25	3

Intersection: 34: Elizabeth Avenue & Westerland Road

Movement	EB	EB	WB	SB	SB
Directions Served	L	T	TR	L	R
Maximum Queue (m)	37.4	364.2	180.1	56.1	14.4
Average Queue (m)	35.9	258.9	94.0	28.6	0.5
95th Queue (m)	43.2	514.8	191.4	50.6	10.5
Link Distance (m)		391.9	553.5	353.9	
Upstream Blk Time (%)		10			
Queuing Penalty (veh)		91			
Storage Bay Dist (m)	35.0				70.0
Storage Blk Time (%)	57	8		0	0
Queuing Penalty (veh)	210	43		0	0

Intersection: 35: Prince Philip Drive & Clinch Crescent

Movement	EB	EB	EB	WB	WB	WB	SB	SB
Directions Served	L	T	T	T	T	R	L	R
Maximum Queue (m)	142.5	288.9	289.1	41.5	45.1	24.7	72.1	73.4
Average Queue (m)	142.3	282.7	257.3	16.1	19.8	3.4	26.5	8.2
95th Queue (m)	144.6	297.9	323.5	34.4	38.8	16.0	58.6	39.9
Link Distance (m)		280.6	280.6	573.0	573.0			269.1
Upstream Blk Time (%)		34	9					
Queuing Penalty (veh)		358	99					
Storage Bay Dist (m)	140.0					70.0	80.0	
Storage Blk Time (%)	3	68					1	
Queuing Penalty (veh)	22	442					4	

Intersection: 37: Thorburn Road & Prince Philip Drive

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	T	T	T	TR	L	L
Maximum Queue (m)	177.5	324.0	322.1	320.1	36.4	48.2	46.6	49.1	56.1	62.1	152.5	381.9
Average Queue (m)	157.7	312.3	309.7	284.5	17.8	23.2	24.1	22.4	22.3	30.4	151.2	352.6
95th Queue (m)	245.2	334.2	335.6	424.5	32.7	40.6	40.6	41.1	44.5	51.7	157.0	454.9
Link Distance (m)		308.0	308.0	308.0		134.5	134.5	134.5	126.5	126.5		372.8
Upstream Blk Time (%)		81	66	48								67
Queuing Penalty (veh)		0	0	0								0
Storage Bay Dist (m)	175.0				110.0						150.0	
Storage Blk Time (%)	1	78									47	79
Queuing Penalty (veh)	7	210									138	230

Intersection: 37: Thorburn Road & Prince Philip Drive

Movement	SB	SB
Directions Served	T	TR
Maximum Queue (m)	383.4	152.5
Average Queue (m)	325.7	68.2
95th Queue (m)	522.0	145.8
Link Distance (m)	372.8	
Upstream Blk Time (%)	62	
Queuing Penalty (veh)	0	
Storage Bay Dist (m)		150.0
Storage Blk Time (%)	3	1
Queuing Penalty (veh)	14	1

Intersection: 40: Prince Philip Drive & Wicklow Street

Movement	EB	EB	EB	B45	B45	B36	B36	WB	WB	SB	SB
Directions Served	L	T	T	T	T	T	T	T	TR	L	R
Maximum Queue (m)	52.3	216.5	214.1	248.9	247.3	143.6	146.4	30.5	268.8	59.7	44.6
Average Queue (m)	7.3	205.7	193.8	227.5	225.9	119.4	118.9	9.5	31.2	38.5	9.9
95th Queue (m)	36.4	235.0	257.7	304.9	306.5	188.1	190.0	23.5	132.2	60.7	38.3
Link Distance (m)		189.0	189.0	222.8	222.8	134.5	134.5	280.6	280.6		264.8
Upstream Blk Time (%)		90	39	86	65	22	18		0		
Queuing Penalty (veh)		911	400	865	653	220	185		2		
Storage Bay Dist (m)	50.0									60.0	
Storage Blk Time (%)	0	86								3	0
Queuing Penalty (veh)	1	15								1	0

Intersection: 46: Stamps Lane/Oxen Pond Road & Freshwater Road

Movement	EB	EB	WB	NB	SB	SB
Directions Served	T	R	TR	LTR	L	TR
Maximum Queue (m)	369.4	368.8	116.7	93.8	14.4	45.3
Average Queue (m)	360.9	347.4	45.0	46.5	2.0	14.3
95th Queue (m)	365.9	391.4	99.9	79.4	8.4	31.1
Link Distance (m)	357.5	357.5	256.2	366.1		137.9
Upstream Blk Time (%)	26	7				
Queuing Penalty (veh)	224	63				
Storage Bay Dist (m)					30.0	
Storage Blk Time (%)						2
Queuing Penalty (veh)						0

Intersection: 47: Freshwater Road & Thorburn Road

Movement	EB	EB	WB	WB	WB	SB	SB	SB	B43	B43
Directions Served	T	T	T	T	R	L	L	R	T	T
Maximum Queue (m)	175.7	175.7	23.6	20.6	27.4	72.7	67.1	36.8	74.6	77.9
Average Queue (m)	166.9	166.6	10.3	5.3	12.6	39.1	34.7	14.1	10.6	10.4
95th Queue (m)	173.8	176.0	19.7	15.3	23.1	74.1	67.7	28.5	54.9	57.0
Link Distance (m)	160.8	160.8	357.5	357.5		52.2	52.2	52.2	126.5	126.5
Upstream Blk Time (%)	94	85				12	7	0	0	0
Queuing Penalty (veh)	0	0				32	20	0	1	1
Storage Bay Dist (m)					30.0					
Storage Blk Time (%)				0	0					
Queuing Penalty (veh)				0	0					

Intersection: 51: Freshwater Road & Elizabeth Avenue

Movement	WB	NB	SB	SB
Directions Served	R	TR	L	T
Maximum Queue (m)	48.0	171.3	32.4	259.6
Average Queue (m)	17.2	75.7	32.2	206.8
95th Queue (m)	35.4	142.0	32.5	305.7
Link Distance (m)	266.6	206.4		256.2
Upstream Blk Time (%)		0		3
Queuing Penalty (veh)		0		32
Storage Bay Dist (m)			30.0	
Storage Blk Time (%)			46	6
Queuing Penalty (veh)			168	53

Intersection: 52: Elizabeth Avenue & Paton Street

Movement	EB	EB	WB	SB
Directions Served	L	T	TR	LR
Maximum Queue (m)	27.3	174.3	20.1	28.3
Average Queue (m)	5.1	50.8	3.6	9.9
95th Queue (m)	21.3	166.6	12.8	28.9
Link Distance (m)		266.6	45.6	410.7
Upstream Blk Time (%)		0		
Queuing Penalty (veh)		3		
Storage Bay Dist (m)	30.0			
Storage Blk Time (%)	0	19		
Queuing Penalty (veh)	0	6		

Intersection: 55: Anderson Avenue & Elizabeth Avenue

Movement	EB	WB	WB	NB	NB
Directions Served	TR	L	T	L	R
Maximum Queue (m)	41.5	30.3	0.9	203.2	88.1
Average Queue (m)	19.7	10.3	0.0	57.6	43.0
95th Queue (m)	56.6	22.4	0.9	216.7	102.8
Link Distance (m)	45.6		391.9	325.0	
Upstream Blk Time (%)	9			4	
Queuing Penalty (veh)	74			0	
Storage Bay Dist (m)		40.0			100.0
Storage Blk Time (%)		0		10	20
Queuing Penalty (veh)		0		19	9

Intersection: 59: Clinch Crescent & Arctic Avenue

Movement	WB	WB	WB	NB	NB	SB
Directions Served	L	L	R	T	R	LT
Maximum Queue (m)	102.5	214.3	177.8	68.4	87.3	117.9
Average Queue (m)	63.6	156.1	103.2	11.1	59.3	40.4
95th Queue (m)	134.4	277.6	274.1	40.7	94.2	101.8
Link Distance (m)		205.9	205.9	83.2	83.2	188.1
Upstream Blk Time (%)		50	33	0	2	1
Queuing Penalty (veh)		0	0	0	18	0
Storage Bay Dist (m)	100.0					
Storage Blk Time (%)	2	61				
Queuing Penalty (veh)	2	85				

Intersection: 61: Prince Philip Drive & Morrissey Drive

Movement	EB	EB	WB	WB	WB	WB	SB	SB
Directions Served	T	T	L	T	T	R	L	TR
Maximum Queue (m)	27.5	29.5	72.5	465.3	456.9	32.5	42.4	121.3
Average Queue (m)	9.2	10.3	34.6	327.6	345.5	31.0	32.3	46.9
95th Queue (m)	21.8	23.7	89.2	610.2	609.7	39.8	49.5	106.7
Link Distance (m)	469.8	469.8		438.0	438.0			278.5
Upstream Blk Time (%)				25	37			
Queuing Penalty (veh)				236	347			
Storage Bay Dist (m)			70.0			30.0	40.0	
Storage Blk Time (%)			0	50	51	9	8	14
Queuing Penalty (veh)			2	48	376	48	13	23

Network Summary

Network wide Queuing Penalty: 10970

		Scenario 3 - PM Peak Hour						
Intersection		Synchro				SimTraffic		
		Delay/Veh (s)	LOS	V/C	Queue (m) 95th%ile	Delay/Veh (s)	Equivalent LOS	Queue (m) 95th%ile
Street	Movement							
Columbus Drive/ Prince Philip Drive & Thorburn Road		162.6	F			96.7	F	
Columbus Drive/ Prince Philip Drive	Eastbound Left - Turn	386.3	F	1.78	267.2	308.9	F	177.4
	Eastbound Through	53.6	D	0.96	197.4	70.2	E	365.7
	Eastbound Right - Turn	21.2	C	0.54	72.4	23.4	C	425.9
	Westbound Left - Turn	246.0	F	1.48	68.8	86.5	F	104.2
	Westbound Through	86.9	F	1.12	144.5	37.7	D	111.1
	Westbound Right - Turn	20.3	C	0.82	78.4	4.4	A	29.2
Thorburn Road	Northbound Through	178.3	F	1.33	162.6	29.9	C	62.0
	Northbound Right - Turn					24.8	C	66.5
	Southbound Left - Turn	333.9	F	1.63	122.3	94.8	F	417.1
	Southbound Through	223.8	F	1.43	371.4	183.2	F	384.0
	Southbound Right - Turn					230.2	F	153.2
Prince Philip Drive & Wicklow Street		46.2	D			17.9	B	
Prince Philip Drive	Eastbound Left - Turn	3.8	A	0.18	0.4	30.9	C	13.7
	Eastbound Through	7.7	A	0.68	73.6	2.9	A	15.3
	Westbound Through	63.1	E	1.11	48.9	14.3	B	63.4
	Westbound Right - Turn					15.0	B	193.5
Wicklow Street	Southbound Left - Turn	129.7	F	1.11	139.5	84.6	F	72.3
	Southbound Right - Turn	11.9	B	0.31	14.8	35.8	D	179.0
Prince Philip Drive & Clinch Crescent		97.9	F			14.1	B	
Prince Philip Drive	Eastbound Left - Turn	256.7	F	1.46	151.5	24.2	C	51.6
	Eastbound Through	5.0	A	0.72	64.6	5.5	A	43.1
	Westbound Through	132.3	F	1.25	74.7	16.4	B	70.2
	Westbound Right - Turn	5.3	A	0.16	1.1	9.1	A	15.2
Clinch Crescent	Southbound Left - Turn	40.5	D	0.35	40.9	53.3	D	61.7
	Southbound Right - Turn	165.4	F	1.28	188.6	13.6	B	109.2
Prince Philip Drive & Clinch Crescent/ Westerland Road		183.5	F			100.4	F	
Prince Philip Drive	Eastbound Left - Turn	380.9	F	1.76	192.7	157.5	F	93.5
	Eastbound Through	63.7	E	0.99	209.9	111.2	F	474.6
	Eastbound Right - Turn	11.4	B	0.37	27.7	87.3	F	169.8
	Westbound Left - Turn	46.4	D	0.74	25.3	186.2	F	91.2
	Westbound Through	269.6	F	1.53	337.2	132.6	F	379.6
	Westbound Right - Turn					143.3	F	387.0
Clinch Crescent/ Westerland Road	Northbound Left - Turn	291.9	F	1.57	81.3	38.4	D	40.4
	Northbound Through	44.0	D	0.85	70.7	40.1	D	50.7
	Northbound Right - Turn	20.0	B	0.77	21.7	19.0	B	37.7
	Southbound Left - Turn	185.4	F	1.30	109.4	39.0	D	61.5
	Southbound Through	185.0	F	1.30	201.6	89.0	F	102.9
	Southbound Right - Turn	251.2	F	1.47	224.7	29.8	C	104.4
Clinch Crescent & Arctic Avenue		210.4	F			122.1	F	
Arctic Avenue	Westbound Left - Turn	646.2	F	2.31	278.2	547.7	F	215.0
	Westbound Right - Turn	11.5	B	0.08	2.0	104.4	F	244.0
Clinch Crescent	Northbound Through	0.0	-	0.46	0.0	1.4	A	11.9
	Northbound Right - Turn					3.8	A	42.2
	Southbound Left - Turn	0.9	A	0.03	0.7	77.2	F	251.0
	Southbound Through					74.4	F	
Prince Philip Drive & Morrissey Drive		25.2	C			175.9	F	
Prince Philip Drive	Eastbound Through	19.7	B	0.97	105.5	247.7	F	540.1
	Westbound Left - Turn	18.5	B	0.50	1.9	30.5	C	15.8
	Westbound Through	8.0	A	0.71	53.1	16.1	B	36.3
	Westbound Right - Turn	0.6	A	0.35	0.9	14.3	B	22.5
Morrissey Drive	Southbound Left - Turn	64.2	E	0.86	129.6	558.1	F	45.0
	Southbound Through	102.2	F	1.06	169.2	438.3	F	289.2
	Southbound Right - Turn					423.8	F	
Prince Philip Drive & Allandale Road		241.5	F			314.2	F	
	Eastbound Left - Turn	791.1	F	2.71	417.2	400.7	F	223.6


Prince Philip Drive	Eastbound Through	34.4	C	0.86	145.1	74.4	E	610.3
	Eastbound Right - Turn	16.0	B	0.69	84.1	111.9	F	117.8
	Westbound Left - Turn	369.1	F	1.73	134.4	997.4	F	77.2
	Westbound Through	187.7	F	1.36	242.4	677.0	F	860.0
	Westbound Right - Turn					660.6	F	861.9
Allandale Road	Northbound Left - Turn	596.7	F	2.27	151.6	320.1	F	77.9
	Northbound Through	237.8	F	1.46	348.6	172.2	F	429.8
	Northbound Right - Turn	16.6	B	0.76	100.6	23.7	C	348.4
	Southbound Left - Turn	323.4	F	1.48	27.9	190.9	F	58.1
	Southbound Through	200.9	F	1.35	184.6	161.9	F	126.4
	Southbound Right - Turn	19.2	B	0.47	47.2	13.0	B	64.9
Prince Philip Drive & Confederation Building Lot		32.9	C			87.3	F	
Prince Philip Drive	Eastbound Left - Turn	80.3	F	0.96	100.2	61.9	E	141.2
	Eastbound Right - Turn	10.6	B	0.59	13.7	157.1	F	150.2
Confederation Building Lot	Northbound Left - Turn	84.7	F	1.01	122.1	13.9	B	33.1
	Northbound Through	7.5	A	0.60	64.3	4.7	A	29.3
	Southbound Through	43.5	D	0.92	182.7	172.6	F	196.7
	Southbound Right - Turn	3.5	A	0.32	13.3	46.8	D	148.9
Bonaventure Avenue/ Allandale Road & Elizabeth Avenue		251.4	F			225.0	F	
Bonaventure Avenue/ Allandale Road	Eastbound Left - Turn	109.4	F	1.08	59.3	66.7	E	69.7
	Eastbound Through	285.5	F	1.55	298.2	68.3	E	219.2
	Eastbound Right - Turn					53.6	D	
	Westbound Left - Turn	46.5	D	0.68	34.1	554.9	F	60.1
	Westbound Through	64.4	E	0.91	167.1	627.0	F	376.9
	Westbound Right - Turn	2.2	A	0.17	4.1	61.1	E	415.4
Elizabeth Avenue	Northbound Left - Turn	26.9	C	0.46	16.8	650.1	F	71.7
	Northbound Through	399.8	F	1.82	530.2	150.4	F	245.7
	Northbound Right - Turn	7.6	A	0.25	19.4	139.2	F	37.9
	Southbound Left - Turn	51.0	D	0.91	17.6	282.7	F	45.8
	Southbound Through	335.8	F	1.70	326.5	226.8	F	462.4
	Southbound Right - Turn	4.1	A	0.43	3.9	477.9	F	500.9
Elizabeth Avenue & Westerland Road		72.3	E			337.7	F	
Elizabeth Avenue	Eastbound Left - Turn	144.1	F	1.22	48.6	10.8	B	25.1
	Eastbound Through	4.7	A	0.44	18.2	4.7	A	25.2
	Westbound Through	97.9	F	1.15	327.1	913.0	F	593.9
	Westbound Right - Turn					903.4	F	
Westerland Road	Southbound Left - Turn	103.1	F	1.16	114.1	214.9	F	451.6
	Southbound Right - Turn	2.3	A	0.65	0.6	268.5	F	88.5
Elizabeth Avenue & Anderson Avenue		1466.8	F			412.4	F	
Elizabeth Avenue	Eastbound Through	0.0	-	0.60	0.0	1.5	A	9.3
	Eastbound Right - Turn					0.6	A	
	Westbound Left - Turn	13.7	B	0.39	13.9	467.1	F	60.3
	Westbound Through	0.0	-	0.37	0.0	515.9	F	413.9
Anderson Avenue	Northbound Left - Turn	ERROR	F	4.50	ERROR	2820.4	F	330.4
	Northbound Right - Turn					2428.1	F	64.5
Elizabeth Avenue & Paton Street		39.3	E			257.9	F	
Elizabeth Avenue	Eastbound Left - Turn	9.7	A	0.07	1.7	5.6	A	9.0
	Eastbound Through	0.0	-	0.53	0.0	2.5	A	12.9
	Westbound Through	0.0	-	0.45	0.0	84.5	F	50.5
	Westbound Right - Turn					71.5	F	
Paton Street	Southbound Left - Turn	422.1	F	1.70	104.9	1631.3	F	491.7
	Southbound Right - Turn					1645.3	F	
Elizabeth Avenue & Freshwater Road		200.2	F			178.7	F	
Elizabeth Avenue	Westbound Right - Turn	71.8	E	1.07	104.0	516.8	F	271.1
Freshwater Road	Northbound Through	254.2	F	1.48	390.0	156.4	F	216.7
	Northbound Right - Turn					153.2	F	
	Southbound Left - Turn	392.0	F	1.83	54.4	86.2	F	32.7
	Southbound Through	10.8	B	0.55	23.8	63.5	E	308.3
Freshwater Road & Stamps Lane/ Oxen Pond Road		369.1	F			157.9	F	
Freshwater Road	Eastbound Through	477.5	F	2.00	677.1	178.9	F	365.4
	Eastbound Right - Turn	24.9	C	0.68	79.5	64.8	E	378.1
	Westbound Through	456.2	F	1.96	449.6	113.9	F	260.8

	Westbound Right - Turn	430.2	F	1.00	442.0	108.5	F	200.0
Stamps Lane/ Oxen Pond Road	Northbound Left - Turn	431.9	F	1.88	317.2	353.0	F	380.5
	Northbound Through					360.8	F	
	Northbound Right - Turn					344.3	F	
	Southbound Left - Turn	17.7	B	0.05	7.0	23.2	C	16.2
	Southbound Through	29.5	C	0.66	113.0	25.5	C	92.4
	Southbound Right - Turn					19.5	B	
Freshwater Road & Thorburn Road		48.1	D			75.4	E	
Freshwater Road	Eastbound Through	37.6	D	0.91	205.6	241.1	F	172.0
	Westbound Through	12.0	B	0.68	29.5	15.6	B	76.2
	Westbound Right - Turn	69.9	E	1.13	0.8	12.4	B	37.3
Thorburn Road	Southbound Left - Turn	25.9	C	0.82	86.2	83.4	F	81.2
	Southbound Right - Turn	125.3	F	1.22	138.3	23.0	C	54.1
Allandale Road & Confederation Building Lot		30.7	C			78.7	E	
Confederation Building Lot	Westbound Left - Turn	33.1	C	0.47	32.3	125.3	F	106.3
	Westbound Right - Turn	47.8	D	0.91	56.1	24.3	C	93.6
Allandale Road	Northbound Through	47.8	D	1.00	227.3	16.4	B	76.8
	Northbound Right - Turn	2.9	A	0.40	14.8	4.7	A	2.8
	Southbound Left - Turn	50.6	D	0.86	65.7	45.1	D	188.5
	Southbound Through	8.0	A	0.64	87.8	175.3	F	210.2
Allandale Road & Higgins Line		17.7	B			69.1	E	
Higgins Line	Westbound Left - Turn	55.8	E	0.87	79.2	487.3	F	147.6
	Westbound Right - Turn	9.3	A	0.50	21.0	309.6	F	54.6
Allandale Road	Northbound Through	13.5	B	0.76	124.2	6.3	A	47.5
	Northbound Right - Turn	10.4	B	0.81	144.6	5.7	A	55.8
	Southbound Left - Turn	47.6	D	0.84	54.3	19.1	B	97.5
	Southbound Through	3.9	A	0.44	26.6	67.1	E	114.7
Allandale Road & Mt. Scio Road		76.6	E			37.8	D	
Allandale Road	Eastbound Left - Turn	79.3	E	0.96	64.3	44.5	D	70.0
	Eastbound Through	44.0	D	0.93	157.3	44.0	D	197.7
	Eastbound Right - Turn					37.9	D	204.2
	Westbound Left - Turn	42.4	D	0.72	20.3	30.1	C	25.5
	Westbound Through	124.5	F	1.22	210.4	17.1	B	71.8
	Westbound Right - Turn					7.0	A	58.7
Mt. Scio Road	Northbound Left - Turn	37.3	D	0.63	24.2	47.3	D	39.4
	Northbound Through	24.1	C	0.48	36.7	56.0	E	
	Northbound Right - Turn					27.7	C	
	Southbound Left - Turn	24.2	C	0.35	26.9	54.9	D	74.0
	Southbound Through	56.6	E	0.94	122.9	72.6	E	
	Southbound Right - Turn					44.9	D	
Outer Ring Road NB & Allandale Road		112.8	F			20.9	C	
Allandale Road	Eastbound Left - Turn	1.0	A	0.03	0.7	12.7	B	52.9
	Eastbound Through					6.9	A	
	Westbound Through	0.0	-	0.79	0.0	7.4	A	0.0
	Westbound Right - Turn	0.0	-	0.32	0.0	8.6	A	64.2
Outer Ring Road SB	Northbound Left - Turn	394.2	F	1.82	465.0	60.6	F	192.6
	Northbound Right - Turn	0.0	-	0.00	0.0	46.1	E	23.7
Outer Ring Road SB & Allandale Road		72.5	F			7.6	A	
Allandale Road	Eastbound Left - Turn	1.2	A	0.01	0.1	2.0	A	3.6
	Eastbound Through					2.7	A	
	Westbound Through	0.0	-	0.84	0.0	8.8	A	1.9
	Westbound Right - Turn					7.0	A	
Outer Ring Road SB	Southbound Left - Turn	268.3	F	1.50	225.4	8.9	A	46.4
	Southbound Right - Turn	0.0	-	0.00	0.0	2.9	A	13.5

MUN Area Traffic Study
Allandale Road & Confederation Building Lot

Scenario 3 - 2025 PM

06/07/2015

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔↔	↔	↕↕	↔	↔	↕↕
Traffic Volume (vph)	266	306	1686	382	202	1296
Future Volume (vph)	266	306	1686	382	202	1296
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	4.0	4.0	4.0	3.5
Grade (%)	0%		0%			0%
Storage Length (m)	45.0	0.0		110.0	130.0	
Storage Lanes	1	1		1	1	
Taper Length (m)	2.5				2.5	
Lane Util. Factor	0.97	1.00	0.95	1.00	1.00	0.95
Ped Bike Factor						
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3395	1566	3697	1654	1848	3500
Flt Permitted	0.950				0.075	
Satd. Flow (perm)	3395	1566	3697	1654	146	3500
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		147		394		
Link Speed (k/h)	50		60			60
Link Distance (m)	100.1		513.4			163.6
Travel Time (s)	7.2		30.8			9.8
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.67	0.67	0.97	0.97	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Adj. Flow (vph)	397	457	1738	394	220	1409
Shared Lane Traffic (%)						
Lane Group Flow (vph)	397	457	1738	394	220	1409
Turn Type	Prot	Perm	NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2	6	
Total Split (s)	34.0	34.0	53.0	53.0	13.0	66.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Act Effect Green (s)	25.1	25.1	47.2	47.2	62.9	62.9
Actuated g/C Ratio	0.25	0.25	0.47	0.47	0.63	0.63
v/c Ratio	0.47	0.91	1.00	0.40	0.86	0.64
Control Delay	33.1	47.8	47.8	2.9	50.6	8.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.1	47.8	47.8	2.9	50.6	8.0
LOS	C	D	D	A	D	A
Approach Delay	41.0		39.5			13.7
Approach LOS	D		D			B
Stops (vph)	216	200	1466	26	150	768
Fuel Used(l)	14	19	201	23	17	61
CO Emissions (g/hr)	263	347	3732	429	317	1143



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
NOx Emissions (g/hr)	51	67	720	83	61	221
VOC Emissions (g/hr)	61	80	861	99	73	264
Dilemma Vehicles (#)	0	0	80	0	0	9
Queue Length 50th (m)	32.3	58.4	~171.6	0.0	~30.2	81.6
Queue Length 95th (m)	32.3	56.1	#227.3	14.8	m#65.7	87.8
Internal Link Dist (m)	76.1		489.4			139.6
Turn Bay Length (m)	45.0			110.0	130.0	
Base Capacity (vph)	950	544	1745	989	257	2203
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	0.42	0.84	1.00	0.40	0.86	0.64

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 23 (23%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.00

Intersection Signal Delay: 30.7

Intersection LOS: C

Intersection Capacity Utilization 81.1%

ICU Level of Service D

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

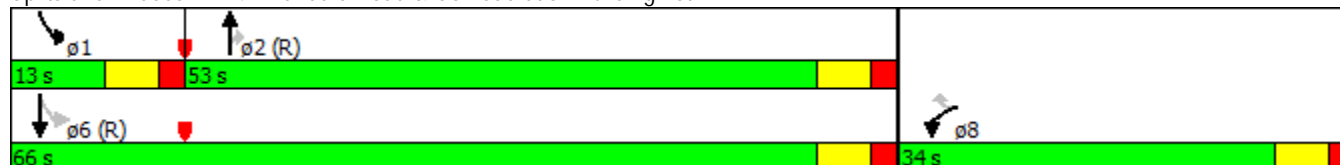
Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

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

Splits and Phases: 24: Allandale Road & Confederation Building Lot



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	←←	←	→→	←	←	→→
Traffic Volume (vph)	527	231	1190	803	254	971
Future Volume (vph)	527	231	1190	803	254	971
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	4.0	4.0	3.5	3.5	4.0	3.5
Grade (%)	0%		3%			-3%
Storage Length (m)	0.0	40.0		80.0	80.0	
Storage Lanes	2	1		1	1	
Taper Length (m)	2.5				2.5	
Lane Util. Factor	0.97	1.00	0.95	1.00	1.00	0.95
Ped Bike Factor						
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3586	1654	3447	1542	1876	3552
Flt Permitted	0.950				0.090	
Satd. Flow (perm)	3586	1654	3447	1542	178	3552
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		234		680		
Link Speed (k/h)	50		50			50
Link Distance (m)	128.4		114.7			80.6
Travel Time (s)	9.2		8.3			5.8
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.96	0.96	0.88	0.88	0.88	0.88
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Adj. Flow (vph)	549	241	1352	913	289	1103
Shared Lane Traffic (%)						
Lane Group Flow (vph)	549	241	1352	913	289	1103
Turn Type	Prot	Perm	NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2	6	
Total Split (s)	24.0	24.0	56.0	56.0	20.0	76.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Act Effect Green (s)	17.6	17.6	51.5	51.5	70.4	70.4
Actuated g/C Ratio	0.18	0.18	0.52	0.52	0.70	0.70
v/c Ratio	0.87	0.50	0.76	0.81	0.84	0.44
Control Delay	55.8	9.3	13.5	10.4	47.6	3.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	55.8	9.3	13.5	10.4	47.6	3.9
LOS	E	A	B	B	D	A
Approach Delay	41.6		12.3			13.0
Approach LOS	D		B			B
Stops (vph)	484	34	972	580	193	194
Fuel Used(l)	40	5	66	41	34	80
CO Emissions (g/hr)	743	97	1221	756	629	1480



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
NOx Emissions (g/hr)	143	19	236	146	121	286
VOC Emissions (g/hr)	171	22	282	174	145	341
Dilemma Vehicles (#)	0	0	0	0	0	0
Queue Length 50th (m)	53.6	1.1	107.1	138.6	45.2	22.0
Queue Length 95th (m)	#79.2	21.0	m124.2	m144.6	m54.3	m26.6
Internal Link Dist (m)	104.4		90.7			56.6
Turn Bay Length (m)		40.0		80.0	80.0	
Base Capacity (vph)	645	489	1775	1124	363	2500
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	0.85	0.49	0.76	0.81	0.80	0.44

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 56 (56%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 17.7

Intersection LOS: B

Intersection Capacity Utilization 77.0%

ICU Level of Service D

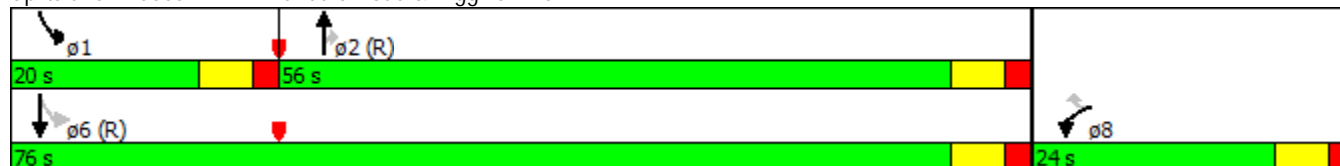
Analysis Period (min) 15





















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.

Splits and Phases: 22: Allandale Road & Higgins Line



												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	181	1006	141	117	1243	60	97	66	113	106	113	303
Future Volume (vph)	181	1006	141	117	1243	60	97	66	113	106	113	303
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.6	3.6	3.6	3.5	3.5	3.5	3.6	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	75.0		0.0	75.0		0.0	60.0		25.0	60.0		25.0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.982			0.993			0.905			0.891	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1750	3437	0	1770	3514	0	1750	1667	0	1770	1641	0
Flt Permitted	0.108			0.108			0.160			0.492		
Satd. Flow (perm)	199	3437	0	201	3514	0	295	1667	0	916	1641	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		17			5			82			128	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		358.1			559.6			322.8			111.1	
Travel Time (s)		21.5			33.6			23.2			8.0	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.96	0.96	0.96	0.82	0.82	0.82	0.78	0.78	0.78	0.87	0.87	0.87
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	189	1048	147	143	1516	73	124	85	145	122	130	348
Shared Lane Traffic (%)												
Lane Group Flow (vph)	189	1195	0	143	1589	0	124	230	0	122	478	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Total Split (s)	13.0	43.0		13.0	43.0		13.0	31.0		13.0	31.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Act Effect Green (s)	44.0	37.0		44.0	37.0		32.0	25.0		32.0	25.0	
Actuated g/C Ratio	0.44	0.37		0.44	0.37		0.32	0.25		0.32	0.25	
v/c Ratio	0.96	0.93		0.72	1.22		0.63	0.48		0.35	0.94	
Control Delay	79.3	44.0		42.4	124.5		37.3	24.1		24.2	56.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	79.3	44.0		42.4	124.5		37.3	24.1		24.2	56.6	
LOS	E	D		D	F		D	C		C	E	
Approach Delay		48.8			117.7			28.7			50.0	
Approach LOS		D			F			C			D	
Stops (vph)	99	1005		82	1077		67	98		74	275	
Fuel Used(l)	20	107		15	253		7	11		5	29	
CO Emissions (g/hr)	370	1989		276	4697		135	205		88	533	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	71	384		53	907		26	39		17	103	
VOC Emissions (g/hr)	85	459		64	1083		31	47		20	123	
Dilemma Vehicles (#)	0	55		0	24		0	0		0	0	
Queue Length 50th (m)	21.3	114.2		9.5	~202.9		15.8	23.9		15.5	69.7	
Queue Length 95th (m)	#64.3	#157.3		m20.3	#210.4		24.2	36.7		26.9	#122.9	
Internal Link Dist (m)		334.1			535.6			298.8			87.1	
Turn Bay Length (m)	75.0			75.0			60.0			60.0		
Base Capacity (vph)	196	1282		198	1303		196	478		352	506	
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	0.96	0.93		0.72	1.22		0.63	0.48		0.35	0.94	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 21 (21%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.22

Intersection Signal Delay: 76.6

Intersection LOS: E

Intersection Capacity Utilization 96.7%

ICU Level of Service F

Analysis Period (min) 15

~ 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.

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
























Splits and Phases: 11: Mt. Scio Road & Allandale Road















MUN Area Traffic Study
Prince Philip Drive & Allandale Road

Scenario 3 - 2025 PM

06/07/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	922	1043	476	331	1011	154	374	992	543	72	957	532
Future Volume (vph)	922	1043	476	331	1011	154	374	992	543	72	957	532
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	3.8	3.8	3.0	3.7	3.7	3.5	3.5	3.5	3.0	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	200.0		120.0	65.0		25.0	70.0		0.0	42.0		35.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	0.95	0.88
Ped Bike Factor			0.98		1.00		1.00		0.98			
Frt			0.850		0.980				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1652	3618	1619	1652	3500	0	1750	1842	1566	1652	3500	2756
Flt Permitted	0.105			0.125			0.950			0.138		
Satd. Flow (perm)	183	3618	1593	217	3500	0	1748	1842	1541	240	3500	2756
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			257		14				262			91
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		455.9			851.6			464.8			121.6	
Travel Time (s)		23.4			43.8			33.5			8.8	
Confl. Peds. (#/hr)	2		2	2		2	2		2	2		2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.94	0.94	0.94	0.91	0.91	0.91	0.94	0.94	0.94	0.84	0.84	0.84
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	981	1110	506	364	1111	169	398	1055	578	86	1139	633
Shared Lane Traffic (%)												
Lane Group Flow (vph)	981	1110	506	364	1280	0	398	1055	578	86	1139	633
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Prot	NA	Perm	Perm	NA	pt+ov
Protected Phases	5	2		1	6		7	4			8	8 5
Permitted Phases	2		2	6					4	8		
Total Split (s)	28.0	50.0	50.0	17.0	39.0		18.0	53.0	53.0	35.0	35.0	
Total Lost Time (s)	6.0	7.0	7.0	6.0	7.0		6.0	6.0	6.0	6.0	6.0	
Act Effect Green (s)	61.0	43.0	43.0	44.0	32.0		12.0	47.0	47.0	29.0	29.0	57.0
Actuated g/C Ratio	0.51	0.36	0.36	0.37	0.27		0.10	0.39	0.39	0.24	0.24	0.48
v/c Ratio	2.71	0.86	0.69	1.73	1.36		2.27	1.46	0.76	1.48	1.35	0.47
Control Delay	791.1	34.4	16.0	369.1	187.7		596.7	237.8	16.6	323.4	200.9	19.2
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	791.1	34.4	16.0	369.1	187.7		596.7	237.8	16.6	323.4	200.9	19.2
LOS	F	C	B	F	F		F	F	B	F	F	B
Approach Delay		316.7			227.9			245.2			144.7	
Approach LOS		F			F			F			F	
Stops (vph)	590	958	318	276	903		241	751	380	47	748	298
Fuel Used(l)	621	108	37	137	316		194	242	39	23	222	47
CO Emissions (g/hr)	11559	2016	697	2543	5870		3602	4504	734	434	4138	867

Synchro 9 Report

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	2231	389	135	491	1133		695	869	142	84	799	167
VOC Emissions (g/hr)	2666	465	161	587	1354		831	1039	169	100	954	200
Dilemma Vehicles (#)	0	31	0	0	6		0	0	0	0	0	0
Queue Length 50th (m)	~387.0	133.7	69.9	~109.3	~211.7		~151.6	~348.6	100.6	~27.9	~184.6	47.2
Queue Length 95th (m)	m#417.2	m145.1	m84.1	m#134.4	m#242.4		m#112.3	m#217.9	m64.5	#55.9	#203.4	57.6
Internal Link Dist (m)		431.9			827.6			440.8			97.6	
Turn Bay Length (m)	200.0		120.0	65.0			70.0			42.0		35.0
Base Capacity (vph)	362	1296	735	211	943		175	721	762	58	845	1356
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	2.71	0.86	0.69	1.73	1.36		2.27	1.46	0.76	1.48	1.35	0.47

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green, Master Intersection

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 2.71

Intersection Signal Delay: 241.5

Intersection LOS: F

Intersection Capacity Utilization 177.8%

ICU Level of Service H

Analysis Period (min) 15

~ 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.

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


















Splits and Phases: 7: Allandale Road & Prince Philip Drive







MUN Area Traffic Study
Allandale Road & TCH NB

Scenario 3 - 2025 PM

06/07/2015

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	9	473	0	0	1173	471	6	0	856	0	0	0
Future Volume (Veh/h)	9	473	0	0	1173	471	6	0	856	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.86	0.86	0.86	0.87	0.87	0.87	0.88	0.88	0.88	0.92	0.92	0.92
Hourly flow rate (vph)	10	550	0	0	1348	541	7	0	973	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)										3		
Median type	None				None							
Median storage (veh)												
Upstream signal (m)	358											
pX, platoon unblocked	0.59							0.59	0.59			
vC, conflicting volume	1348				550				1918	1918	550	1918
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1243				550				2206	2206	550	2206
tC, single (s)	4.1				4.1				7.1	6.5	6.2	7.1
tC, 2 stage (s)												
tF (s)	2.2				2.2				3.5	4.0	3.3	3.5
p0 queue free %	97				100				62	100	0	0
cM capacity (veh/h)	332				1020				18	25	535	0
											25	126
Direction, Lane #	EB 1	WB 1	WB 2	NB 1								
Volume Total	560	1348	541	980								
Volume Left	10	0	0	7								
Volume Right	0	0	541	973								
cSH	332	1700	1700	539								
Volume to Capacity	0.03	0.79	0.32	1.82								
Queue Length 95th (m)	0.7	0.0	0.0	465.0								
Control Delay (s)	1.0	0.0	0.0	394.2								
Lane LOS	A				F							
Approach Delay (s)	1.0	0.0			394.2							
Approach LOS					F							
Intersection Summary												
Average Delay				112.8								
Intersection Capacity Utilization				85.1%	ICU Level of Service				E			
Analysis Period (min)				15								


























Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	26	24	1155	456	7
Future Volume (Veh/h)	5	26	24	1155	456	7
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.62	0.62	0.83	0.83	0.85	0.85
Hourly flow rate (vph)	8	42	29	1392	536	8
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						3
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	29				783	725
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	29				783	725
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				0	98
cM capacity (veh/h)	1584				361	425
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	50	1421	544			
Volume Left	8	0	536			
Volume Right	0	1392	8			
cSH	1584	1700	362			
Volume to Capacity	0.01	0.84	1.50			
Queue Length 95th (m)	0.1	0.0	225.4			
Control Delay (s)	1.2	0.0	268.3			
Lane LOS	A		F			
Approach Delay (s)	1.2	0.0	268.3			
Approach LOS			F			
Intersection Summary						
Average Delay		72.5				
Intersection Capacity Utilization		104.7%	ICU Level of Service	G		
Analysis Period (min)		15				

MUN Area Traffic Study
Bonaventure Avenue/ Allandale Road & Elizabeth Avenue

Scenario 3 - 2025 PM

06/07/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	192	716	106	101	449	87	64	1142	154	128	1152	282
Future Volume (vph)	192	716	106	101	449	87	64	1142	154	128	1152	282
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	3.5	3.7	3.0	3.5	3.7	3.0	3.4	3.4	3.0	3.4	3.4
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	55.0		0.0	55.0		0.0	55.0		35.0	40.0		0.0
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.981				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1652	1807	0	1652	1842	1601	1652	1821	1548	1652	1821	1548
Flt Permitted	0.115			0.122			0.085			0.082		
Satd. Flow (perm)	200	1807	0	212	1842	1601	148	1821	1548	143	1821	1548
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6				136			136			136
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		335.6			298.1			241.6			464.8	
Travel Time (s)		24.2			21.5			17.4			33.5	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.97	0.97	0.97	0.95	0.95	0.95	0.90	0.90	0.90	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	198	738	109	106	473	92	71	1269	171	139	1252	307
Shared Lane Traffic (%)												
Lane Group Flow (vph)	198	847	0	106	473	92	71	1269	171	139	1252	307
Turn Type	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2			6		6	4		4	8		8
Total Split (s)	15.0	42.0		13.0	40.0	40.0	13.0	52.0	52.0	13.0	52.0	52.0
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
Act Effect Green (s)	45.0	36.0		41.0	34.0	34.0	53.0	46.0	46.0	54.2	48.6	48.6
Actuated g/C Ratio	0.38	0.30		0.34	0.28	0.28	0.44	0.38	0.38	0.45	0.40	0.40
v/c Ratio	1.08	1.55		0.68	0.91	0.17	0.46	1.82	0.25	0.91	1.70	0.43
Control Delay	109.4	285.5		46.5	64.4	2.2	26.9	399.8	7.6	51.0	335.8	4.1
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	109.4	285.5		46.5	64.4	2.2	26.9	399.8	7.6	51.0	335.8	4.1
LOS	F	F		D	E	A	C	F	A	D	F	A
Approach Delay		252.1			53.0			337.9			252.5	
Approach LOS		F			D			F			F	
Stops (vph)	113	583		66	400	3	34	768	27	128	742	34
Fuel Used(l)	35	264		8	44	3	4	395	5	14	365	14
CO Emissions (g/hr)	654	4911		148	817	50	66	7343	94	252	6793	262

MUN Area Traffic Study
Bonaventure Avenue/ Allandale Road & Elizabeth Avenue

Scenario 3 - 2025 PM

06/07/2015



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	126	948		29	158	10	13	1417	18	49	1311	51
VOC Emissions (g/hr)	151	1133		34	188	11	15	1694	22	58	1567	61
Dilemma Vehicles (#)	0	0		0	0	0	0	0	0	0	0	0
Queue Length 50th (m)	~38.4	~281.8		15.5	107.5	0.0	8.6	~450.8	5.1	21.2	~443.7	5.6
Queue Length 95th (m)	m#59.3	m#298.2		#34.1	#167.1	4.1	16.8	#530.2	19.4	m17.6	m#326.5	m3.9
Internal Link Dist (m)		311.6			274.1			217.6			440.8	
Turn Bay Length (m)	55.0			55.0			55.0		35.0	40.0		
Base Capacity (vph)	183	546		156	521	551	153	698	677	152	737	708
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	1.08	1.55		0.68	0.91	0.17	0.46	1.82	0.25	0.91	1.70	0.43

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 38 (32%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.82

Intersection Signal Delay: 251.4

Intersection LOS: F

Intersection Capacity Utilization 137.1%

ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

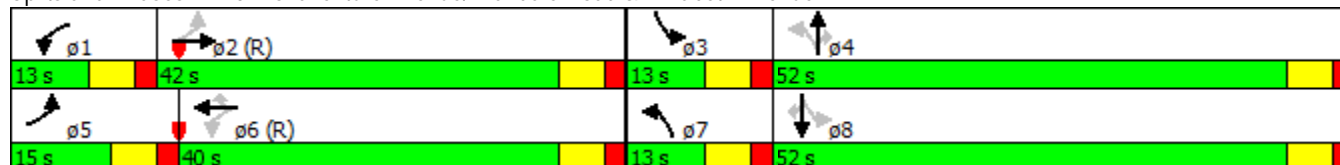
Queue shown is maximum after two cycles.












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

Queue shown is maximum after two cycles.

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

Splits and Phases: 10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue











































						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	748	41	239	649	14	611
Future Volume (Veh/h)	748	41	239	649	14	611
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	901	49	288	782	17	736
Pedestrians	47		47			47
Lane Width (m)	3.7		4.0			3.7
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	4		4			4
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (m)			105			
pX, platoon unblocked						
vC, conflicting volume	1152	382			1117	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1152	382			1117	
tC, single (s)	6.4	6.3			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.4			2.3	
p0 queue free %	0	92			97	
cM capacity (veh/h)	195	605			560	
Direction, Lane #	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1
Volume Total	450	450	49	288	782	753
Volume Left	450	450	0	0	0	17
Volume Right	0	0	49	0	782	0
cSH	195	195	605	1700	1700	560
Volume to Capacity	2.31	2.31	0.08	0.17	0.46	0.03
Queue Length 95th (m)	278.2	278.2	2.0	0.0	0.0	0.7
Control Delay (s)	646.2	646.2	11.5	0.0	0.0	0.9
Lane LOS	F	F	B			A
Approach Delay (s)	613.4			0.0		0.9
Approach LOS	F					
Intersection Summary						
Average Delay			210.4			
Intersection Capacity Utilization			83.6%		ICU Level of Service	E
Analysis Period (min)			15			

MUN Area Traffic Study
Prince Philip Drive & Thorburn Road

Scenario 3 - 2025 PM

06/07/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			  			 		 	 	
Traffic Volume (vph)	578	1216	365	273	1571	485	0	1030	56	462	992	877
Future Volume (vph)	578	1216	365	273	1571	485	0	1030	56	462	992	877
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.8	4.2	3.5	3.8	4.0	2.4	3.8	4.3	3.5	3.8	3.8
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	175.0		0.0	110.0		90.0	0.0		0.0	150.0		150.0
Storage Lanes	1		1	1		0	0		0	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.95	0.95	0.97	0.95	0.95
Ped Bike Factor			0.98			0.98		1.00		1.00	0.99	
Frt			0.850			0.850		0.992			0.930	
Flt Protected	0.950			0.950						0.950		
Satd. Flow (prot)	1750	3618	1689	1750	5198	1654	0	3586	0	3395	3339	0
Flt Permitted	0.100			0.118						0.950		
Satd. Flow (perm)	184	3618	1662	217	5198	1627	0	3586	0	3388	3339	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			145			227		4			218	
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		327.2			152.5			152.8			386.6	
Travel Time (s)		16.8			7.8			11.0			27.8	
Confl. Peds. (#/hr)	2		2	2		2	2		2	2		2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.96	0.96	0.96	0.95	0.95	0.95	0.91	0.91	0.91	0.91	0.91	0.91
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	602	1267	380	287	1654	511	0	1132	62	508	1090	964
Shared Lane Traffic (%)												
Lane Group Flow (vph)	602	1267	380	287	1654	511	0	1194	0	508	2054	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm		NA		Prot	NA	
Protected Phases	5	2		1	6			4		3	8	
Permitted Phases	2		2	6		6						
Total Split (s)	25.0	51.0	51.0	15.0	41.0	41.0		37.0		17.0	54.0	
Total Lost Time (s)	6.0	7.0	7.0	6.0	7.0	7.0		7.0		6.0	7.0	
Act Effect Green (s)	60.0	44.0	44.0	44.0	34.0	34.0		30.0		11.0	47.0	
Actuated g/C Ratio	0.50	0.37	0.37	0.37	0.28	0.28		0.25		0.09	0.39	
v/c Ratio	1.78	0.96	0.54	1.48	1.12	0.82		1.33		1.63	1.43	
Control Delay	386.3	53.6	21.2	246.0	86.9	20.3		178.3		333.9	223.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Total Delay	386.3	53.6	21.2	246.0	86.9	20.3		178.3		333.9	223.8	
LOS	F	D	C	F	F	C		F		F	F	
Approach Delay		137.2			91.7			178.3			245.6	
Approach LOS		F			F			F			F	
Stops (vph)	335	1090	180	185	1403	410		860		329	1276	
Fuel Used(l)	202	130	24	73	243	49		191		143	419	
CO Emissions (g/hr)	3756	2425	439	1358	4512	911		3561		2661	7795	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	725	468	85	262	871	176		687		514	1504	
VOC Emissions (g/hr)	866	559	101	313	1041	210		821		614	1798	
Dilemma Vehicles (#)	0	49	0	0	12	0		0		0	0	
Queue Length 50th (m)	~198.0	151.6	42.7	~76.0	~169.5	94.7		~195.3		~89.0	~329.0	
Queue Length 95th (m)	#267.2	#197.4	72.4	m#68.8	m#144.5	m78.4		m#162.6		#122.3	#371.4	
Internal Link Dist (m)		303.2			128.5			128.8			362.6	
Turn Bay Length (m)	175.0			110.0		90.0				150.0		
Base Capacity (vph)	339	1326	701	194	1472	623		899		311	1440	
Starvation Cap Reductn	0	0	0	0	0	0		0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0		0		0	0	
Storage Cap Reductn	0	0	0	0	0	0		0		0	0	
Reduced v/c Ratio	1.78	0.96	0.54	1.48	1.12	0.82		1.33		1.63	1.43	

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 20 (17%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.78

Intersection Signal Delay: 162.6

Intersection LOS: F

Intersection Capacity Utilization 134.7%

ICU Level of Service H

Analysis Period (min) 15

~ 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.

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

Splits and Phases: 37: Thorburn Road & Prince Philip Drive



						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	734	189	241	592	130	167
Future Volume (Veh/h)	734	189	241	592	130	167
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.93	0.93	0.90	0.90
Hourly flow rate (vph)	816	210	259	637	144	186
Pedestrians	2			2	6	
Lane Width (m)	3.7			3.7	3.7	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	0			0	1	
Right turn flare (veh)						13
Median type	None			None		
Median storage veh						
Upstream signal (m)	343					
pX, platoon unblocked						
vC, conflicting volume			1032		2084	929
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1032		2084	929
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			61		0	42
cM capacity (veh/h)			670		36	322
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	1026	259	637	330		
Volume Left	0	259	0	144		
Volume Right	210	0	0	186		
cSH	1700	670	1700	73		
Volume to Capacity	0.60	0.39	0.37	4.50		
Queue Length 95th (m)	0.0	13.9	0.0	Err		
Control Delay (s)	0.0	13.7	0.0	Err		
Lane LOS		B		F		
Approach Delay (s)	0.0	4.0		Err		
Approach LOS				F		
Intersection Summary						
Average Delay			1466.8			
Intersection Capacity Utilization			81.2%	ICU Level of Service	D	
Analysis Period (min)			15			

MUN Area Traffic Study
Freshwater Road & Elizabeth Avenue

Scenario 3 - 2025 PM

06/07/2015

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	722	824	48	886	638
Future Volume (vph)	0	722	824	48	886	638
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.7	4.5	3.4	3.7	3.0	3.4
Grade (%)	0%		0%			0%
Storage Length (m)	0.0	0.0		0.0	30.0	
Storage Lanes	0	1		0	1	
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			1.00			
Frt		0.865	0.993			
Flt Protected					0.950	
Satd. Flow (prot)	0	1772	1803	0	1652	1821
Flt Permitted					0.082	
Satd. Flow (perm)	0	1772	1803	0	143	1821
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		501	3			
Link Speed (k/h)	50		50			50
Link Distance (m)	279.7		216.7			273.7
Travel Time (s)	20.1		15.6			19.7
Confl. Peds. (#/hr)				9	9	
Confl. Bikes (#/hr)						
Peak Hour Factor	0.88	0.88	0.91	0.91	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Adj. Flow (vph)	0	820	905	53	963	693
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	820	958	0	963	693
Turn Type		Perm	NA		pm+pt	NA
Protected Phases			2		1	6
Permitted Phases		8			6	
Total Split (s)		31.0	49.0		40.0	89.0
Total Lost Time (s)		6.0	6.0		6.0	6.0
Act Effect Green (s)		25.0	43.0		83.0	83.0
Actuated g/C Ratio		0.21	0.36		0.69	0.69
v/c Ratio		1.07	1.48		1.83	0.55
Control Delay		71.8	254.2		392.0	10.8
Queue Delay		0.0	0.0		0.0	0.0
Total Delay		71.8	254.2		392.0	10.8
LOS		E	F		F	B
Approach Delay			254.2			232.5
Approach LOS			F			F
Stops (vph)		363	641		529	564
Fuel Used(l)		67	203		302	35
CO Emissions (g/hr)		1250	3774		5620	642

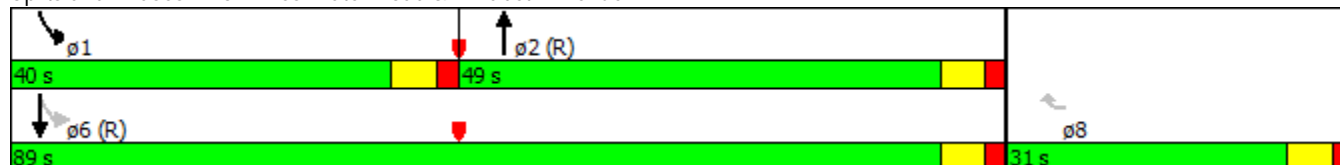


Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
NOx Emissions (g/hr)		241	728		1085	124
VOC Emissions (g/hr)		288	870		1296	148
Dilemma Vehicles (#)		0	0		0	0
Queue Length 50th (m)		~98.2	~312.8		~322.3	162.1
Queue Length 95th (m)		m#104.0	#390.0		m54.4	m23.8
Internal Link Dist (m)	255.7		192.7			249.7
Turn Bay Length (m)					30.0	
Base Capacity (vph)		765	648		526	1259
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		1.07	1.48		1.83	0.55





Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 79 (66%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.83
Intersection Signal Delay: 200.2 Intersection LOS: F
Intersection Capacity Utilization 105.4% ICU Level of Service G
Analysis Period (min) 15
~ 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.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 51: Freshwater Road & Elizabeth Avenue



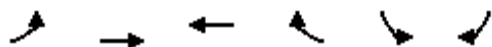


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	50	814	609	112	108	38
Future Volume (Veh/h)	50	814	609	112	108	38
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.90	0.90	0.94	0.94	0.83	0.83
Hourly flow rate (vph)	56	904	648	119	130	46
Pedestrians		18	27		17	
Lane Width (m)		3.0	3.7		4.5	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		1	2		2	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)		280				
pX, platoon unblocked						
vC, conflicting volume	784				1768	742
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	784				1768	742
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	93				0	89
cM capacity (veh/h)	820				82	403
Direction, Lane #	EB 1	EB 2	WB 1	SB 1		
Volume Total	56	904	767	176		
Volume Left	56	0	0	130		
Volume Right	0	0	119	46		
cSH	820	1700	1700	104		
Volume to Capacity	0.07	0.53	0.45	1.70		
Queue Length 95th (m)	1.7	0.0	0.0	104.9		
Control Delay (s)	9.7	0.0	0.0	422.1		
Lane LOS	A			F		
Approach Delay (s)	0.6		0.0	422.1		
Approach LOS				F		
Intersection Summary						
Average Delay			39.3			
Intersection Capacity Utilization			60.3%	ICU Level of Service		B
Analysis Period (min)			15			

MUN Area Traffic Study
Westerland Road & Elizabeth Avenue

Scenario 3 - 2025 PM

06/07/2015



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	302	490	486	408	416	363
Future Volume (vph)	302	490	486	408	416	363
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	2.8	3.0	3.6	3.7	3.4	3.4
Grade (%)		0%	0%		0%	
Storage Length (m)	35.0			0.0	0.0	70.0
Storage Lanes	1			0	1	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt			0.938			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1612	1739	1747	0	1730	1548
Flt Permitted	0.062				0.950	
Satd. Flow (perm)	105	1739	1747	0	1730	1548
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			50			349
Link Speed (k/h)		50	50		50	
Link Distance (m)		402.3	566.1		375.0	
Travel Time (s)		29.0	40.8		27.0	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.96	0.96	0.88	0.88	0.89	0.89
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	315	510	552	464	467	408
Shared Lane Traffic (%)						
Lane Group Flow (vph)	315	510	1016	0	467	408
Turn Type	pm+pt	NA	NA		Prot	Perm
Protected Phases	5	2	6		8	
Permitted Phases	2					8
Total Split (s)	21.0	86.0	65.0		34.0	34.0
Total Lost Time (s)	6.0	6.0	6.0		6.0	6.0
Act Effect Green (s)	80.0	80.0	59.0		28.0	28.0
Actuated g/C Ratio	0.67	0.67	0.49		0.23	0.23
v/c Ratio	1.22	0.44	1.15		1.16	0.65
Control Delay	144.1	4.7	97.9		103.1	2.3
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	144.1	4.7	97.9		103.1	2.3
LOS	F	A	F		F	A
Approach Delay		57.9	97.9		56.1	
Approach LOS		E	F		E	
Stops (vph)	215	96	459		292	52
Fuel Used(l)	50	23	154		54	15
CO Emissions (g/hr)	927	421	2869		1011	274



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
NOx Emissions (g/hr)	179	81	554		195	53
VOC Emissions (g/hr)	214	97	662		233	63
Dilemma Vehicles (#)	0	0	0		0	0
Queue Length 50th (m)	~79.3	24.7	~278.8		~124.5	0.0
Queue Length 95th (m)	m48.6	m18.2	m#327.1		m#114.1	m0.6
Internal Link Dist (m)		378.3	542.1		351.0	
Turn Bay Length (m)	35.0					70.0
Base Capacity (vph)	258	1159	884		403	628
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	1.22	0.44	1.15		1.16	0.65

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 78 (65%), Referenced to phase 2:EBTL and 6:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.22

Intersection Signal Delay: 72.3

Intersection LOS: E

Intersection Capacity Utilization 105.3%

ICU Level of Service G

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

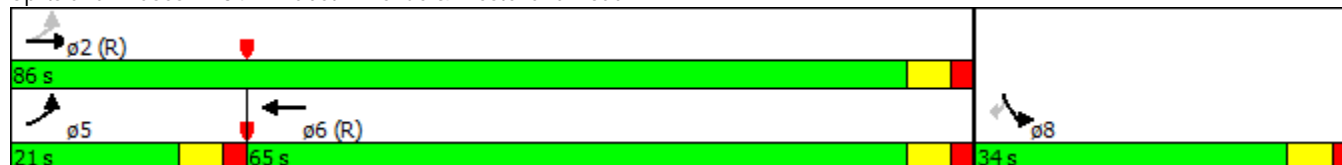
Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

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

Splits and Phases: 34: Elizabeth Avenue & Westerland Road



MUN Area Traffic Study
Freshwater Road & Thorburn Road

Scenario 3 - 2025 PM

06/07/2015



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑	↑	↑↑	↑
Traffic Volume (vph)	0	1416	1136	1087	970	660
Future Volume (vph)	0	1416	1136	1087	970	660
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.7	3.7	3.7	3.7	3.7	3.7
Grade (%)		0%	0%		0%	
Storage Length (m)	0.0			30.0	0.0	0.0
Storage Lanes	0			1	2	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Ped Bike Factor				0.94	0.93	0.97
Frt				0.850		0.850
Flt Protected					0.950	
Satd. Flow (prot)	0	3579	3579	1601	3471	1601
Flt Permitted					0.950	
Satd. Flow (perm)	0	3579	3579	1511	3237	1550
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				531		37
Link Speed (k/h)		50	50		50	
Link Distance (m)		173.6	374.8		70.3	
Travel Time (s)		12.5	27.0		5.1	
Confl. Peds. (#/hr)	20			20	18	9
Confl. Bikes (#/hr)						
Peak Hour Factor	0.88	0.88	0.95	0.95	0.83	0.83
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	0	1609	1196	1144	1169	795
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1609	1196	1144	1169	795
Turn Type		NA	NA	Perm	Prot	Perm
Protected Phases		4	8		6	
Permitted Phases				8		6
Total Split (s)		65.0	65.0	65.0	55.0	55.0
Total Lost Time (s)		6.0	6.0	6.0	6.0	6.0
Act Effect Green (s)		59.0	59.0	59.0	49.0	49.0
Actuated g/C Ratio		0.49	0.49	0.49	0.41	0.41
v/c Ratio		0.91	0.68	1.13	0.82	1.22
Control Delay		37.6	12.0	69.9	25.9	125.3
Queue Delay		0.0	0.0	0.0	0.0	0.0
Total Delay		37.6	12.0	69.9	25.9	125.3
LOS		D	B	E	C	F
Approach Delay		37.6	40.3		66.1	
Approach LOS		D	D		E	
Stops (vph)		1229	530	131	838	515
Fuel Used(l)		92	63	100	59	89
CO Emissions (g/hr)		1709	1168	1862	1091	1658



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
NOx Emissions (g/hr)		330	225	359	211	320
VOC Emissions (g/hr)		394	269	429	252	383
Dilemma Vehicles (#)		0	0	0	0	0
Queue Length 50th (m)		178.6	56.0	~253.1	126.7	~228.2
Queue Length 95th (m)		205.6	m29.5	m0.8	m86.2	m138.3
Internal Link Dist (m)		149.6	350.8		46.3	
Turn Bay Length (m)				30.0		
Base Capacity (vph)		1759	1759	1012	1417	654
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		0.91	0.68	1.13	0.82	1.22

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 29 (24%), Referenced to phase 4:EBT and 8:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.22

Intersection Signal Delay: 48.1

Intersection LOS: D

Intersection Capacity Utilization 83.2%

ICU Level of Service E

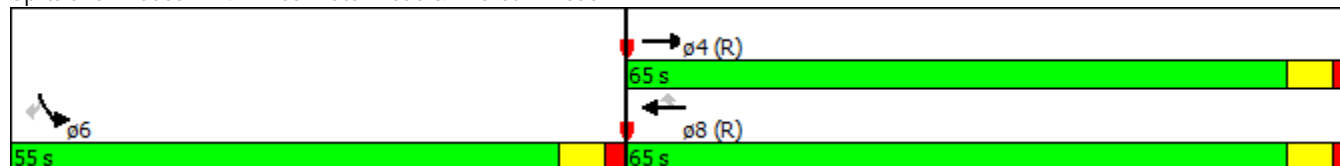
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

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
























Splits and Phases: 47: Freshwater Road & Thorburn Road



MUN Area Traffic Study
Prince Philip Drive & Westerland Road/ Clinch Crescent

Scenario 3 - 2025 PM

06/07/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	371	1223	224	112	1426	198	276	319	255	295	484	579
Future Volume (vph)	371	1223	224	112	1426	198	276	319	255	295	484	579
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	4.0	3.5	3.5	3.5	3.5	3.0	3.0	3.5	3.3	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	75.0		185.0	90.0		0.0	60.0		45.0	0.0		80.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.88		1.00				0.69			0.98
Frt			0.850		0.982				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1750	3697	1566	1750	3430	0	1652	1739	1566	1711	1842	1566
Flt Permitted	0.089			0.100			0.138			0.229		
Satd. Flow (perm)	164	3697	1381	184	3430	0	240	1739	1087	412	1842	1541
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			252		14				147			145
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		591.3			489.3			375.0			105.3	
Travel Time (s)		30.4			25.2			27.0			7.6	
Confl. Peds. (#/hr)	2		30	30		2	2		150	150		2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.89	0.89	0.89	0.92	0.92	0.92	0.89	0.89	0.89	0.76	0.76	0.76
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	417	1374	252	122	1550	215	310	358	287	388	637	762
Shared Lane Traffic (%)												
Lane Group Flow (vph)	417	1374	252	122	1765	0	310	358	287	388	637	762
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2		2	6			4		4	8		8
Total Split (s)	18.0	52.0	52.0	13.0	47.0		16.0	36.0	36.0	19.0	39.0	39.0
Total Lost Time (s)	6.0	7.0	7.0	6.0	7.0		6.0	7.0	7.0	6.0	7.0	7.0
Act Effect Green (s)	58.0	45.0	45.0	48.0	40.0		40.0	29.0	29.0	46.0	32.0	32.0
Actuated g/C Ratio	0.48	0.38	0.38	0.40	0.33		0.33	0.24	0.24	0.38	0.27	0.27
v/c Ratio	1.76	0.99	0.37	0.74	1.53		1.57	0.85	0.77	1.30	1.30	1.47
Control Delay	380.9	63.7	11.4	46.4	269.6		291.9	44.0	20.0	185.4	185.0	251.2
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	380.9	63.7	11.4	46.4	269.6		291.9	44.0	20.0	185.4	185.0	251.2
LOS	F	E	B	D	F		F	D	B	F	F	F
Approach Delay		122.0			255.2			117.3			213.3	
Approach LOS		F			F			F			F	
Stops (vph)	255	1070	67	60	1404		150	276	179	175	381	348
Fuel Used(l)	138	166	16	11	463		75	28	17	49	82	126
CO Emissions (g/hr)	2563	3084	292	206	8618		1399	527	317	911	1530	2335

MUN Area Traffic Study
Prince Philip Drive & Westerland Road/ Clinch Crescent

Scenario 3 - 2025 PM

06/07/2015



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	495	595	56	40	1663		270	102	61	176	295	451
VOC Emissions (g/hr)	591	711	67	48	1988		323	122	73	210	353	539
Dilemma Vehicles (#)	0	29	0	0	74		0	0	0	0	0	0
Queue Length 50th (m)	~132.1	159.6	13.7	14.9	~301.1		~90.5	77.3	26.4	~87.9	~191.8	~221.8
Queue Length 95th (m)	#192.7	#209.9	m27.7	m25.3	m#337.2		m#81.3	m70.7	m21.7	#109.4	#201.6	#224.7
Internal Link Dist (m)		567.3			465.3			351.0			81.3	
Turn Bay Length (m)	75.0		185.0	90.0			60.0		45.0			80.0
Base Capacity (vph)	237	1386	675	164	1152		197	420	374	298	491	517
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	1.76	0.99	0.37	0.74	1.53		1.57	0.85	0.77	1.30	1.30	1.47

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 49 (41%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.76

Intersection Signal Delay: 183.5

Intersection LOS: F

Intersection Capacity Utilization 128.7%

ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

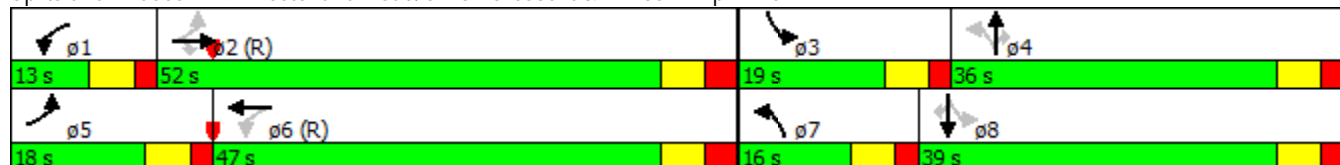
Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

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

Splits and Phases: 9: Westerland Road/Clinch Crescent & Prince Philip Drive





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	330	1561	1935	107	114	544
Future Volume (vph)	330	1561	1935	107	114	544
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	4.0	4.0	3.7	3.3	3.5
Grade (%)		0%	0%		0%	
Storage Length (m)	140.0			70.0	80.0	0.0
Storage Lanes	1			1	1	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Ped Bike Factor				0.97	1.00	0.98
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1652	3697	3697	1601	1711	1566
Flt Permitted	0.062				0.950	
Satd. Flow (perm)	108	3697	3697	1558	1704	1541
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				62		213
Link Speed (k/h)		70	70		50	
Link Distance (m)		289.0	591.3		280.3	
Travel Time (s)		14.9	30.4		20.2	
Confl. Peds. (#/hr)	2			2	2	2
Confl. Bikes (#/hr)						
Peak Hour Factor	0.90	0.90	0.87	0.87	0.80	0.80
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	367	1734	2224	123	143	680
Shared Lane Traffic (%)						
Lane Group Flow (vph)	367	1734	2224	123	143	680
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	5	2	6		8	
Permitted Phases	2			6		8
Total Split (s)	20.0	85.0	65.0	65.0	35.0	35.0
Total Lost Time (s)	6.0	7.0	7.0	7.0	6.0	6.0
Act Effect Green (s)	79.0	78.0	58.0	58.0	29.0	29.0
Actuated g/C Ratio	0.66	0.65	0.48	0.48	0.24	0.24
v/c Ratio	1.46	0.72	1.25	0.16	0.35	1.28
Control Delay	256.7	4.9	131.4	5.3	40.5	165.1
Queue Delay	0.0	0.1	0.8	0.0	0.0	0.4
Total Delay	256.7	5.0	132.3	5.3	40.5	165.4
LOS	F	A	F	A	D	F
Approach Delay		49.0	125.6		143.7	
Approach LOS		D	F		F	
Stops (vph)	290	303	1185	22	92	302
Fuel Used(l)	86	56	341	7	9	90
CO Emissions (g/hr)	1594	1041	6341	122	161	1681



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
NOx Emissions (g/hr)	308	201	1224	24	31	324
VOC Emissions (g/hr)	368	240	1463	28	37	388
Dilemma Vehicles (#)	0	87	37	0	0	0
Queue Length 50th (m)	~104.9	23.1	~340.1	4.4	28.0	~162.7
Queue Length 95th (m)	m#151.5	m64.6	m74.7	m1.1	40.9	#188.6
Internal Link Dist (m)		265.0	567.3		256.3	
Turn Bay Length (m)	140.0			70.0	80.0	
Base Capacity (vph)	251	2403	1786	785	413	533
Starvation Cap Reductn	0	66	0	0	0	0
Spillback Cap Reductn	0	0	403	0	0	23
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.46	0.74	1.61	0.16	0.35	1.33

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 62 (52%), Referenced to phase 2:EBTL and 6:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.46

Intersection Signal Delay: 97.9

Intersection LOS: F

Intersection Capacity Utilization 98.2%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

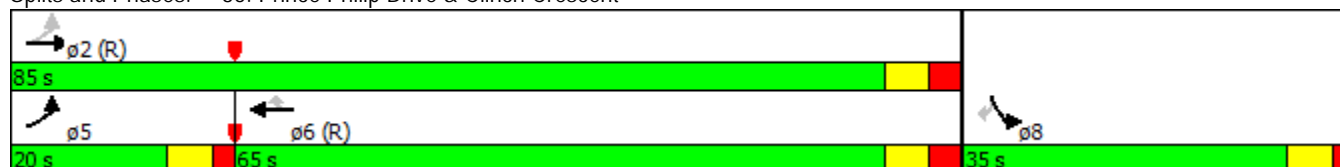
Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

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

Splits and Phases: 35: Prince Philip Drive & Clinch Crescent



MUN Area Traffic Study
Prince Philip Drive & Confederation Building Lot

Scenario 3 - 2025 PM

06/07/2015



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	292	280	347	1311	1217	237
Future Volume (vph)	292	280	347	1311	1217	237
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	4.0	3.5	4.0	3.7	4.0
Grade (%)	0%			0%	0%	
Storage Length (m)	0.0	0.0	75.0			100.0
Storage Lanes	1	1	1			1
Taper Length (m)	2.5		2.5			
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Ped Bike Factor						
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1750	1654	1750	3697	3579	1654
Flt Permitted	0.950		0.070			
Satd. Flow (perm)	1750	1654	129	3697	3579	1654
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		337				272
Link Speed (k/h)	50			70	70	
Link Distance (m)	119.9			283.2	155.8	
Travel Time (s)	8.6			14.6	8.0	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.73	0.73	0.89	0.89	0.87	0.87
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	400	384	390	1473	1399	272
Shared Lane Traffic (%)						
Lane Group Flow (vph)	400	384	390	1473	1399	272
Turn Type	Prot	Perm	pm+pt	NA	NA	Perm
Protected Phases	8		5	2	6	
Permitted Phases		8	2			6
Total Split (s)	35.0	35.0	28.0	85.0	57.0	57.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Act Effect Green (s)	28.7	28.7	79.3	79.3	51.0	51.0
Actuated g/C Ratio	0.24	0.24	0.66	0.66	0.42	0.42
v/c Ratio	0.96	0.59	1.01	0.60	0.92	0.32
Control Delay	80.3	10.6	84.7	7.5	43.5	3.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	80.3	10.6	84.7	7.5	43.5	3.5
LOS	F	B	F	A	D	A
Approach Delay	46.2			23.7	37.0	
Approach LOS	D			C	D	
Stops (vph)	258	47	457	405	1080	18
Fuel Used(l)	27	7	75	146	104	4
CO Emissions (g/hr)	505	122	1390	2725	1928	83



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
NOx Emissions (g/hr)	97	23	268	526	372	16
VOC Emissions (g/hr)	116	28	321	628	445	19
Dilemma Vehicles (#)	0	0	0	21	50	0
Queue Length 50th (m)	93.0	8.7	~85.3	58.8	160.7	0.0
Queue Length 95th (m)	#100.2	13.7 m	#122.1	m64.3	182.7	13.3
Internal Link Dist (m)	95.9			259.2	131.8	
Turn Bay Length (m)			75.0			100.0
Base Capacity (vph)	422	655	387	2443	1521	859
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	0.95	0.59	1.01	0.60	0.92	0.32

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 40 (33%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.01

Intersection Signal Delay: 32.9

Intersection LOS: C

Intersection Capacity Utilization 84.0%

ICU Level of Service E

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

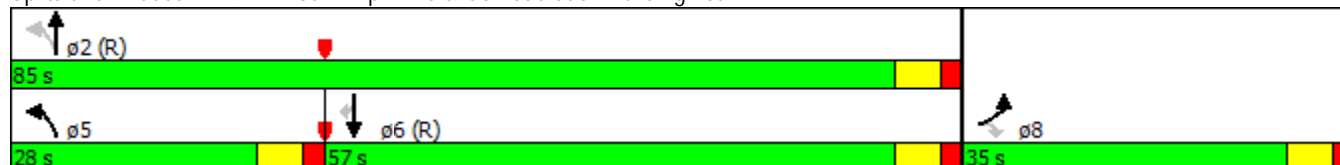
Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

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

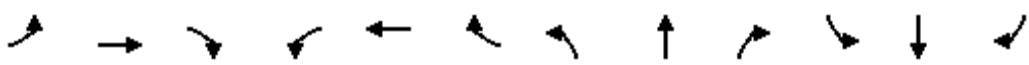
Splits and Phases: 29: Prince Philip Drive & Confederation Building Lot

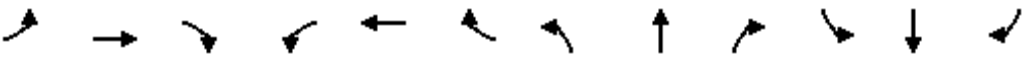


MUN Area Traffic Study
Prince Philip Drive & Morrissey Drive

Scenario 3 - 2025 PM

06/07/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑	↗				↖	↗	
Traffic Volume (vph)	0	1774	0	70	1521	326	0	0	0	323	181	215
Future Volume (vph)	0	1774	0	70	1521	326	0	0	0	323	181	215
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.8	3.8	3.8	3.0	3.8	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	0.0		0.0	70.0		30.0	0.0		0.0	40.0		0.0
Storage Lanes	0		0	1		1	0		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
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	1.00
Ped Bike Factor						0.95				0.95	0.97	
Frt						0.850					0.918	
Flt Protected				0.950						0.950		
Satd. Flow (prot)	0	3618	0	1652	3618	1566	0	0	0	1750	1635	0
Flt Permitted				0.056						0.950		
Satd. Flow (perm)	0	3618	0	97	3618	1483	0	0	0	1662	1635	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						169					32	
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		489.3			455.9			114.5			292.8	
Travel Time (s)		25.2			23.4			8.2			21.1	
Confl. Peds. (#/hr)	2		2	10		10	25		25	25		25
Confl. Bikes (#/hr)												
Peak Hour Factor	0.91	0.91	0.91	0.92	0.92	0.92	0.69	0.69	0.69	0.89	0.89	0.89
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	1949	0	76	1653	354	0	0	0	363	203	242
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1949	0	76	1653	354	0	0	0	363	445	0
Turn Type		NA		pm+pt	NA	Perm				pm+pt	NA	
Protected Phases		2		1	6					3	8	
Permitted Phases				6		6				8		
Total Split (s)		71.0		13.0	84.0	84.0				36.0	36.0	
Total Lost Time (s)		7.0		6.0	7.0	7.0				7.0	7.0	
Act Effect Green (s)		66.6		78.0	77.0	77.0				29.0	29.0	
Actuated g/C Ratio		0.56		0.65	0.64	0.64				0.24	0.24	
v/c Ratio		0.97		0.50	0.71	0.35				0.86	1.06	
Control Delay		19.7		18.5	8.0	0.6				64.2	102.2	
Queue Delay		0.0		0.0	0.0	0.0				0.0	0.0	
Total Delay		19.7		18.5	8.0	0.6				64.2	102.2	
LOS		B		B	A	A				E	F	
Approach Delay		19.7			7.1						85.2	
Approach LOS		B			A						F	
Stops (vph)		710		52	997	30				291	313	
Fuel Used(l)		129		6	110	14				31	49	
CO Emissions (g/hr)		2394		109	2039	252				585	915	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)		462		21	393	49				113	177	
VOC Emissions (g/hr)		552		25	470	58				135	211	
Dilemma Vehicles (#)		112		0	19	0				0	0	
Queue Length 50th (m)		~108.4		1.9	133.3	1.2				82.3	~109.4	
Queue Length 95th (m)		m105.5		m1.9	m53.1	m0.9				#129.6	#169.2	
Internal Link Dist (m)		465.3			431.9			90.5			268.8	
Turn Bay Length (m)				70.0		30.0				40.0		
Base Capacity (vph)		2007		153	2321	1012				422	419	
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		0.97		0.50	0.71	0.35				0.86	1.06	

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 43 (36%), Referenced to phase 2:EBT and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.06

Intersection Signal Delay: 25.2

Intersection LOS: C

Intersection Capacity Utilization 93.8%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

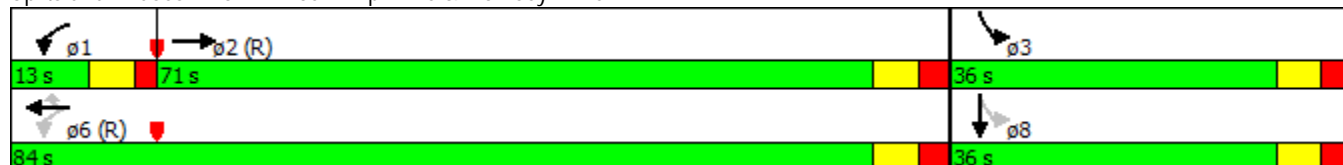
Queue shown is maximum after two cycles.

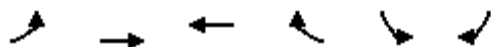
95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

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

Splits and Phases: 61: Prince Philip Drive & Morrissey Drive





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	25	1593	2130	350	299	95
Future Volume (vph)	25	1593	2130	350	299	95
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	4.0	4.0	4.0	3.0	3.0
Grade (%)		0%	0%		0%	
Storage Length (m)	50.0			0.0	60.0	0.0
Storage Lanes	1			0	1	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	0.95	0.95	0.95	1.00	1.00
Ped Bike Factor			1.00		1.00	0.98
Frt			0.979			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1652	3697	3605	0	1652	1478
Flt Permitted	0.050				0.950	
Satd. Flow (perm)	87	3697	3605	0	1645	1454
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			28			103
Link Speed (k/h)		70	70		50	
Link Distance (m)		204.4	289.0		276.1	
Travel Time (s)		10.5	14.9		19.9	
Confl. Peds. (#/hr)	2			2	2	2
Confl. Bikes (#/hr)						
Peak Hour Factor	0.90	0.90	0.96	0.96	0.85	0.85
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	28	1770	2219	365	352	112
Shared Lane Traffic (%)						
Lane Group Flow (vph)	28	1770	2584	0	352	112
Turn Type	pm+pt	NA	NA		Prot	Perm
Protected Phases	5	2	6		8	
Permitted Phases	2					8
Total Split (s)	13.0	91.0	78.0		29.0	29.0
Total Lost Time (s)	6.0	6.0	6.0		6.0	6.0
Act Effect Green (s)	85.0	85.0	77.2		23.0	23.0
Actuated g/C Ratio	0.71	0.71	0.64		0.19	0.19
v/c Ratio	0.18	0.68	1.11		1.11	0.31
Control Delay	3.8	7.7	63.1		129.7	11.9
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	3.8	7.7	63.1		129.7	11.9
LOS	A	A	E		F	B
Approach Delay		7.7	63.1		101.2	
Approach LOS		A	E		F	
Stops (vph)	7	1346	575		248	18
Fuel Used(l)	2	146	204		43	4
CO Emissions (g/hr)	30	2707	3796		804	70



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
NOx Emissions (g/hr)	6	522	733		155	14
VOC Emissions (g/hr)	7	624	875		185	16
Dilemma Vehicles (#)	0	9	62		0	0
Queue Length 50th (m)	0.5	162.4	~379.6		~94.9	1.8
Queue Length 95th (m)	m0.4	m73.6	m48.9		#139.5	14.8
Internal Link Dist (m)		180.4	265.0		252.1	
Turn Bay Length (m)	50.0				60.0	
Base Capacity (vph)	152	2618	2329		316	361
Starvation Cap Reductn	0	0	7		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.18	0.68	1.11		1.11	0.31

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 63 (53%), Referenced to phase 2:EBTL and 6:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.11

Intersection Signal Delay: 46.2

Intersection LOS: D

Intersection Capacity Utilization 96.6%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

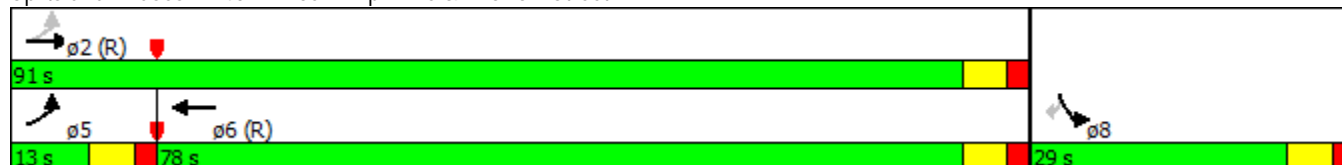
Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

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

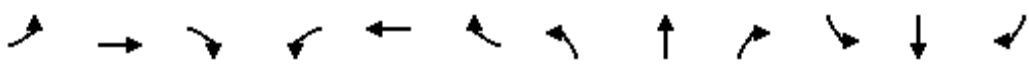
Splits and Phases: 40: Prince Philip Drive & Wicklow Street



MUN Area Traffic Study
Freshwater Road & Stamps Lane/ Oxen Pond Road

Scenario 3 - 2025 PM

06/07/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑	↗		↖			↕		↖	↗	
Traffic Volume (vph)	0	1452	488	0	1467	80	306	234	53	19	202	215
Future Volume (vph)	0	1452	488	0	1467	80	306	234	53	19	202	215
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	4.0	4.0	4.0	3.0	3.0	3.0	2.6	2.9	2.9
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	0.0		0.0	0.0		0.0	0.0		0.0	30.0		0.0
Storage Lanes	0		1	0		0	0		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt			0.850		0.993			0.988			0.923	
Flt Protected								0.975		0.950		
Satd. Flow (prot)	0	1842	1566	0	1932	0	0	1648	0	1573	1571	0
Flt Permitted								0.509		0.477		
Satd. Flow (perm)	0	1842	1566	0	1932	0	0	860	0	790	1571	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			196		3			4			8	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		374.8			273.7			376.6			148.1	
Travel Time (s)		27.0			19.7			27.1			10.7	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.91	0.91	0.91	0.94	0.94	0.94	0.91	0.91	0.91	0.86	0.86	0.86
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	6%	3%	2%	4%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	1596	536	0	1561	85	336	257	58	22	235	250
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1596	536	0	1646	0	0	651	0	22	485	0
Turn Type		NA	Perm		NA		Perm	NA		pm+pt	NA	
Protected Phases		8			4			2		1	6	
Permitted Phases			8				2			6		
Total Split (s)		58.0	58.0		58.0		46.0	46.0		16.0	62.0	
Total Lost Time (s)		6.0	6.0		6.0			6.0		6.0	6.0	
Act Effect Green (s)		52.0	52.0		52.0			48.0		56.0	56.0	
Actuated g/C Ratio		0.43	0.43		0.43			0.40		0.47	0.47	
v/c Ratio		2.00	0.68		1.96			1.88		0.05	0.66	
Control Delay		477.5	24.9		456.2			431.9		17.7	29.5	
Queue Delay		0.0	0.0		0.0			0.0		0.0	0.0	
Total Delay		477.5	24.9		456.2			431.9		17.7	29.5	
LOS		F	C		F			F		B	C	
Approach Delay		363.7			456.2			431.9			29.0	
Approach LOS		F			F			F			C	
Stops (vph)		973	292		1033			393		11	311	
Fuel Used(l)		607	33		606			227		1	22	
CO Emissions (g/hr)		11290	619		11280			4217		14	415	

MUN Area Traffic Study
Freshwater Road & Stamps Lane/ Oxen Pond Road

Scenario 3 - 2025 PM

06/07/2015



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)		2179	119		2177			814		3	80	
VOC Emissions (g/hr)		2604	143		2602			973		3	96	
Dilemma Vehicles (#)		0	0		0			0		0	0	
Queue Length 50th (m)		~598.1	61.6		~616.7			~245.0		2.7	84.5	
Queue Length 95th (m)		m#677.1	m79.5		m#449.6			#317.2		7.0	113.0	
Internal Link Dist (m)		350.8			249.7			352.6			124.1	
Turn Bay Length (m)										30.0		
Base Capacity (vph)		798	789		838			346		433	737	
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		2.00	0.68		1.96			1.88		0.05	0.66	

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 80 (67%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 2.00

Intersection Signal Delay: 369.1

Intersection LOS: F

Intersection Capacity Utilization 153.3%

ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

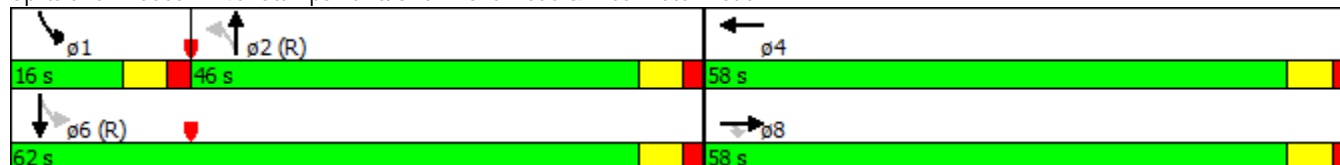
Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

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

Splits and Phases: 46: Stamps Lane/Oxen Pond Road & Freshwater Road



Summary of All Intervals

Run Number	1	10	2	3	4	5	6
Start Time	6:30	6:30	6:30	6:30	6:30	6:30	6:30
End Time	8:00	8:00	8:00	8:00	8:00	8:00	8:00
Total Time (min)	90	90	90	90	90	90	90
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	5	5	5	5	5	5	5
# of Recorded Intervals	4	4	4	4	4	4	4
Vehs Entered	13340	13074	13513	13836	13600	13626	13646
Vehs Exited	12843	12422	12933	13268	12950	13143	13023
Starting Vehs	2066	2168	2049	2047	1991	2090	2053
Ending Vehs	2563	2820	2629	2615	2641	2573	2676
Travel Distance (km)	22060	20712	21838	22685	22344	22067	22236
Travel Time (hr)	8609.9	8653.9	8471.1	8355.5	8149.0	8400.8	8297.0
Total Delay (hr)	8195.5	8264.1	8060.4	7928.6	7729.7	7986.8	7881.4
Total Stops	43005	38650	39812	44937	42492	42490	42087
Fuel Used (l)	8830.2	8793.3	8701.4	8648.7	8448.0	8666.0	8584.2

Summary of All Intervals

Run Number	7	8	9	Avg
Start Time	6:30	6:30	6:30	6:30
End Time	8:00	8:00	8:00	8:00
Total Time (min)	90	90	90	90
Time Recorded (min)	60	60	60	60
# of Intervals	5	5	5	5
# of Recorded Intervals	4	4	4	4
Vehs Entered	13495	13032	13312	13448
Vehs Exited	12925	12349	12733	12861
Starting Vehs	2096	2090	2034	2065
Ending Vehs	2666	2773	2613	2660
Travel Distance (km)	21774	20486	21703	21790
Travel Time (hr)	8298.6	8547.8	8430.6	8421.4
Total Delay (hr)	7889.6	8162.4	8024.6	8012.3
Total Stops	40201	37837	39964	41147
Fuel Used (l)	8558.0	8694.7	8662.5	8658.7

Interval #0 Information Seeding

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

Interval #1 Information Recording #1

Start Time	7:00
End Time	7:15
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	3519	3363	3612	3861	3612	3641	3645
Vehs Exited	3185	3161	3381	3406	3257	3307	3343
Starting Vehs	2066	2168	2049	2047	1991	2090	2053
Ending Vehs	2400	2370	2280	2502	2346	2424	2355
Travel Distance (km)	5719	5433	5731	6054	5681	5787	5794
Travel Time (hr)	1286.2	1279.3	1253.9	1285.7	1178.1	1270.3	1258.7
Total Delay (hr)	1178.7	1177.2	1145.5	1172.2	1071.2	1161.6	1150.3
Total Stops	11349	10449	10557	12185	10865	10868	10721
Fuel Used (l)	1477.1	1457.3	1454.0	1498.7	1381.9	1473.6	1458.5

Interval #1 Information Recording #1

Start Time	7:00
End Time	7:15
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	3614	3667	3521	3600
Vehs Exited	3356	3387	3194	3299
Starting Vehs	2096	2090	2034	2065
Ending Vehs	2354	2370	2361	2368
Travel Distance (km)	5812	5822	5679	5751
Travel Time (hr)	1246.7	1243.9	1238.0	1254.1
Total Delay (hr)	1137.1	1134.3	1132.0	1146.0
Total Stops	10835	11242	10402	10949
Fuel Used (l)	1449.8	1450.3	1435.5	1453.7

Interval #2 Information Recording #2

Start Time	7:15
End Time	7:30
Total Time (min)	15
Volumes adjusted by PHF, Growth Factors.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	3527	3355	3514	3586	3444	3655	3476
Vehs Exited	3313	3160	3249	3429	3296	3407	3270
Starting Vehs	2400	2370	2280	2502	2346	2424	2355
Ending Vehs	2614	2565	2545	2659	2494	2672	2561
Travel Distance (km)	5605	5123	5486	5657	5532	5560	5528
Travel Time (hr)	1898.2	1871.8	1835.7	1814.6	1770.3	1823.6	1804.8
Total Delay (hr)	1793.3	1775.6	1732.4	1707.8	1666.4	1719.1	1701.2
Total Stops	10701	9250	10262	11201	10344	10968	10498
Fuel Used (l)	1994.3	1947.2	1933.5	1923.2	1878.9	1934.4	1911.5

Interval #2 Information Recording #2

Start Time	7:15
End Time	7:30
Total Time (min)	15
Volumes adjusted by PHF, Growth Factors.	

Run Number	7	8	9	Avg
Vehs Entered	3517	3521	3302	3489
Vehs Exited	3347	3310	3215	3297
Starting Vehs	2354	2370	2361	2368
Ending Vehs	2524	2581	2448	2563
Travel Distance (km)	5455	5469	5436	5485
Travel Time (hr)	1811.1	1820.6	1832.4	1828.3
Total Delay (hr)	1708.2	1718.3	1730.6	1725.3
Total Stops	10407	9958	9822	10341
Fuel Used (l)	1915.1	1921.9	1924.9	1928.5

Interval #3 Information Recording #3

Start Time	7:30
End Time	7:45
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	3096	3085	3261	3120	3235	3163	3190
Vehs Exited	3174	2863	3197	3143	3186	3185	3236
Starting Vehs	2614	2565	2545	2659	2494	2672	2561
Ending Vehs	2536	2787	2609	2636	2543	2650	2515
Travel Distance (km)	5302	4806	5407	5328	5493	5350	5411
Travel Time (hr)	2479.7	2493.4	2439.5	2392.2	2362.5	2407.1	2389.9
Total Delay (hr)	2379.6	2402.4	2338.3	2291.9	2259.3	2306.8	2288.6
Total Stops	10047	8934	9875	10269	10219	10383	10658
Fuel Used (l)	2474.9	2457.0	2450.2	2399.3	2386.9	2415.2	2410.5

Interval #3 Information Recording #3

Start Time	7:30
End Time	7:45
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	3126	2942	3222	3144
Vehs Exited	3133	2881	3161	3117
Starting Vehs	2524	2581	2448	2563
Ending Vehs	2517	2642	2509	2587
Travel Distance (km)	5174	4554	5279	5210
Travel Time (hr)	2379.4	2438.0	2441.4	2422.3
Total Delay (hr)	2282.7	2351.9	2342.6	2324.4
Total Stops	9163	8342	9642	9758
Fuel Used (l)	2389.6	2403.1	2445.6	2423.2

Interval #4 Information Recording #4

Start Time	7:45
End Time	8:00
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	3198	3271	3126	3269	3309	3167	3335
Vehs Exited	3171	3238	3106	3290	3211	3244	3174
Starting Vehs	2536	2787	2609	2636	2543	2650	2515
Ending Vehs	2563	2820	2629	2615	2641	2573	2676
Travel Distance (km)	5434	5351	5214	5646	5638	5369	5504
Travel Time (hr)	2945.7	3009.4	2942.0	2863.0	2838.1	2899.9	2843.6
Total Delay (hr)	2843.9	2908.9	2844.2	2756.7	2732.9	2799.4	2741.2
Total Stops	10908	10017	9118	11282	11064	10271	10210
Fuel Used (l)	2883.8	2931.8	2863.7	2827.6	2800.3	2842.7	2803.6

Interval #4 Information Recording #4

Start Time	7:45
End Time	8:00
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	3238	2902	3267	3206
Vehs Exited	3089	2771	3163	3147
Starting Vehs	2517	2642	2509	2587
Ending Vehs	2666	2773	2613	2660
Travel Distance (km)	5332	4641	5309	5344
Travel Time (hr)	2861.4	3045.4	2918.8	2916.7
Total Delay (hr)	2761.5	2957.8	2819.5	2816.6
Total Stops	9796	8295	10098	10100
Fuel Used (l)	2803.6	2919.3	2856.6	2853.3

1: Allandale Road & TCH NB Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.1	24.2	24.3
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	96.9	101.2	36.0
Total Delay (hr)	0.0	0.9	1.6	0.7	0.1	10.6	14.0
Total Del/Veh (s)	12.7	6.9	7.4	8.6	60.6	46.1	20.9
Stop Delay (hr)	0.0	0.7	0.5	0.2	0.1	9.4	10.9
Stop Del/Veh (s)	10.5	5.3	2.4	2.1	53.4	40.9	16.2

7: Allandale Road & Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	109.4	120.2	56.9	2.5	6.8	0.6	59.2	157.8	87.0	0.0	0.7	0.1
Denied Del/Veh (s)	636.2	628.2	624.5	47.6	39.6	25.2	877.0	858.1	865.0	3.4	3.9	1.6
Total Delay (hr)	56.0	10.5	7.5	65.4	144.2	19.8	17.4	23.9	1.7	2.4	28.7	1.2
Total Del/Veh (s)	400.7	74.4	111.9	997.4	677.0	660.6	320.1	172.2	23.7	190.9	161.9	13.0
Stop Delay (hr)	54.7	5.6	5.6	66.5	143.3	19.8	16.2	20.7	1.2	2.4	27.2	0.7
Stop Del/Veh (s)	391.2	39.6	84.3	1013.7	672.6	658.6	297.2	149.1	16.0	186.0	153.5	7.4

7: Allandale Road & Prince Philip Drive Performance by movement

Movement	All
Denied Delay (hr)	601.2
Denied Del/Veh (s)	453.5
Total Delay (hr)	378.9
Total Del/Veh (s)	314.2
Stop Delay (hr)	363.8
Stop Del/Veh (s)	301.6

9: Westerland Road/Clinch Crescent & Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	2.1	7.0	0.8	0.0	0.1	0.0	0.1	0.0	0.0	1.0	2.4	2.0
Denied Del/Veh (s)	27.0	28.0	17.2	0.1	0.3	0.0	1.6	0.3	1.5	22.6	30.7	22.6
Total Delay (hr)	12.6	27.8	4.0	2.9	31.4	4.5	1.2	1.6	0.6	1.8	7.1	2.7
Total Del/Veh (s)	157.5	111.2	87.3	186.2	132.6	143.3	38.4	40.1	19.0	39.0	89.0	29.8
Stop Delay (hr)	11.5	23.3	3.6	2.7	25.7	3.9	1.1	1.4	0.5	1.6	6.7	2.5
Stop Del/Veh (s)	144.3	93.4	79.3	169.2	108.5	124.5	34.6	35.4	17.4	35.3	83.7	27.6

9: Westerland Road/Clinch Crescent & Prince Philip Drive Performance by movement

Movement	All
Denied Delay (hr)	15.5
Denied Del/Veh (s)	16.2
Total Delay (hr)	98.2
Total Del/Veh (s)	100.4
Stop Delay (hr)	84.7
Stop Del/Veh (s)	86.5

10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.5	1.6	0.2	24.3	104.2	20.0	29.4	523.7	68.0	0.0	0.0	0.0
Denied Del/Veh (s)	15.7	13.8	11.4	839.6	848.6	808.7	1373.9	1385.2	1359.6	0.0	0.0	0.0
Total Delay (hr)	2.0	8.1	1.0	6.6	31.0	0.6	5.6	21.2	2.7	6.0	51.3	21.2
Total Del/Veh (s)	66.7	68.3	53.6	554.9	627.0	61.1	650.1	150.4	139.2	282.7	226.8	477.9
Stop Delay (hr)	1.7	6.6	0.8	6.6	30.9	0.6	5.4	18.3	2.3	5.5	45.5	20.8
Stop Del/Veh (s)	56.3	55.6	43.1	552.0	624.4	57.2	631.9	129.6	120.8	257.5	201.0	468.6

10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue Performance by movement

Movement	All
Denied Delay (hr)	771.7
Denied Del/Veh (s)	729.7
Total Delay (hr)	157.5
Total Del/Veh (s)	225.0
Stop Delay (hr)	145.0
Stop Del/Veh (s)	207.2

11: Mt. Scio Road & Allandale Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.1	0.4	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.8	0.9	2.3
Denied Del/Veh (s)	1.7	1.4	0.8	0.2	0.0	0.0	5.6	2.4	3.4	28.9	28.3	26.9
Total Delay (hr)	2.3	12.3	1.4	0.6	3.3	0.1	1.2	1.0	0.9	1.6	2.3	3.8
Total Del/Veh (s)	44.5	44.0	37.9	30.1	17.1	7.0	47.3	56.0	27.7	54.9	72.6	44.9
Stop Delay (hr)	1.9	9.7	1.2	0.4	1.6	0.0	1.2	0.9	0.8	1.4	2.0	3.4
Stop Del/Veh (s)	37.0	34.5	30.9	23.0	8.0	1.3	44.1	50.6	24.9	49.3	64.2	39.4

11: Mt. Scio Road & Allandale Road Performance by movement

Movement	All
Denied Delay (hr)	4.8
Denied Del/Veh (s)	6.0
Total Delay (hr)	30.8
Total Del/Veh (s)	37.8
Stop Delay (hr)	24.4
Stop Del/Veh (s)	29.9

17: Allandale Road & TCH SB Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.1	0.0	0.1
Denied Del/Veh (s)	0.1	0.1	0.0	0.1	0.6	1.0	0.3
Total Delay (hr)	0.0	0.0	0.1	1.5	1.1	0.0	2.7
Total Del/Veh (s)	2.0	2.7	8.8	7.0	8.9	2.9	7.6
Stop Delay (hr)	0.0	0.0	0.0	0.0	0.7	0.0	0.7
Stop Del/Veh (s)	0.1	2.2	0.1	0.0	5.6	0.7	2.0

18: TCH SB Performance by movement

Movement	NBR	SBT	All
Denied Delay (hr)	0.2	0.1	0.2
Denied Del/Veh (s)	0.6	0.6	0.6
Total Delay (hr)	2.3	0.2	2.5
Total Del/Veh (s)	8.2	2.1	6.6
Stop Delay (hr)	0.0	0.2	0.2
Stop Del/Veh (s)	0.1	1.9	0.5

22: Allandale Road & Higgins Line Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	146.1	66.4	0.0	0.0	0.5	2.4	215.5
Denied Del/Veh (s)	997.9	1013.1	0.0	0.0	9.5	10.7	264.2
Total Delay (hr)	22.1	6.1	1.2	0.7	1.1	15.1	46.4
Total Del/Veh (s)	487.3	309.6	6.3	5.7	19.1	67.1	69.1
Stop Delay (hr)	21.9	6.0	0.7	0.2	0.9	14.9	44.5
Stop Del/Veh (s)	483.3	306.6	3.5	1.2	14.9	65.9	66.3

24: Allandale Road & Confederation Building Lot Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	6.9	8.3	0.0	0.0	0.0	0.4	15.6
Denied Del/Veh (s)	93.4	96.8	0.0	0.1	1.1	1.7	22.4
Total Delay (hr)	9.0	2.0	4.0	0.2	1.6	38.3	55.1
Total Del/Veh (s)	125.3	24.3	16.4	4.7	45.1	175.3	78.7
Stop Delay (hr)	8.8	1.8	2.5	0.0	1.3	37.7	52.2
Stop Del/Veh (s)	121.8	22.3	10.4	0.1	38.4	172.6	74.5

29: Prince Philip Drive & Confederation Building Lot Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Delay (hr)	15.7	17.2	0.0	0.0	228.3	43.1	304.3
Denied Del/Veh (s)	196.3	212.0	0.1	0.0	674.1	675.3	385.0
Total Delay (hr)	4.4	11.4	0.7	0.9	33.8	1.7	52.8
Total Del/Veh (s)	61.9	157.1	13.9	4.7	172.6	46.8	87.3
Stop Delay (hr)	4.0	11.7	0.5	0.5	33.1	1.5	51.3
Stop Del/Veh (s)	56.3	161.7	10.6	2.6	168.8	41.5	84.7

34: Elizabeth Avenue & Westerland Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	31.8	26.5	0.0	0.0	0.0	58.3
Denied Del/Veh (s)	0.0	0.0	581.1	600.3	0.0	0.0	0.0	173.1
Total Delay (hr)	0.4	0.3	44.6	35.4	15.0	0.6	17.2	113.5
Total Del/Veh (s)	10.8	4.7	913.0	903.4	214.9	75.0	268.5	337.7
Stop Delay (hr)	0.2	0.2	45.6	36.2	14.3	0.5	17.0	114.0
Stop Del/Veh (s)	6.9	2.2	931.7	924.5	204.8	70.8	265.1	339.1

35: Prince Philip Drive & Clinch Crescent Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.1	0.1	0.2
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	3.2	0.8	0.3
Total Delay (hr)	1.6	1.7	5.6	0.2	1.8	2.1	12.9
Total Del/Veh (s)	24.2	5.5	16.4	9.1	53.3	13.6	14.1
Stop Delay (hr)	1.2	0.8	2.6	0.0	1.6	1.2	7.5
Stop Del/Veh (s)	19.2	2.7	7.6	0.3	48.2	7.7	8.2

37: Thorburn Road & Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR	All
Denied Delay (hr)	130.2	274.6	80.9	0.3	1.0	0.3	0.0	0.0	235.0	505.4	446.1	1673.8
Denied Del/Veh (s)	757.3	757.6	758.3	5.3	3.4	2.6	0.0	0.0	1502.7	1497.6	1506.4	807.5
Total Delay (hr)	38.4	17.4	1.7	4.8	11.7	0.4	5.4	0.3	5.4	22.7	26.2	134.4
Total Del/Veh (s)	308.9	70.2	23.4	86.5	37.7	4.4	29.9	24.8	94.8	183.2	230.2	96.7
Stop Delay (hr)	36.8	11.6	1.2	4.6	8.8	0.1	4.3	0.2	4.8	19.6	23.0	115.2
Stop Del/Veh (s)	295.8	46.8	16.9	82.8	28.6	0.6	24.2	22.0	84.7	158.3	202.2	82.9

40: Prince Philip Drive & Wicklow Street Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.3	0.0	0.3
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	3.7	1.0	0.4
Total Delay (hr)	0.2	0.9	5.9	1.0	7.1	1.0	16.0
Total Del/Veh (s)	30.9	2.9	14.3	15.0	84.6	35.8	17.9
Stop Delay (hr)	0.1	0.1	2.2	0.4	6.5	0.9	10.2
Stop Del/Veh (s)	28.4	0.2	5.3	6.6	76.8	31.4	11.3

46: Stamps Lane/Oxen Pond Road & Freshwater Road Performance by movement

Movement	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	5.5	0.4	64.0	50.8	12.2	0.0	0.0	0.0	133.0
Denied Del/Veh (s)	0.0	0.0	26.8	39.1	706.9	714.9	730.1	3.4	0.5	0.5	161.0
Total Delay (hr)	48.3	4.2	24.2	1.2	24.0	19.0	4.2	0.1	1.4	1.1	127.9
Total Del/Veh (s)	178.9	64.8	113.9	108.5	353.0	360.8	344.3	23.2	25.5	19.5	157.9
Stop Delay (hr)	42.2	3.3	19.6	1.0	24.3	19.2	4.3	0.1	1.1	0.9	115.9
Stop Del/Veh (s)	156.6	50.8	91.9	89.2	356.7	363.3	349.3	17.8	19.1	15.8	143.1

47: Freshwater Road & Thorburn Road Performance by movement

Movement	EBT	WBT	WBR	SBL	SBT	SBR	All
Denied Delay (hr)	693.3	0.0	0.2	4.5	0.0	3.0	700.9
Denied Del/Veh (s)	1474.3	0.1	0.8	29.6	0.0	29.3	629.7
Total Delay (hr)	42.9	3.1	2.3	12.8	0.1	1.1	62.4
Total Del/Veh (s)	241.1	15.6	12.4	83.4	23.0	10.8	75.4
Stop Delay (hr)	42.7	2.1	1.0	12.3	0.1	0.9	59.2
Stop Del/Veh (s)	239.8	10.6	5.4	80.6	20.7	9.2	71.6

51: Freshwater Road & Elizabeth Avenue Performance by movement

Movement	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	67.9	268.9	16.2	0.1	0.0	353.1
Denied Del/Veh (s)	738.4	1038.5	1061.9	0.5	0.3	613.4
Total Delay (hr)	38.8	23.6	1.4	10.9	5.5	80.2
Total Del/Veh (s)	516.8	156.4	153.2	86.2	63.5	178.7
Stop Delay (hr)	40.1	20.7	1.2	8.7	3.9	74.6
Stop Del/Veh (s)	534.4	136.9	135.9	68.8	45.0	166.2

52: Elizabeth Avenue & Paton Street Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.5	0.1	15.2	4.9	20.7
Denied Del/Veh (s)	0.0	0.0	7.8	12.1	479.2	453.4	84.1
Total Delay (hr)	0.0	0.3	5.2	0.9	40.8	14.6	61.8
Total Del/Veh (s)	5.6	2.5	84.5	71.5	1631.3	1645.3	257.9
Stop Delay (hr)	0.0	0.0	5.1	0.9	41.1	14.7	61.8
Stop Del/Veh (s)	2.5	0.2	83.1	72.3	1642.4	1656.8	257.9

55: Anderson Avenue & Elizabeth Avenue Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Delay (hr)	0.0	0.0	0.1	0.4	72.6	91.6	164.7
Denied Del/Veh (s)	0.0	0.0	4.6	5.4	1853.4	1853.2	527.6
Total Delay (hr)	0.2	0.0	14.3	42.0	30.6	19.6	106.5
Total Del/Veh (s)	1.5	0.6	467.1	515.9	2820.4	2428.1	412.4
Stop Delay (hr)	0.0	0.0	14.7	43.3	30.6	19.6	108.3
Stop Del/Veh (s)	0.1	0.2	481.7	532.5	2825.2	2431.8	419.1

59: Clinch Crescent & Arctic Avenue Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	451.1	24.1	0.0	0.0	0.9	47.5	523.7
Denied Del/Veh (s)	1763.4	1701.6	0.0	0.1	265.9	281.5	875.6
Total Delay (hr)	33.8	0.3	0.1	0.4	0.2	11.7	46.5
Total Del/Veh (s)	547.7	104.4	1.4	3.8	77.2	74.4	122.1
Stop Delay (hr)	34.3	0.3	0.0	0.2	0.2	10.4	45.4
Stop Del/Veh (s)	555.5	100.8	0.4	1.9	70.8	66.7	119.4

61: Prince Philip Drive & Morrissey Drive Performance by movement

Movement	EBT	WBL	WBT	WBR	SBL	SBT	SBR	All
Denied Delay (hr)	4.7	0.0	0.0	0.0	155.9	87.1	107.9	355.5
Denied Del/Veh (s)	14.8	0.0	0.0	0.0	1497.0	1499.7	1482.1	412.4
Total Delay (hr)	82.1	0.3	4.0	0.8	20.8	9.1	11.3	128.4
Total Del/Veh (s)	247.7	30.5	16.1	14.3	558.1	438.3	423.8	175.9
Stop Delay (hr)	75.1	0.2	1.5	0.2	20.7	9.0	11.2	118.0
Stop Del/Veh (s)	226.5	22.4	6.2	4.5	555.5	431.8	420.1	161.7

Total Network Performance

Denied Delay (hr)	5937.5
Denied Del/Veh (s)	912.2
Total Delay (hr)	2074.8
Total Del/Veh (s)	481.2
Stop Delay (hr)	1934.5
Stop Del/Veh (s)	448.7

Intersection: 1: Allandale Road & TCH NB

Movement	EB	WB	NB	NB
Directions Served	LT	R	LT	R
Maximum Queue (m)	54.0	106.7	154.8	23.1
Average Queue (m)	8.4	3.8	116.8	22.3
95th Queue (m)	52.9	64.2	192.6	23.7
Link Distance (m)	145.7	337.2	138.9	
Upstream Blk Time (%)	1	0	50	
Queuing Penalty (veh)	6	0	0	
Storage Bay Dist (m)				20.0
Storage Blk Time (%)			15	48
Queuing Penalty (veh)			131	3

Intersection: 7: Allandale Road & Prince Philip Drive

Movement	EB	EB	EB	EB	WB	WB	WB	B27	B27	NB	NB	NB
Directions Served	L	T	T	R	L	T	TR	T	T	L	T	R
Maximum Queue (m)	202.5	450.9	453.3	107.3	67.4	862.1	863.5	282.6	284.1	72.4	415.8	338.0
Average Queue (m)	200.7	445.0	384.5	44.9	65.6	851.8	852.8	260.8	261.5	71.0	327.7	197.8
95th Queue (m)	223.6	448.9	610.3	117.8	77.2	860.0	861.9	336.1	337.9	77.9	429.8	348.4
Link Distance (m)		438.1	438.1			834.7	834.7	270.6	270.6		443.9	443.9
Upstream Blk Time (%)		64	19			98	99	28	37		2	0
Queuing Penalty (veh)		670	200			738	739	210	275		12	1
Storage Bay Dist (m)	200.0			120.0	65.0					70.0		
Storage Blk Time (%)	84	26	3	10	74	33				59	22	
Queuing Penalty (veh)	437	236	14	53	372	108				584	82	

Intersection: 7: Allandale Road & Prince Philip Drive

Movement	SB	SB	SB	SB	SB	B1123	B1123
Directions Served	L	T	T	R	R	T	T
Maximum Queue (m)	44.3	131.3	126.3	78.1	30.0	512.2	513.6
Average Queue (m)	26.5	121.4	119.3	19.0	4.0	498.7	499.9
95th Queue (m)	58.1	126.4	123.3	64.9	22.9	547.1	547.6
Link Distance (m)		104.4	104.4	104.4		500.7	500.7
Upstream Blk Time (%)		87	75	0		34	42
Queuing Penalty (veh)		452	388	1		270	328
Storage Bay Dist (m)	42.0				35.0		
Storage Blk Time (%)	3	85		9	0		
Queuing Penalty (veh)	14	61		24	1		

Intersection: 9: Westerland Road/Clinch Crescent & Prince Philip Drive

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	TR	L	T	R	L	T
Maximum Queue (m)	77.4	313.7	303.7	136.3	81.8	287.9	295.3	47.5	63.5	46.9	71.0	92.8
Average Queue (m)	68.7	186.0	175.5	58.6	33.1	168.7	175.9	20.7	24.9	15.5	29.7	76.2
95th Queue (m)	93.5	474.6	467.2	169.8	91.2	379.6	387.0	40.4	50.7	37.7	61.5	102.9
Link Distance (m)		573.0	573.0			470.0	470.0		353.9		83.2	83.2
Upstream Blk Time (%)		2	2								0	29
Queuing Penalty (veh)		13	13								1	208
Storage Bay Dist (m)	75.0			185.0	90.0			60.0		45.0		
Storage Blk Time (%)	17	25	14	0	3	36		0	2	0		33
Queuing Penalty (veh)	107	92	31	2	24	41		0	11	1		203

Intersection: 9: Westerland Road/Clinch Crescent & Prince Philip Drive

Movement	SB
Directions Served	R
Maximum Queue (m)	82.5
Average Queue (m)	61.1
95th Queue (m)	104.4
Link Distance (m)	
Upstream Blk Time (%)	2
Queuing Penalty (veh)	0
Storage Bay Dist (m)	80.0
Storage Blk Time (%)	3
Queuing Penalty (veh)	15

Intersection: 10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	T	R	L	T	R	L	T	R
Maximum Queue (m)	57.4	224.4	57.4	293.7	292.5	57.3	248.0	37.5	42.5	453.9	466.8
Average Queue (m)	34.0	121.2	19.5	249.2	194.3	35.4	238.8	12.1	20.4	444.8	446.2
95th Queue (m)	69.7	219.2	60.1	376.9	415.4	71.7	245.7	37.9	45.8	462.4	500.9
Link Distance (m)		321.0		286.5	286.5		234.0			443.9	443.9
Upstream Blk Time (%)				76	55		74			38	49
Queuing Penalty (veh)				0	0		0			336	431
Storage Bay Dist (m)	55.0		55.0			55.0		35.0	40.0		
Storage Blk Time (%)	1	37	0	87		32	41	0	1	55	
Queuing Penalty (veh)	6	70	1	87		408	90	4	6	70	

Intersection: 11: Mt. Scio Road & Allandale Road

Movement	EB	EB	EB	WB	WB	WB	B3	B3	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	T	T	L	TR	L	TR
Maximum Queue (m)	77.4	177.3	175.9	29.6	80.0	68.8	7.2	18.0	52.2	104.9	62.4	112.0
Average Queue (m)	32.0	80.8	84.6	9.7	40.1	29.0	0.3	1.4	17.7	31.6	35.1	81.7
95th Queue (m)	70.0	197.7	204.2	25.5	71.8	58.7	7.3	19.0	39.4	108.4	74.0	127.9
Link Distance (m)		337.2	337.2		543.7	543.7	73.6	73.6		309.7		98.0
Upstream Blk Time (%)		2	4				0	0		1		28
Queuing Penalty (veh)		13	23				0	1		0		0
Storage Bay Dist (m)	75.0			75.0					60.0		60.0	
Storage Blk Time (%)	0	10			0				2	2	1	37
Queuing Penalty (veh)	1	18			0				3	2	4	40

Intersection: 17: Allandale Road & TCH SB

Movement	EB	WB	SB	SB
Directions Served	LT	TR	L	R
Maximum Queue (m)	4.0	3.6	50.7	17.7
Average Queue (m)	0.3	0.1	21.5	3.0
95th Queue (m)	3.6	1.9	46.4	13.5
Link Distance (m)	158.6	145.7	127.1	
Upstream Blk Time (%)			1	
Queuing Penalty (veh)			4	
Storage Bay Dist (m)				20.0
Storage Blk Time (%)			6	0
Queuing Penalty (veh)			0	0

Intersection: 18: TCH SB

Movement	SB
Directions Served	T
Maximum Queue (m)	15.4
Average Queue (m)	1.4
95th Queue (m)	24.1
Link Distance (m)	149.1
Upstream Blk Time (%)	1
Queuing Penalty (veh)	0
Storage Bay Dist (m)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 22: Allandale Road & Higgins Line

Movement	WB	WB	WB	NB	NB	NB	SB	SB	SB	B3	B3	B2
Directions Served	L	L	R	T	T	R	L	T	T	T	T	T
Maximum Queue (m)	123.7	127.3	42.5	52.9	66.4	75.6	73.6	93.5	90.8	203.0	201.4	417.9
Average Queue (m)	103.3	110.0	19.9	17.1	20.5	12.5	53.8	68.3	68.0	112.1	111.5	136.3
95th Queue (m)	141.2	147.6	54.6	41.8	47.5	55.8	97.5	114.7	110.6	260.7	259.8	441.9
Link Distance (m)	117.4	117.4		101.8	101.8			73.6	73.6	178.6	178.6	543.7
Upstream Blk Time (%)	48	77			0		1	51	62	45	47	6
Queuing Penalty (veh)	0	0			0		0	313	379	270	280	38
Storage Bay Dist (m)			40.0			80.0	80.0					
Storage Blk Time (%)		85	14		0	0	1	51				
Queuing Penalty (veh)		198	37		0	2	5	129				

Intersection: 22: Allandale Road & Higgins Line

Movement	B2
Directions Served	T
Maximum Queue (m)	467.7
Average Queue (m)	147.8
95th Queue (m)	470.8
Link Distance (m)	543.7
Upstream Blk Time (%)	7
Queuing Penalty (veh)	40
Storage Bay Dist (m)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 24: Allandale Road & Confederation Building Lot

Movement	WB	WB	WB	NB	NB	NB	B1123	SB	SB	SB	B4	B4
Directions Served	L	L	R	T	T	R	T	L	T	T	T	T
Maximum Queue (m)	47.4	95.7	95.4	75.0	84.1	2.8	11.4	132.5	172.4	172.7	113.4	113.9
Average Queue (m)	35.2	67.0	44.3	37.7	49.7	0.1	0.8	105.6	152.5	152.9	91.3	91.2
95th Queue (m)	64.5	106.3	93.6	63.6	76.8	2.8	16.5	188.5	210.2	209.2	149.3	147.6
Link Distance (m)		87.5	87.5	500.7	500.7		104.4		147.6	147.6	101.8	101.8
Upstream Blk Time (%)		25	9				0		76	85	41	48
Queuing Penalty (veh)		0	0				0		570	635	312	365
Storage Bay Dist (m)	45.0					110.0		130.0				
Storage Blk Time (%)	3	48						1	74			
Queuing Penalty (veh)	5	68						7	150			

Intersection: 29: Prince Philip Drive & Confederation Building Lot

Movement	EB	EB	NB	NB	NB	B27	SB	SB	SB
Directions Served	L	R	L	T	T	T	T	T	R
Maximum Queue (m)	117.8	120.7	42.1	35.4	39.3	171.0	161.4	162.4	102.5
Average Queue (m)	87.7	91.1	16.6	9.6	12.1	6.1	141.2	139.1	72.0
95th Queue (m)	141.2	150.2	33.1	27.1	29.3	124.9	191.1	196.7	148.9
Link Distance (m)	108.9	108.9		270.6	270.6	834.7	148.3	148.3	
Upstream Blk Time (%)	24	57				0	70	75	
Queuing Penalty (veh)	0	0				0	0	0	
Storage Bay Dist (m)			75.0						100.0
Storage Blk Time (%)							73	2	
Queuing Penalty (veh)							175	15	

Intersection: 34: Elizabeth Avenue & Westerland Road

Movement	EB	EB	WB	B33	SB	SB
Directions Served	L	T	TR	T	L	R
Maximum Queue (m)	31.2	35.4	579.7	325.4	349.1	72.5
Average Queue (m)	11.1	8.4	567.2	296.3	264.0	69.2
95th Queue (m)	25.1	25.2	593.9	421.5	451.6	88.5
Link Distance (m)		391.9	553.5	321.0	353.9	
Upstream Blk Time (%)			96	56	20	
Queuing Penalty (veh)			761	447	175	
Storage Bay Dist (m)	35.0				70.0	
Storage Blk Time (%)	0	0			23	66
Queuing Penalty (veh)	0	1			83	279

Intersection: 35: Prince Philip Drive & Clinch Crescent

Movement	EB	EB	EB	WB	WB	WB	SB	SB
Directions Served	L	T	T	T	T	R	L	R
Maximum Queue (m)	59.7	50.6	48.1	76.1	74.3	28.7	76.5	137.0
Average Queue (m)	28.8	13.0	13.9	41.3	43.0	1.1	31.5	50.3
95th Queue (m)	51.6	42.9	43.1	68.6	70.2	15.2	61.7	109.2
Link Distance (m)		280.6	280.6	573.0	573.0			269.1
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (m)	140.0					70.0	80.0	
Storage Blk Time (%)		0			1	0	0	3
Queuing Penalty (veh)		0			1	0	0	5

Intersection: 37: Thorburn Road & Prince Philip Drive

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	B36	B36	NB
Directions Served	L	T	T	R	L	T	T	T	R	T	T	T
Maximum Queue (m)	177.5	324.9	315.6	315.0	101.9	117.7	105.4	91.2	55.7	8.2	8.6	67.1
Average Queue (m)	177.4	314.6	302.1	199.7	52.2	70.9	67.8	59.8	4.9	0.9	0.7	42.1
95th Queue (m)	177.4	320.4	365.7	425.9	104.2	111.1	102.5	87.0	29.2	10.1	11.0	62.0
Link Distance (m)		308.0	308.0	308.0		134.5	134.5	134.5	134.5	222.8	222.8	126.5
Upstream Blk Time (%)		92	19	7		2	0					
Queuing Penalty (veh)		0	0	0		10	1					
Storage Bay Dist (m)	175.0				110.0							
Storage Blk Time (%)	83	36			3	1						
Queuing Penalty (veh)	505	207			18	2						

Intersection: 37: Thorburn Road & Prince Philip Drive

Movement	NB	SB	SB	SB	SB
Directions Served	TR	L	L	T	TR
Maximum Queue (m)	71.1	87.4	383.2	389.6	152.5
Average Queue (m)	47.0	29.2	372.3	378.8	152.4
95th Queue (m)	66.5	62.9	417.1	384.0	153.2
Link Distance (m)	126.5		372.8	372.8	
Upstream Blk Time (%)			31	81	
Queuing Penalty (veh)			0	0	
Storage Bay Dist (m)		150.0			150.0
Storage Blk Time (%)		0	0	16	60
Queuing Penalty (veh)		0	0	227	295

Intersection: 40: Prince Philip Drive & Wicklow Street

Movement	EB	EB	EB	WB	WB	SB	SB
Directions Served	L	T	T	T	TR	L	R
Maximum Queue (m)	18.6	25.8	25.7	75.7	294.2	62.4	169.5
Average Queue (m)	4.6	4.2	4.0	35.7	70.2	56.2	72.2
95th Queue (m)	13.7	15.3	14.8	63.4	193.5	72.3	179.0
Link Distance (m)		189.0	189.0	280.6	280.6		264.8
Upstream Blk Time (%)					1		1
Queuing Penalty (veh)					9		0
Storage Bay Dist (m)	50.0					60.0	
Storage Blk Time (%)		0				30	4
Queuing Penalty (veh)		0				28	12

Intersection: 46: Stamps Lane/Oxen Pond Road & Freshwater Road

Movement	EB	EB	WB	NB	SB	SB
Directions Served	T	R	TR	LTR	L	TR
Maximum Queue (m)	368.4	373.1	261.5	383.6	30.2	110.1
Average Queue (m)	361.0	357.7	259.1	373.6	3.5	52.2
95th Queue (m)	365.4	378.1	260.8	380.5	16.2	92.4
Link Distance (m)	357.5	357.5	256.2	366.1		137.9
Upstream Blk Time (%)	51	23	26	98		0
Queuing Penalty (veh)	603	279	395	0		0
Storage Bay Dist (m)					30.0	
Storage Blk Time (%)					0	21
Queuing Penalty (veh)					0	4

Intersection: 47: Freshwater Road & Thorburn Road

Movement	EB	EB	WB	WB	WB	SB	SB	SB	B43	B43
Directions Served	T	T	T	T	R	L	L	R	T	T
Maximum Queue (m)	175.2	175.7	66.7	94.6	32.5	77.1	70.2	66.9	131.8	133.3
Average Queue (m)	166.8	166.8	34.8	41.7	29.8	64.9	61.2	24.1	63.9	67.6
95th Queue (m)	172.0	171.9	54.9	76.2	37.3	81.2	78.0	54.1	145.4	156.7
Link Distance (m)	160.8	160.8	357.5	357.5		52.2	52.2	52.2	126.5	126.5
Upstream Blk Time (%)	98	94				65	49	2	4	7
Queuing Penalty (veh)	0	0				357	265	12	31	56
Storage Bay Dist (m)					30.0					
Storage Blk Time (%)				8	8					
Queuing Penalty (veh)				90	44					

Intersection: 51: Freshwater Road & Elizabeth Avenue

Movement	WB	NB	SB	SB
Directions Served	R	TR	L	T
Maximum Queue (m)	271.6	220.5	32.3	260.0
Average Queue (m)	269.3	212.1	32.2	205.5
95th Queue (m)	271.1	216.7	32.7	308.3
Link Distance (m)	266.6	206.4		256.2
Upstream Blk Time (%)	69	79		1
Queuing Penalty (veh)	447	0		23
Storage Bay Dist (m)			30.0	
Storage Blk Time (%)			59	7
Queuing Penalty (veh)			375	65

Intersection: 52: Elizabeth Avenue & Paton Street

Movement	EB	EB	WB	SB
Directions Served	L	T	TR	LR
Maximum Queue (m)	13.8	22.0	52.2	417.3
Average Queue (m)	2.0	2.5	48.4	370.7
95th Queue (m)	9.0	12.9	50.5	491.7
Link Distance (m)		266.6	45.6	410.7
Upstream Blk Time (%)			70	62
Queuing Penalty (veh)			504	0
Storage Bay Dist (m)	30.0			
Storage Blk Time (%)		0		
Queuing Penalty (veh)		0		

Intersection: 55: Anderson Avenue & Elizabeth Avenue

Movement	EB	WB	WB	NB	NB
Directions Served	TR	L	T	L	R
Maximum Queue (m)	15.6	42.5	417.9	332.2	92.2
Average Queue (m)	2.0	36.3	409.0	326.1	11.4
95th Queue (m)	9.3	60.3	413.9	330.4	64.5
Link Distance (m)	45.6		391.9	325.0	
Upstream Blk Time (%)			97	100	
Queuing Penalty (veh)			823	0	
Storage Bay Dist (m)		40.0			100.0
Storage Blk Time (%)		2	91	99	0
Queuing Penalty (veh)		10	220	166	0

Intersection: 59: Clinch Crescent & Arctic Avenue

Movement	WB	WB	WB	NB	NB	SB
Directions Served	L	L	R	T	R	LT
Maximum Queue (m)	102.5	219.1	217.2	21.0	54.2	177.3
Average Queue (m)	57.6	209.3	204.6	2.6	17.2	109.0
95th Queue (m)	139.4	215.0	244.0	11.7	42.2	251.0
Link Distance (m)		205.9	205.9	83.2	83.2	188.1
Upstream Blk Time (%)		100	80			38
Queuing Penalty (veh)		0	0			0
Storage Bay Dist (m)	100.0					
Storage Blk Time (%)	1	97				
Queuing Penalty (veh)	4	364				

Intersection: 61: Prince Philip Drive & Morrissey Drive

Movement	EB	EB	WB	WB	WB	WB	SB	SB
Directions Served	T	T	L	T	T	R	L	TR
Maximum Queue (m)	477.8	477.2	21.6	34.5	43.1	32.1	42.4	294.3
Average Queue (m)	365.3	361.8	6.2	14.4	18.0	7.8	42.0	284.0
95th Queue (m)	538.3	540.1	15.8	28.0	36.3	22.5	45.0	289.2
Link Distance (m)	470.0	470.0		438.1	438.1			278.6
Upstream Blk Time (%)	5	5						97
Queuing Penalty (veh)	42	47						0
Storage Bay Dist (m)			70.0			30.0	40.0	
Storage Blk Time (%)					1	0	83	22
Queuing Penalty (veh)					3	1	329	71

Network Summary

Network wide Queuing Penalty: 21483

Intersection: 7: Allandale Road & Prince Philip Drive

Phase	1	2	4	5	6	7	8
Movement(s) Served	WBL	EBTL	NBT	EBL	WBTL	NBL	SBTL
Maximum Green (s)	11.0	43.0	47.0	22.0	32.0	12.0	29.0
Minimum Green (s)	7.0	25.0	25.0	7.0	25.0	7.0	25.0
Recall	None	C-Max	None	None	C-Max	None	None
Avg. Green (s)	11.0	43.0	47.0	22.0	32.0	12.0	29.0
g/C Ratio	NA	NA	NA	NA	NA	NA	NA
Cycles Skipped (%)	0	0	0	0	0	0	0
Cycles @ Minimum (%)	0	0	0	0	0	0	0
Cycles Maxed Out (%)	97	100	100	100	100	97	100
Cycles with Peds (%)	0	21	14	0	14	0	0

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Intersection: 9: Westerland Road/Clinch Crescent & Prince Philip Drive

Phase	1	2	3	4	5	6	7	8
Movement(s) Served	WBL	EBTL	SBL	NBTL	EBL	WBTL	NBL	SBTL
Maximum Green (s)	7.0	45.0	13.0	29.0	12.0	40.0	10.0	32.0
Minimum Green (s)	7.0	25.0	7.0	25.0	7.0	25.0	7.0	25.0
Recall	None	C-Max	None	None	None	C-Max	None	None
Avg. Green (s)	7.0	48.2	12.3	32.4	12.3	40.5	9.3	34.0
g/C Ratio	-0.01	NA	-0.01	NA	NA	NA	-0.01	NA
Cycles Skipped (%)	21	0	11	0	0	0	7	0
Cycles @ Minimum (%)	76	0	4	0	0	0	10	0
Cycles Maxed Out (%)	72	100	61	89	93	100	55	89
Cycles with Peds (%)	0	71	0	96	0	68	0	68

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Intersection: 10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue

Phase	1	2	3	4	5	6	7	8
Movement(s) Served	WBL	EBTL	SBL	NBTL	EBL	WBTL	NBL	SBTL
Maximum Green (s)	7.0	36.0	7.0	46.0	9.0	34.0	7.0	46.0
Minimum Green (s)	7.0	25.0	7.0	25.0	7.0	25.0	7.0	25.0
Recall	None	C-Max	None	None	None	C-Max	None	None
Avg. Green (s)	7.5	45.0	16.2	52.8	8.2	37.1	7.2	48.8
g/C Ratio	-0.01	NA	-0.01	-0.01	-0.01	NA	-0.01	NA
Cycles Skipped (%)	67	0	41	7	14	0	18	0
Cycles @ Minimum (%)	33	0	48	0	21	0	82	0
Cycles Maxed Out (%)	33	100	59	93	38	100	82	100
Cycles with Peds (%)	0	0	0	0	0	0	0	0

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Intersection: 11: Mt. Scio Road & Allandale Road

Phase	1	2	3	4	5	6	7	8
Movement(s) Served	WBL	EBTL	NBL	SBTL	EBL	WBTL	SBL	NBTL
Maximum Green (s)	7.0	37.0	7.0	25.0	7.0	37.0	7.0	25.0
Minimum Green (s)	7.0	25.0	7.0	25.0	7.0	25.0	7.0	25.0
Recall	None	C-Max	None	None	None	C-Max	None	None
Avg. Green (s)	7.2	47.2	8.3	27.4	7.4	40.7	13.8	27.2
g/C Ratio	-0.01	NA	-0.01	-0.01	-0.01	NA	-0.01	-0.01
Cycles Skipped (%)	61	0	15	3	12	0	12	22
Cycles @ Minimum (%)	39	0	82	81	85	0	68	63
Cycles Maxed Out (%)	36	100	85	94	85	100	88	75
Cycles with Peds (%)	0	0	0	0	0	0	0	0

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Intersection: 22: Allandale Road & Higgins Line

Phase	1	2	6	8
Movement(s) Served	SBL	NBT	SBTL	WBL
Maximum Green (s)	14.0	50.0	70.0	18.0
Minimum Green (s)	7.0	25.0	25.0	10.0
Recall	None	C-Max	C-Max	None
Avg. Green (s)	9.8	60.6	70.0	18.0
g/C Ratio	-0.01	NA	NA	NA
Cycles Skipped (%)	38	0	0	0
Cycles @ Minimum (%)	12	0	0	0
Cycles Maxed Out (%)	9	100	100	97
Cycles with Peds (%)	0	0	0	0

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Intersection: 24: Allandale Road & Confederation Building Lot

Phase	1	2	6	8
Movement(s) Served	SBL	NBT	SBTL	WBL
Maximum Green (s)	7.0	47.0	60.0	28.0
Minimum Green (s)	7.0	25.0	25.0	10.0
Recall	None	C-Max	C-Max	None
Avg. Green (s)	7.6	53.5	62.0	27.2
g/C Ratio	-0.01	NA	NA	NA
Cycles Skipped (%)	32	0	0	0
Cycles @ Minimum (%)	62	0	0	0
Cycles Maxed Out (%)	62	100	100	84
Cycles with Peds (%)	0	11	0	9

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Intersection: 29: Prince Philip Drive & Confederation Building Lot

Phase	2	5	6	8
Movement(s) Served	NBTL	NBL	SBT	EBL
Maximum Green (s)	79.0	22.0	51.0	29.0
Minimum Green (s)	25.0	7.0	25.0	10.0
Recall	C-Max	None	C-Max	None
Avg. Green (s)	82.4	9.4	72.5	28.3
g/C Ratio	NA	-0.01	NA	NA
Cycles Skipped (%)	0	33	0	0
Cycles @ Minimum (%)	0	26	0	0
Cycles Maxed Out (%)	100	0	100	93
Cycles with Peds (%)	0	0	0	0

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Intersection: 34: Elizabeth Avenue & Westerland Road

Phase	2	5	6	8
Movement(s) Served	EBTL	EBL	WBT	SBL
Maximum Green (s)	80.0	15.0	59.0	28.0
Minimum Green (s)	25.0	7.0	25.0	10.0
Recall	C-Max	None	C-Max	None
Avg. Green (s)	91.2	9.4	80.9	23.8
g/C Ratio	-0.01	-0.01	-0.01	-0.01
Cycles Skipped (%)	4	44	4	3
Cycles @ Minimum (%)	0	26	0	3
Cycles Maxed Out (%)	96	0	96	55
Cycles with Peds (%)	0	0	0	0

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Intersection: 35: Prince Philip Drive & Clinch Crescent

Phase	2	5	6	8
Movement(s) Served	EBTL	EBL	WBT	SBL
Maximum Green (s)	78.0	14.0	58.0	29.0
Minimum Green (s)	25.0	7.0	25.0	10.0
Recall	C-Max	None	C-Max	None
Avg. Green (s)	99.1	10.9	79.2	15.0
g/C Ratio	-0.01	-0.01	NA	-0.01
Cycles Skipped (%)	4	22	0	3
Cycles @ Minimum (%)	0	16	0	21
Cycles Maxed Out (%)	96	0	100	0
Cycles with Peds (%)	0	0	11	14

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Intersection: 37: Thorburn Road & Prince Philip Drive

Phase	1	2	3	4	5	6	8
Movement(s) Served	WBL	EBTL	SBL	NBT	EBL	WBTL	SBT
Maximum Green (s)	9.0	44.0	11.0	30.0	19.0	34.0	47.0
Minimum Green (s)	7.0	25.0	7.0	25.0	7.0	25.0	25.0
Recall	None	C-Max	None	None	None	C-Max	None
Avg. Green (s)	9.0	45.8	10.7	30.8	19.0	34.0	47.0
g/C Ratio	NA	NA	NA	NA	NA	NA	NA
Cycles Skipped (%)	0	0	0	0	0	0	0
Cycles @ Minimum (%)	4	0	0	0	0	0	0
Cycles Maxed Out (%)	85	100	79	100	100	100	100
Cycles with Peds (%)	0	14	0	0	0	17	17

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Intersection: 40: Prince Philip Drive & Wicklow Street

Phase	2	5	6	8
Movement(s) Served	EBTL	EBL	WBT	SBL
Maximum Green (s)	85.0	7.0	72.0	23.0
Minimum Green (s)	25.0	7.0	25.0	10.0
Recall	C-Max	None	C-Max	None
Avg. Green (s)	85.9	10.5	85.8	22.2
g/C Ratio	NA	-0.01	NA	NA
Cycles Skipped (%)	0	96	0	0
Cycles @ Minimum (%)	0	4	0	0
Cycles Maxed Out (%)	100	4	100	80
Cycles with Peds (%)	0	0	15	13

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Intersection: 46: Stamps Lane/Oxen Pond Road & Freshwater Road

Phase	1	2	4	6	8
Movement(s) Served	SBL	NBTL	WBT	SBTL	EBT
Maximum Green (s)	10.0	40.0	52.0	56.0	52.0
Minimum Green (s)	7.0	10.0	25.0	10.0	25.0
Recall	None	C-Max	Max	C-Max	Max
Avg. Green (s)	9.0	53.8	52.0	56.0	52.0
g/C Ratio	-0.01	NA	NA	NA	NA
Cycles Skipped (%)	84	0	0	0	0
Cycles @ Minimum (%)	12	0	0	0	0
Cycles Maxed Out (%)	0	100	100	100	100
Cycles with Peds (%)	0	7	3	3	3

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Intersection: 47: Freshwater Road & Thorburn Road

Phase	4	6	8
Movement(s) Served	EBT	SBL	WBT
Maximum Green (s)	59.0	49.0	59.0
Minimum Green (s)	25.0	10.0	25.0
Recall	C-Max	Max	C-Max
Avg. Green (s)	59.0	49.0	59.0
g/C Ratio	NA	NA	NA
Cycles Skipped (%)	0	0	0
Cycles @ Minimum (%)	0	0	0
Cycles Maxed Out (%)	100	100	100
Cycles with Peds (%)	0	29	54

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Intersection: 51: Freshwater Road & Elizabeth Avenue

Phase	1	2	6	8
Movement(s) Served	SBL	NBT	SBTL	WBR
Maximum Green (s)	34.0	43.0	83.0	25.0
Minimum Green (s)	7.0	25.0	25.0	10.0
Recall	None	C-Max	C-Max	Max
Avg. Green (s)	27.2	51.8	83.0	25.0
g/C Ratio	NA	NA	NA	NA
Cycles Skipped (%)	0	0	0	0
Cycles @ Minimum (%)	0	0	0	0
Cycles Maxed Out (%)	32	100	100	100
Cycles with Peds (%)	0	26	0	0

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

Intersection: 61: Prince Philip Drive & Morrissey Drive

Phase	1	2	3	6	8
Movement(s) Served	WBL	EBT	SBL	WBTL	SBTL
Maximum Green (s)	7.0	64.0	29.0	77.0	29.0
Minimum Green (s)	7.0	25.0	7.0	25.0	25.0
Recall	None	C-Max	None	C-Max	None
Avg. Green (s)	7.8	74.5	29.0	77.0	29.0
g/C Ratio	-0.01	NA	NA	NA	NA
Cycles Skipped (%)	81	0	0	0	0
Cycles @ Minimum (%)	19	0	0	0	0
Cycles Maxed Out (%)	19	100	96	100	96
Cycles with Peds (%)	0	46	0	43	50

Controller Summary

Average Cycle Length (s): NA
Number of Complete Cycles : 0

		Scenario 4 - AM Peak Hour						
Intersection		Synchro				SimTraffic		
Street	Movement	Delay/Veh (s)	LOS	V/C	Queue (m) 95th%ile	Delay/Veh (s)	Equivalent LOS	Queue (m) 95th%ile
Columbus Drive/ Prince Philip Drive & Thorburn Road		44.7	D			132.7	F	
Columbus Drive/ Prince Philip Drive	Eastbound Left - Turn	28.8	C	0.74	56.1	112.1	F	246.4
	Eastbound Through	62.0	E	1.01	237.3	204.7	F	390.3
	Eastbound Right - Turn	7.1	A	0.24	20.0	27.2	C	450.5
	Westbound Left - Turn	101.5	F	0.99	58.4	38.8	D	39.3
	Westbound Through	26.0	C	0.50	67.1	19.8	B	45.4
	Westbound Right - Turn	7.8	A	0.41	21.5	3.2	A	42.6
Thorburn Road	Northbound Through	28.5	C	0.71	63.1	28.7	C	46.9
	Northbound Right - Turn					33.4	C	190.0
	Southbound Left - Turn	106.5	F	1.03	79.0	588.5	F	470.5
	Southbound Through	32.2	C	0.69	108.5	71.8	E	477.5
	Southbound Right - Turn					74.1	E	162.9
Prince Philip Drive & Wicklow Street		9.5	A			59.6	E	
Prince Philip Drive	Eastbound Left - Turn	0.8	A	0.07	0.4	140.3	F	41.7
	Eastbound Through	4.5	A	0.66	185.4	103.6	F	282.7
	Westbound Through	8.5	A	0.47	67.9	9.9	A	65.8
	Westbound Right - Turn					10.3	B	99.6
Wicklow Street	Southbound Left - Turn	64.2	E	0.73	62.0	51.0	D	57.3
	Southbound Right - Turn	13.3	B	0.16	8.9	8.5	A	34.0
Prince Philip Drive & Clinch Crescent		17.8	B			84.3	F	
Prince Philip Drive	Eastbound Left - Turn	51.7	D	0.94	178.8	114.8	F	157.6
	Eastbound Through	3.1	A	0.56	39.3	174.1	F	334.3
	Westbound Through	22.0	C	0.81	97.8	18.3	B	51.4
	Westbound Right - Turn	3.0	A	0.36	9.1	9.3	A	25.2
Clinch Crescent	Southbound Left - Turn	43.8	D	0.35	28.5	65.3	E	43.4
	Southbound Right - Turn	10.8	B	0.29	21.3	3.3	A	19.8
Prince Philip Drive & Clinch Crescent/ Westerland Road		152.2	F			189.3	F	
Prince Philip Drive	Eastbound Left - Turn	424.9	F	1.87	334.0	509.6	F	77.7
	Eastbound Through	34.0	C	0.46	89.7	136.4	F	633.5
	Eastbound Right - Turn	10.3	B	0.36	32.2	92.3	F	132.4
	Westbound Left - Turn	16.7	B	0.33	13.4	127.3	F	103.3
	Westbound Through	144.8	F	1.23	149.6	190.6	F	373.7
	Westbound Right - Turn					254.7	F	380.5
Clinch Crescent/ Westerland Road	Northbound Left - Turn	31.8	C	0.33	20.4	153.4	F	71.4
	Northbound Through	214.2	F	1.37	239.4	136.7	F	422.4
	Northbound Right - Turn	3.1	A	0.23	0.4	130.9	F	61.8
	Southbound Left - Turn	42.3	D	0.61	28.1	36.5	D	31.8
	Southbound Through	54.3	D	0.61	91.3	31.5	C	69.5
	Southbound Right - Turn	6.9	A	0.44	19.6	10.4	B	46.0
Clinch Crescent & Arctic Avenue		67.7	E			13.0	B	
Arctic Avenue	Westbound Left - Turn	48.3	D	0.65	37.3	48.5	D	82.6
	Westbound Right - Turn	11.9	B	0.41	14.2	7.0	A	19.2
Clinch Crescent	Northbound Through	8.8	A	0.14	19.6	7.4	A	92.3
	Northbound Right - Turn	119.2	F	1.22	302.5	9.0	A	72.9
	Southbound Left - Turn	4.1	A	0.24	9.2	7.3	A	24.0
	Southbound Through	3.4	A	0.16	11.2	5.1	A	32.3
Prince Philip Drive & Morrissey Drive		7.7	A			17.5	B	
Prince Philip Drive	Eastbound Through	3.3	A	0.39	15.7	6.3	A	18.6
	Westbound Left - Turn	2.0	A	0.26	2.6	16.6	B	17.0
	Westbound Through	1.8	A	0.32	16.2	16.3	B	36.3
	Westbound Right - Turn	2.6	A	0.61	0.0	19.6	B	34.1
Morrissey Drive	Southbound Left - Turn	51.0	D	0.43	34.2	50.0	D	40.2
	Southbound Through	50.9	D	0.75	50.1	50.4	D	67.7
	Southbound Right - Turn					28.7	C	
Prince Philip Drive & Allandale Road		50.0	D			148.6	F	
Prince Philip Drive	Eastbound Left - Turn	140.5	F	1.17	107.9	36.5	D	55.6
	Eastbound Through	37.3	D	0.55	72.1	38.3	D	57.3
	Eastbound Right - Turn	18.6	B	0.53	58.7	6.2	A	22.8
	Westbound Left - Turn	34.1	C	0.71	57.6	306.2	F	86.2
	Westbound Through	72.1	E	1.01	145.4	355.1	F	609.4
	Westbound Right - Turn	7.4	A	0.14	10.2	393.0	F	34.9
	Northbound Left - Turn	85.8	F	1.09	126.0	192.9	F	75.2

















Allandale Road	Northbound Through	5.8	A	0.34	12.8	123.6	F	492.0
	Northbound Right - Turn	0.3	A	0.25	0.0	11.0	B	339.6
	Southbound Left - Turn	41.8	D	0.18	16.6	48.6	D	35.7
	Southbound Through	52.3	D	0.76	84.7	42.9	D	75.3
	Southbound Right - Turn	25.4	C	0.45	53.9	8.9	A	81.5
Prince Philip Drive & Confederation Building Lot		8.4	A			4.3	A	
Prince Philip Drive	Eastbound Left - Turn	53.8	D	0.15	10.6	64.9	E	14.3
	Eastbound Right - Turn	22.6	C	0.12	5.1	6.4	A	10.3
Confederation Building Lot	Northbound Left - Turn	20.3	C	0.59	37.6	9.2	A	31.8
	Northbound Through	1.2	A	0.18	9.0	1.2	A	10.8
	Southbound Through	9.0	A	0.44	88.0	3.9	A	48.7
	Southbound Right - Turn	1.8	A	0.10	6.4	2.9	A	0.0
Bonaventure Avenue/ Allandale Road & Elizabeth Avenue		43.7	A			37.6	D	
Bonaventure Avenue/ Allandale Road	Eastbound Left - Turn	21.2	C	0.19	8.4	35.3	D	18.4
	Eastbound Through	29.9	C	0.42	42.5	10.6	B	45.2
	Eastbound Right - Turn	0.2	A	0.05	0.3	2.1	A	0.0
	Westbound Left - Turn	32.2	C	0.26	21.1	30.2	C	23.5
	Westbound Through	40.7	D	0.52	49.7	36.3	D	49.3
	Westbound Right - Turn					6.4	A	48.7
Elizabeth Avenue	Northbound Left - Turn	14.2	B	0.32	17.6	74.8	E	57.5
	Northbound Through	82.9	F	1.07	340.3	71.1	E	256.3
	Northbound Right - Turn	2.2	A	0.14	6.6	60.8	E	38.7
	Southbound Left - Turn	18.1	B	0.28	3.4	50.2	D	22.8
	Southbound Through	15.1	B	0.69	134.5	18.6	B	172.7
	Southbound Right - Turn	1.5	A	0.17	3.8	6.8	A	161.8
Elizabeth Avenue & Westerland Road		16.9	B			27.4	C	
Elizabeth Avenue	Eastbound Left - Turn	20.8	C	0.94	17.1	66.3	E	44.9
	Eastbound Through	1.6	A	0.26	6.0	6.5	A	293.7
	Westbound Through	14.9	B	0.38	34.3	13.6	B	36.4
	Westbound Right - Turn					21.4	C	65.3
Westerland Road	Southbound Left - Turn	61.3	E	0.42	45.2	60.2	E	40.3
	Southbound Right - Turn	25.7	C	0.48	32.1	4.1	A	0.0
Elizabeth Avenue & Anderson Avenue		7.7	A			5.1	A	
Elizabeth Avenue	Eastbound Through	0.0	-	0.41	0.0	1.8	A	15.1
	Eastbound Right - Turn					0.7	A	
	Westbound Left - Turn	12.2	B	0.18	4.8	12.4	B	20.2
	Westbound Through	0.0	-	0.06	0.0	3.8	A	0.9
Anderson Avenue	Northbound Left - Turn	34.0	D	0.74	47.4	14.0	B	32.7
	Northbound Right - Turn					12.5	B	46.0
Elizabeth Avenue & Paton Street		0.8	A			5.0	A	
Elizabeth Avenue	Eastbound Left - Turn	8.0	A	0.04	0.9	7.6	A	15.2
	Eastbound Through	0.0	-	0.31	0.0	5.6	A	44.5
	Westbound Through	0.0	-	0.10	0.0	1.2	A	13.9
	Westbound Right - Turn					1.2	A	
Paton Street	Southbound Left - Turn	18.1	C	0.13	3.4	12.6	B	13.7
	Southbound Right - Turn					3.9	A	
Elizabeth Avenue & Freshwater Road		52.6	D			76.8	E	
Elizabeth Avenue	Westbound Left - Turn	38.4	D	0.09	16.4	42.2	D	11.9
	Westbound Right - Turn	9.1	A	0.11	19.9	2.2	A	10.4
Freshwater Road	Northbound Through	94.8	F	1.05	176.8	84.0	F	225.2
	Northbound Right - Turn	18.8	B	0.05	6.8	52.1	D	37.6
	Southbound Left - Turn	60.1	E	1.08	156.7	114.7	F	273.8
	Southbound Through	12.2	B	0.44	86.7	24.6	C	321.0
Freshwater Road & Stamps Lane/ Oxen Pond Road		30.4	C			112.2	F	
Freshwater Road	Eastbound Through	37.7	D	1.00	162.2	174.5	F	367.6
	Eastbound Right - Turn					163.0	F	367.1
	Westbound Through	4.9	A	0.35	17.4	11.4	B	20.3
	Westbound Right - Turn					9.6	A	34.6
Stamps Lane/ Oxen Pond Road	Northbound Left - Turn	45.8	D	0.64	100.4	38.7	D	72.2
	Northbound Through					39.4	D	
	Northbound Right - Turn					36.1	D	
	Southbound Left - Turn	27.9	C	0.07	7.3	36.5	D	12.9
	Southbound Through	27.3	C	0.23	25.8	29.5	C	35.4
	Southbound Right - Turn					14.8	B	
Freshwater Road & Thorburn Road		14.8	B			65.8	E	
Freshwater Road	Eastbound Through	18.4	B	0.64	126.5	148.5	F	174.0
	Westbound Through	3.5	A	0.18	6.6	4.9	A	18.2
	Westbound Right - Turn	2.4	A	0.44	11.9	6.5	A	26.3

Thorburn Road	Southbound Left - Turn	27.1	C	0.61	85.9	21.0	C	67.2
	Southbound Right - Turn	5.8	A	0.41	24.9	3.9	A	24.9
Allandale Road & Confederation Building Lot		4.6	A			3.0	A	
Confederation Building Lot	Westbound Left - Turn	32.4	C	0.03	2.9	44.1	D	10.7
	Westbound Right - Turn	12.3	B	0.09	4.0	5.0	A	10.5
Allandale Road	Northbound Through	9.7	A	0.12	39.5	3.7	A	24.4
	Northbound Right - Turn	2.6	A	0.19	13.9	3.3	A	8.8
	Southbound Left - Turn	2.0	A	0.14	6.2	4.1	A	16.4
	Southbound Through	2.5	A	0.34	20.1	2.0	A	25.5
Allandale Road & Higgins Line		9.5	A			9.7	A	
Higgins Line	Westbound Left - Turn	45.9	D	0.61	40.2	39.1	D	55.9
	Westbound Right - Turn	10.8	B	0.28	12.4	3.8	A	18.9
Allandale Road	Northbound Through	3.8	A	0.14	3.6	3.9	A	17.1
	Northbound Right - Turn	1.8	A	0.21	0.2	2.9	A	0.0
	Southbound Left - Turn	1.6	A	0.17	2.7	3.9	A	19.0
	Southbound Through	2.2	A	0.35	6.7	2.9	A	34.0
Allandale Road & Mt. Scio Road		19.7	B			17.6	B	
Allandale Road	Eastbound Left - Turn	13.6	B	0.29	29.6	15.9	B	28.3
	Eastbound Through	23.4	C	0.52	87.5	17.1	B	60.8
	Eastbound Right - Turn	5.6	A	0.50	29.6	8.0	A	40.1
	Westbound Left - Turn	11.6	B	0.14	8.0	16.5	B	13.0
	Westbound Through	16.2	B	0.20	17.4	14.9	B	22.0
Mt. Scio Road	Westbound Right - Turn	0.2	A	0.05	0.3	2.7	A	0.0
	Northbound Left - Turn	32.8	C	0.60	23.3	37.9	D	26.5
	Northbound Through	33.3	C	0.50	23.9	31.8	C	26.5
	Northbound Right - Turn	1.4	A	0.19	0.3	3.4	A	9.9
	Southbound Left - Turn	41.2	D	0.26	21.2	39.1	D	24.0
	Southbound Through	51.6	D	0.60	42.2	39.7	D	41.7
	Southbound Right - Turn	4.3	A	0.39	4.9	2.9	A	14.7
Outer Ring Road NB & Allandale Road		169.2	F			4.8	A	
Allandale Road	Eastbound Left - Turn	0.2	A	0.00	0.1	3.6	A	3.9
	Eastbound Through					1.1	A	
	Westbound Through	0.0	-	0.31	0.0	2.6	A	0.0
	Westbound Right - Turn	0.0	-	0.17	0.0	6.2	A	93.9
Outer Ring Road SB	Northbound Left - Turn	348.9	F	1.73	504.9	8.3	A	5.3
	Northbound Right - Turn	0.0	-	0.00	0.0	6.7	A	9.8
Outer Ring Road SB & Allandale Road		6.6	A			4.5	A	
Allandale Road	Eastbound Left - Turn	1.1	A	0.00	0.1	1.2	A	2.5
	Eastbound Through					0.6	A	
	Westbound Through	0.0	-	0.25	0.0	2.3	A	0.0
	Westbound Right - Turn					3.6	A	
Outer Ring Road SB	Southbound Left - Turn	14.5	B	0.50	21.5	5.8	A	26.1
	Southbound Right - Turn	0.0	-	0.00	0.0	1.8	A	5.7
New Connection & Clinch Crescent		5.6	A			6.2	A	
Clinch Crescent	Eastbound Left - Turn	47.1	D	0.40	27.6	44.0	D	25.2
	Eastbound Right - Turn	12.8	B	0.62	21.0	8.8	A	28.3
Clinch Crescent/ New Connection	Northbound Left - Turn	1.9	A	0.26	5.2	11.4	B	28.9
	Northbound Through					1.3	A	5.7
	Southbound Through	0.5	A	0.27	0.4	5.6	A	7.5
	Southbound Right - Turn					4.9	A	23.3
Mt. Scio Road & New Connection		7.4	A			10.6	B	
Mt. Scio Road	Eastbound Left - Turn	48.0	D	0.44	30.4	42.6	D	27.6
	Eastbound Right - Turn	12.1	B	0.44	15.9	7.2	A	19.4
Mt. Scio Road/ New Connection	Northbound Left - Turn	3.4	A	0.01	1.3	11.0	B	5.3
	Northbound Through	3.0	A	0.11	12.7	4.2	A	17.5
	Southbound Through	3.5	A	0.21	26.1	9.4	A	21.9
	Southbound Right - Turn	1.1	A	0.08	5.2	8.9	A	1.7

MUN Area Traffic Study
Allandale Road & Confederation Building Lot

Scenario 4A - 2025 AM

07/07/2015

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	 		 		 	 
Traffic Volume (vph)	13	17	387	220	102	933
Future Volume (vph)	13	17	387	220	102	933
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	4.0	4.8	4.0	3.5
Grade (%)	0%		0%			0%
Storage Length (m)	45.0	0.0		110.0	130.0	
Storage Lanes	1	1		1	1	
Taper Length (m)	2.5				2.5	
Lane Util. Factor	0.97	1.00	0.95	1.00	1.00	0.95
Ped Bike Factor						
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3395	1566	3697	1794	1848	3500
Flt Permitted	0.950				0.465	
Satd. Flow (perm)	3395	1566	3697	1794	905	3500
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		23		237		
Link Speed (k/h)	50		60			60
Link Distance (m)	100.1		513.4			163.6
Travel Time (s)	7.2		30.8			9.8
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.75	0.75	0.93	0.93	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Adj. Flow (vph)	17	23	416	237	109	993
Shared Lane Traffic (%)						
Lane Group Flow (vph)	17	23	416	237	109	993
Turn Type	Prot	Perm	NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2	6	
Total Split (s)	39.0	39.0	44.0	44.0	17.0	61.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Act Effect Green (s)	14.4	14.4	66.2	66.2	80.0	82.4
Actuated g/C Ratio	0.14	0.14	0.66	0.66	0.80	0.82
v/c Ratio	0.03	0.09	0.17	0.19	0.14	0.34
Control Delay	32.4	12.3	9.7	2.6	2.7	2.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.4	12.3	9.7	2.6	2.7	2.5
LOS	C	B	A	A	A	A
Approach Delay	20.8		7.1			2.5
Approach LOS	C		A			A
Stops (vph)	11	6	153	18	12	132
Fuel Used(l)	1	0	29	13	3	29
CO Emissions (g/hr)	13	8	543	247	58	537



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
NOx Emissions (g/hr)	2	2	105	48	11	104
VOC Emissions (g/hr)	3	2	125	57	13	124
Dilemma Vehicles (#)	0	0	20	0	0	29
Queue Length 50th (m)	1.5	0.0	15.1	0.0	2.2	13.2
Queue Length 95th (m)	2.9	4.0	39.5	13.9	6.2	20.1
Internal Link Dist (m)	76.1		489.4			139.6
Turn Bay Length (m)	45.0			110.0	130.0	
Base Capacity (vph)	1120	532	2448	1268	827	2884
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	0.02	0.04	0.17	0.19	0.13	0.34

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 34 (34%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.34

Intersection Signal Delay: 4.6

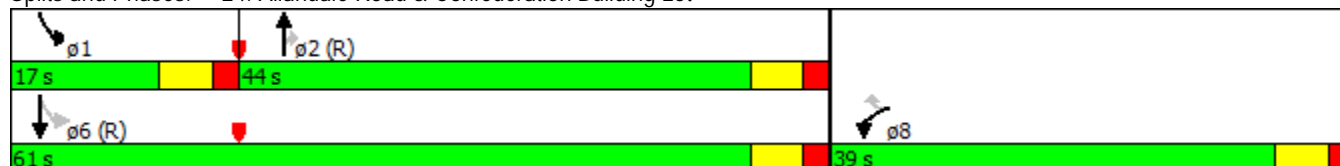
Intersection LOS: A

Intersection Capacity Utilization 50.0%







ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 24: Allandale Road & Confederation Building Lot



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	←←	←	↑↑	↑	↓	↓↓
Traffic Volume (vph)	277	78	232	172	117	758
Future Volume (vph)	277	78	232	172	117	758
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	4.0	4.0	3.5	3.5	4.0	3.5
Grade (%)	0%		0%			0%
Storage Length (m)	0.0	40.0		80.0	80.0	
Storage Lanes	2	1		1	1	
Taper Length (m)	2.5				2.5	
Lane Util. Factor	0.97	1.00	0.95	1.00	1.00	0.95
Ped Bike Factor						
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3586	1654	3500	1566	1848	3500
Flt Permitted	0.950				0.522	
Satd. Flow (perm)	3586	1654	3500	1566	1016	3500
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		85		215		
Link Speed (k/h)	50		50			60
Link Distance (m)	128.4		114.7			80.6
Travel Time (s)	9.2		8.3			4.8
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.80	0.80	0.83	0.83
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Adj. Flow (vph)	301	85	290	215	141	913
Shared Lane Traffic (%)						
Lane Group Flow (vph)	301	85	290	215	141	913
Turn Type	Prot	Perm	NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2	6	
Total Split (s)	32.0	32.0	46.0	46.0	22.0	68.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Act Effect Green (s)	13.7	13.7	60.4	60.4	74.3	74.3
Actuated g/C Ratio	0.14	0.14	0.60	0.60	0.74	0.74
v/c Ratio	0.61	0.28	0.14	0.21	0.17	0.35
Control Delay	45.9	10.8	3.8	1.8	1.6	2.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.9	10.8	3.8	1.8	1.6	2.2
LOS	D	B	A	A	A	A
Approach Delay	38.2		3.0			2.1
Approach LOS	D		A			A
Stops (vph)	254	16	66	18	9	100
Fuel Used(l)	19	2	8	5	9	59
CO Emissions (g/hr)	351	36	154	96	165	1101

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
NOx Emissions (g/hr)	68	7	30	19	32	212
VOC Emissions (g/hr)	81	8	36	22	38	254
Dilemma Vehicles (#)	0	0	0	0	0	9
Queue Length 50th (m)	28.7	0.0	1.9	0.0	1.4	5.0
Queue Length 95th (m)	40.2	12.4	3.6	0.2	2.7	6.7
Internal Link Dist (m)	104.4		90.7			56.6
Turn Bay Length (m)		40.0		80.0	80.0	
Base Capacity (vph)	932	492	2113	1030	888	2600
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	0.32	0.17	0.14	0.21	0.16	0.35

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 52 (52%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.61

Intersection Signal Delay: 9.5

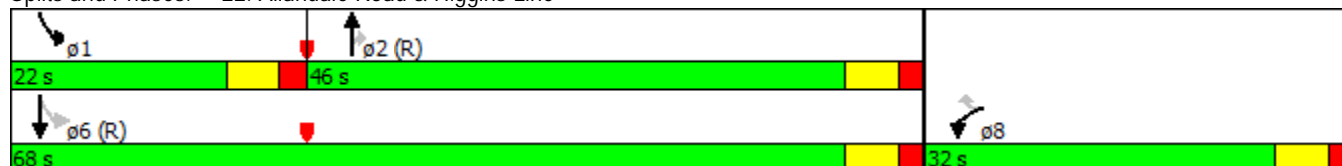
Intersection LOS: A

Intersection Capacity Utilization 50.6%

ICU Level of Service A

Analysis Period (min) 15

























Splits and Phases: 22: Allandale Road & Higgins Line















MUN Area Traffic Study
Allandale Road & Mt. Scio Road

Scenario 4A - 2025 AM

07/07/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	163	762	453	40	238	32	213	95	60	53	123	146
Future Volume (vph)	163	762	453	40	238	32	213	95	60	53	123	146
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.3	3.5	3.5	3.7	4.0	3.5	3.5	3.5	3.6	3.3	4.8
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	75.0		50.0	75.0		50.0	60.0		25.0	60.0		50.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1750	3421	1566	1750	3579	1654	3395	1842	1566	1770	1801	1794
Flt Permitted	0.535			0.282			0.950			0.950		
Satd. Flow (perm)	985	3421	1566	519	3579	1654	3395	1842	1566	1770	1801	1794
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			428			164			229			229
Link Speed (k/h)		60			60			60				50
Link Distance (m)		368.0			559.6			460.8			111.1	
Travel Time (s)		22.1			33.6			27.6			8.0	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.96	0.96	0.96	0.82	0.82	0.82	0.78	0.78	0.78	0.87	0.87	0.87
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	170	794	472	49	290	39	273	122	77	61	141	168
Shared Lane Traffic (%)												
Lane Group Flow (vph)	170	794	472	49	290	39	273	122	77	61	141	168
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases	2		2	6		6			8			4
Total Split (s)	15.0	34.0	34.0	22.0	41.0	41.0	22.0	22.0	22.0	22.0	22.0	22.0
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	6.0
Act Effect Green (s)	52.4	44.8	44.8	48.0	40.6	40.6	13.3	13.3	13.3	13.1	13.1	13.1
Actuated g/C Ratio	0.52	0.45	0.45	0.48	0.41	0.41	0.13	0.13	0.13	0.13	0.13	0.13
v/c Ratio	0.29	0.52	0.50	0.14	0.20	0.05	0.60	0.50	0.19	0.26	0.60	0.39
Control Delay	13.6	23.4	5.6	11.6	16.2	0.2	32.8	33.3	1.4	41.2	51.6	4.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.6	23.4	5.6	11.6	16.2	0.2	32.8	33.3	1.4	41.2	51.6	4.3
LOS	B	C	A	B	B	A	C	C	A	D	D	A
Approach Delay		16.4			13.9			27.8			28.4	
Approach LOS		B			B			C			C	
Stops (vph)	82	547	60	15	91	0	149	67	2	46	113	6
Fuel Used(l)	10	56	18	4	23	2	19	8	3	3	9	2
CO Emissions (g/hr)	178	1036	341	69	429	43	348	156	47	61	162	40

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	34	200	66	13	83	8	67	30	9	12	31	8
VOC Emissions (g/hr)	41	239	79	16	99	10	80	36	11	14	37	9
Dilemma Vehicles (#)	0	38	0	0	17	0	0	3	0	0	0	0
Queue Length 50th (m)	15.3	59.0	4.9	3.2	11.4	0.0	21.7	18.7	0.0	10.8	26.1	0.0
Queue Length 95th (m)	29.6	87.5	29.6	8.0	17.4	0.3	23.3	23.9	0.3	21.2	42.2	4.9
Internal Link Dist (m)		344.0			535.6			436.8			87.1	
Turn Bay Length (m)	75.0		50.0	75.0		50.0	60.0		25.0	60.0		50.0
Base Capacity (vph)	589	1532	937	484	1451	768	543	294	442	283	288	479
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.29	0.52	0.50	0.10	0.20	0.05	0.50	0.41	0.17	0.22	0.49	0.35

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 85 (85%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.60

Intersection Signal Delay: 19.7

Intersection LOS: B

Intersection Capacity Utilization 66.5%

ICU Level of Service C

Analysis Period (min) 15

























Splits and Phases: 11: Mt. Scio Road & Allandale Road















MUN Area Traffic Study
Prince Philip Drive & Allandale Road

Scenario 4A - 2025 AM

07/07/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	235	440	312	190	756	60	483	313	216	32	498	415
Future Volume (vph)	235	440	312	190	756	60	483	313	216	32	498	415
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	3.8	3.8	3.0	3.7	3.7	3.5	3.5	3.5	3.0	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	200.0		120.0	65.0		25.0	70.0		0.0	42.0		35.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	0.95	0.88
Ped Bike Factor			0.98	1.00		0.98	1.00		0.98	1.00		
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1652	3618	1619	1652	3579	1601	1750	1842	1566	1652	3500	2756
Flt Permitted	0.143			0.371			0.950			0.562		
Satd. Flow (perm)	249	3618	1593	644	3579	1575	1748	1842	1541	975	3500	2756
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			328			136			227			91
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		455.9			851.6			464.8			121.6	
Travel Time (s)		23.4			43.8			33.5			8.8	
Confl. Peds. (#/hr)	3		2	2		2	2		2	2		2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.93	0.93	0.93	0.95	0.95	0.95	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	247	463	328	204	813	65	508	329	227	36	553	461
Shared Lane Traffic (%)												
Lane Group Flow (vph)	247	463	328	204	813	65	508	329	227	36	553	461
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	Perm	NA	pt+ov
Protected Phases	5	2		1	6		7	4			8	8 5
Permitted Phases	2		2	6		6			4	8		
Total Split (s)	17.0	35.0	35.0	16.0	34.0	34.0	38.0	69.0	69.0	31.0	31.0	
Total Lost Time (s)	6.0	7.0	7.0	6.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0	
Act Effect Green (s)	40.0	28.0	28.0	38.0	27.0	27.0	32.0	63.0	63.0	25.0	25.0	42.0
Actuated g/C Ratio	0.33	0.23	0.23	0.32	0.22	0.22	0.27	0.52	0.52	0.21	0.21	0.35
v/c Ratio	1.17	0.55	0.53	0.71	1.01	0.14	1.09	0.34	0.25	0.18	0.76	0.45
Control Delay	140.5	37.3	18.6	34.1	72.1	7.4	85.8	5.8	0.3	41.8	52.3	25.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	140.5	37.3	18.6	34.1	72.1	7.4	85.8	5.8	0.3	41.8	52.3	25.4
LOS	F	D	B	C	E	A	F	A	A	D	D	C
Approach Delay		56.0			61.0			42.9			40.1	
Approach LOS		E			E			D			D	
Stops (vph)	171	388	212	154	677	14	384	84	8	28	460	251
Fuel Used(l)	42	46	25	29	141	6	62	17	10	4	60	39
CO Emissions (g/hr)	774	856	472	545	2632	121	1150	318	182	67	1124	721

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	149	165	91	105	508	23	222	61	35	13	217	139
VOC Emissions (g/hr)	179	197	109	126	607	28	265	73	42	15	259	166
Dilemma Vehicles (#)	0	17	0	0	20	0	0	0	0	0	0	0
Queue Length 50th (m)	~56.1	52.0	35.2	33.9	~103.3	1.7	~131.7	12.9	0.1	7.0	65.0	37.5
Queue Length 95th (m)	#107.9	72.1	58.7	#57.6	#145.4	10.2 m	#126.0	m12.8	m0.0	16.6	84.7	53.9
Internal Link Dist (m)		431.9			827.6			440.8			97.6	
Turn Bay Length (m)	200.0		120.0	65.0		25.0	70.0			42.0		35.0
Base Capacity (vph)	211	844	623	287	805	459	466	967	916	203	729	1023
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.17	0.55	0.53	0.71	1.01	0.14	1.09	0.34	0.25	0.18	0.76	0.45

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green, Master Intersection

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.17

Intersection Signal Delay: 50.0

Intersection LOS: D

Intersection Capacity Utilization 102.3%

ICU Level of Service G

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

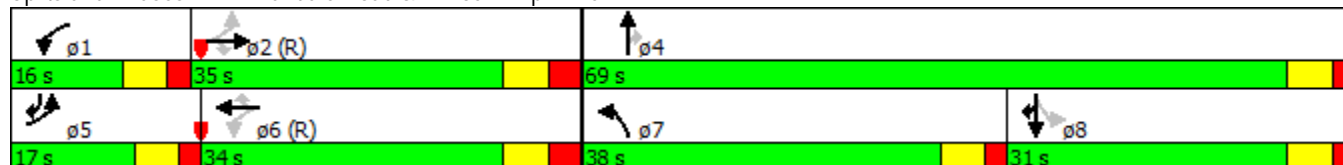
Queue shown is maximum after two cycles.


















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

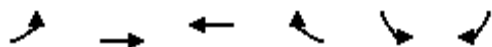
Queue shown is maximum after two cycles.





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

Splits and Phases: 7: Allandale Road & Prince Philip Drive



												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	366	0	0	390	207	3	0	1013	0	0	0
Future Volume (Veh/h)	5	366	0	0	390	207	3	0	1013	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.73	0.73	0.73	0.89	0.89	0.89	0.92	0.92	0.92
Hourly flow rate (vph)	5	389	0	0	534	284	3	0	1138	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)									13			
Median type		None			None							
Median storage (veh)												
Upstream signal (m)					368							
pX, platoon unblocked	0.97						0.97	0.97		0.97	0.97	0.97
vC, conflicting volume	534			389			933	933	389	933	933	534
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	501			389			914	914	389	914	914	501
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 %	100			100			99	100	0	0	100	100
cM capacity (veh/h)	1028			1170			245	263	659	0	263	551
Direction, Lane #	EB 1	WB 1	WB 2	NB 1								
Volume Total	394	534	284	1141								
Volume Left	5	0	0	3								
Volume Right	0	0	284	1138								
cSH	1028	1700	1700	661								
Volume to Capacity	0.00	0.31	0.17	1.73								
Queue Length 95th (m)	0.1	0.0	0.0	504.9								
Control Delay (s)	0.2	0.0	0.0	348.9								
Lane LOS	A			F								
Approach Delay (s)	0.2	0.0		348.9								
Approach LOS				F								
Intersection Summary												
Average Delay			169.2									
Intersection Capacity Utilization			88.9%		ICU Level of Service				E			
Analysis Period (min)			15									

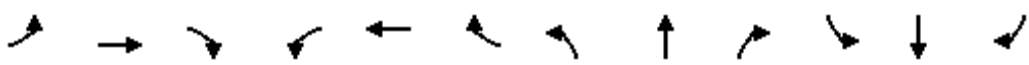


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	18	8	385	353	1
Future Volume (Veh/h)	3	18	8	385	353	1
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	0.92	0.92	0.95	0.95
Hourly flow rate (vph)	3	18	9	418	372	1
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						3
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	9				242	218
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	9				242	218
tC, single (s)	4.6				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.7				3.5	3.3
p0 queue free %	100				50	100
cM capacity (veh/h)	1347				745	822
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	21	427	373			
Volume Left	3	0	372			
Volume Right	0	418	1			
cSH	1347	1700	747			
Volume to Capacity	0.00	0.25	0.50			
Queue Length 95th (m)	0.1	0.0	21.5			
Control Delay (s)	1.1	0.0	14.5			
Lane LOS	A		B			
Approach Delay (s)	1.1	0.0	14.5			
Approach LOS			B			
Intersection Summary						
Average Delay			6.6			
Intersection Capacity Utilization			50.5%	ICU Level of Service		A
Analysis Period (min)			15			

MUN Area Traffic Study
Bonaventure Avenue/ Allandale Road & Elizabeth Avenue

Scenario 4A - 2025 AM

07/07/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	37	148	19	60	245	82	89	874	103	39	534	121
Future Volume (vph)	37	148	19	60	245	82	89	874	103	39	534	121
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	3.5	3.7	3.0	3.5	3.7	3.0	3.4	3.4	3.0	3.4	3.4
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	55.0		0.0	55.0		0.0	55.0		35.0	40.0		0.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt			0.850		0.962				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1652	1842	1601	1652	3367	0	1652	1821	1548	1652	1821	1548
Flt Permitted	0.361			0.532			0.250			0.069		
Satd. Flow (perm)	628	1842	1601	925	3367	0	435	1821	1548	120	1821	1548
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			136		34				136			136
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		335.6			298.1			241.6			464.8	
Travel Time (s)		24.2			21.5			17.4			33.5	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.83	0.83	0.83	0.78	0.78	0.78	0.90	0.90	0.90	0.90	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	45	178	23	77	314	105	99	971	114	43	593	134
Shared Lane Traffic (%)												
Lane Group Flow (vph)	45	178	23	77	419	0	99	971	114	43	593	134
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2		2	6			4		4	8		8
Total Split (s)	13.0	31.0	31.0	13.0	31.0		13.0	63.0	63.0	13.0	63.0	63.0
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
Act Effect Green (s)	33.2	27.6	27.6	33.2	27.6		65.2	59.6	59.6	64.0	57.0	57.0
Actuated g/C Ratio	0.28	0.23	0.23	0.28	0.23		0.54	0.50	0.50	0.53	0.48	0.48
v/c Ratio	0.19	0.42	0.05	0.26	0.52		0.32	1.07	0.14	0.28	0.69	0.17
Control Delay	21.2	29.9	0.2	32.2	40.7		14.2	82.9	2.2	18.1	15.1	1.5
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	21.2	29.9	0.2	32.2	40.7		14.2	82.9	2.2	18.1	15.1	1.5
LOS	C	C	A	C	D		B	F	A	B	B	A
Approach Delay		25.5			39.4			69.4			12.9	
Approach LOS		C			D			E			B	
Stops (vph)	17	101	0	44	260		40	701	6	18	386	22
Fuel Used(l)	4	18	2	4	25		4	92	3	3	38	6
CO Emissions (g/hr)	77	341	30	78	471		73	1702	50	50	715	111

MUN Area Traffic Study
Bonaventure Avenue/ Allandale Road & Elizabeth Avenue

Scenario 4A - 2025 AM

07/07/2015



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	15	66	6	15	91		14	329	10	10	138	21
VOC Emissions (g/hr)	18	79	7	18	109		17	393	11	11	165	26
Dilemma Vehicles (#)	0	0	0	0	0		0	0	0	0	0	0
Queue Length 50th (m)	4.3	27.9	0.0	13.0	43.2		9.8	~263.9	0.0	2.1	97.5	3.0
Queue Length 95th (m)	8.4	42.5	m0.3	21.1	49.7		17.6	#340.3	6.6	m3.4	134.5	m3.8
Internal Link Dist (m)		311.6			274.1			217.6			440.8	
Turn Bay Length (m)	55.0			55.0			55.0		35.0	40.0		
Base Capacity (vph)	233	423	473	298	800		306	904	837	153	864	806
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	0.19	0.42	0.05	0.26	0.52		0.32	1.07	0.14	0.28	0.69	0.17

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 71 (59%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.07

Intersection Signal Delay: 43.7

Intersection LOS: D

Intersection Capacity Utilization 94.3%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

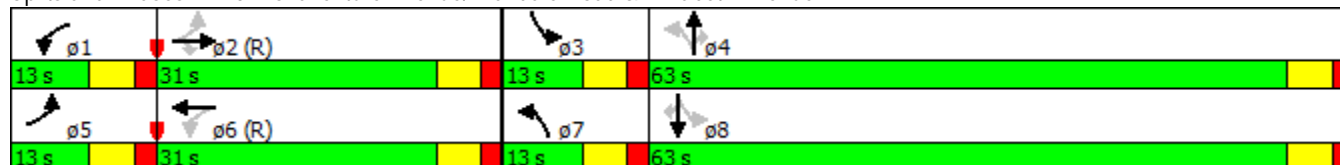
Queue shown is maximum after two cycles.
















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

Queue shown is maximum after two cycles.

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

Splits and Phases: 10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue



						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	 		 			 
Traffic Volume (vph)	239	101	287	1154	133	371
Future Volume (vph)	239	101	287	1154	133	371
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	4.0	4.0	4.0	3.7	3.7
Grade (%)	0%		0%			0%
Storage Length (m)	100.0	0.0		50.0	50.0	
Storage Lanes	1	1		1	1	
Taper Length (m)	2.5				2.5	
Lane Util. Factor	0.97	1.00	0.95	1.00	1.00	0.95
Ped Bike Factor	0.70	0.81		0.68	0.84	
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3064	1654	3697	1654	1690	3510
Flt Permitted	0.950				0.507	
Satd. Flow (perm)	2136	1339	3697	1129	760	3510
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		113		955		
Link Speed (k/h)	60		70			70
Link Distance (m)	215.4		105.3			120.0
Travel Time (s)	12.9		5.4			6.2
Confl. Peds. (#/hr)	97	97		97	97	
Confl. Bikes (#/hr)						
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	13%	2%	2%	2%	8%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Adj. Flow (vph)	269	113	322	1297	149	417
Shared Lane Traffic (%)						
Lane Group Flow (vph)	269	113	322	1297	149	417
Turn Type	Prot	Perm	NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2	6	
Total Split (s)	22.0	22.0	65.0	65.0	13.0	78.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Act Effect Green (s)	13.6	13.6	61.1	61.1	74.4	74.4
Actuated g/C Ratio	0.14	0.14	0.61	0.61	0.74	0.74
v/c Ratio	0.65	0.41	0.14	1.22	0.24	0.16
Control Delay	48.3	11.9	8.8	119.2	4.1	3.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.3	11.9	8.8	119.2	4.1	3.4
LOS	D	B	A	F	A	A
Approach Delay	37.5		97.2			3.6
Approach LOS	D		F			A
Stops (vph)	220	19	116	265	28	78
Fuel Used(l)	20	3	9	127	4	12
CO Emissions (g/hr)	380	64	177	2369	80	220



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
NOx Emissions (g/hr)	73	12	34	457	15	42
VOC Emissions (g/hr)	88	15	41	546	19	51
Dilemma Vehicles (#)	0	0	14	0	0	22
Queue Length 50th (m)	25.6	0.0	13.3	~232.5	5.9	8.9
Queue Length 95th (m)	37.3	14.2	19.6	#302.5	9.2	11.2
Internal Link Dist (m)	191.4		81.3			96.0
Turn Bay Length (m)	100.0			50.0	50.0	
Base Capacity (vph)	490	309	2259	1061	633	2612
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	0.55	0.37	0.14	1.22	0.24	0.16

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 55 (55%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.22

Intersection Signal Delay: 67.7

Intersection LOS: E

Intersection Capacity Utilization 94.7%

ICU Level of Service F

Analysis Period (min) 15

~ 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.

Splits and Phases: 59: Clinch Crescent & Arctic Avenue





Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	73	228	167	221	276	366
Future Volume (vph)	73	228	167	221	276	366
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.7	3.7	3.7	3.7	3.7	3.7
Grade (%)	0%			0%	0%	
Storage Length (m)	50.0	0.0	0.0			0.0
Storage Lanes	1	1	0			0
Taper Length (m)	2.5		2.5			
Lane Util. Factor	1.00	1.00	0.95	0.95	0.95	0.95
Ped Bike Factor						
Frt		0.850			0.914	
Flt Protected	0.950			0.979		
Satd. Flow (prot)	1789	1601	0	3503	3271	0
Flt Permitted	0.950			0.585		
Satd. Flow (perm)	1789	1601	0	2093	3271	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		248			398	
Link Speed (k/h)	50			60	60	
Link Distance (m)	568.9			135.4	751.4	
Travel Time (s)	41.0			8.1	45.1	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	79	248	182	240	300	398
Shared Lane Traffic (%)						
Lane Group Flow (vph)	79	248	0	422	698	0
Turn Type	Prot	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Total Split (s)	39.0	39.0	61.0	61.0	61.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0	
Act Effect Green (s)	11.1	11.1		76.9	76.9	
Actuated g/C Ratio	0.11	0.11		0.77	0.77	
v/c Ratio	0.40	0.62		0.26	0.27	
Control Delay	47.1	12.8		1.9	0.5	
Queue Delay	0.0	0.0		0.0	0.0	
Total Delay	47.1	12.8		1.9	0.5	
LOS	D	B		A	A	
Approach Delay	21.0			1.9	0.5	
Approach LOS	C			A	A	
Stops (vph)	67	31		67	17	
Fuel Used(l)	10	21		11	43	
CO Emissions (g/hr)	187	397		211	794	



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
NOx Emissions (g/hr)	36	77		41	153	
VOC Emissions (g/hr)	43	91		49	183	
Dilemma Vehicles (#)	0	0		13	14	
Queue Length 50th (m)	14.7	0.0		2.1	0.0	
Queue Length 95th (m)	27.6	21.0		5.2	0.4	
Internal Link Dist (m)	544.9			111.4	727.4	
Turn Bay Length (m)	50.0					
Base Capacity (vph)	590	694		1609	2606	
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	0.36		0.26	0.27	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 84 (84%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.62

Intersection Signal Delay: 5.6

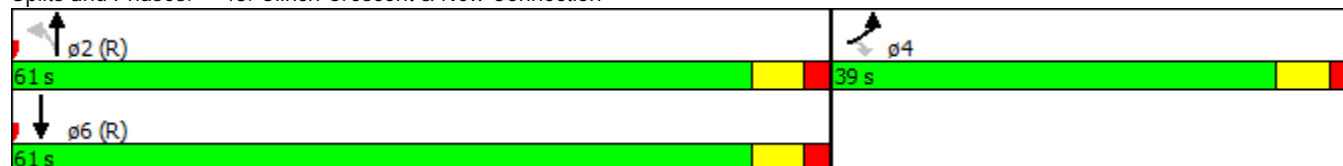
Intersection LOS: A

Intersection Capacity Utilization 65.0%

ICU Level of Service C

Analysis Period (min) 15






















Splits and Phases: 48: Clinch Crescent & New Connection















MUN Area Traffic Study
Prince Philip Drive & Thorburn Road

Scenario 4A - 2025 AM

07/07/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	264	1390	174	131	687	240	0	369	68	358	566	292
Future Volume (vph)	264	1390	174	131	687	240	0	369	68	358	566	292
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.8	4.2	3.5	3.8	4.0	2.4	3.8	4.3	3.5	3.8	3.8
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	175.0		0.0	110.0		90.0	0.0		0.0	150.0		150.0
Storage Lanes	1		1	1		0	0		0	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.95	0.95	0.97	0.95	0.95
Ped Bike Factor	1.00		0.98			0.98		1.00		1.00	0.99	
Frt			0.850			0.850		0.977			0.949	
Flt Protected	0.950			0.950						0.950		
Satd. Flow (prot)	1750	3618	1689	1750	5198	1654	0	3527	0	3395	3415	0
Flt Permitted	0.205			0.102						0.950		
Satd. Flow (perm)	377	3618	1662	188	5198	1627	0	3527	0	3380	3415	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			145			300			16			87
Link Speed (k/h)		70			70			50				50
Link Distance (m)		327.2			152.5			152.8				386.6
Travel Time (s)		16.8			7.8			11.0				27.8
Confl. Peds. (#/hr)	2		2	2		2	2		2	2		2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.93	0.93	0.93	0.80	0.80	0.80	0.83	0.83	0.83	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	284	1495	187	164	859	300	0	445	82	377	596	307
Shared Lane Traffic (%)												
Lane Group Flow (vph)	284	1495	187	164	859	300	0	527	0	377	903	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm		NA		Prot	NA	
Protected Phases	5	2		1	6			4		3	8	
Permitted Phases	2		2	6		6						
Total Split (s)	28.0	56.0	56.0	13.0	41.0	41.0		32.0		19.0	51.0	
Total Lost Time (s)	6.0	7.0	7.0	6.0	7.0	7.0		7.0		6.0	7.0	
Act Effect Green (s)	62.7	49.0	49.0	47.4	39.4	39.4		25.0		13.0	44.0	
Actuated g/C Ratio	0.52	0.41	0.41	0.40	0.33	0.33		0.21		0.11	0.37	
v/c Ratio	0.74	1.01	0.24	0.99	0.50	0.41		0.71		1.03	0.69	
Control Delay	28.8	62.0	7.1	101.5	26.0	7.8		28.5		106.5	32.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Total Delay	28.8	62.0	7.1	101.5	26.0	7.8		28.5		106.5	32.2	
LOS	C	E	A	F	C	A		C		F	C	
Approach Delay		52.0			31.2			28.5			54.1	
Approach LOS		D			C			C			D	
Stops (vph)	149	1236	31	97	548	88		396		311	648	
Fuel Used(l)	19	158	7	21	71	17		28		49	67	
CO Emissions (g/hr)	361	2933	129	387	1321	314		516		920	1252	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	70	566	25	75	255	61		100		178	242	
VOC Emissions (g/hr)	83	676	30	89	305	72		119		212	289	
Dilemma Vehicles (#)	0	55	0	0	4	0		0		0	0	
Queue Length 50th (m)	36.5	~187.8	5.9	24.5	45.0	6.1		61.9		~48.7	85.5	
Queue Length 95th (m)	56.1	#237.3	20.0	#58.4	67.1	21.5		63.1		#79.0	108.5	
Internal Link Dist (m)		303.2			128.5			128.8			362.6	
Turn Bay Length (m)	175.0			110.0		90.0				150.0		
Base Capacity (vph)	449	1477	764	165	1706	735		747		367	1307	
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	0.63	1.01	0.24	0.99	0.50	0.41		0.71		1.03	0.69	

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 19 (16%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.03

Intersection Signal Delay: 44.7

Intersection LOS: D

Intersection Capacity Utilization 98.4%

ICU Level of Service F

Analysis Period (min) 15

~ 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.

Splits and Phases: 37: Thorburn Road & Prince Philip Drive



						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↱		↱	↑↑	↱	↱
Traffic Volume (veh/h)	893	46	96	195	25	288
Future Volume (Veh/h)	893	46	96	195	25	288
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.90	0.90	0.85	0.85
Hourly flow rate (vph)	1051	54	107	217	29	339
Pedestrians				2	17	
Lane Width (m)				3.7	3.7	
Walking Speed (m/s)				1.2	1.2	
Percent Blockage				0	1	
Right turn flare (veh)					13	
Median type	None			None		
Median storage veh						
Upstream signal (m)	343					
pX, platoon unblocked						
vC, conflicting volume			1122		1418	572
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1122		1418	572
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			82		72	26
cM capacity (veh/h)			609		104	456
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1
Volume Total	701	404	107	108	108	368
Volume Left	0	0	107	0	0	29
Volume Right	0	54	0	0	0	339
cSH	1700	1700	609	1700	1700	495
Volume to Capacity	0.41	0.24	0.18	0.06	0.06	0.74
Queue Length 95th (m)	0.0	0.0	4.8	0.0	0.0	47.4
Control Delay (s)	0.0	0.0	12.2	0.0	0.0	34.0
Lane LOS			B	D		
Approach Delay (s)	0.0		4.0			34.0
Approach LOS						D
Intersection Summary						
Average Delay			7.7			
Intersection Capacity Utilization			50.9%	ICU Level of Service		A
Analysis Period (min)			15			

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	31	196	461	18	1073	510
Future Volume (vph)	31	196	461	18	1073	510
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.7	4.5	3.4	3.7	3.0	3.4
Grade (%)	0%		0%			0%
Storage Length (m)	0.0	50.0		50.0	50.0	
Storage Lanes	1	1		1	1	
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	0.88	1.00	1.00	0.97	1.00
Ped Bike Factor				0.95	0.92	
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1789	3065	1821	1601	3204	1821
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1789	3065	1821	1518	2940	1821
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		126		13		
Link Speed (k/h)	50		50			50
Link Distance (m)	279.7		216.7			273.7
Travel Time (s)	20.1		15.6			19.7
Confl. Peds. (#/hr)				18	49	
Confl. Bikes (#/hr)						
Peak Hour Factor	0.94	0.94	0.80	0.80	0.91	0.91
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Adj. Flow (vph)	33	209	576	23	1179	560
Shared Lane Traffic (%)						
Lane Group Flow (vph)	33	209	576	23	1179	560
Turn Type	Prot	pt+ov	NA	Perm	Prot	NA
Protected Phases	8	8 1	2		1	6
Permitted Phases				2		
Total Split (s)	31.0		42.0	42.0	47.0	89.0
Total Lost Time (s)	6.0		6.0	6.0	6.0	6.0
Act Effect Green (s)	25.0	72.0	36.0	36.0	41.0	83.0
Actuated g/C Ratio	0.21	0.60	0.30	0.30	0.34	0.69
v/c Ratio	0.09	0.11	1.05	0.05	1.08	0.44
Control Delay	38.4	9.1	94.8	18.8	60.1	12.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	38.4	9.1	94.8	18.8	60.1	12.2
LOS	D	A	F	B	E	B
Approach Delay	13.1		91.9			44.6
Approach LOS	B		F			D
Stops (vph)	29	71	396	8	906	395
Fuel Used(l)	2	8	52	1	98	27
CO Emissions (g/hr)	44	152	967	15	1819	500



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
NOx Emissions (g/hr)	9	29	187	3	351	97
VOC Emissions (g/hr)	10	35	223	3	420	115
Dilemma Vehicles (#)	0	0	0	0	0	0
Queue Length 50th (m)	6.9	8.9	~148.4	1.7	~156.5	85.0
Queue Length 95th (m)	m16.4	19.9	#176.8	6.8m	#156.7	m86.7
Internal Link Dist (m)	255.7		192.7			249.7
Turn Bay Length (m)		50.0		50.0	50.0	
Base Capacity (vph)	372	1889	546	464	1094	1259
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	0.09	0.11	1.05	0.05	1.08	0.44

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 111 (93%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.08

Intersection Signal Delay: 52.6

Intersection LOS: D

Intersection Capacity Utilization 78.2%

ICU Level of Service D

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

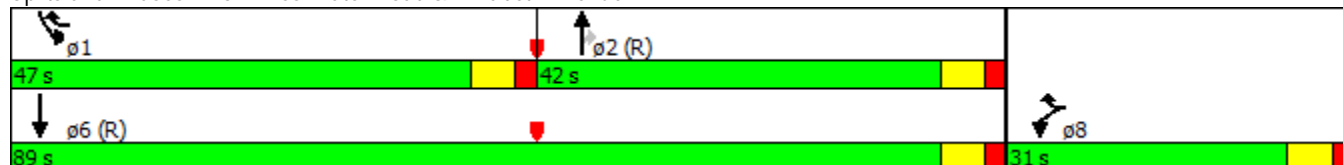
Queue shown is maximum after two cycles.

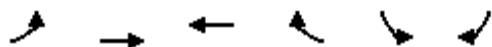
95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

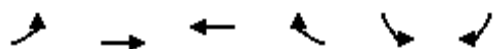
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 51: Freshwater Road & Elizabeth Avenue





Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	43	922	197	23	18	15
Future Volume (Veh/h)	43	922	197	23	18	15
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.87	0.87	0.81	0.81	0.80	0.80
Hourly flow rate (vph)	49	1060	243	28	23	19
Pedestrians		81	70		23	
Lane Width (m)		3.0	3.7		4.5	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		6	6		2	
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)		280				
pX, platoon unblocked						
vC, conflicting volume	294				978	240
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	294				978	240
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				89	97
cM capacity (veh/h)	1234				218	702
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1
Volume Total	49	530	530	162	109	42
Volume Left	49	0	0	0	0	23
Volume Right	0	0	0	0	28	19
cSH	1234	1700	1700	1700	1700	317
Volume to Capacity	0.04	0.31	0.31	0.10	0.06	0.13
Queue Length 95th (m)	0.9	0.0	0.0	0.0	0.0	3.4
Control Delay (s)	8.0	0.0	0.0	0.0	0.0	18.1
Lane LOS	A					C
Approach Delay (s)	0.4			0.0		18.1
Approach LOS						C
Intersection Summary						
Average Delay			0.8			
Intersection Capacity Utilization			44.9%		ICU Level of Service	A
Analysis Period (min)			15			



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	643	499	130	213	107	180
Future Volume (vph)	643	499	130	213	107	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	2.8	3.0	3.6	3.7	3.4	3.4
Grade (%)		0%	0%		0%	
Storage Length (m)	35.0			0.0	0.0	70.0
Storage Lanes	1			0	1	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	0.95	0.95	0.95	1.00	1.00
Ped Bike Factor						
Frt			0.907			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1612	3303	3210	0	1730	1548
Flt Permitted	0.367				0.950	
Satd. Flow (perm)	623	3303	3210	0	1730	1548
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			237			205
Link Speed (k/h)		50	50		50	
Link Distance (m)		402.3	566.1		375.0	
Travel Time (s)		29.0	40.8		27.0	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.78	0.78	0.90	0.90	0.88	0.88
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	824	640	144	237	122	205
Shared Lane Traffic (%)						
Lane Group Flow (vph)	824	640	381	0	122	205
Turn Type	pm+pt	NA	NA		Prot	Perm
Protected Phases	5	2	6		8	
Permitted Phases	2					8
Total Split (s)	63.0	94.0	31.0		26.0	26.0
Total Lost Time (s)	6.0	6.0	6.0		6.0	6.0
Act Effect Green (s)	88.0	88.0	30.9		20.0	20.0
Actuated g/C Ratio	0.73	0.73	0.26		0.17	0.17
v/c Ratio	0.94	0.26	0.38		0.42	0.48
Control Delay	20.8	1.6	14.9		61.3	25.7
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	20.8	1.6	14.9		61.3	25.7
LOS	C	A	B		E	C
Approach Delay		12.4	14.9		39.0	
Approach LOS		B	B		D	
Stops (vph)	279	42	253		101	185
Fuel Used(l)	41	21	39		11	14
CO Emissions (g/hr)	765	384	725		207	263



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
NOx Emissions (g/hr)	148	74	140		40	51
VOC Emissions (g/hr)	176	89	167		48	61
Dilemma Vehicles (#)	0	0	0		0	0
Queue Length 50th (m)	25.3	6.3	23.4		28.4	15.2
Queue Length 95th (m)	m17.1	m6.0	34.3		45.2	32.1
Internal Link Dist (m)		378.3	542.1		351.0	
Turn Bay Length (m)	35.0					70.0
Base Capacity (vph)	926	2422	1003		288	428
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	0.89	0.26	0.38		0.42	0.48

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 54 (45%), Referenced to phase 2:EBTL and 6:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.94

Intersection Signal Delay: 16.9

Intersection LOS: B

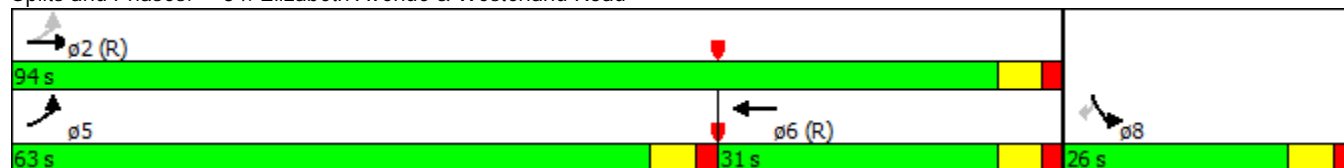
Intersection Capacity Utilization 88.1%

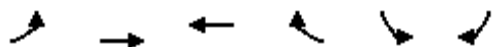
ICU Level of Service E

Analysis Period (min) 15

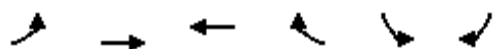
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 34: Elizabeth Avenue & Westerland Road





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑	↑	↑↑	↑
Traffic Volume (vph)	0	1258	334	438	606	266
Future Volume (vph)	0	1258	334	438	606	266
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.7	3.7	3.7	3.7	3.7	3.7
Grade (%)		0%	0%		0%	
Storage Length (m)	0.0			100.0	0.0	0.0
Storage Lanes	0			1	2	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Ped Bike Factor						
Frt				0.850		0.850
Flt Protected					0.950	
Satd. Flow (prot)	0	3579	3579	1601	3471	1601
Flt Permitted					0.950	
Satd. Flow (perm)	0	3579	3579	1601	3471	1601
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				498		292
Link Speed (k/h)		50	50		70	
Link Distance (m)		173.6	374.8		70.3	
Travel Time (s)		12.5	27.0		3.6	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.94	0.94	0.88	0.88	0.91	0.91
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	0	1338	380	498	666	292
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1338	380	498	666	292
Turn Type		NA	NA	Perm	Prot	Perm
Protected Phases		4	8		6	
Permitted Phases				8		6
Total Split (s)		76.0	76.0	76.0	44.0	44.0
Total Lost Time (s)		6.0	6.0	6.0	6.0	6.0
Act Effect Green (s)		70.0	70.0	70.0	38.0	38.0
Actuated g/C Ratio		0.58	0.58	0.58	0.32	0.32
v/c Ratio		0.64	0.18	0.44	0.61	0.41
Control Delay		18.4	3.5	2.4	27.1	5.8
Queue Delay		0.0	0.0	0.0	0.0	0.0
Total Delay		18.4	3.5	2.4	27.1	5.8
LOS		B	A	A	C	A
Approach Delay		18.4	2.9		20.6	
Approach LOS		B	A		C	
Stops (vph)		804	48	71	512	94
Fuel Used(l)		57	14	18	39	9
CO Emissions (g/hr)		1053	258	335	721	169



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
NOx Emissions (g/hr)		203	50	65	139	33
VOC Emissions (g/hr)		243	60	77	166	39
Dilemma Vehicles (#)		0	0	0	0	0
Queue Length 50th (m)		104.5	8.3	6.3	70.2	21.7
Queue Length 95th (m)		126.5	6.6	11.9	m85.9	m24.9
Internal Link Dist (m)		149.6	350.8		46.3	
Turn Bay Length (m)				100.0		
Base Capacity (vph)		2087	2087	1141	1099	706
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		0.64	0.18	0.44	0.61	0.41

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 21 (18%), Referenced to phase 4:EBT and 8:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.64

Intersection Signal Delay: 14.8

Intersection LOS: B

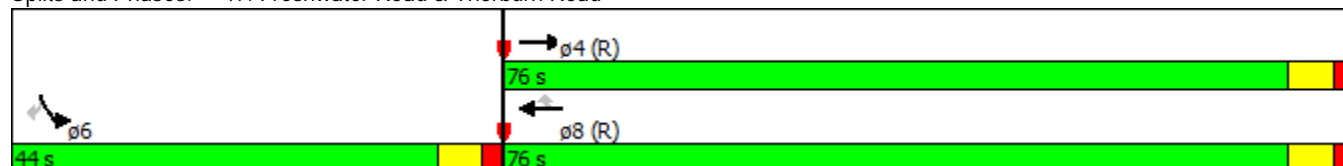
Intersection Capacity Utilization 62.1%

ICU Level of Service B

Analysis Period (min) 15

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

Splits and Phases: 47: Freshwater Road & Thorburn Road





Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	82	122	7	287	520	97
Future Volume (vph)	82	122	7	287	520	97
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.7	3.7	3.7	3.7	3.7	3.7
Grade (%)	0%			0%	0%	
Storage Length (m)	0.0	50.0	100.0			100.0
Storage Lanes	1	1	1			1
Taper Length (m)	2.5		2.5			
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Ped Bike Factor						
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1789	1601	1789	3579	3579	1601
Flt Permitted	0.950		0.440			
Satd. Flow (perm)	1789	1601	829	3579	3579	1601
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		133				105
Link Speed (k/h)	50			60	60	
Link Distance (m)	271.6			751.4	460.8	
Travel Time (s)	19.6			45.1	27.6	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	89	133	8	312	565	105
Shared Lane Traffic (%)						
Lane Group Flow (vph)	89	133	8	312	565	105
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases		4	2			6
Total Split (s)	39.0	39.0	61.0	61.0	61.0	61.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Act Effect Green (s)	11.3	11.3	76.7	76.7	76.7	76.7
Actuated g/C Ratio	0.11	0.11	0.77	0.77	0.77	0.77
v/c Ratio	0.44	0.44	0.01	0.11	0.21	0.08
Control Delay	48.0	12.1	3.4	3.0	3.5	1.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.0	12.1	3.4	3.0	3.5	1.1
LOS	D	B	A	A	A	A
Approach Delay	26.5			3.0	3.1	
Approach LOS	C			A	A	
Stops (vph)	75	20	3	73	136	9
Fuel Used(l)	7	5	1	22	27	4
CO Emissions (g/hr)	127	88	11	404	495	79



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
NOx Emissions (g/hr)	25	17	2	78	95	15
VOC Emissions (g/hr)	29	20	2	93	114	18
Dilemma Vehicles (#)	0	0	0	35	18	0
Queue Length 50th (m)	16.6	0.0	0.1	2.7	12.7	0.0
Queue Length 95th (m)	30.4	15.9	m1.3	12.7	26.1	5.2
Internal Link Dist (m)	247.6			727.4	436.8	
Turn Bay Length (m)		50.0	100.0			100.0
Base Capacity (vph)	590	617	635	2743	2743	1251
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	0.15	0.22	0.01	0.11	0.21	0.08

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 39 (39%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.44

Intersection Signal Delay: 7.4

Intersection LOS: A

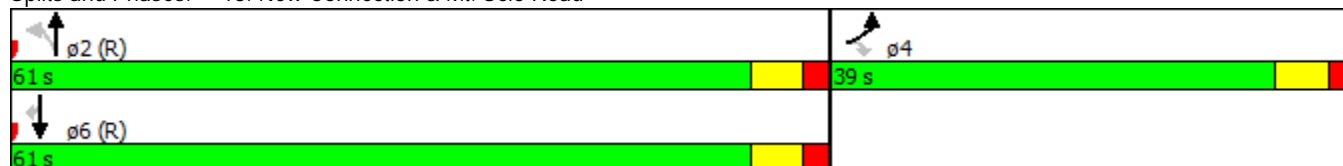
Intersection Capacity Utilization 51.7%

ICU Level of Service A

Analysis Period (min) 15

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
























Splits and Phases: 13: New Connection & Mt. Scio Road



MUN Area Traffic Study
Prince Philip Drive & Clinch Crescent/ Westerland Road

Scenario 4A - 2025 AM













07/07/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	708	644	241	72	627	213	75	519	83	91	276	243
Future Volume (vph)	708	644	241	72	627	213	75	519	83	91	276	243
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	4.0	3.5	3.5	3.5	3.5	3.0	3.0	3.5	3.3	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	75.0		185.0	90.0		0.0	60.0		45.0	0.0		80.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.88	0.96	1.00		1.00		0.69			0.98
Frt			0.850		0.962				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1750	3697	1566	1750	3353	0	1652	1739	1566	1711	1842	1566
Flt Permitted	0.105			0.394			0.386			0.125		
Satd. Flow (perm)	193	3697	1381	697	3353	0	670	1739	1087	225	1842	1541
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			254		38				200			264
Link Speed (k/h)		70			70			50			60	
Link Distance (m)		591.3			489.3			375.0			105.3	
Travel Time (s)		30.4			25.2			27.0			6.3	
Confl. Peds. (#/hr)	2		30	30		2	2		150	150		2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.74	0.74	0.74	0.82	0.82	0.82	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	745	678	254	97	847	288	91	633	101	99	300	264
Shared Lane Traffic (%)												
Lane Group Flow (vph)	745	678	254	97	1135	0	91	633	101	99	300	264
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2		2	6			4		4	8		8
Total Split (s)	29.0	55.0	55.0	13.0	39.0		13.0	39.0	39.0	13.0	39.0	39.0
Total Lost Time (s)	6.0	7.0	7.0	6.0	7.0		6.0	7.0	7.0	6.0	7.0	7.0
Act Effect Green (s)	62.0	48.0	48.0	40.0	32.0		40.0	32.0	32.0	40.0	32.0	32.0
Actuated g/C Ratio	0.52	0.40	0.40	0.33	0.27		0.33	0.27	0.27	0.33	0.27	0.27
v/c Ratio	1.87	0.46	0.36	0.33	1.23		0.33	1.37	0.23	0.61	0.61	0.44
Control Delay	424.9	34.0	10.3	16.7	144.8		31.8	214.2	3.1	42.3	44.8	6.5
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	9.5	0.4
Total Delay	424.9	34.0	10.3	16.7	144.8		31.8	214.2	3.1	42.3	54.3	6.9
LOS	F	C	B	B	F		C	F	A	D	D	A
Approach Delay		204.1			134.8			168.3			33.6	
Approach LOS		F			F			F			C	
Stops (vph)	468	542	101	39	647		73	413	9	62	239	25
Fuel Used(l)	286	72	18	6	156		6	113	3	6	20	4
CO Emissions (g/hr)	5322	1333	334	102	2892		114	2108	62	108	367	79

MUN Area Traffic Study
Prince Philip Drive & Clinch Crescent/ Westerland Road

Scenario 4A - 2025 AM

07/07/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	1027	257	64	20	558		22	407	12	21	71	15
VOC Emissions (g/hr)	1228	307	77	24	667		26	486	14	25	85	18
Dilemma Vehicles (#)	0	19	0	0	28		0	0	0	0	11	0
Queue Length 50th (m)	~259.4	73.3	15.1	9.9	~167.8		18.0	~203.1	0.1	15.1	62.1	0.0
Queue Length 95th (m)	#334.0	89.7	32.2	13.4	#149.6		m20.4	#239.4	m0.4	#28.1	91.3	19.6
Internal Link Dist (m)		567.3			465.3			351.0			81.3	
Turn Bay Length (m)	75.0		185.0	90.0			60.0		45.0			80.0
Base Capacity (vph)	398	1478	704	293	922		280	463	436	161	491	604
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	156	89
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	1.87	0.46	0.36	0.33	1.23		0.33	1.37	0.23	0.61	0.90	0.51

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 42 (35%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.87

Intersection Signal Delay: 152.2

Intersection LOS: F

Intersection Capacity Utilization 118.2%

ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

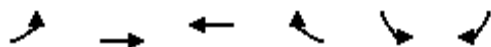
95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

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

Splits and Phases: 9: Westerland Road/Clinch Crescent & Prince Philip Drive





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	577	1350	782	190	77	298
Future Volume (vph)	577	1350	782	190	77	298
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	4.0	4.0	3.7	3.3	3.5
Grade (%)		0%	0%		0%	
Storage Length (m)	140.0			70.0	80.0	50.0
Storage Lanes	1			1	1	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	0.88
Ped Bike Factor				0.97	1.00	
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1652	3697	3697	1601	1711	2756
Flt Permitted	0.105				0.950	
Satd. Flow (perm)	183	3697	3697	1558	1704	2756
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				191		21
Link Speed (k/h)		70	70		50	
Link Distance (m)		289.0	591.3		280.3	
Travel Time (s)		14.9	30.4		20.2	
Confl. Peds. (#/hr)	2			2	2	2
Confl. Bikes (#/hr)						
Peak Hour Factor	0.96	0.96	0.92	0.92	0.62	0.62
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	601	1406	850	207	124	481
Shared Lane Traffic (%)						
Lane Group Flow (vph)	601	1406	850	207	124	481
Turn Type	pm+pt	NA	NA	Perm	Prot	pt+ov
Protected Phases	5	2	6		8	8 5
Permitted Phases	2			6		
Total Split (s)	51.0	89.0	38.0	38.0	31.0	
Total Lost Time (s)	6.0	7.0	7.0	7.0	6.0	
Act Effect Green (s)	83.0	82.0	34.1	34.1	25.0	72.9
Actuated g/C Ratio	0.69	0.68	0.28	0.28	0.21	0.61
v/c Ratio	0.94	0.56	0.81	0.36	0.35	0.29
Control Delay	51.7	3.1	22.0	3.0	43.8	10.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	51.7	3.1	22.0	3.0	43.8	10.8
LOS	D	A	C	A	D	B
Approach Delay		17.6	18.3		17.6	
Approach LOS		B	B		B	
Stops (vph)	606	176	639	54	65	126
Fuel Used(l)	63	43	79	12	10	29
CO Emissions (g/hr)	1175	794	1468	222	191	546



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
NOx Emissions (g/hr)	227	153	283	43	37	105
VOC Emissions (g/hr)	271	183	339	51	44	126
Dilemma Vehicles (#)	0	43	17	0	0	0
Queue Length 50th (m)	74.3	13.3	102.7	9.3	25.1	25.2
Queue Length 95th (m)	#178.8	39.3	m97.8	m9.1	28.5	21.3
Internal Link Dist (m)		265.0	567.3		256.3	
Turn Bay Length (m)	140.0			70.0	80.0	50.0
Base Capacity (vph)	677	2526	1052	580	356	1753
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	0.89	0.56	0.81	0.36	0.35	0.27

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 87 (73%), Referenced to phase 2:EBTL and 6:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.94

Intersection Signal Delay: 17.8

Intersection LOS: B

Intersection Capacity Utilization 90.2%

ICU Level of Service E

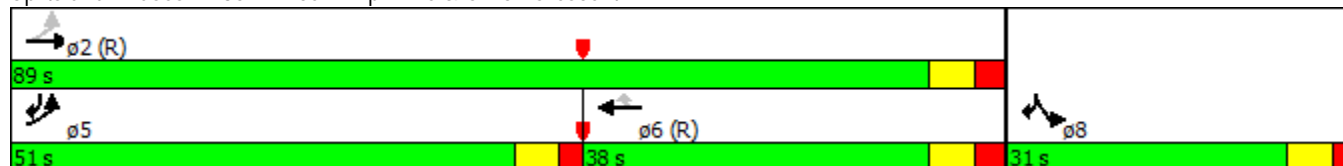
Analysis Period (min) 15

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.

Splits and Phases: 35: Prince Philip Drive & Clinch Crescent





Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	16	13	215	474	993	107
Future Volume (vph)	16	13	215	474	993	107
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	4.0	3.5	4.0	3.7	4.0
Grade (%)	0%			0%	0%	
Storage Length (m)	0.0	0.0	75.0			100.0
Storage Lanes	1	1	1			1
Taper Length (m)	2.5		2.5			
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Ped Bike Factor						
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1750	1654	1750	3697	3579	1654
Flt Permitted	0.950		0.200			
Satd. Flow (perm)	1750	1654	368	3697	3579	1654
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		18				123
Link Speed (k/h)	50			70	70	
Link Distance (m)	119.9			283.2	155.8	
Travel Time (s)	8.6			14.6	8.0	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.74	0.74	0.81	0.81	0.87	0.87
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	22	18	265	585	1141	123
Shared Lane Traffic (%)						
Lane Group Flow (vph)	22	18	265	585	1141	123
Turn Type	Prot	Perm	pm+pt	NA	NA	Perm
Protected Phases	8		5	2	6	
Permitted Phases		8	2			6
Total Split (s)	23.0	23.0	30.0	97.0	67.0	67.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Act Effect Green (s)	10.0	10.0	104.4	106.8	87.1	87.1
Actuated g/C Ratio	0.08	0.08	0.87	0.89	0.73	0.73
v/c Ratio	0.15	0.12	0.59	0.18	0.44	0.10
Control Delay	53.8	22.6	20.3	1.2	9.0	1.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	53.8	22.6	20.3	1.2	9.0	1.8
LOS	D	C	C	A	A	A
Approach Delay	39.7			7.1	8.3	
Approach LOS	D			A	A	
Stops (vph)	16	5	159	40	397	7
Fuel Used(l)	1	0	30	46	37	2
CO Emissions (g/hr)	22	9	562	855	686	34

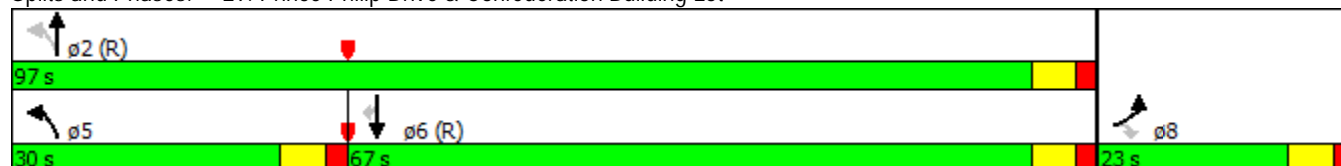


Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
NOx Emissions (g/hr)	4	2	108	165	132	6
VOC Emissions (g/hr)	5	2	130	197	158	8
Dilemma Vehicles (#)	0	0	0	7	42	0
Queue Length 50th (m)	4.9	0.0	23.8	7.8	59.4	0.0
Queue Length 95th (m)	10.6	5.1	37.6	9.0	88.0	6.4
Internal Link Dist (m)	95.9			259.2	131.8	
Turn Bay Length (m)			75.0			100.0
Base Capacity (vph)	247	249	596	3290	2598	1234
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	0.09	0.07	0.44	0.18	0.44	0.10

Intersection Summary

Area Type: Other
 Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 29 (24%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.59
 Intersection Signal Delay: 8.4
 Intersection LOS: A
 Intersection Capacity Utilization 62.7%
 ICU Level of Service B
 Analysis Period (min) 15


Splits and Phases: 29: Prince Philip Drive & Confederation Building Lot















MUN Area Traffic Study
Prince Philip Drive & Morrissey Drive

Scenario 4A - 2025 AM

07/07/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑	↗				↖	↗	
Traffic Volume (vph)	0	818	0	112	805	737	0	0	0	88	67	108
Future Volume (vph)	0	818	0	112	805	737	0	0	0	88	67	108
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.8	3.8	3.7	3.7	3.8	3.5	3.7	3.7	3.7	3.5	3.7	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	0.0		0.0	70.0		30.0	0.0		0.0	40.0		0.0
Storage Lanes	0		0	1		1	0		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
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	1.00
Ped Bike Factor				1.00		0.95				0.96	0.96	
Frt						0.850					0.907	
Flt Protected				0.950						0.950		
Satd. Flow (prot)	0	3618	0	1789	3618	1566	0	0	0	1750	1638	0
Flt Permitted				0.261						0.950		
Satd. Flow (perm)	0	3618	0	491	3618	1483	0	0	0	1687	1638	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						792					61	
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		489.3			455.9			119.6			292.8	
Travel Time (s)		25.2			23.4			8.6			21.1	
Confl. Peds. (#/hr)	2		2	3		10				25		25
Confl. Bikes (#/hr)												
Peak Hour Factor	0.91	0.91	0.92	0.93	0.93	0.93	0.92	0.92	0.92	0.82	0.82	0.82
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	899	0	120	866	792	0	0	0	107	82	132
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	899	0	120	866	792	0	0	0	107	214	0
Turn Type		NA		pm+pt	NA	Perm				Prot	NA	
Protected Phases		2		1	6					7	4	
Permitted Phases				6		6						
Total Split (s)		75.0		14.0	89.0	89.0				31.0	31.0	
Total Lost Time (s)		7.0		6.0	7.0	7.0				6.0	6.0	
Act Effect Green (s)		76.3		91.0	90.0	90.0				17.0	17.0	
Actuated g/C Ratio		0.64		0.76	0.75	0.75				0.14	0.14	
v/c Ratio		0.39		0.26	0.32	0.61				0.43	0.75	
Control Delay		3.3		2.0	1.8	2.6				51.0	50.9	
Queue Delay		0.0		0.0	0.0	0.0				0.0	0.0	
Total Delay		3.3		2.0	1.8	2.6				51.0	50.9	
LOS		A		A	A	A				D	D	
Approach Delay		3.3			2.2						50.9	
Approach LOS		A			A						D	
Stops (vph)		97		9	100	157				77	119	
Fuel Used(l)		39		5	35	36				8	14	
CO Emissions (g/hr)		723		88	658	664				142	268	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)		140		17	127	128				27	52	
VOC Emissions (g/hr)		167		20	152	153				33	62	
Dilemma Vehicles (#)		28		0	18	0				0	0	
Queue Length 50th (m)		6.8		1.5	6.4	8.2				23.4	35.2	
Queue Length 95th (m)		15.7		m2.6	m16.2	m0.0				34.2	50.1	
Internal Link Dist (m)		465.3			431.9			95.6			268.8	
Turn Bay Length (m)				70.0		30.0				40.0		
Base Capacity (vph)		2299		460	2712	1309				364	389	
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		0.39		0.26	0.32	0.61				0.29	0.55	

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 43 (36%), Referenced to phase 2:EBT and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.75

Intersection Signal Delay: 7.7

Intersection LOS: A

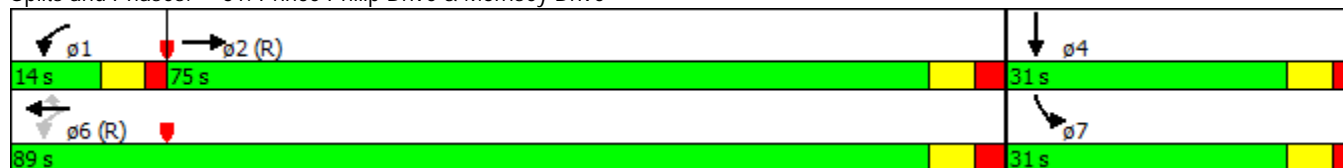
Intersection Capacity Utilization 57.2%

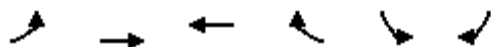
ICU Level of Service B

Analysis Period (min) 15

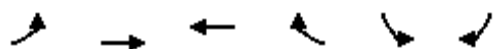
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 61: Prince Philip Drive & Morrissey Drive





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	19	1761	1010	70	166	37
Future Volume (vph)	19	1761	1010	70	166	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	4.0	4.0	4.0	3.0	3.0
Grade (%)		0%	0%		0%	
Storage Length (m)	50.0			0.0	60.0	0.0
Storage Lanes	1			0	1	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	0.95	0.95	0.95	1.00	1.00
Ped Bike Factor			1.00		1.00	0.98
Frt			0.990			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1652	3697	3653	0	1652	1478
Flt Permitted	0.177				0.950	
Satd. Flow (perm)	308	3697	3653	0	1645	1454
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			10			42
Link Speed (k/h)		70	70		50	
Link Distance (m)		204.4	289.0		276.1	
Travel Time (s)		10.5	14.9		19.9	
Confl. Peds. (#/hr)	2			2	2	2
Confl. Bikes (#/hr)						
Peak Hour Factor	0.97	0.97	0.90	0.90	0.88	0.88
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	20	1815	1122	78	189	42
Shared Lane Traffic (%)						
Lane Group Flow (vph)	20	1815	1200	0	189	42
Turn Type	pm+pt	NA	NA		Prot	Perm
Protected Phases	5	2	6		8	
Permitted Phases	2					8
Total Split (s)	13.0	89.0	76.0		31.0	31.0
Total Lost Time (s)	6.0	6.0	6.0		6.0	6.0
Act Effect Green (s)	89.2	89.2	84.0		18.8	18.8
Actuated g/C Ratio	0.74	0.74	0.70		0.16	0.16
v/c Ratio	0.07	0.66	0.47		0.73	0.16
Control Delay	0.8	4.5	8.5		64.2	13.3
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	0.8	4.5	8.5		64.2	13.3
LOS	A	A	A		E	B
Approach Delay		4.4	8.5		54.9	
Approach LOS		A	A		D	
Stops (vph)	3	828	319		155	9
Fuel Used(l)	1	127	47		16	2
CO Emissions (g/hr)	20	2371	865		298	29



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
NOx Emissions (g/hr)	4	458	167		58	6
VOC Emissions (g/hr)	5	547	200		69	7
Dilemma Vehicles (#)	0	7	83		0	0
Queue Length 50th (m)	0.0	0.2	36.8		42.8	0.0
Queue Length 95th (m)	m0.4	m185.4	67.9		62.0	8.9
Internal Link Dist (m)		180.4	265.0		252.1	
Turn Bay Length (m)	50.0				60.0	
Base Capacity (vph)	307	2748	2560		344	336
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	0.07	0.66	0.47		0.55	0.13

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 58 (48%), Referenced to phase 2:EBTL and 6:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 9.5

Intersection LOS: A

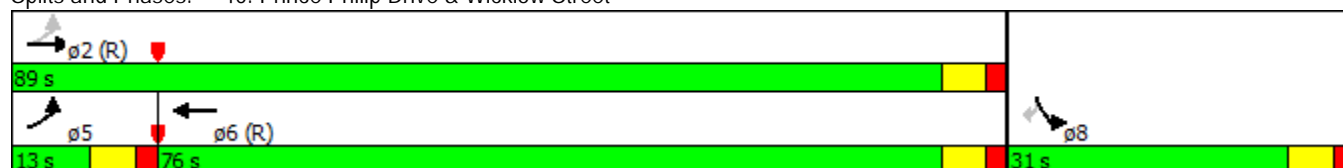
Intersection Capacity Utilization 68.2%

ICU Level of Service C

Analysis Period (min) 15

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

Splits and Phases: 40: Prince Philip Drive & Wicklow Street



MUN Area Traffic Study
Freshwater Road & Stamps Lane/ Oxen pond Road

Scenario 4A - 2025 AM













07/07/2015

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑			↑↑			↑↑		↑	↑	
Traffic Volume (vph)	0	1523	259	0	619	38	68	127	44	15	70	18
Future Volume (vph)	0	1523	259	0	619	38	68	127	44	15	70	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	4.0	4.0	4.0	3.0	3.0	3.0	2.6	2.9	2.9
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	0.0		0.0	0.0		0.0	0.0		0.0	30.0		0.0
Storage Lanes	0		0	0		0	0		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.978			0.991			0.975			0.969	
Flt Protected								0.986		0.950		
Satd. Flow (prot)	0	3423	0	0	3630	0	0	1663	0	1528	1558	0
Flt Permitted								0.864		0.438		
Satd. Flow (perm)	0	3423	0	0	3630	0	0	1457	0	705	1558	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		26			8			9			12	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		374.8			273.7			376.6			148.1	
Travel Time (s)		27.0			19.7			27.1			10.7	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.91	0.91	0.91	0.92	0.92	0.92	0.88	0.88	0.88	0.73	0.73	0.73
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	3%	2%	2%	3%	2%	5%	10%	5%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	1674	285	0	673	41	77	144	50	21	96	25
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1959	0	0	714	0	0	271	0	21	121	0
Turn Type		NA			NA		Perm	NA		pm+pt	NA	
Protected Phases		8			4			2		1	6	
Permitted Phases							2			6		
Total Split (s)		74.0			74.0		32.0	32.0		14.0	46.0	
Total Lost Time (s)		6.0			6.0			6.0		6.0	6.0	
Act Effct Green (s)		68.0			68.0			34.5		40.0	40.0	
Actuated g/C Ratio		0.57			0.57			0.29		0.33	0.33	
v/c Ratio		1.00			0.35			0.64		0.07	0.23	
Control Delay		37.7			4.9			45.8		27.9	27.3	
Queue Delay		0.0			0.0			0.0		0.0	0.0	
Total Delay		37.7			4.9			45.8		27.9	27.3	
LOS		D			A			D		C	C	
Approach Delay		37.7			4.9			45.8			27.4	
Approach LOS		D			A			D			C	
Stops (vph)		801			268			191		11	55	
Fuel Used(l)		133			26			21		1	4	
CO Emissions (g/hr)		2477			476			394		14	80	

MUN Area Traffic Study
Freshwater Road & Stamps Lane/ Oxen pond Road

Scenario 4A - 2025 AM

07/07/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)		478			92			76		3	16	
VOC Emissions (g/hr)		571			110			91		3	19	
Dilemma Vehicles (#)		0			0			0		0	0	
Queue Length 50th (m)		~120.6			19.0			50.2		3.3	18.3	
Queue Length 95th (m)		#162.2			m17.4			#100.4		7.3	25.8	
Internal Link Dist (m)		350.8			249.7			352.6			124.1	
Turn Bay Length (m)										30.0		
Base Capacity (vph)		1950			2060			425		289	527	
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		1.00			0.35			0.64		0.07	0.23	

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 106 (88%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.00

Intersection Signal Delay: 30.4

Intersection LOS: C

Intersection Capacity Utilization 81.2%

ICU Level of Service D

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

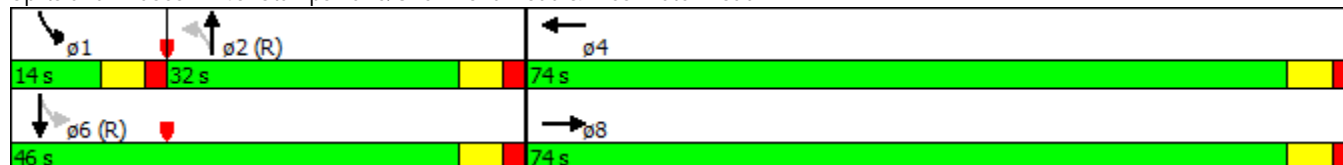
Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

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

Splits and Phases: 46: Stamps Lane/Oxen Pond Road & Freshwater Road



Summary of All Intervals

Run Number	1	10	2	3	4	5	6
Start Time	6:30	6:30	6:30	6:30	6:30	6:30	6:30
End Time	8:00	8:00	8:00	8:00	8:00	8:00	8:00
Total Time (min)	90	90	90	90	90	90	90
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	5	5	5	5	5	5	5
# of Recorded Intervals	4	4	4	4	4	4	4
Vehs Entered	10944	10865	11046	10887	11086	10669	10782
Vehs Exited	10632	10583	10608	10570	10744	10269	10479
Starting Vehs	1129	1097	1077	1087	1060	1088	1056
Ending Vehs	1441	1379	1515	1404	1402	1488	1359
Travel Distance (km)	20529	20330	20711	20317	20653	19886	20016
Travel Time (hr)	2032.9	1948.4	2074.8	1943.5	1818.8	2129.0	2041.9
Total Delay (hr)	1645.8	1564.9	1684.3	1560.1	1429.7	1753.1	1663.8
Total Stops	34415	32052	35078	34004	33774	33282	33095
Fuel Used (l)	3062.9	2978.1	3104.1	2977.2	2882.2	3096.4	3037.1

Summary of All Intervals

Run Number	7	8	9	Avg
Start Time	6:30	6:30	6:30	6:30
End Time	8:00	8:00	8:00	8:00
Total Time (min)	90	90	90	90
Time Recorded (min)	60	60	60	60
# of Intervals	5	5	5	5
# of Recorded Intervals	4	4	4	4
Vehs Entered	11079	10888	10963	10918
Vehs Exited	10657	10547	10594	10572
Starting Vehs	1001	1021	1005	1051
Ending Vehs	1423	1362	1374	1411
Travel Distance (km)	20449	20255	20617	20376
Travel Time (hr)	1998.0	1911.0	1964.6	1986.3
Total Delay (hr)	1613.7	1528.8	1575.7	1602.0
Total Stops	32880	32416	33249	33420
Fuel Used (l)	3025.7	2940.2	3014.2	3011.8

Interval #0 Information Seeding

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

Interval #1 Information Recording #1

Start Time	7:00
End Time	7:15
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	2725	2681	2805	2762	2700	2668	2735
Vehs Exited	2624	2650	2575	2622	2668	2512	2566
Starting Vehs	1129	1097	1077	1087	1060	1088	1056
Ending Vehs	1230	1128	1307	1227	1092	1244	1225
Travel Distance (km)	5059	5106	5118	5113	5206	5004	5046
Travel Time (hr)	333.6	330.0	348.8	334.3	306.8	337.7	340.1
Total Delay (hr)	238.1	234.1	252.6	237.8	209.1	243.1	245.2
Total Stops	8069	7558	8069	8216	7274	7947	7721
Fuel Used (l)	610.6	616.5	628.4	620.6	598.9	609.3	617.7

Interval #1 Information Recording #1

Start Time	7:00
End Time	7:15
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	2698	2813	2676	2728
Vehs Exited	2617	2660	2604	2608
Starting Vehs	1001	1021	1005	1051
Ending Vehs	1082	1174	1077	1175
Travel Distance (km)	5172	5285	5095	5120
Travel Time (hr)	327.7	296.4	331.1	328.6
Total Delay (hr)	230.8	197.2	235.2	232.3
Total Stops	7233	7663	7233	7696
Fuel Used (l)	612.3	596.1	612.4	612.3

Interval #2 Information Recording #2

Start Time	7:15
End Time	7:30
Total Time (min)	15
Volumes adjusted by PHF, Growth Factors.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	3059	3126	3068	2993	3269	2962	3045
Vehs Exited	2745	2822	2843	2820	2906	2745	2794
Starting Vehs	1230	1128	1307	1227	1092	1244	1225
Ending Vehs	1544	1432	1532	1400	1455	1461	1476
Travel Distance (km)	5299	5226	5330	5138	5467	5193	5180
Travel Time (hr)	473.7	430.8	484.3	440.9	414.0	487.2	469.8
Total Delay (hr)	373.2	331.5	383.3	343.3	310.8	388.4	371.5
Total Stops	8858	8191	8941	8400	9443	8597	8844
Fuel Used (l)	745.4	703.3	758.1	709.7	705.1	752.3	733.5

Interval #2 Information Recording #2

Start Time	7:15
End Time	7:30
Total Time (min)	15
Volumes adjusted by PHF, Growth Factors.	

Run Number	7	8	9	Avg
Vehs Entered	3193	2956	3135	3072
Vehs Exited	2848	2729	2804	2806
Starting Vehs	1082	1174	1077	1175
Ending Vehs	1427	1401	1408	1446
Travel Distance (km)	5361	4975	5440	5261
Travel Time (hr)	451.8	413.4	456.1	452.2
Total Delay (hr)	350.3	318.9	353.1	352.4
Total Stops	8578	7902	8813	8653
Fuel Used (l)	728.1	671.3	742.5	724.9

Interval #3 Information Recording #3

Start Time	7:30
End Time	7:45
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	2431	2397	2604	2549	2548	2602	2424
Vehs Exited	2613	2506	2608	2608	2597	2665	2545
Starting Vehs	1544	1432	1532	1400	1455	1461	1476
Ending Vehs	1362	1323	1528	1341	1406	1398	1355
Travel Distance (km)	4957	4804	5107	4995	5036	5000	4805
Travel Time (hr)	572.5	546.7	588.6	552.1	510.7	605.8	576.4
Total Delay (hr)	479.0	456.0	492.4	457.8	415.9	511.3	485.7
Total Stops	8102	7545	9161	8611	8652	8895	7839
Fuel Used (l)	811.1	773.6	831.0	794.6	758.6	840.4	803.1

Interval #3 Information Recording #3

Start Time	7:30
End Time	7:45
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	2520	2496	2613	2517
Vehs Exited	2562	2547	2688	2590
Starting Vehs	1427	1401	1408	1446
Ending Vehs	1385	1350	1333	1373
Travel Distance (km)	4838	4942	5062	4955
Travel Time (hr)	566.6	555.5	550.4	562.5
Total Delay (hr)	475.9	462.4	455.2	469.1
Total Stops	7965	8148	8702	8358
Fuel Used (l)	799.8	792.8	799.3	800.4

Interval #4 Information Recording #4

Start Time	7:45
End Time	8:00
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	2729	2661	2569	2583	2569	2437	2578
Vehs Exited	2650	2605	2582	2520	2573	2347	2574
Starting Vehs	1362	1323	1528	1341	1406	1398	1355
Ending Vehs	1441	1379	1515	1404	1402	1488	1359
Travel Distance (km)	5213	5194	5155	5071	4944	4689	4985
Travel Time (hr)	653.2	640.9	653.1	616.2	587.3	698.4	655.6
Total Delay (hr)	555.5	543.3	555.9	521.2	494.0	610.3	561.5
Total Stops	9386	8758	8907	8777	8405	7843	8691
Fuel Used (l)	895.8	884.7	886.5	852.2	819.6	894.4	882.7

Interval #4 Information Recording #4

Start Time	7:45
End Time	8:00
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	2668	2623	2539	2595
Vehs Exited	2630	2611	2498	2560
Starting Vehs	1385	1350	1333	1373
Ending Vehs	1423	1362	1374	1411
Travel Distance (km)	5077	5053	5020	5040
Travel Time (hr)	651.9	645.7	627.0	642.9
Total Delay (hr)	556.7	550.4	532.2	548.1
Total Stops	9104	8703	8501	8709
Fuel Used (l)	885.5	880.0	859.9	874.1

1: Allandale Road & TCH NB Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.9	0.9
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	2.1	3.3	1.7
Total Delay (hr)	0.0	0.1	0.3	0.3	0.0	1.9	2.6
Total Del/Veh (s)	3.6	1.1	2.6	6.2	8.3	6.7	4.8
Stop Delay (hr)	0.0	0.0	0.1	0.1	0.0	0.0	0.1
Stop Del/Veh (s)	1.2	0.2	0.5	1.2	5.0	0.0	0.3

7: Allandale Road & Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.3	1.2	0.1	2.4	1.4	0.7	0.0	0.0	0.0
Denied Del/Veh (s)	0.5	0.0	0.5	5.0	5.7	5.6	18.3	15.8	13.2	0.0	0.0	0.1
Total Delay (hr)	1.8	3.5	0.4	17.0	82.6	6.8	26.0	11.2	0.6	0.4	6.0	1.0
Total Del/Veh (s)	36.5	38.3	6.2	306.2	355.1	393.0	192.9	123.6	11.0	48.6	42.9	8.9
Stop Delay (hr)	1.6	2.8	0.0	15.2	75.8	6.4	22.1	9.1	0.3	0.3	5.2	0.6
Stop Del/Veh (s)	30.9	30.3	0.7	273.1	326.0	374.0	164.4	100.7	5.4	44.0	37.5	5.0

7: Allandale Road & Prince Philip Drive Performance by movement

Movement	All
Denied Delay (hr)	6.2
Denied Del/Veh (s)	6.0
Total Delay (hr)	157.2
Total Del/Veh (s)	148.6
Stop Delay (hr)	139.5
Stop Del/Veh (s)	131.8

9: Westerland Road/Clinch Crescent & Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	58.2	54.6	18.7	0.2	2.4	0.9	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	390.4	390.6	350.3	12.3	13.2	15.5	0.0	0.0	0.0	0.0	0.3	0.0
Total Delay (hr)	74.3	16.6	4.3	2.5	35.5	14.8	2.9	23.8	2.7	0.9	2.5	0.7
Total Del/Veh (s)	509.6	136.4	92.3	127.3	190.6	254.7	153.4	136.7	130.9	36.5	31.5	10.4
Stop Delay (hr)	73.0	10.1	2.3	2.1	31.1	14.0	2.4	20.3	2.3	0.8	2.1	0.6
Stop Del/Veh (s)	500.6	83.2	50.3	106.8	167.3	241.2	131.1	116.5	110.7	34.1	26.6	8.8

9: Westerland Road/Clinch Crescent & Prince Philip Drive Performance by movement

Movement	All
Denied Delay (hr)	135.0
Denied Del/Veh (s)	139.1
Total Delay (hr)	181.4
Total Del/Veh (s)	189.3
Stop Delay (hr)	161.2
Stop Del/Veh (s)	168.3

10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.1	0.0	0.0	4.3	41.6	4.7	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	3.4	0.1	0.2	162.9	165.7	162.8	0.0	0.0	0.0
Total Delay (hr)	0.3	1.4	0.0	0.5	2.5	0.2	1.9	17.1	1.7	0.5	4.0	0.2
Total Del/Veh (s)	35.3	10.6	2.1	30.2	36.3	6.4	74.8	71.1	60.8	50.2	18.6	6.8
Stop Delay (hr)	0.3	1.2	0.0	0.4	2.2	0.1	1.4	12.1	1.2	0.4	2.3	0.1
Stop Del/Veh (s)	32.2	9.1	0.0	26.9	31.7	3.4	54.8	50.2	42.2	39.8	10.6	2.7

10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue Performance by movement

Movement	All
Denied Delay (hr)	50.6
Denied Del/Veh (s)	62.5
Total Delay (hr)	30.2
Total Del/Veh (s)	37.6
Stop Delay (hr)	21.5
Stop Del/Veh (s)	26.8

11: Mt. Scio Road & Allandale Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.2
Denied Del/Veh (s)	0.1	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.2	3.7	0.8	3.6
Total Delay (hr)	0.7	3.7	1.0	0.2	0.9	0.0	1.9	0.8	0.0	0.6	1.4	0.1
Total Del/Veh (s)	15.9	17.1	8.0	16.5	14.9	2.7	37.9	31.8	3.4	39.1	39.7	2.9
Stop Delay (hr)	0.5	2.2	0.0	0.1	0.7	0.0	1.7	0.7	0.0	0.5	1.2	0.0
Stop Del/Veh (s)	10.7	10.0	0.2	14.1	11.8	0.0	34.7	27.1	0.9	36.0	34.9	0.1

11: Mt. Scio Road & Allandale Road Performance by movement

Movement	All
Denied Delay (hr)	0.3
Denied Del/Veh (s)	0.4
Total Delay (hr)	11.4
Total Del/Veh (s)	17.6
Stop Delay (hr)	7.8
Stop Del/Veh (s)	12.0

13: New Connection & Mt. Scio Road Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Delay (hr)	0.0	0.1	0.0	0.0	0.0	0.0	0.1
Denied Del/Veh (s)	0.4	3.9	0.2	0.0	0.0	0.0	0.5
Total Delay (hr)	1.0	0.2	0.0	0.3	1.4	0.2	3.1
Total Del/Veh (s)	42.6	7.2	11.0	4.2	9.4	8.9	10.6
Stop Delay (hr)	0.9	0.2	0.0	0.1	0.3	0.0	1.5
Stop Del/Veh (s)	40.0	6.1	8.3	2.0	1.8	0.8	5.2

17: Allandale Road & TCH SB Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	0.1	0.0	0.0	0.2	0.6	0.1
Total Delay (hr)	0.0	0.0	0.0	0.4	0.6	0.0	0.9
Total Del/Veh (s)	1.2	0.6	2.3	3.6	5.8	1.8	4.5
Stop Delay (hr)	0.0	0.0	0.0	0.0	0.3	0.0	0.3
Stop Del/Veh (s)	0.2	0.0	0.0	0.0	2.9	0.3	1.3

18: TCH SB Performance by movement

Movement	NBT	SBT	All
Denied Delay (hr)	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.2	0.1
Total Delay (hr)	0.5	0.0	0.5
Total Del/Veh (s)	4.8	0.1	3.3
Stop Delay (hr)	0.0	0.0	0.0
Stop Del/Veh (s)	0.0	0.0	0.0

22: Allandale Road & Higgins Line Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.1	0.0	0.0	0.0	0.0	0.1
Denied Del/Veh (s)	0.2	3.4	0.0	0.0	0.0	0.0	0.2
Total Delay (hr)	3.1	0.1	0.2	0.1	0.1	0.6	4.3
Total Del/Veh (s)	39.1	3.8	3.9	2.9	3.9	2.9	9.7
Stop Delay (hr)	2.8	0.0	0.2	0.0	0.1	0.2	3.3
Stop Del/Veh (s)	35.1	0.4	2.8	0.0	1.8	1.0	7.3

24: Allandale Road & Confederation Building Lot Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.2	0.1	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	0.2	0.0	0.3	0.2	0.1	0.5	1.4
Total Del/Veh (s)	44.1	5.0	3.7	3.3	4.1	2.0	3.0
Stop Delay (hr)	0.2	0.0	0.2	0.0	0.1	0.2	0.7
Stop Del/Veh (s)	42.3	5.0	2.1	0.1	2.2	0.8	1.5

29: Prince Philip Drive & Confederation Building Lot Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.1	0.1	0.2
Denied Del/Veh (s)	0.1	0.1	0.2	0.0	0.3	2.5	0.4
Total Delay (hr)	0.3	0.0	0.4	0.1	1.1	0.1	2.1
Total Del/Veh (s)	64.9	6.4	9.2	1.2	3.9	2.9	4.3
Stop Delay (hr)	0.3	0.0	0.3	0.0	0.4	0.0	1.0
Stop Del/Veh (s)	62.7	6.3	5.8	0.2	1.6	0.1	2.2

34: Elizabeth Avenue & Westerland Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.4	0.3	0.0	0.0	0.0	0.0	0.0	0.7
Denied Del/Veh (s)	2.4	2.4	0.0	0.0	0.0	0.0	0.0	1.3
Total Delay (hr)	10.2	0.9	0.9	1.3	1.5	0.1	0.2	15.0
Total Del/Veh (s)	66.3	6.5	13.6	21.4	60.2	1.8	4.1	27.4
Stop Delay (hr)	9.4	0.4	0.7	1.1	1.4	0.0	0.0	13.0
Stop Del/Veh (s)	60.7	2.9	10.9	18.2	55.9	0.3	0.3	23.6

35: Prince Philip Drive & Clinch Crescent Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Denied Del/Veh (s)	0.2	0.2	0.0	0.3	0.1	0.0	0.0	0.1
Total Delay (hr)	12.5	47.8	3.9	0.5	1.4	0.0	0.3	66.4
Total Del/Veh (s)	114.8	174.1	18.3	9.3	65.3	0.7	3.3	84.3
Stop Delay (hr)	10.5	42.3	2.2	0.0	1.4	0.0	0.0	56.4
Stop Del/Veh (s)	96.4	154.0	10.2	0.9	62.0	0.0	0.5	71.6

37: Thorburn Road & Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR	All
Denied Delay (hr)	28.6	142.0	16.5	0.0	0.0	0.0	0.0	0.0	15.9	25.8	13.4	242.3
Denied Del/Veh (s)	386.2	368.3	356.9	0.0	0.0	0.0	0.0	0.0	160.3	162.4	163.3	193.5
Total Delay (hr)	6.4	63.5	1.0	1.3	3.8	0.2	3.0	0.6	52.1	9.7	5.2	146.7
Total Del/Veh (s)	112.1	204.7	27.2	38.8	19.8	3.2	28.7	33.4	588.5	71.8	74.1	132.7
Stop Delay (hr)	5.5	56.2	0.8	1.2	2.9	0.0	2.5	0.6	52.0	7.9	4.3	133.9
Stop Del/Veh (s)	97.4	181.1	21.3	35.9	15.1	0.0	24.5	32.2	586.6	58.7	61.1	121.1

40: Prince Philip Drive & Wicklow Street Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.2	0.0	0.2
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	3.8	0.5	0.3
Total Delay (hr)	0.4	36.1	2.7	0.2	2.4	0.1	41.8
Total Del/Veh (s)	140.3	103.6	9.9	10.3	51.0	8.5	59.6
Stop Delay (hr)	0.4	31.6	1.1	0.1	2.2	0.1	35.5
Stop Del/Veh (s)	135.4	90.8	4.1	5.1	47.3	7.4	50.5

46: Stamps Lane/Oxen Pond Road & Freshwater Road Performance by movement

Movement	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.2	0.3	0.3	4.1	0.2	0.2	0.1
Total Delay (hr)	64.8	9.4	2.0	0.1	0.7	1.5	0.4	0.1	0.6	0.1	79.6
Total Del/Veh (s)	174.5	163.0	11.4	9.6	38.7	39.4	36.1	36.5	29.5	14.8	112.2
Stop Delay (hr)	53.2	7.6	1.0	0.1	0.7	1.2	0.4	0.1	0.5	0.1	64.7
Stop Del/Veh (s)	143.3	131.6	5.6	4.9	34.2	33.7	32.9	33.5	25.7	13.4	91.2

47: Freshwater Road & Thorburn Road Performance by movement

Movement	EBT	WBT	WBR	SBL	SBT	SBR	All
Denied Delay (hr)	227.5	0.0	0.1	0.0	0.0	0.0	227.5
Denied Del/Veh (s)	629.9	0.0	0.4	0.0	0.0	0.0	294.3
Total Delay (hr)	41.0	0.5	0.8	2.9	0.0	0.2	45.4
Total Del/Veh (s)	148.5	4.9	6.5	21.0	3.4	3.9	65.8
Stop Delay (hr)	41.3	0.3	0.1	2.5	0.0	0.2	44.4
Stop Del/Veh (s)	149.7	2.9	1.2	17.8	1.7	2.7	64.3

48: Clinch Crescent & New Connection Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	0.6	0.1	0.4	0.4	0.1	0.4	0.5	2.6
Total Del/Veh (s)	44.0	1.4	8.8	11.4	1.3	5.6	4.9	6.2
Stop Delay (hr)	0.6	0.0	0.3	0.4	0.0	0.1	0.1	1.4
Stop Del/Veh (s)	39.8	0.0	6.3	9.2	0.4	1.1	1.0	3.4

51: Freshwater Road & Elizabeth Avenue Performance by movement

Movement	WBL	WBT	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.0	0.0	1.4	0.1	0.0	0.0	1.5
Denied Del/Veh (s)	0.0	0.0	0.2	11.0	10.9	0.0	0.0	2.8
Total Delay (hr)	0.3	0.0	0.1	11.2	0.3	27.8	2.8	42.5
Total Del/Veh (s)	42.2	0.3	2.2	84.0	52.1	114.7	24.6	76.8
Stop Delay (hr)	0.3	0.0	0.0	9.6	0.2	22.7	1.7	34.6
Stop Del/Veh (s)	40.6	0.0	0.2	72.0	43.4	93.8	15.3	62.5

52: Elizabeth Avenue & Paton Street Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.1	0.1	0.0
Total Delay (hr)	0.1	1.3	0.1	0.0	0.1	0.0	1.6
Total Del/Veh (s)	7.6	5.6	1.2	1.2	12.6	3.9	5.0
Stop Delay (hr)	0.0	0.3	0.0	0.0	0.1	0.0	0.4
Stop Del/Veh (s)	2.0	1.3	0.5	0.9	10.5	3.8	1.4

55: Anderson Avenue & Elizabeth Avenue Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.3	0.3
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.7	3.3	0.7
Total Delay (hr)	0.4	0.0	0.3	0.2	0.1	1.0	1.9
Total Del/Veh (s)	1.8	0.7	12.4	3.8	14.0	12.5	5.1
Stop Delay (hr)	0.1	0.0	0.2	0.0	0.1	0.9	1.3
Stop Del/Veh (s)	0.5	0.3	7.0	0.3	11.7	11.6	3.4

59: Clinch Crescent & Arctic Avenue Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.1	0.0	0.0	0.0	0.0	0.0	0.1
Denied Del/Veh (s)	0.8	0.2	0.0	0.0	0.2	0.0	0.1
Total Delay (hr)	3.3	0.2	0.5	2.2	0.2	0.5	6.8
Total Del/Veh (s)	48.5	7.0	7.4	9.0	7.3	5.1	13.0
Stop Delay (hr)	2.9	0.2	0.3	0.9	0.2	0.2	4.6
Stop Del/Veh (s)	42.5	6.3	4.8	3.6	5.5	2.5	8.8

61: Prince Philip Drive & Morrissey Drive Performance by movement

Movement	EBT	WBL	WBT	WBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	3.6	0.5	0.4	0.2
Total Delay (hr)	1.0	0.5	3.4	3.9	1.2	0.9	0.9	11.8
Total Del/Veh (s)	6.3	16.6	16.3	19.6	50.0	50.4	28.7	17.5
Stop Delay (hr)	0.3	0.3	1.4	1.3	1.1	0.8	0.8	6.0
Stop Del/Veh (s)	2.0	9.7	6.6	6.5	46.1	44.8	26.3	9.0

Total Network Performance

Denied Delay (hr)	666.1
Denied Del/Veh (s)	196.2
Total Delay (hr)	935.9
Total Del/Veh (s)	281.2
Stop Delay (hr)	792.9
Stop Del/Veh (s)	238.2

Intersection: 1: Allandale Road & TCH NB

Movement	EB	WB	NB	NB
Directions Served	LT	R	LT	R
Maximum Queue (m)	7.7	145.5	7.3	16.3
Average Queue (m)	0.4	7.7	0.9	0.8
95th Queue (m)	3.9	93.9	5.3	9.8
Link Distance (m)	137.0	341.1	139.4	
Upstream Blk Time (%)		0		
Queuing Penalty (veh)		0		
Storage Bay Dist (m)			100.0	
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 7: Allandale Road & Prince Philip Drive

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB
Directions Served	L	T	T	R	L	T	T	R	L	T	R	L
Maximum Queue (m)	68.2	63.2	61.0	48.9	67.4	577.9	579.9	27.5	72.5	438.9	406.1	44.3
Average Queue (m)	31.0	35.6	33.8	3.2	55.9	423.5	427.0	13.0	71.9	361.9	115.7	11.8
95th Queue (m)	55.6	57.3	54.6	22.8	86.2	607.5	609.4	34.9	75.2	492.0	339.6	35.7
Link Distance (m)		438.0	438.0			834.7	834.7			440.2	440.2	
Upstream Blk Time (%)										3	0	
Queuing Penalty (veh)										13	1	
Storage Bay Dist (m)	200.0			120.0	65.0			25.0	70.0			42.0
Storage Blk Time (%)					4	61	78	1	57	17		0
Queuing Penalty (veh)					14	116	46	2	179	82		0

Intersection: 7: Allandale Road & Prince Philip Drive

Movement	SB	SB	SB	SB	B5
Directions Served	T	T	R	R	T
Maximum Queue (m)	79.7	78.8	89.4	37.5	1.3
Average Queue (m)	51.1	46.1	29.7	16.7	0.0
95th Queue (m)	75.3	70.0	81.5	46.9	1.3
Link Distance (m)	104.0	104.0	104.0		500.7
Upstream Blk Time (%)		0	0		
Queuing Penalty (veh)		0	0		
Storage Bay Dist (m)				35.0	
Storage Blk Time (%)	20		7	4	
Queuing Penalty (veh)	7		14	8	

Intersection: 9: Westerland Road/Clinch Crescent & Prince Philip Drive

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	TR	L	T	R	L	T
Maximum Queue (m)	77.5	583.3	584.3	187.3	92.5	341.4	348.4	62.4	355.4	47.5	38.3	77.2
Average Queue (m)	77.4	577.5	570.8	36.7	40.4	224.1	239.5	28.7	275.5	25.6	17.0	41.9
95th Queue (m)	77.7	581.1	633.5	132.4	103.3	373.7	380.5	71.4	422.4	61.8	31.8	69.5
Link Distance (m)		572.7	572.7			469.5	469.5		350.2		83.1	83.1
Upstream Blk Time (%)		52	17						9			0
Queuing Penalty (veh)		374	121						78			0
Storage Bay Dist (m)	75.0			185.0	90.0			60.0		45.0		
Storage Blk Time (%)	77	47	4	0	0	54		0	65	1		0
Queuing Penalty (veh)	249	333	9	1	1	40		1	102	3		0

Intersection: 9: Westerland Road/Clinch Crescent & Prince Philip Drive

Movement	SB
Directions Served	R
Maximum Queue (m)	68.4
Average Queue (m)	23.0
95th Queue (m)	46.0
Link Distance (m)	
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (m)	80.0
Storage Blk Time (%)	0
Queuing Penalty (veh)	0

Intersection: 10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue

Movement	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	L	T	TR	L	T	R	L	T	R
Maximum Queue (m)	23.6	54.7	32.0	55.0	54.1	57.3	248.4	37.5	33.5	265.2	264.7
Average Queue (m)	7.4	24.3	10.5	29.7	22.7	22.7	236.9	13.7	8.1	53.0	22.2
95th Queue (m)	18.4	45.2	23.5	49.3	48.7	57.5	256.3	38.7	22.8	172.7	161.8
Link Distance (m)		321.8		285.8	285.8		232.6			440.2	440.2
Upstream Blk Time (%)							46			0	0
Queuing Penalty (veh)							0			0	1
Storage Bay Dist (m)	55.0		55.0			55.0		35.0	40.0		
Storage Blk Time (%)	0	0		0		0	41	0	0	11	
Queuing Penalty (veh)	0	0		0		1	79	2	0	4	

Intersection: 11: Mt. Scio Road & Allandale Road

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB
Directions Served	L	T	T	R	L	T	T	L	L	T	R	L
Maximum Queue (m)	39.5	60.8	74.0	52.3	17.4	27.0	24.1	32.8	33.7	33.7	25.3	31.0
Average Queue (m)	12.9	32.7	35.3	8.5	4.7	10.5	8.0	12.9	13.0	10.9	1.2	10.9
95th Queue (m)	28.3	54.0	60.8	40.1	13.0	22.0	18.6	26.1	26.5	26.5	9.9	24.0
Link Distance (m)		341.1	341.1			542.0	542.0		444.3	444.3		
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (m)	75.0			50.0	75.0			60.0			25.0	60.0
Storage Blk Time (%)		0	1	0						1	0	0
Queuing Penalty (veh)		0	5	1						1	0	0

Intersection: 11: Mt. Scio Road & Allandale Road

Movement	SB	SB
Directions Served	T	R
Maximum Queue (m)	48.8	28.2
Average Queue (m)	22.8	1.8
95th Queue (m)	41.7	14.7
Link Distance (m)	97.3	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		50.0
Storage Blk Time (%)	0	0
Queuing Penalty (veh)	0	0

Intersection: 13: New Connection & Mt. Scio Road

Movement	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	L	T	T	T	T	R
Maximum Queue (m)	35.2	25.8	8.8	22.5	23.9	20.7	27.2	1.6
Average Queue (m)	13.0	10.6	1.0	6.0	5.7	5.4	9.9	0.1
95th Queue (m)	27.6	19.4	5.3	17.5	17.2	16.3	21.9	1.7
Link Distance (m)	251.1			728.9	728.9	444.3	444.3	
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (m)		50.0	100.0					100.0
Storage Blk Time (%)	0	0						
Queuing Penalty (veh)	0	0						

Intersection: 17: Allandale Road & TCH SB

Movement	EB	SB	SB
Directions Served	LT	L	R
Maximum Queue (m)	3.0	33.4	12.8
Average Queue (m)	0.1	17.0	0.6
95th Queue (m)	2.5	26.1	5.7
Link Distance (m)	158.6	127.3	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			20.0
Storage Blk Time (%)		2	0
Queuing Penalty (veh)		0	0

Intersection: 18: TCH SB

Movement
Directions Served
Maximum Queue (m)
Average Queue (m)
95th Queue (m)
Link Distance (m)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (m)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 22: Allandale Road & Higgins Line

Movement	WB	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	L	R	T	T	L	T	T
Maximum Queue (m)	63.9	57.5	41.8	21.0	19.4	24.6	34.1	44.7
Average Queue (m)	34.6	24.5	2.5	6.5	5.7	8.4	10.3	13.9
95th Queue (m)	55.9	47.3	18.9	17.1	16.0	19.0	27.0	34.0
Link Distance (m)	117.4	117.4		101.8	101.8		73.6	73.6
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (m)			40.0			80.0		
Storage Blk Time (%)		3	0					
Queuing Penalty (veh)		2	0					

Intersection: 24: Allandale Road & Confederation Building Lot

Movement	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	L	R	T	T	R	L	T	T
Maximum Queue (m)	3.1	14.1	11.4	24.4	36.2	14.4	21.3	26.7	35.6
Average Queue (m)	0.1	3.2	3.5	4.1	7.2	0.7	6.8	4.2	7.3
95th Queue (m)	1.6	10.7	10.5	15.2	24.4	8.8	16.4	16.6	25.5
Link Distance (m)		87.5	87.5	500.7	500.7			147.6	147.6
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (m)	45.0					110.0	130.0		
Storage Blk Time (%)									
Queuing Penalty (veh)									

Intersection: 29: Prince Philip Drive & Confederation Building Lot

Movement	EB	EB	NB	NB	NB	SB	SB
Directions Served	L	R	L	T	T	T	T
Maximum Queue (m)	19.3	12.3	41.9	17.3	16.5	61.0	46.3
Average Queue (m)	5.3	3.2	16.1	1.1	1.6	20.1	12.3
95th Queue (m)	14.3	10.3	31.8	10.8	8.7	48.7	34.7
Link Distance (m)	108.9	108.9		270.6	270.6	148.3	148.3
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (m)			75.0				
Storage Blk Time (%)			0	0			
Queuing Penalty (veh)			0	0			

Intersection: 34: Elizabeth Avenue & Westerland Road

Movement	EB	EB	EB	WB	WB	SB
Directions Served	L	T	T	T	TR	L
Maximum Queue (m)	37.4	235.9	173.8	43.7	68.3	44.4
Average Queue (m)	34.0	100.3	52.0	15.5	31.0	22.5
95th Queue (m)	44.9	293.7	226.9	36.4	65.3	40.3
Link Distance (m)		393.0	393.0	553.8	553.8	350.2
Upstream Blk Time (%)		2	1			
Queuing Penalty (veh)		10	3			
Storage Bay Dist (m)	35.0					
Storage Blk Time (%)	38	7				
Queuing Penalty (veh)	95	42				

Intersection: 35: Prince Philip Drive & Clinch Crescent

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB
Directions Served	L	T	T	T	T	R	L	R	R
Maximum Queue (m)	142.5	290.8	286.7	57.1	62.3	44.1	51.5	28.3	26.3
Average Queue (m)	140.9	274.4	248.2	23.2	28.5	5.8	21.3	3.5	5.2
95th Queue (m)	157.6	334.3	331.2	45.7	51.4	25.2	43.4	17.5	19.8
Link Distance (m)		280.6	280.6	572.7	572.7			262.0	
Upstream Blk Time (%)		29	8						
Queuing Penalty (veh)		280	75						
Storage Bay Dist (m)	140.0					70.0	80.0		50.0
Storage Blk Time (%)	4	64			0	0			0
Queuing Penalty (veh)	27	372			0	0			0

Intersection: 37: Thorburn Road & Prince Philip Drive

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	T	T	T	TR	L	L
Maximum Queue (m)	177.5	322.7	319.5	321.7	44.2	53.2	55.2	51.2	52.6	55.1	152.5	382.6
Average Queue (m)	147.6	281.5	277.0	230.4	21.1	27.9	27.6	23.5	19.9	25.9	130.3	253.6
95th Queue (m)	246.4	388.2	390.3	450.5	39.3	44.6	45.4	43.4	42.6	46.9	190.0	470.5
Link Distance (m)		308.0	308.0	308.0		134.5	134.5	134.5	126.5	126.5		372.8
Upstream Blk Time (%)		64	54	37								32
Queuing Penalty (veh)		0	0	0								0
Storage Bay Dist (m)	175.0				110.0						150.0	
Storage Blk Time (%)	1	60									36	56
Queuing Penalty (veh)	6	159									65	99

Intersection: 37: Thorburn Road & Prince Philip Drive

Movement	SB	SB
Directions Served	T	TR
Maximum Queue (m)	383.3	152.5
Average Queue (m)	215.7	94.0
95th Queue (m)	477.5	162.9
Link Distance (m)	372.8	
Upstream Blk Time (%)	35	
Queuing Penalty (veh)	0	
Storage Bay Dist (m)		150.0
Storage Blk Time (%)	3	2
Queuing Penalty (veh)	18	6

Intersection: 40: Prince Philip Drive & Wicklow Street

Movement	EB	EB	EB	B45	B45	B36	B36	WB	WB	SB	SB
Directions Served	L	T	T	T	T	T	T	T	TR	L	R
Maximum Queue (m)	52.3	216.8	214.5	247.5	247.5	142.8	146.7	100.0	153.2	60.8	62.3
Average Queue (m)	9.6	188.9	178.1	200.1	198.2	100.7	100.2	21.2	32.0	35.8	10.0
95th Queue (m)	41.7	282.3	282.7	339.4	339.0	192.9	194.0	65.8	99.6	57.3	34.0
Link Distance (m)		189.0	189.0	222.8	222.8	134.5	134.5	280.6	280.6		264.8
Upstream Blk Time (%)		82	34	75	52	13	12		0		
Queuing Penalty (veh)		744	307	682	479	122	111		0		
Storage Bay Dist (m)	50.0									60.0	
Storage Blk Time (%)	0	79								2	0
Queuing Penalty (veh)	1	15								1	0

Intersection: 46: Stamps Lane/Oxen Pond Road & Freshwater Road

Movement	EB	EB	WB	WB	NB	SB	SB
Directions Served	T	TR	T	TR	LTR	L	TR
Maximum Queue (m)	369.7	371.0	31.0	42.9	80.5	19.2	46.6
Average Queue (m)	360.4	360.3	7.2	15.1	41.9	3.5	16.2
95th Queue (m)	367.6	367.1	20.3	34.6	72.2	12.9	35.4
Link Distance (m)	357.5	357.5	263.0	263.0	363.4		138.0
Upstream Blk Time (%)	14	14					
Queuing Penalty (veh)	130	133					
Storage Bay Dist (m)						30.0	
Storage Blk Time (%)						0	3
Queuing Penalty (veh)						0	0

Intersection: 47: Freshwater Road & Thorburn Road

Movement	EB	EB	WB	WB	WB	SB	SB	SB	B43	B43
Directions Served	T	T	T	T	R	L	L	R	T	T
Maximum Queue (m)	177.6	176.9	21.9	19.1	34.9	66.0	67.5	28.8	24.4	33.8
Average Queue (m)	167.6	167.6	8.3	4.7	12.8	37.9	40.7	14.1	2.0	2.6
95th Queue (m)	174.0	173.4	18.2	14.7	26.3	65.4	67.2	24.9	15.6	20.9
Link Distance (m)	160.8	160.8	357.5	357.5		52.2	52.2	52.2	126.5	126.5
Upstream Blk Time (%)	95	95				3	4			
Queuing Penalty (veh)	0	0				8	11			
Storage Bay Dist (m)					100.0					
Storage Blk Time (%)										
Queuing Penalty (veh)										

Intersection: 48: Clinch Crescent & New Connection

Movement	EB	EB	B39	NB	NB	SB	SB
Directions Served	L	R	T	LT	T	T	TR
Maximum Queue (m)	29.7	32.7	221.4	35.9	12.0	13.4	35.1
Average Queue (m)	11.7	17.0	11.8	14.1	1.0	1.7	10.3
95th Queue (m)	25.2	28.3	103.6	28.9	5.7	7.5	23.3
Link Distance (m)		551.3	262.0	123.3	123.3	728.9	728.9
Upstream Blk Time (%)			0				
Queuing Penalty (veh)			3				
Storage Bay Dist (m)	50.0						
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 51: Freshwater Road & Elizabeth Avenue

Movement	WB	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	R	R	T	R	L	L	T
Maximum Queue (m)	16.3	13.0	17.5	207.9	52.5	52.4	278.0	280.0
Average Queue (m)	4.2	0.4	1.8	127.7	9.0	51.8	268.6	253.7
95th Queue (m)	11.9	5.3	10.4	225.2	37.6	53.8	273.8	321.0
Link Distance (m)	260.3	260.3		199.6			263.0	263.0
Upstream Blk Time (%)				16			28	12
Queuing Penalty (veh)				0			219	98
Storage Bay Dist (m)			50.0		50.0	50.0		
Storage Blk Time (%)				45	0	24	43	
Queuing Penalty (veh)				8	1	126	231	

Intersection: 52: Elizabeth Avenue & Paton Street

Movement	EB	EB	EB	WB	WB	SB
Directions Served	L	T	T	T	TR	LR
Maximum Queue (m)	25.0	58.8	48.8	9.8	20.6	15.0
Average Queue (m)	4.0	18.6	13.2	0.8	3.9	5.9
95th Queue (m)	15.2	44.5	35.6	5.4	13.9	13.7
Link Distance (m)		260.3	260.3	44.4	44.4	407.0
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (m)	30.0					
Storage Blk Time (%)	0	2				
Queuing Penalty (veh)	0	1				

Intersection: 55: Anderson Avenue & Elizabeth Avenue

Movement	EB	EB	WB	WB	WB	NB	NB
Directions Served	T	TR	L	T	T	L	R
Maximum Queue (m)	19.1	18.4	24.3	0.9	0.9	28.2	51.2
Average Queue (m)	1.9	1.5	8.4	0.0	0.0	6.3	22.0
95th Queue (m)	15.1	9.9	20.2	0.9	0.9	32.7	46.0
Link Distance (m)	44.4	44.4		393.0	393.0	321.2	
Upstream Blk Time (%)	0						
Queuing Penalty (veh)	2						
Storage Bay Dist (m)			40.0			100.0	
Storage Blk Time (%)			0			1	1
Queuing Penalty (veh)			0			2	0

Intersection: 59: Clinch Crescent & Arctic Avenue

Movement	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	L	R	T	T	R	L	T	T
Maximum Queue (m)	62.5	97.4	22.1	54.3	87.5	52.5	26.4	23.2	40.1
Average Queue (m)	14.6	47.8	11.0	12.7	35.9	34.7	12.5	4.8	15.8
95th Queue (m)	41.8	82.6	19.2	33.9	92.3	72.9	24.0	16.2	32.3
Link Distance (m)		204.3	204.3	83.1	83.1			105.9	105.9
Upstream Blk Time (%)				0	1				
Queuing Penalty (veh)				0	7				
Storage Bay Dist (m)	100.0					50.0	50.0		
Storage Blk Time (%)	0	1			2	8			
Queuing Penalty (veh)	0	1			24	12			

Intersection: 61: Prince Philip Drive & Morrissey Drive

Movement	EB	EB	WB	WB	WB	WB	SB	SB
Directions Served	T	T	L	T	T	R	L	TR
Maximum Queue (m)	24.2	24.2	22.6	36.1	51.8	32.3	42.3	91.3
Average Queue (m)	6.4	6.9	7.8	8.9	15.3	20.2	21.0	32.4
95th Queue (m)	18.5	18.6	17.0	24.4	36.3	34.1	40.2	67.7
Link Distance (m)	469.5	469.5		438.0	438.0			278.5
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (m)			70.0			30.0	40.0	
Storage Blk Time (%)					0	2	1	6
Queuing Penalty (veh)					3	7	2	6

Network Summary

Network wide Queuing Penalty: 6649

		Scenario 4 - PM Peak Hour						
Intersection		Synchro				SimTraffic		
		Delay/Veh (s)	LOS	V/C	Queue (m) 95th%ile	Delay/Veh (s)	Equivalent LOS	Queue (m) 95th%ile
Street	Movement							
Columbus Drive/ Prince Philip Drive & Thorburn Road		174.9	F			116.7	F	
Columbus Drive/ Prince Philip Drive	Eastbound Left - Turn	379.9	F	1.76	254.5	319.1	F	216.3
	Eastbound Through	68.1	E	1.01	205.0	83.2	F	383.1
	Eastbound Right - Turn	21.4	C	0.53	67.4	112.2	F	427.2
	Westbound Left - Turn	221.9	F	1.41	82.3	202.8	F	139.7
	Westbound Through	90.0	F	1.13	162.3	50.7	D	173.3
	Westbound Right - Turn	22.9	C	0.84	84.1	5.0	A	34.3
Thorburn Road	Northbound Through	222.5	F	1.42	228.4	65.0	E	144.9
	Northbound Right - Turn					65.3	E	147.4
	Southbound Left - Turn	299.2	F	1.55	115.2	95.5	F	418.6
	Southbound Through	246.0	F	1.48	397.4	213.0	F	383.3
	Southbound Right - Turn					275.5	F	153.6
Prince Philip Drive & Wicklow Street		36.0	D			22.7	C	
Prince Philip Drive	Eastbound Left - Turn	3.0	A	0.15	0.3	33.0	C	11.0
	Eastbound Through	3.6	A	0.53	48.3	2.3	A	11.7
	Westbound Through	46.3	D	1.05	180.9	21.7	C	171.4
	Westbound Right - Turn					23.6	C	183.9
Wicklow Street	Southbound Left - Turn	122.6	F	1.08	125.2	98.9	F	73.5
	Southbound Right - Turn	10.7	B	0.29	12.5	53.7	D	186.6
Prince Philip Drive & Clinch Crescent		27.2	C			14.7	B	
Prince Philip Drive	Eastbound Left - Turn	118.8	F	1.09	119.9	30.1	C	52.4
	Eastbound Through	2.2	A	0.60	25.1	5.8	A	41.5
	Westbound Through	24.0	C	1.00	55.3	16.1	B	107.9
	Westbound Right - Turn	2.9	A	0.15	0.4	10.9	B	0.0
	Clinch Crescent	Southbound Left - Turn	55.5	E	0.53	44.1	57.3	E
Southbound Right - Turn		46.4	D	0.86	110.0	14.9	B	95.9
Prince Philip Drive & Clinch Crescent/ Westerland Road		183.7	F			152.5	F	
Prince Philip Drive	Eastbound Left - Turn	469.5	F	1.97	267.7	361.0	F	96.9
	Eastbound Through	51.0	D	0.87	157.8	107.8	F	532.6
	Eastbound Right - Turn	12.6	B	0.29	27.3	125.4	F	166.3
	Westbound Left - Turn	48.4	D	0.70	26.2	251.7	F	117.6
	Westbound Through	228.4	F	1.45	306.6	233.6	F	493.6
	Westbound Right - Turn					251.6	F	497.5
Clinch Crescent/ Westerland Road	Northbound Left - Turn	235.2	F	1.42	70.3	126.0	F	77.5
	Northbound Through	135.6	F	1.20	195.0	97.7	F	344.1
	Northbound Right - Turn	8.8	A	0.55	18.0	73.0	E	64.1
	Southbound Left - Turn	204.3	F	1.31	73.0	48.1	D	46.7
	Southbound Through	274.3	F	1.51	253.2	63.2	E	95.4
	Southbound Right - Turn	128.1	F	1.18	162.8	30.0	C	107.7
Clinch Crescent & Arctic Avenue		18.1	B			78.7	E	
Arctic Avenue	Westbound Left - Turn	45.0	D	0.84	77.7	304.6	F	215.4
	Westbound Right - Turn	13.4	B	0.60	30.0	55.1	E	230.2
Clinch Crescent	Northbound Through	16.6	B	0.37	52.6	11.0	B	41.4
	Northbound Right - Turn	6.3	A	0.70	10.3	4.0	A	28.0
	Southbound Left - Turn	8.6	A	0.23	9.6	15.3	B	23.4
	Southbound Through	9.0	A	0.36	34.5	61.5	E	164.6
Prince Philip Drive & Morrissey Drive		27.7	C			62.2	E	
Prince Philip Drive	Eastbound Through	30.7	C	0.87	144.9	26.0	C	106.1
	Westbound Left - Turn	7.3	A	0.38	4.8	25.0	C	18.6
	Westbound Through	14.9	B	0.66	104.6	24.3	C	88.5
	Westbound Right - Turn	5.4	A	0.33	22.4	19.0	B	32.5
	Morrissey Drive	Southbound Left - Turn	42.2	D	0.56	78.4	188.6	F
Southbound Through		68.7	E	0.94	150.0	191.2	F	340.0
Southbound Right - Turn						182.9	F	
Prince Philip Drive & Allandale Road		146.1	F			293.0	F	
Prince Philip Drive	Eastbound Left - Turn	497.9	F	2.04	243.4	345.5	F	217.8
	Eastbound Through	59.7	E	1.02	183.3	78.6	E	447.1
	Eastbound Right - Turn	25.1	C	0.86	118.0	168.6	F	160.7
	Westbound Left - Turn	463.4	F	1.95	156.9	986.0	F	67.9
















	Westbound Through	114.5	F	1.19	183.8	596.9	F	865.3
	Westbound Right - Turn	4.8	A	0.36	11.9	549.6	F	39.0
Allandale Road	Northbound Left - Turn	476.0	F	1.99	109.4	323.6	F	77.3
	Northbound Through	103.4	F	1.18	183.4	172.1	F	456.5
	Northbound Right - Turn	2.1	A	0.59	7.8	23.2	C	384.5
	Southbound Left - Turn	396.2	F	1.68	63.2	186.9	F	61.2
	Southbound Through	57.5	E	0.96	147.0	155.5	F	127.3
	Southbound Right - Turn	17.1	B	0.31	37.1	11.8	B	52.0
Prince Philip Drive & Confederation Building Lot		32.8	C			75.3	E	
Prince Philip Drive	Eastbound Left - Turn	79.2	E	0.95	98.9	60.0	E	130.7
	Eastbound Right - Turn	10.1	B	0.59	12.0	107.8	F	141.0
Confederation Building Lot	Northbound Left - Turn	71.5	E	0.98	96.0	17.6	B	45.2
	Northbound Through	6.2	A	0.56	47.5	7.9	A	47.7
	Southbound Through	46.6	D	0.94	189.8	163.0	F	194.5
	Southbound Right - Turn	3.8	A	0.32	13.9	46.4	D	149.6
Bonaventure Avenue/ Allandale Road & Elizabeth Avenue		201.3	F			120.4	F	
Bonaventure Avenue/ Allandale Road	Eastbound Left - Turn	47.1	D	0.75	75.2	102.2	F	72.6
	Eastbound Through	197.8	F	1.33	283.2	86.9	F	268.6
	Eastbound Right - Turn	6.9	A	0.15	12.6	6.2	A	129.7
	Westbound Left - Turn	57.5	E	0.76	41.9	67.1	E	54.2
	Westbound Through	46.3	D	0.70	84.0	58.5	E	139.9
	Westbound Right - Turn					28.5	C	136.6
Elizabeth Avenue	Northbound Left - Turn	21.0	C	0.34	12.3	148.2	F	41.8
	Northbound Through	328.8	F	1.66	499.9	109.8	F	242.7
	Northbound Right - Turn	10.2	B	0.30	28.7	98.3	F	45.8
	Southbound Left - Turn	36.8	D	0.89	14.7	255.2	F	46.1
	Southbound Through	299.5	F	1.61	411.5	186.1	F	452.5
	Southbound Right - Turn	7.1	A	0.37	15.4	105.0	F	467.7
Elizabeth Avenue & Westerland Road		19.9	B			42.0	D	
Elizabeth Avenue	Eastbound Left - Turn	18.2	B	0.94	6.5	25.6	C	45.0
	Eastbound Through	1.7	A	0.31	5.2	3.4	A	51.9
	Westbound Through	32.5	C	0.90	168.1	62.1	E	294.9
	Westbound Right - Turn					70.9	E	298.1
Westerland Road	Southbound Left - Turn	27.2	C	0.75	18.1	76.2	E	194.4
	Southbound Right - Turn	14.4	B	0.93	0.5	33.1	C	51.7
Elizabeth Avenue & Anderson Avenue		1179.7	F			39.2	E	
Elizabeth Avenue	Eastbound Through	0.0	-	0.42	0.0	1.1	A	8.1
	Eastbound Right - Turn					0.8	A	
	Westbound Left - Turn	22.2	C	0.65	35.7	41.8	E	35.0
	Westbound Through	0.0	-	0.27	0.0	45.5	E	224.1
Anderson Avenue	Northbound Left - Turn	ERROR	F	8.37	ERROR	242.8	F	202.2
	Northbound Right - Turn					52.9	F	55.4
Elizabeth Avenue & Paton Street		13.3	B			32.7	D	
Elizabeth Avenue	Eastbound Left - Turn	11.0	B	0.10	2.5	96.3	F	22.5
	Eastbound Through	0.0	-	0.33	0.0	26.4	D	125.1
	Westbound Through	0.0	-	0.36	0.0	12.2	B	41.9
	Westbound Right - Turn					7.7	A	52.6
Paton Street	Southbound Left - Turn	186.7	F	1.16	71.2	151.7	F	193.8
	Southbound Right - Turn					169.5	F	
Elizabeth Avenue & Freshwater Road		182.1	F			110.0	F	
Elizabeth Avenue	Westbound Left - Turn	44.3	D	0.30	32.3	52.3	D	306.0
	Westbound Right - Turn	33.8	C	0.73	141.3	114.9	F	339.6
Freshwater Road	Northbound Through	271.0	F	1.52	458.4	108.6	F	210.5
	Northbound Right - Turn	15.7	B	0.05	9.5	118.2	F	34.8
	Southbound Left - Turn	362.2	F	1.75	113.0	170.7	F	278.9
	Southbound Through	17.0	B	0.70	54.2	21.9	C	345.3
Freshwater Road & Stamps Lane/ Oxen Pond Road		207.8	F			168.3	F	
Freshwater Road	Eastbound Through	288.7	F	1.57	443.5	207.6	F	364.0
	Eastbound Right - Turn					212.7	F	365.1
	Westbound Through	151.7	F	1.28	259.3	123.2	F	364.2
	Westbound Right - Turn					147.2	F	351.4
Stamps Lane/ Oxen Pond Road	Northbound Left - Turn	186.1	F	1.30	249.1	269.0	F	469.5
	Northbound Through					270.1	F	
	Northbound Right - Turn					270.9	F	
	Southbound Left - Turn	20.3	C	0.12	12.2	59.0	E	28.7
	Southbound Through	25.0	C	0.46	73.4	32.0	C	90.1

	Southbound Right - Turn	25.7	C	0.40	13.4	25.6	C	20.1
Freshwater Road & Thorburn Road		41.4	D			88.3	F	
Freshwater Road	Eastbound Through	74.7	E	1.07	266.0	188.3	F	173.7
	Westbound Through	8.6	A	0.77	30.1	17.7	B	401.7
	Westbound Right - Turn	21.4	C	0.98	216.2	83.7	F	129.8
Thorburn Road	Southbound Left - Turn	23.1	C	0.81	61.6	105.7	F	76.7
	Southbound Right - Turn	81.3	F	1.12	99.7	14.0	B	57.2
Allandale Road & Confederation Building Lot		17.8	B			72.0	E	
Confederation Building Lot	Westbound Left - Turn	47.4	D	0.61	38.6	256.4	F	116.9
	Westbound Right - Turn	32.9	C	0.86	30.5	23.7	C	101.1
Allandale Road	Northbound Through	18.1	B	0.64	89.6	15.8	B	85.1
	Northbound Right - Turn	3.1	A	0.36	0.2	5.2	A	13.4
	Southbound Left - Turn	29.9	C	0.66	30.6	35.7	D	180.4
	Southbound Through	3.4	A	0.45	22.2	117.2	F	229.8
Allandale Road & Higgins Line		16.6	B			35.7	D	
Higgins Line	Westbound Left - Turn	59.3	E	0.83	80.8	134.5	F	146.7
	Westbound Right - Turn	13.5	B	0.53	31.0	67.2	E	61.6
Allandale Road	Northbound Through	11.7	B	0.55	44.8	5.3	A	55.9
	Northbound Right - Turn	9.1	A	0.73	182.1	7.7	A	81.3
	Southbound Left - Turn	18.7	B	0.81	18.9	15.0	B	70.5
	Southbound Through	1.6	A	0.32	7.5	17.3	B	74.3
Allandale Road & Mt. Scio Road		44.5	D			29.9	C	
Allandale Road	Eastbound Left - Turn	93.4	F	0.98	66.2	47.6	D	70.1
	Eastbound Through	38.5	D	0.69	108.6	34.1	C	130.6
	Eastbound Right - Turn	11.0	B	0.64	53.0	15.6	B	75.7
	Westbound Left - Turn	52.6	D	0.78	48.0	34.5	C	31.4
	Westbound Through	32.7	C	0.90	73.9	23.4	C	61.5
Mt. Scio Road	Westbound Right - Turn	0.1	A	0.04	0.0	4.4	A	5.3
	Northbound Left - Turn	68.0	E	0.96	101.9	42.7	D	86.6
	Northbound Through	43.0	D	0.50	59.8	32.6	C	60.4
	Northbound Right - Turn	14.3	B	0.54	26.4	7.9	A	35.1
	Southbound Left - Turn	50.2	D	0.32	30.7	54.1	D	42.9
	Southbound Through	74.8	E	0.82	82.6	61.9	E	97.9
	Southbound Right - Turn	76.3	E	0.99	99.9	10.3	B	63.3
Outer Ring Road NB & Allandale Road		134.1	F			5.8	A	
Allandale Road	Eastbound Left - Turn	0.9	A	0.03	0.6	12.6	B	34.2
	Eastbound Through					2.6	A	
	Westbound Through	0.0	-	0.84	0.0	7.0	A	6.2
	Westbound Right - Turn	0.0	-	0.41	0.0	9.2	A	166.9
Outer Ring Road SB	Northbound Left - Turn	521.9	F	2.10	521.0	50.5	F	16.5
	Northbound Right - Turn	0.0	-	0.00	0.0	4.7	A	14.3
Outer Ring Road SB & Allandale Road		139.1	F			8.7	A	
Allandale Road	Eastbound Left - Turn	1.2	A	0.01	0.1	2.1	A	0.9
	Eastbound Through					0.5	A	
	Westbound Through	0.0	-	0.88	0.0	10.4	B	3.1
	Westbound Right - Turn					8.6	A	
Outer Ring Road SB	Southbound Left - Turn	463.0	F	1.95	349.3	9.3	A	51.1
	Southbound Right - Turn	0.0	-	0.00	0.0	5.7	A	16.3
New Connection & Clinch Crescent		8.6	A			40.4	D	
Clinch Crescent	Eastbound Left - Turn	49.3	D	0.65	52.5	70.3	E	47.1
	Eastbound Right - Turn	10.1	B	0.71	25.3	46.1	D	230.6
Clinch Crescent/ New Connection	Northbound Left - Turn	5.0	A	0.50	26.2	10.1	B	28.9
	Northbound Through					2.5	A	17.1
	Southbound Through	0.6	A	0.25	0.4	72.1	E	268.0
	Southbound Right - Turn					70.4	E	278.5
Mt. Scio Road & New Connection		9.6	A			21.2	C	
Mt. Scio Road	Eastbound Left - Turn	49.5	D	0.71	62.5	47.3	D	98.2
	Eastbound Right - Turn	9.8	A	0.15	8.7	27.8	C	26.6
Mt. Scio Road/ New Connection	Northbound Left - Turn	4.4	A	0.08	5.4	13.0	B	12.1
	Northbound Through	4.8	A	0.37	46.1	5.9	A	30.5
	Southbound Through	6.3	A	0.23	31.1	28.0	C	174.1
	Southbound Right - Turn	1.4	A	0.28	9.4	20.7	C	15.1

MUN Area Traffic Study
Allandale Road & Confederation Building Lot

Scenario 4A - 2025 PM

07/07/2015

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	 		 			 
Traffic Volume (vph)	267	305	1251	379	205	1025
Future Volume (vph)	267	305	1251	379	205	1025
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	4.0	4.0	4.0	3.5
Grade (%)	0%		0%			0%
Storage Length (m)	45.0	0.0		110.0	130.0	
Storage Lanes	1	1		1	1	
Taper Length (m)	2.5				2.5	
Lane Util. Factor	0.97	1.00	0.95	1.00	1.00	0.95
Ped Bike Factor						
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3395	1566	3697	1654	1848	3500
Flt Permitted	0.950				0.114	
Satd. Flow (perm)	3395	1566	3697	1654	222	3500
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		283		391		
Link Speed (k/h)	50		60			60
Link Distance (m)	100.1		513.4			163.6
Travel Time (s)	7.2		30.8			9.8
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.67	0.67	0.97	0.97	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Adj. Flow (vph)	399	455	1290	391	223	1114
Shared Lane Traffic (%)						
Lane Group Flow (vph)	399	455	1290	391	223	1114
Turn Type	Prot	Perm	NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2	6	
Total Split (s)	39.0	39.0	58.0	58.0	23.0	81.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Act Effect Green (s)	23.2	23.2	65.2	65.2	84.8	84.8
Actuated g/C Ratio	0.19	0.19	0.54	0.54	0.71	0.71
v/c Ratio	0.61	0.86	0.64	0.36	0.66	0.45
Control Delay	47.4	32.9	18.1	3.1	29.9	3.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	47.4	32.9	18.1	3.1	29.9	3.4
LOS	D	C	B	A	C	A
Approach Delay	39.7		14.6			7.8
Approach LOS	D		B			A
Stops (vph)	235	125	890	51	152	191
Fuel Used(l)	18	13	114	24	14	34
CO Emissions (g/hr)	326	250	2128	441	260	627



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
NOx Emissions (g/hr)	63	48	411	85	50	121
VOC Emissions (g/hr)	75	58	491	102	60	145
Dilemma Vehicles (#)	0	0	21	0	0	23
Queue Length 50th (m)	45.1	42.0	107.4	6.9	18.2	15.6
Queue Length 95th (m)	38.6	30.5	m89.6	m0.2	m30.6	22.2
Internal Link Dist (m)	76.1		489.4			139.6
Turn Bay Length (m)	45.0			110.0	130.0	
Base Capacity (vph)	933	635	2009	1077	388	2474
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	0.43	0.72	0.64	0.36	0.57	0.45

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 5 (4%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 17.8

Intersection LOS: B

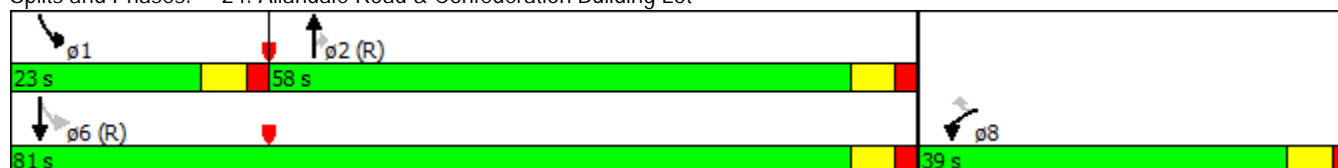
Intersection Capacity Utilization 69.3%

ICU Level of Service C

Analysis Period (min) 15

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

Splits and Phases: 24: Allandale Road & Confederation Building Lot



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	←←	←	→→	→	←	→→
Traffic Volume (vph)	510	238	857	699	364	721
Future Volume (vph)	510	238	857	699	364	721
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	4.0	4.0	3.5	3.5	4.0	3.5
Grade (%)	0%		3%			-3%
Storage Length (m)	0.0	40.0		80.0	80.0	
Storage Lanes	2	1		1	1	
Taper Length (m)	2.5				2.5	
Lane Util. Factor	0.97	1.00	0.95	1.00	1.00	0.95
Ped Bike Factor						
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3586	1654	3447	1542	1876	3552
Flt Permitted	0.950				0.194	
Satd. Flow (perm)	3586	1654	3447	1542	383	3552
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		210		622		
Link Speed (k/h)	50		60			60
Link Distance (m)	128.4		114.7			80.6
Travel Time (s)	9.2		6.9			4.8
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.96	0.96	0.88	0.88	0.88	0.88
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Adj. Flow (vph)	531	248	974	794	414	819
Shared Lane Traffic (%)						
Lane Group Flow (vph)	531	248	974	794	414	819
Turn Type	Prot	Perm	NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2	6	
Total Split (s)	29.0	29.0	60.0	60.0	31.0	91.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Act Effect Green (s)	21.5	21.5	61.8	61.8	86.5	86.5
Actuated g/C Ratio	0.18	0.18	0.52	0.52	0.72	0.72
v/c Ratio	0.83	0.53	0.55	0.73	0.81	0.32
Control Delay	59.3	13.5	11.7	8.2	18.7	1.6
Queue Delay	0.0	0.0	0.0	0.9	0.0	0.0
Total Delay	59.3	13.5	11.7	9.1	18.7	1.6
LOS	E	B	B	A	B	A
Approach Delay	44.7		10.6			7.4
Approach LOS	D		B			A
Stops (vph)	479	48	490	409	138	54
Fuel Used(l)	40	6	42	33	36	55
CO Emissions (g/hr)	748	120	788	612	669	1017



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
NOx Emissions (g/hr)	144	23	152	118	129	196
VOC Emissions (g/hr)	173	28	182	141	154	234
Dilemma Vehicles (#)	0	0	6	0	0	11
Queue Length 50th (m)	61.7	7.5	78.2	133.1	6.7	6.9
Queue Length 95th (m)	80.8	31.0	44.8	182.1	18.9	7.5
Internal Link Dist (m)	104.4		90.7			56.6
Turn Bay Length (m)		40.0		80.0	80.0	
Base Capacity (vph)	687	486	1775	1095	587	2561
Starvation Cap Reductn	0	0	0	110	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.77	0.51	0.55	0.81	0.71	0.32

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 24 (20%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 16.6

Intersection LOS: B

Intersection Capacity Utilization 73.4%

ICU Level of Service D

Analysis Period (min) 15

























Splits and Phases: 22: Allandale Road & Higgins Line















MUN Area Traffic Study
Allandale Road & Mt. Scio Road

Scenario 4A - 2025 PM

07/07/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	154	778	489	158	915	22	637	179	238	69	185	290
Future Volume (vph)	154	778	489	158	915	22	637	179	238	69	185	290
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	3.6	3.6	3.6	3.5	3.5	3.5	3.6	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	75.0		50.0	75.0		50.0	60.0		25.0	60.0		50.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1750	3500	1566	1770	3539	1583	3395	1842	1566	1770	1842	1566
Flt Permitted	0.100			0.174			0.950			0.950		
Satd. Flow (perm)	184	3500	1566	324	3539	1583	3395	1842	1566	1770	1842	1566
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			408			136			229			136
Link Speed (k/h)		60			60			60			50	
Link Distance (m)		358.1			559.6			454.0			111.1	
Travel Time (s)		21.5			33.6			27.2			8.0	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.96	0.96	0.96	0.82	0.82	0.82	0.78	0.78	0.78	0.87	0.87	0.87
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	160	810	509	193	1116	27	817	229	305	79	213	333
Shared Lane Traffic (%)												
Lane Group Flow (vph)	160	810	509	193	1116	27	817	229	305	79	213	333
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases	2		2	6		6			8			4
Total Split (s)	13.0	46.0	46.0	15.0	48.0	48.0	36.0	36.0	36.0	23.0	23.0	23.0
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	6.0
Act Effect Green (s)	47.0	40.0	40.0	51.0	42.0	42.0	30.0	30.0	30.0	17.0	17.0	17.0
Actuated g/C Ratio	0.39	0.33	0.33	0.42	0.35	0.35	0.25	0.25	0.25	0.14	0.14	0.14
v/c Ratio	0.98	0.69	0.64	0.78	0.90	0.04	0.96	0.50	0.54	0.32	0.82	0.99
Control Delay	93.4	38.5	11.0	52.6	32.7	0.1	68.0	43.0	14.3	50.2	74.8	76.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	93.4	38.5	11.0	52.6	32.7	0.1	68.0	43.0	14.3	50.2	74.8	76.3
LOS	F	D	B	D	C	A	E	D	B	D	E	E
Approach Delay		35.0			34.9			51.6			72.5	
Approach LOS		C			C			D			E	
Stops (vph)	86	658	105	94	592	0	574	151	60	62	168	151
Fuel Used(l)	19	68	23	21	108	2	77	18	14	5	16	23
CO Emissions (g/hr)	347	1274	423	387	2007	30	1431	332	259	89	305	436

Synchro 9 Report

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	67	246	82	75	387	6	276	64	50	17	59	84
VOC Emissions (g/hr)	80	294	98	89	463	7	330	77	60	21	70	101
Dilemma Vehicles (#)	0	32	0	0	51	0	0	8	0	0	0	0
Queue Length 50th (m)	22.6	86.6	16.9	23.9	42.8	0.0	98.4	46.4	14.2	16.9	49.3	49.1
Queue Length 95th (m)	#66.2	108.6	53.0	#48.0	73.9	m0.0	101.9	59.8	26.4	30.7	#82.6	#99.9
Internal Link Dist (m)		334.1			535.6			430.0			87.1	
Turn Bay Length (m)	75.0		50.0	75.0		50.0	60.0		25.0	60.0		50.0
Base Capacity (vph)	163	1166	794	246	1238	642	848	460	563	250	260	338
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.98	0.69	0.64	0.78	0.90	0.04	0.96	0.50	0.54	0.32	0.82	0.99

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 64 (53%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.99

Intersection Signal Delay: 44.5

Intersection LOS: D

Intersection Capacity Utilization 84.4%

ICU Level of Service E

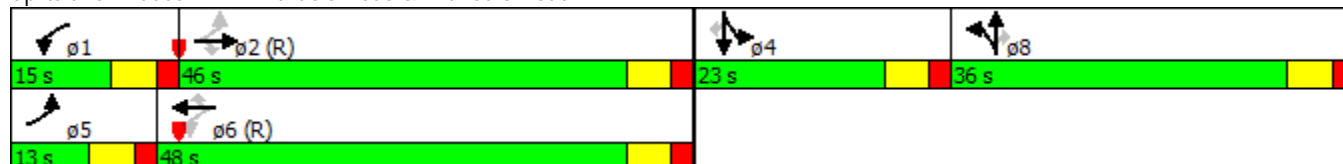
Analysis Period (min) 15

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.





























Splits and Phases: 11: Mt. Scio Road & Allandale Road















MUN Area Traffic Study
Prince Philip Drive & Allandale Road

Scenario 4A - 2025 PM

07/07/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 						 	 
Traffic Volume (vph)	534	1007	516	375	966	160	353	935	478	81	848	363
Future Volume (vph)	534	1007	516	375	966	160	353	935	478	81	848	363
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	3.8	3.8	3.0	3.7	3.7	3.5	3.5	3.5	3.0	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	200.0		120.0	65.0		25.0	70.0		0.0	42.0		35.0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	0.95	0.88
Ped Bike Factor			0.98			0.98	1.00		0.98			
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1652	3618	1619	1652	3579	1601	1750	1842	1566	1652	3500	2756
Flt Permitted	0.114			0.133			0.950			0.111		
Satd. Flow (perm)	198	3618	1593	231	3579	1575	1748	1842	1541	193	3500	2756
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			245			136			298			91
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		455.9			851.6			464.8			121.6	
Travel Time (s)		23.4			43.8			33.5			8.8	
Confl. Peds. (#/hr)	2		2	2		2	2		2	2		2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.94	0.94	0.94	0.91	0.91	0.91	0.94	0.94	0.94	0.84	0.84	0.84
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	568	1071	549	412	1062	176	376	995	509	96	1010	432
Shared Lane Traffic (%)												
Lane Group Flow (vph)	568	1071	549	412	1062	176	376	995	509	96	1010	432
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	Perm	NA	pt+ov
Protected Phases	5	2		1	6		7	4			8	8 5
Permitted Phases	2		2	6		6			4	8		
Total Split (s)	22.0	42.0	42.0	17.0	37.0	37.0	19.0	61.0	61.0	42.0	42.0	
Total Lost Time (s)	6.0	7.0	7.0	6.0	7.0	7.0	6.0	6.0	6.0	6.0	6.0	
Act Effect Green (s)	52.0	35.0	35.0	42.0	30.0	30.0	13.0	55.0	55.0	36.0	36.0	58.0
Actuated g/C Ratio	0.43	0.29	0.29	0.35	0.25	0.25	0.11	0.46	0.46	0.30	0.30	0.48
v/c Ratio	2.04	1.02	0.86	1.95	1.19	0.36	1.99	1.18	0.59	1.68	0.96	0.31
Control Delay	497.9	59.7	25.1	463.4	114.5	4.8	476.0	103.4	2.1	396.2	57.5	17.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	497.9	59.7	25.1	463.4	114.5	4.8	476.0	103.4	2.1	396.2	57.5	17.1
LOS	F	E	C	F	F	A	F	F	A	F	E	B
Approach Delay		164.8			189.9			150.5			67.3	
Approach LOS		F			F			F			E	
Stops (vph)	352	911	305	266	813	50	228	768	117	51	794	288
Fuel Used(l)	240	124	43	180	210	18	150	133	24	31	106	33
CO Emissions (g/hr)	4462	2299	791	3349	3907	327	2790	2472	455	571	1981	616

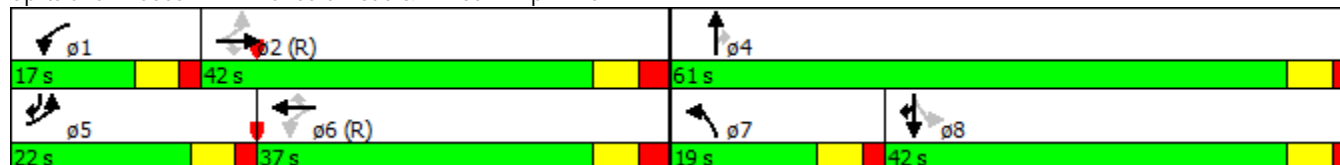
Synchro 9 Report

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	861	444	153	646	754	63	539	477	88	110	382	119
VOC Emissions (g/hr)	1029	530	182	772	901	75	644	570	105	132	457	142
Dilemma Vehicles (#)	0	39	0	0	6	0	0	0	0	0	0	0
Queue Length 50th (m)	~199.5	~139.7	71.5	~132.8	~162.0	10.5	~136.6	~281.6	12.3	~33.9	130.9	27.3
Queue Length 95th (m)	m#243.4	#183.3	m#118.0	m#156.9	m#183.8	m11.9	m#109.4	m183.4	m7.8	#63.2	#147.0	37.1
Internal Link Dist (m)		431.9			827.6			440.8			97.6	
Turn Bay Length (m)	200.0		120.0	65.0		25.0	70.0			42.0		35.0
Base Capacity (vph)	279	1055	638	211	894	495	189	844	867	57	1050	1379
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	2.04	1.02	0.86	1.95	1.19	0.36	1.99	1.18	0.59	1.68	0.96	0.31

Intersection Summary

Area Type: Other
 Cycle Length: 120
 Actuated Cycle Length: 120
 Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green, Master Intersection
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 2.04
 Intersection Signal Delay: 146.1 Intersection LOS: F
 Intersection Capacity Utilization 147.2% ICU Level of Service H
 Analysis Period (min) 15
 ~ 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.
 m Volume for 95th percentile queue is metered by upstream signal.


















Splits and Phases: 7: Allandale Road & Prince Philip Drive

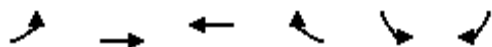






MUN Area Traffic Study
Allandale Road & TCH NB

Scenario 4A - 2025 PM

07/07/2015

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	576	0	0	1242	601	5	0	845	0	0	0
Future Volume (Veh/h)	8	576	0	0	1242	601	5	0	845	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.86	0.86	0.86	0.87	0.87	0.87	0.88	0.88	0.88	0.92	0.92	0.92
Hourly flow rate (vph)	9	670	0	0	1428	691	6	0	960	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)										13		
Median type	None				None							
Median storage (veh)												
Upstream signal (m)	358											
pX, platoon unblocked	0.67							0.67	0.67			
vC, conflicting volume	1428				670				2116	2116	670	2116
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1392				670				2422	2422	670	2422
tC, single (s)	4.1				4.1				7.1	6.5	6.2	7.1
tC, 2 stage (s)												
tF (s)	2.2				2.2				3.5	4.0	3.3	3.5
p0 queue free %	97				100				59	100	0	0
cM capacity (veh/h)	328				920				15	21	457	0
Direction, Lane #	EB 1	WB 1	WB 2	NB 1								
Volume Total	679	1428	691	966								
Volume Left	9	0	0	6								
Volume Right	0	0	691	960								
cSH	328	1700	1700	460								
Volume to Capacity	0.03	0.84	0.41	2.10								
Queue Length 95th (m)	0.6	0.0	0.0	521.0								
Control Delay (s)	0.9	0.0	0.0	521.9								
Lane LOS	A				F							
Approach Delay (s)	0.9	0.0			521.9							
Approach LOS					F							
Intersection Summary												
Average Delay				134.1								
Intersection Capacity Utilization				89.7%	ICU Level of Service				E			
Analysis Period (min)				15								


























Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	26	25	1222	559	7
Future Volume (Veh/h)	5	26	25	1222	559	7
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.62	0.62	0.83	0.83	0.85	0.85
Hourly flow rate (vph)	8	42	30	1472	658	8
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						3
Median type		None	None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	30				824	766
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	30				824	766
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				0	98
cM capacity (veh/h)	1583				341	403
Direction, Lane #	EB 1	WB 1	SB 1			
Volume Total	50	1502	666			
Volume Left	8	0	658			
Volume Right	0	1472	8			
cSH	1583	1700	342			
Volume to Capacity	0.01	0.88	1.95			
Queue Length 95th (m)	0.1	0.0	349.3			
Control Delay (s)	1.2	0.0	463.0			
Lane LOS	A		F			
Approach Delay (s)	1.2	0.0	463.0			
Approach LOS			F			
Intersection Summary						
Average Delay		139.1				
Intersection Capacity Utilization		114.6%		ICU Level of Service		H
Analysis Period (min)		15				

MUN Area Traffic Study
Bonaventure Avenue/ Allandale Road & Elizabeth Avenue

Scenario 4A - 2025 PM

07/07/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	185	651	79	113	469	78	47	1108	195	125	1158	253
Future Volume (vph)	185	651	79	113	469	78	47	1108	195	125	1158	253
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	3.5	3.7	3.0	3.5	3.7	3.0	3.4	3.4	3.0	3.4	3.4
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	55.0		0.0	55.0		0.0	55.0		35.0	40.0		0.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt			0.850		0.979				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1652	1842	1601	1652	3426	0	1652	1821	1548	1652	1821	1548
Flt Permitted	0.195			0.148			0.080			0.078		
Satd. Flow (perm)	339	1842	1601	257	3426	0	139	1821	1548	136	1821	1548
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			136		15				136			136
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		335.6			298.1			241.6			464.8	
Travel Time (s)		24.2			21.5			17.4			33.5	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.97	0.97	0.97	0.95	0.95	0.95	0.90	0.90	0.90	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	191	671	81	119	494	82	52	1231	217	136	1259	275
Shared Lane Traffic (%)												
Lane Group Flow (vph)	191	671	81	119	576	0	52	1231	217	136	1259	275
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2		2	6			4		4	8		8
Total Split (s)	18.0	39.0	39.0	13.0	34.0		13.0	55.0	55.0	13.0	55.0	55.0
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
Act Effect Green (s)	44.7	33.0	33.0	35.3	28.3		56.0	49.0	49.0	57.2	51.6	51.6
Actuated g/C Ratio	0.37	0.28	0.28	0.29	0.24		0.47	0.41	0.41	0.48	0.43	0.43
v/c Ratio	0.75	1.33	0.15	0.76	0.70		0.34	1.66	0.30	0.89	1.61	0.37
Control Delay	47.1	197.8	6.9	57.5	46.3		21.0	328.8	10.2	36.8	299.5	7.1
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	47.1	197.8	6.9	57.5	46.3		21.0	328.8	10.2	36.8	299.5	7.1
LOS	D	F	A	E	D		C	F	B	D	F	A
Approach Delay		150.9			48.3			272.1			230.0	
Approach LOS		F			D			F			F	
Stops (vph)	184	525	22	79	480		24	770	50	87	813	109
Fuel Used(l)	27	167	8	10	46		2	323	7	11	336	15
CO Emissions (g/hr)	496	3100	143	186	851		44	6009	133	205	6254	279

MUN Area Traffic Study
Bonaventure Avenue/ Allandale Road & Elizabeth Avenue

Scenario 4A - 2025 PM

07/07/2015



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	96	598	28	36	164		9	1160	26	40	1207	54
VOC Emissions (g/hr)	114	715	33	43	196		10	1386	31	47	1443	64
Dilemma Vehicles (#)	0	0	0	0	0		0	0	0	0	0	0
Queue Length 50th (m)	45.3	~210.8	3.3	18.4	64.3		5.9	~421.0	11.7	16.1	~438.8	17.1
Queue Length 95th (m)	#75.2	#283.2	m12.6	#41.9	84.0		12.3	#499.9	28.7	m14.7	m#411.5	m15.4
Internal Link Dist (m)		311.6			274.1			217.6			440.8	
Turn Bay Length (m)	55.0			55.0			55.0		35.0	40.0		
Base Capacity (vph)	258	506	538	157	819		153	743	712	152	782	743
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	0.74	1.33	0.15	0.76	0.70		0.34	1.66	0.30	0.89	1.61	0.37

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 65 (54%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.66

Intersection Signal Delay: 201.3

Intersection LOS: F

Intersection Capacity Utilization 127.3%

ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

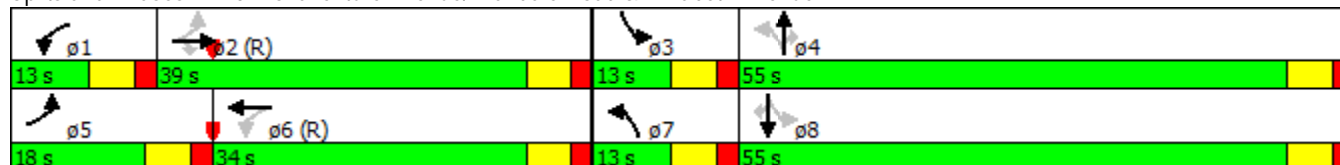
Queue shown is maximum after two cycles.
















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

Queue shown is maximum after two cycles.

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

Splits and Phases: 10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue



						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	 		 			 
Traffic Volume (vph)	592	269	583	606	73	664
Future Volume (vph)	592	269	583	606	73	664
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	4.0	4.0	4.0	3.7	3.7
Grade (%)	0%		0%			0%
Storage Length (m)	100.0	0.0		50.0	50.0	
Storage Lanes	1	1		1	1	
Taper Length (m)	2.5				2.5	
Lane Util. Factor	0.97	1.00	0.95	1.00	1.00	0.95
Ped Bike Factor	0.85	0.90		0.84	0.97	
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	3395	1591	3591	1591	1601	3579
Flt Permitted	0.950				0.300	
Satd. Flow (perm)	2896	1435	3591	1330	489	3579
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		245		730		
Link Speed (k/h)	50		60			60
Link Distance (m)	215.4		105.3			137.8
Travel Time (s)	15.5		6.3			8.3
Confl. Peds. (#/hr)	47	47		47	47	
Confl. Bikes (#/hr)						
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	6%	5%	6%	14%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Adj. Flow (vph)	713	324	702	730	88	800
Shared Lane Traffic (%)						
Lane Group Flow (vph)	713	324	702	730	88	800
Turn Type	Prot	Perm	NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2	6	
Total Split (s)	33.0	33.0	54.0	54.0	13.0	67.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Act Effect Green (s)	25.1	25.1	52.5	52.5	62.9	62.9
Actuated g/C Ratio	0.25	0.25	0.52	0.52	0.63	0.63
v/c Ratio	0.84	0.60	0.37	0.70	0.23	0.36
Control Delay	45.0	13.4	15.9	5.4	8.6	9.0
Queue Delay	0.0	0.0	0.7	0.8	0.0	0.0
Total Delay	45.0	13.4	16.6	6.3	8.6	9.0
LOS	D	B	B	A	A	A
Approach Delay	35.1		11.3			8.9
Approach LOS	D		B			A
Stops (vph)	545	70	338	57	26	280
Fuel Used(l)	45	10	23	10	3	30
CO Emissions (g/hr)	834	183	435	184	60	566



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
NOx Emissions (g/hr)	161	35	84	36	11	109
VOC Emissions (g/hr)	192	42	100	43	14	131
Dilemma Vehicles (#)	0	0	29	0	0	31
Queue Length 50th (m)	65.8	11.8	44.6	0.0	6.5	36.9
Queue Length 95th (m)	77.7	30.0	52.6	10.3	9.6	34.5
Internal Link Dist (m)	191.4		81.3			113.8
Turn Bay Length (m)	100.0			50.0	50.0	
Base Capacity (vph)	916	566	1884	1045	385	2250
Starvation Cap Reductn	0	0	787	110	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.78	0.57	0.64	0.78	0.23	0.36

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 1 (1%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 18.1

Intersection LOS: B

Intersection Capacity Utilization 58.6%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 59: Clinch Crescent & Arctic Avenue





Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	173	409	142	710	329	236
Future Volume (vph)	173	409	142	710	329	236
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.7	3.7	3.7	3.7	3.7	3.7
Grade (%)	0%			0%	0%	
Storage Length (m)	50.0	0.0	0.0			0.0
Storage Lanes	1	1	0			0
Taper Length (m)	2.5		2.5			
Lane Util. Factor	1.00	1.00	0.95	0.95	0.95	0.95
Ped Bike Factor						
Frt		0.850			0.937	
Flt Protected	0.950			0.992		
Satd. Flow (prot)	1789	1601	0	3550	3353	0
Flt Permitted	0.950			0.716		
Satd. Flow (perm)	1789	1601	0	2562	3353	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		445			257	
Link Speed (k/h)	50			60	60	
Link Distance (m)	538.8			167.6	737.1	
Travel Time (s)	38.8			10.1	44.2	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	188	445	154	772	358	257
Shared Lane Traffic (%)						
Lane Group Flow (vph)	188	445	0	926	615	0
Turn Type	Prot	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Total Split (s)	36.0	36.0	64.0	64.0	64.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0	
Act Effect Green (s)	16.2	16.2		71.8	71.8	
Actuated g/C Ratio	0.16	0.16		0.72	0.72	
v/c Ratio	0.65	0.71		0.50	0.25	
Control Delay	49.3	10.1		5.0	0.6	
Queue Delay	0.0	0.0		0.0	0.0	
Total Delay	49.3	10.1		5.0	0.6	
LOS	D	B		A	A	
Approach Delay	21.7			5.0	0.6	
Approach LOS	C			A	A	
Stops (vph)	156	44		247	17	
Fuel Used(l)	23	36		34	37	
CO Emissions (g/hr)	437	667		630	689	



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
NOx Emissions (g/hr)	84	129		122	133	
VOC Emissions (g/hr)	101	154		145	159	
Dilemma Vehicles (#)	0	0		24	28	
Queue Length 50th (m)	34.7	0.0		14.2	0.0	
Queue Length 95th (m)	52.5	25.3		26.2	0.4	
Internal Link Dist (m)	514.8			143.6	713.1	
Turn Bay Length (m)	50.0					
Base Capacity (vph)	536	791		1840	2481	
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	0.35	0.56		0.50	0.25	

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 9 (9%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.71

Intersection Signal Delay: 8.6

Intersection LOS: A

Intersection Capacity Utilization 69.2%

ICU Level of Service C

Analysis Period (min) 15





























Splits and Phases: 5: Clinch Crescent & New Connection















MUN Area Traffic Study
Prince Philip Drive & Thorburn Road

Scenario 4A - 2025 PM

07/07/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			  			 		 	 	
Traffic Volume (vph)	549	1201	339	298	1577	497	0	1127	70	439	1074	894
Future Volume (vph)	549	1201	339	298	1577	497	0	1127	70	439	1074	894
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.8	4.2	3.5	3.8	4.0	2.4	3.8	4.3	3.5	3.8	3.8
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	175.0		0.0	110.0		90.0	0.0		0.0	150.0		150.0
Storage Lanes	1		1	1		0	0		0	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.95	0.95	0.97	0.95	0.95
Ped Bike Factor			0.98			0.98		1.00		1.00	0.99	
Frt			0.850			0.850		0.991			0.932	
Flt Protected	0.950			0.950						0.950		
Satd. Flow (prot)	1750	3618	1689	1750	5198	1654	0	3582	0	3395	3347	0
Flt Permitted	0.100			0.118						0.950		
Satd. Flow (perm)	184	3618	1662	217	5198	1627	0	3582	0	3389	3347	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			145			227		5			208	
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		327.2			152.5			152.8			386.6	
Travel Time (s)		16.8			7.8			11.0			27.8	
Confl. Peds. (#/hr)	2		2	2		2	2		2	2		2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.96	0.96	0.96	0.95	0.95	0.95	0.91	0.91	0.91	0.91	0.91	0.91
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	572	1251	353	314	1660	523	0	1238	77	482	1180	982
Shared Lane Traffic (%)												
Lane Group Flow (vph)	572	1251	353	314	1660	523	0	1315	0	482	2162	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm		NA		Prot	NA	
Protected Phases	5	2		1	6			4		3	8	
Permitted Phases	2		2	6		6						
Total Split (s)	24.0	48.0	48.0	17.0	41.0	41.0		38.0		17.0	55.0	
Total Lost Time (s)	6.0	7.0	7.0	6.0	7.0	7.0		7.0		6.0	7.0	
Act Effect Green (s)	59.0	41.0	41.0	46.0	34.0	34.0		31.0		11.0	48.0	
Actuated g/C Ratio	0.49	0.34	0.34	0.38	0.28	0.28		0.26		0.09	0.40	
v/c Ratio	1.76	1.01	0.53	1.41	1.13	0.84		1.42		1.55	1.48	
Control Delay	379.9	68.1	21.4	221.9	90.0	22.9		222.5		299.2	246.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0	0.0	
Total Delay	379.9	68.1	21.4	221.9	90.0	22.9		222.5		299.2	246.0	
LOS	F	E	C	F	F	C		F		F	F	
Approach Delay		142.5			92.5			222.5			255.7	
Approach LOS		F			F			F			F	
Stops (vph)	318	1071	162	216	1397	390		909		321	1326	
Fuel Used(l)	189	142	22	75	247	50		251		124	474	
CO Emissions (g/hr)	3517	2641	404	1391	4590	928		4664		2314	8823	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	679	510	78	268	886	179		900		447	1703	
VOC Emissions (g/hr)	811	609	93	321	1059	214		1076		534	2035	
Dilemma Vehicles (#)	0	47	0	0	9	0		0		0	0	
Queue Length 50th (m)	~186.7	~158.0	38.4	~82.3	~170.8	89.0		~221.3		~82.4	~355.2	
Queue Length 95th (m)	#254.5	#205.0	67.4	m#82.3	m#162.3	m84.1		m#228.4		#115.2	#397.4	
Internal Link Dist (m)		303.2			128.5			128.8			362.6	
Turn Bay Length (m)	175.0			110.0		90.0				150.0		
Base Capacity (vph)	325	1236	663	223	1472	623		929		311	1463	
Starvation Cap Reductn	0	0	0	0	0	0		0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0		0		0	0	
Storage Cap Reductn	0	0	0	0	0	0		0		0	0	
Reduced v/c Ratio	1.76	1.01	0.53	1.41	1.13	0.84		1.42		1.55	1.48	

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 39 (33%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.76

Intersection Signal Delay: 174.9

Intersection LOS: F

Intersection Capacity Utilization 136.0%

ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

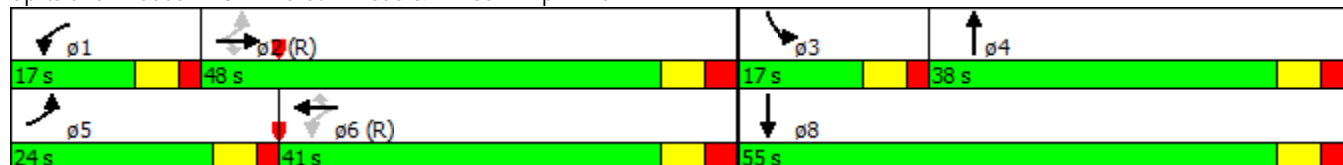
Queue shown is maximum after two cycles.












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

Queue shown is maximum after two cycles.

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

Splits and Phases: 37: Thorburn Road & Prince Philip Drive



						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	959	117	347	856	75	224
Future Volume (Veh/h)	959	117	347	856	75	224
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.93	0.93	0.90	0.90
Hourly flow rate (vph)	1066	130	373	920	83	249
Pedestrians	2			2	6	
Lane Width (m)	3.7			3.7	3.7	
Walking Speed (m/s)	1.2			1.2	1.2	
Percent Blockage	0			0	1	
Right turn flare (veh)						13
Median type	None			None		
Median storage veh						
Upstream signal (m)	343					
pX, platoon unblocked						
vC, conflicting volume			1202		2345	606
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1202		2345	606
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			35		0	43
cM capacity (veh/h)			573		11	437
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1
Volume Total	711	485	373	460	460	332
Volume Left	0	0	373	0	0	83
Volume Right	0	130	0	0	0	249
cSH	1700	1700	573	1700	1700	40
Volume to Capacity	0.42	0.29	0.65	0.27	0.27	8.37
Queue Length 95th (m)	0.0	0.0	35.7	0.0	0.0	Err
Control Delay (s)	0.0	0.0	22.2	0.0	0.0	Err
Lane LOS			C			F
Approach Delay (s)	0.0		6.4			Err
Approach LOS						F
Intersection Summary						
Average Delay			1179.7			
Intersection Capacity Utilization			64.3%	ICU Level of Service		C
Analysis Period (min)			15			

MUN Area Traffic Study
Freshwater Road & Elizabeth Avenue

Scenario 4A - 2025 PM

07/07/2015

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	99	968	1051	32	1156	806
Future Volume (vph)	99	968	1051	32	1156	806
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.7	4.5	3.4	3.7	3.0	3.4
Grade (%)	0%		0%			0%
Storage Length (m)	0.0	50.0		50.0	50.0	
Storage Lanes	1	1		1	1	
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	0.88	1.00	1.00	0.97	1.00
Ped Bike Factor				0.97	0.99	
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1789	3065	1821	1601	3204	1821
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1789	3065	1821	1550	3182	1821
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		42		12		
Link Speed (k/h)	50		50			50
Link Distance (m)	279.7		216.7			273.7
Travel Time (s)	20.1		15.6			19.7
Confl. Peds. (#/hr)				9	9	
Confl. Bikes (#/hr)						
Peak Hour Factor	0.88	0.88	0.91	0.91	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Adj. Flow (vph)	113	1100	1155	35	1257	876
Shared Lane Traffic (%)						
Lane Group Flow (vph)	113	1100	1155	35	1257	876
Turn Type	Prot	pt+ov	NA	Perm	Prot	NA
Protected Phases	8	8 1	2		1	6
Permitted Phases				2		
Total Split (s)	31.0		56.0	56.0	33.0	89.0
Total Lost Time (s)	6.0		6.0	6.0	6.0	6.0
Act Effect Green (s)	25.0	58.0	50.0	50.0	27.0	83.0
Actuated g/C Ratio	0.21	0.48	0.42	0.42	0.22	0.69
v/c Ratio	0.30	0.73	1.52	0.05	1.75	0.70
Control Delay	44.3	33.8	271.0	15.7	362.2	14.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	3.1
Total Delay	44.3	33.8	271.0	15.7	362.2	17.0
LOS	D	C	F	B	F	B
Approach Delay	34.8		263.5			220.4
Approach LOS	C		F			F
Stops (vph)	89	742	759	16	751	743
Fuel Used(l)	8	68	258	1	369	46
CO Emissions (g/hr)	149	1256	4796	26	6865	861



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
NOx Emissions (g/hr)	29	242	926	5	1325	166
VOC Emissions (g/hr)	34	290	1106	6	1583	199
Dilemma Vehicles (#)	0	0	0	0	0	0
Queue Length 50th (m)	24.4	120.8	~380.1	3.2	~223.2	212.4
Queue Length 95th (m)	m32.3	m141.3	#458.4	9.5 m	#113.0	m54.2
Internal Link Dist (m)	255.7		192.7			249.7
Turn Bay Length (m)		50.0		50.0	50.0	
Base Capacity (vph)	372	1503	758	652	720	1259
Starvation Cap Reductn	0	0	0	0	0	273
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.30	0.73	1.52	0.05	1.75	0.89

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 61 (51%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.75

Intersection Signal Delay: 182.1

Intersection LOS: F

Intersection Capacity Utilization 124.1%

ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

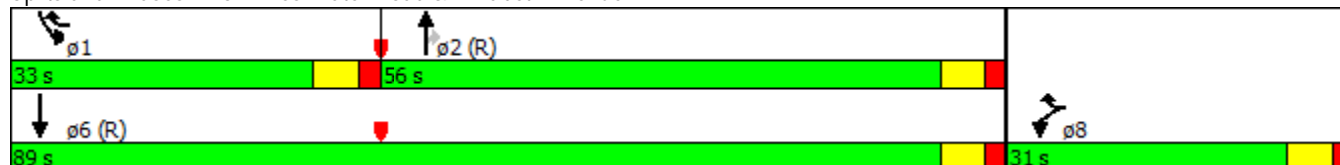
Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

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

Splits and Phases: 51: Freshwater Road & Elizabeth Avenue



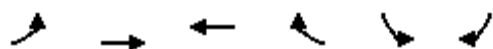


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	60	1018	865	66	57	79
Future Volume (Veh/h)	60	1018	865	66	57	79
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.90	0.90	0.94	0.94	0.83	0.83
Hourly flow rate (vph)	67	1131	920	70	69	95
Pedestrians		18	27		17	
Lane Width (m)		3.0	3.7		4.5	
Walking Speed (m/s)		1.2	1.2		1.2	
Percent Blockage		1	2		2	
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (m)		280				
pX, platoon unblocked						
vC, conflicting volume	1007				1698	530
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1007				1698	530
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	90				4	80
cM capacity (veh/h)	672				72	479
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1
Volume Total	67	566	566	613	377	164
Volume Left	67	0	0	0	0	69
Volume Right	0	0	0	0	70	95
cSH	672	1700	1700	1700	1700	142
Volume to Capacity	0.10	0.33	0.33	0.36	0.22	1.16
Queue Length 95th (m)	2.5	0.0	0.0	0.0	0.0	71.2
Control Delay (s)	11.0	0.0	0.0	0.0	0.0	186.7
Lane LOS	B					F
Approach Delay (s)	0.6			0.0		186.7
Approach LOS						F
Intersection Summary						
Average Delay			13.3			
Intersection Capacity Utilization			50.4%		ICU Level of Service	A
Analysis Period (min)			15			

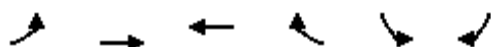
MUN Area Traffic Study
Westerland Road & Elizabeth Avenue

Scenario 4A - 2025 PM

07/07/2015



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	422	668	695	359	247	579
Future Volume (vph)	422	668	695	359	247	579
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	2.8	3.0	3.6	3.7	3.4	3.4
Grade (%)		0%	0%		0%	
Storage Length (m)	35.0			0.0	0.0	70.0
Storage Lanes	1			0	1	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	0.95	0.95	0.95	1.00	1.00
Ped Bike Factor						
Frt			0.949			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1612	3303	3359	0	1730	1548
Flt Permitted	0.078				0.950	
Satd. Flow (perm)	132	3303	3359	0	1730	1548
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			86			473
Link Speed (k/h)		50	50		50	
Link Distance (m)		402.3	566.1		375.0	
Travel Time (s)		29.0	40.8		27.0	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.96	0.96	0.88	0.88	0.89	0.89
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	440	696	790	408	278	651
Shared Lane Traffic (%)						
Lane Group Flow (vph)	440	696	1198	0	278	651
Turn Type	pm+pt	NA	NA		Prot	Perm
Protected Phases	5	2	6		8	
Permitted Phases	2					8
Total Split (s)	35.0	84.0	49.0		36.0	36.0
Total Lost Time (s)	6.0	6.0	6.0		6.0	6.0
Act Effect Green (s)	82.3	82.3	45.5		25.7	25.7
Actuated g/C Ratio	0.69	0.69	0.38		0.21	0.21
v/c Ratio	0.94	0.31	0.90		0.75	0.93
Control Delay	18.2	1.7	32.5		27.2	14.4
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	18.2	1.7	32.5		27.2	14.4
LOS	B	A	C		C	B
Approach Delay		8.1	32.5		18.2	
Approach LOS		A	C		B	
Stops (vph)	103	53	671		148	367
Fuel Used(l)	24	28	132		17	35
CO Emissions (g/hr)	453	513	2449		321	656



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
NOx Emissions (g/hr)	87	99	473		62	127
VOC Emissions (g/hr)	104	118	565		74	151
Dilemma Vehicles (#)	0	0	0		0	0
Queue Length 50th (m)	13.0	7.0	72.7		23.8	125.2
Queue Length 95th (m)	m6.5	m5.2	#168.1		m18.1	m0.5
Internal Link Dist (m)		378.3	542.1		351.0	
Turn Bay Length (m)	35.0					70.0
Base Capacity (vph)	469	2263	1327		432	741
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	0.94	0.31	0.90		0.64	0.88

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 113 (94%), Referenced to phase 2:EBTL and 6:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.94

Intersection Signal Delay: 19.9

Intersection LOS: B

Intersection Capacity Utilization 82.8%

ICU Level of Service E

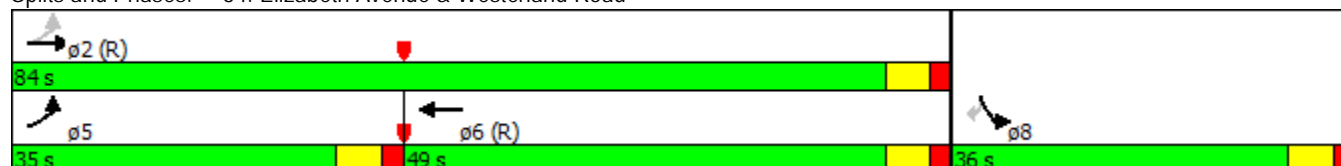
Analysis Period (min) 15

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.

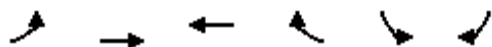
Splits and Phases: 34: Elizabeth Avenue & Westerland Road



MUN Area Traffic Study
Freshwater Road & Thorburn Road

Scenario 4A - 2025 PM

07/07/2015



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑	↑	↑↑	↑
Traffic Volume (vph)	0	1509	1172	1197	1052	659
Future Volume (vph)	0	1509	1172	1197	1052	659
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.7	3.7	3.7	3.7	3.7	3.7
Grade (%)		0%	0%		0%	
Storage Length (m)	0.0			100.0	0.0	0.0
Storage Lanes	0			1	2	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	0.95	0.95	1.00	0.97	1.00
Ped Bike Factor				0.94	0.93	0.97
Frt				0.850		0.850
Flt Protected					0.950	
Satd. Flow (prot)	0	3579	3579	1601	3471	1601
Flt Permitted					0.950	
Satd. Flow (perm)	0	3579	3579	1511	3237	1550
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				1091		23
Link Speed (k/h)		50	50		50	
Link Distance (m)		173.6	374.8		70.3	
Travel Time (s)		12.5	27.0		5.1	
Confl. Peds. (#/hr)	20			20	18	9
Confl. Bikes (#/hr)						
Peak Hour Factor	0.88	0.88	0.95	0.95	0.83	0.83
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	0	1715	1234	1260	1267	794
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1715	1234	1260	1267	794
Turn Type		NA	NA	Perm	Prot	Perm
Protected Phases		4	8		6	
Permitted Phases				8		6
Total Split (s)		60.0	60.0	60.0	60.0	60.0
Total Lost Time (s)		6.0	6.0	6.0	6.0	6.0
Act Effect Green (s)		54.0	54.0	54.0	54.0	54.0
Actuated g/C Ratio		0.45	0.45	0.45	0.45	0.45
v/c Ratio		1.07	0.77	0.98	0.81	1.12
Control Delay		74.7	8.6	21.4	23.1	81.3
Queue Delay		0.0	0.0	0.0	0.0	0.0
Total Delay		74.7	8.6	21.4	23.1	81.3
LOS		E	A	C	C	F
Approach Delay		74.7	15.0		45.5	
Approach LOS		E	B		D	
Stops (vph)		1322	528	932	713	488
Fuel Used(l)		141	61	83	57	66
CO Emissions (g/hr)		2627	1140	1548	1060	1230



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
NOx Emissions (g/hr)		507	220	299	205	237
VOC Emissions (g/hr)		606	263	357	244	284
Dilemma Vehicles (#)		0	0	0	0	0
Queue Length 50th (m)		~234.6	47.6	284.6	93.7	~209.5
Queue Length 95th (m)		#266.0	m30.1	m216.2	m61.6	m99.7
Internal Link Dist (m)		149.6	350.8		46.3	
Turn Bay Length (m)				100.0		
Base Capacity (vph)		1610	1610	1280	1561	710
Starvation Cap Reductn		0	0	0	1	0
Spillback Cap Reductn		0	0	0	0	0
Storage Cap Reductn		0	0	0	0	0
Reduced v/c Ratio		1.07	0.77	0.98	0.81	1.12

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 25 (21%), Referenced to phase 4:EBT and 8:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.12

Intersection Signal Delay: 41.4

Intersection LOS: D

Intersection Capacity Utilization 84.1%

ICU Level of Service E

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

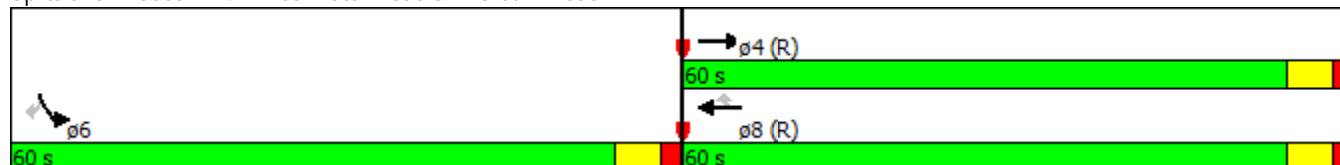
Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

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

Splits and Phases: 47: Freshwater Road & Thorburn Road





Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	215	47	43	839	518	315
Future Volume (vph)	215	47	43	839	518	315
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.7	3.7	3.7	3.7	3.7	3.7
Grade (%)	0%			0%	0%	
Storage Length (m)	0.0	50.0	100.0			100.0
Storage Lanes	1	1	1			1
Taper Length (m)	2.5		2.5			
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Ped Bike Factor						
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1789	1601	1789	3579	3579	1601
Flt Permitted	0.950		0.441			
Satd. Flow (perm)	1789	1601	831	3579	3579	1601
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		51				342
Link Speed (k/h)	50			60	60	
Link Distance (m)	325.6			737.1	454.0	
Travel Time (s)	23.4			44.2	27.2	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	234	51	47	912	563	342
Shared Lane Traffic (%)						
Lane Group Flow (vph)	234	51	47	912	563	342
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases		4	2			6
Total Split (s)	41.0	41.0	59.0	59.0	59.0	59.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Act Effect Green (s)	18.5	18.5	69.5	69.5	69.5	69.5
Actuated g/C Ratio	0.18	0.18	0.70	0.70	0.70	0.70
v/c Ratio	0.71	0.15	0.08	0.37	0.23	0.28
Control Delay	49.5	9.8	4.4	4.8	6.3	1.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	49.5	9.8	4.4	4.8	6.3	1.4
LOS	D	A	A	A	A	A
Approach Delay	42.4			4.8	4.5	
Approach LOS	D			A	A	
Stops (vph)	195	10	10	248	179	15
Fuel Used(l)	19	2	3	65	29	13
CO Emissions (g/hr)	357	38	60	1206	534	246



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
NOx Emissions (g/hr)	69	7	12	233	103	48
VOC Emissions (g/hr)	82	9	14	278	123	57
Dilemma Vehicles (#)	0	0	0	34	26	0
Queue Length 50th (m)	42.9	0.0	1.5	16.2	18.1	0.0
Queue Length 95th (m)	62.5	8.7	m5.4	46.1	31.1	9.4
Internal Link Dist (m)	301.6			713.1	430.0	
Turn Bay Length (m)		50.0	100.0			100.0
Base Capacity (vph)	626	593	577	2486	2486	1216
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	0.37	0.09	0.08	0.37	0.23	0.28

Intersection Summary

Area Type: Other

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 74 (74%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.71

Intersection Signal Delay: 9.6

Intersection LOS: A

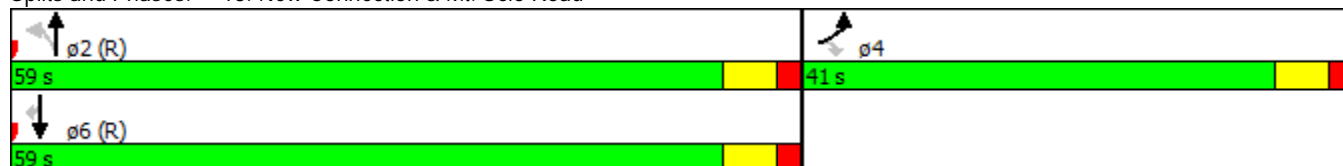
Intersection Capacity Utilization 49.6%

ICU Level of Service A

Analysis Period (min) 15

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
























Splits and Phases: 13: New Connection & Mt. Scio Road



MUN Area Traffic Study
Prince Philip Drive & Westerland Road/ Clinch Crescent

Scenario 4A - 2025 PM

07/07/2015













												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	518	1114	168	106	1304	159	196	512	217	160	581	515
Future Volume (vph)	518	1114	168	106	1304	159	196	512	217	160	581	515
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	4.0	3.5	3.5	3.5	3.5	3.0	3.0	3.5	3.3	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	75.0		185.0	90.0		0.0	60.0		45.0	0.0		80.0
Storage Lanes	1		1	1		0	1		1	1		1
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.88		1.00				0.69			0.98
Frt			0.850		0.984				0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1750	3697	1566	1750	3438	0	1652	1739	1566	1711	1842	1566
Flt Permitted	0.091			0.105			0.121			0.121		
Satd. Flow (perm)	168	3697	1381	193	3438	0	210	1739	1087	218	1842	1541
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			189		11				200			206
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		591.3			489.3			375.0			105.3	
Travel Time (s)		30.4			25.2			27.0			7.6	
Confl. Peds. (#/hr)	2		30	30		2	2		150	150		2
Confl. Bikes (#/hr)												
Peak Hour Factor	0.89	0.89	0.89	0.92	0.92	0.92	0.89	0.89	0.89	0.76	0.76	0.76
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	582	1252	189	115	1417	173	220	575	244	211	764	678
Shared Lane Traffic (%)												
Lane Group Flow (vph)	582	1252	189	115	1590	0	220	575	244	211	764	678
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases	2		2	6			4		4	8		8
Total Split (s)	22.0	54.0	54.0	13.0	45.0		13.0	40.0	40.0	13.0	40.0	40.0
Total Lost Time (s)	6.0	7.0	7.0	6.0	7.0		6.0	7.0	7.0	6.0	7.0	7.0
Act Effect Green (s)	61.0	47.0	47.0	46.0	38.0		41.0	33.0	33.0	41.0	33.0	33.0
Actuated g/C Ratio	0.51	0.39	0.39	0.38	0.32		0.34	0.28	0.28	0.34	0.28	0.28
v/c Ratio	1.97	0.87	0.29	0.70	1.45		1.42	1.20	0.55	1.31	1.51	1.18
Control Delay	469.5	51.0	12.6	48.4	228.4		235.2	135.6	8.8	204.3	272.0	127.1
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	2.3	0.9
Total Delay	469.5	51.0	12.6	48.4	228.4		235.2	135.6	8.8	204.3	274.3	128.1
LOS	F	D	B	D	F		F	F	A	F	F	F
Approach Delay		167.8			216.3			126.9			205.4	
Approach LOS		F			F			F			F	
Stops (vph)	340	972	56	55	1021		97	402	69	91	426	308
Fuel Used(l)	227	140	12	11	360		45	81	11	29	137	62
CO Emissions (g/hr)	4223	2604	226	197	6701		830	1501	200	536	2548	1161

Synchro 9 Report

MUN Area Traffic Study
Prince Philip Drive & Westerland Road/ Clinch Crescent

Scenario 4A - 2025 PM

07/07/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)	815	503	44	38	1293		160	290	39	103	492	224
VOC Emissions (g/hr)	974	601	52	45	1546		191	346	46	124	588	268
Dilemma Vehicles (#)	0	16	0	0	52		0	0	0	0	0	0
Queue Length 50th (m)	~203.1	140.7	10.5	12.4	~263.5		~53.6	~163.7	13.7	~47.9	~250.3	~154.9
Queue Length 95th (m)	#267.7	157.8	27.3	m#26.2	m#306.6		m#70.3	m#195.0	m18.0	#73.0	#253.2	#162.8
Internal Link Dist (m)		567.3			465.3			351.0			81.3	
Turn Bay Length (m)	75.0		185.0	90.0			60.0		45.0			80.0
Base Capacity (vph)	296	1447	655	164	1096		155	478	443	161	506	573
Starvation Cap Reductn	0	0	0	0	0		0	0	0	0	114	64
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	1.97	0.87	0.29	0.70	1.45		1.42	1.20	0.55	1.31	1.95	1.33

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 76 (63%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.97

Intersection Signal Delay: 183.7

Intersection LOS: F

Intersection Capacity Utilization 132.9%

ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

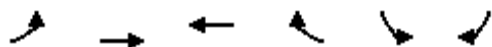
95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

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

Splits and Phases: 9: Westerland Road/Clinch Crescent & Prince Philip Drive





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	301	1480	1738	116	109	671
Future Volume (vph)	301	1480	1738	116	109	671
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	4.0	4.0	3.7	3.3	3.5
Grade (%)		0%	0%		0%	
Storage Length (m)	140.0			70.0	80.0	50.0
Storage Lanes	1			1	1	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	0.88
Ped Bike Factor				0.97	1.00	
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1652	3697	3697	1601	1711	2756
Flt Permitted	0.056				0.950	
Satd. Flow (perm)	97	3697	3697	1558	1704	2756
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				84		12
Link Speed (k/h)		70	70		50	
Link Distance (m)		289.0	591.3		277.4	
Travel Time (s)		14.9	30.4		20.0	
Confl. Peds. (#/hr)	2			2	2	2
Confl. Bikes (#/hr)						
Peak Hour Factor	0.90	0.90	0.87	0.87	0.80	0.80
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	334	1644	1998	133	136	839
Shared Lane Traffic (%)						
Lane Group Flow (vph)	334	1644	1998	133	136	839
Turn Type	pm+pt	NA	NA	Perm	Prot	pt+ov
Protected Phases	5	2	6		8	8 5
Permitted Phases	2			6		
Total Split (s)	24.0	96.0	72.0	72.0	24.0	
Total Lost Time (s)	6.0	7.0	7.0	7.0	6.0	
Act Effect Green (s)	90.0	89.0	65.0	65.0	18.0	42.0
Actuated g/C Ratio	0.75	0.74	0.54	0.54	0.15	0.35
v/c Ratio	1.09	0.60	1.00	0.15	0.53	0.86
Control Delay	118.8	2.2	24.0	2.9	55.5	46.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	118.8	2.2	24.0	2.9	55.5	46.4
LOS	F	A	C	A	E	D
Approach Delay		21.9	22.7		47.7	
Approach LOS		C	C		D	
Stops (vph)	433	232	1477	10	99	590
Fuel Used(l)	54	48	181	6	15	89
CO Emissions (g/hr)	997	884	3360	117	285	1659



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
NOx Emissions (g/hr)	192	171	648	23	55	320
VOC Emissions (g/hr)	230	204	775	27	66	383
Dilemma Vehicles (#)	0	9	12	0	0	0
Queue Length 50th (m)	~73.1	22.2	248.3	2.3	30.0	102.6
Queue Length 95th (m)	m#119.9	m25.1	m55.3	m0.4	44.1	110.0
Internal Link Dist (m)		265.0	567.3		253.4	
Turn Bay Length (m)	140.0			70.0	80.0	50.0
Base Capacity (vph)	306	2741	2002	882	256	972
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	1.09	0.60	1.00	0.15	0.53	0.86

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 95 (79%), Referenced to phase 2:EBTL and 6:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.09

Intersection Signal Delay: 27.2

Intersection LOS: C

Intersection Capacity Utilization 89.3%

ICU Level of Service E

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

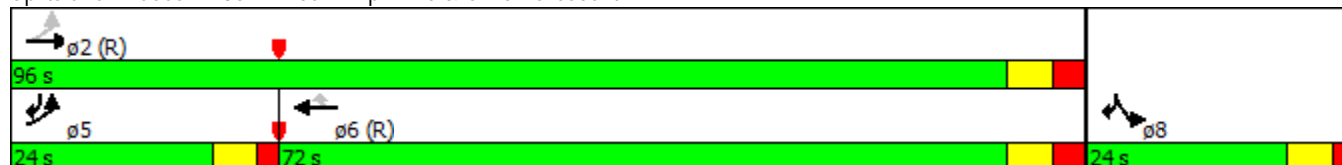
Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

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

Splits and Phases: 35: Prince Philip Drive & Clinch Crescent





Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	288	285	351	1216	1217	234
Future Volume (vph)	288	285	351	1216	1217	234
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	4.0	3.5	4.0	3.7	4.0
Grade (%)	0%			0%	0%	
Storage Length (m)	0.0	0.0	75.0			100.0
Storage Lanes	1	1	1			1
Taper Length (m)	2.5		2.5			
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Ped Bike Factor						
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1750	1654	1750	3697	3579	1654
Flt Permitted	0.950		0.071			
Satd. Flow (perm)	1750	1654	131	3697	3579	1654
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		351				266
Link Speed (k/h)	50			70	70	
Link Distance (m)	119.9			283.2	155.8	
Travel Time (s)	8.6			14.6	8.0	
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.73	0.73	0.89	0.89	0.87	0.87
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	395	390	394	1366	1399	269
Shared Lane Traffic (%)						
Lane Group Flow (vph)	395	390	394	1366	1399	269
Turn Type	Prot	Perm	pm+pt	NA	NA	Perm
Protected Phases	8		5	2	6	
Permitted Phases		8	2			6
Total Split (s)	35.0	35.0	29.0	85.0	56.0	56.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Act Effect Green (s)	28.5	28.5	79.5	79.5	50.0	50.0
Actuated g/C Ratio	0.24	0.24	0.66	0.66	0.42	0.42
v/c Ratio	0.95	0.59	0.98	0.56	0.94	0.32
Control Delay	79.2	10.1	71.5	6.2	46.6	3.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	79.2	10.1	71.5	6.2	46.6	3.8
LOS	E	B	E	A	D	A
Approach Delay	44.8			20.9	39.7	
Approach LOS	D			C	D	
Stops (vph)	255	44	459	328	1086	19
Fuel Used(l)	27	6	72	133	107	4
CO Emissions (g/hr)	494	120	1338	2466	1986	83



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
NOx Emissions (g/hr)	95	23	258	476	383	16
VOC Emissions (g/hr)	114	28	308	569	458	19
Dilemma Vehicles (#)	0	0	0	35	49	0
Queue Length 50th (m)	91.6	7.2	85.2	47.0	163.4	0.4
Queue Length 95th (m)	98.9	12.0	m#96.0	m47.5	#189.8	13.9
Internal Link Dist (m)	95.9			259.2	131.8	
Turn Bay Length (m)			75.0			100.0
Base Capacity (vph)	422	665	403	2448	1491	844
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	0.94	0.59	0.98	0.56	0.94	0.32

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 39 (33%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.98

Intersection Signal Delay: 32.8

Intersection LOS: C

Intersection Capacity Utilization 84.0%

ICU Level of Service E

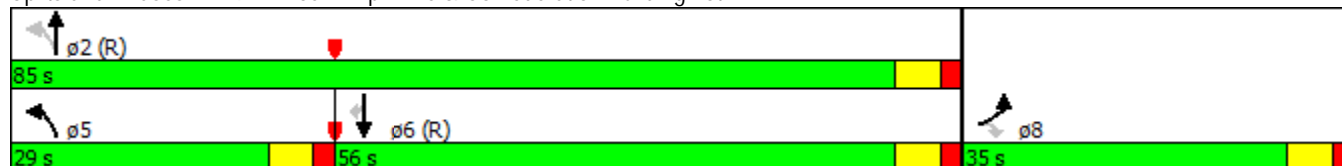
Analysis Period (min) 15

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.


Splits and Phases: 29: Prince Philip Drive & Confederation Building Lot

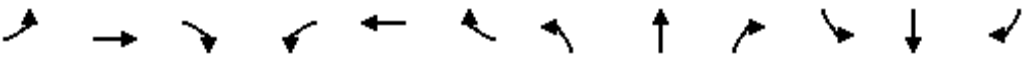


MUN Area Traffic Study
Prince Philip Drive & Morrissey Drive

Scenario 4A - 2025 PM

07/07/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑	↗				↖	↗	
Traffic Volume (vph)	0	1493	0	54	1336	293	0	0	0	236	160	234
Future Volume (vph)	0	1493	0	54	1336	293	0	0	0	236	160	234
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.8	3.8	3.8	3.0	3.8	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	0.0		0.0	70.0		30.0	0.0		0.0	40.0		0.0
Storage Lanes	0		0	1		1	0		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
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	1.00
Ped Bike Factor						0.95				0.97	0.96	
Frt						0.850					0.911	
Flt Protected				0.950						0.950		
Satd. Flow (prot)	0	3618	0	1652	3618	1566	0	0	0	1750	1617	0
Flt Permitted				0.059						0.950		
Satd. Flow (perm)	0	3618	0	103	3618	1483	0	0	0	1704	1617	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						154					40	
Link Speed (k/h)		70			70			50			50	
Link Distance (m)		489.3			455.9			114.5			292.8	
Travel Time (s)		25.2			23.4			8.2			21.1	
Confl. Peds. (#/hr)	2		2	10		10	25		25	25		25
Confl. Bikes (#/hr)												
Peak Hour Factor	0.91	0.91	0.91	0.92	0.92	0.92	0.69	0.69	0.69	0.89	0.89	0.89
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	1641	0	59	1452	318	0	0	0	265	180	263
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1641	0	59	1452	318	0	0	0	265	443	0
Turn Type		NA		pm+pt	NA	Perm				Prot	NA	
Protected Phases		2		1	6					3	8	
Permitted Phases				6		6						
Total Split (s)		66.0		13.0	79.0	79.0				41.0	41.0	
Total Lost Time (s)		7.0		6.0	7.0	7.0				7.0	7.0	
Act Effect Green (s)		62.9		74.3	73.3	73.3				32.7	32.7	
Actuated g/C Ratio		0.52		0.62	0.61	0.61				0.27	0.27	
v/c Ratio		0.87		0.38	0.66	0.33				0.56	0.94	
Control Delay		30.7		7.3	14.9	5.4				42.2	68.7	
Queue Delay		0.0		0.0	0.0	0.0				0.0	0.0	
Total Delay		30.7		7.3	14.9	5.4				42.2	68.7	
LOS		C		A	B	A				D	E	
Approach Delay		30.7			13.0						58.8	
Approach LOS		C			B						E	
Stops (vph)		863		27	1126	132				198	326	
Fuel Used(l)		133		3	114	18				19	39	
CO Emissions (g/hr)		2468		65	2128	333				347	727	

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)		476		13	411	64				67	140	
VOC Emissions (g/hr)		569		15	491	77				80	168	
Dilemma Vehicles (#)		137		0	5	0				0	0	
Queue Length 50th (m)		125.0		4.8	159.2	29.6				52.7	93.0	
Queue Length 95th (m)		m144.9		m4.8	m104.6	m22.4				78.4	#150.0	
Internal Link Dist (m)		465.3			431.9			90.5			268.8	
Turn Bay Length (m)				70.0		30.0				40.0		
Base Capacity (vph)		1894		154	2208	965				495	486	
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		0.87		0.38	0.66	0.33				0.54	0.91	

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 56 (47%), Referenced to phase 2:EBT and 6:WBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.94

Intersection Signal Delay: 27.7

Intersection LOS: C

Intersection Capacity Utilization 80.7%

ICU Level of Service D

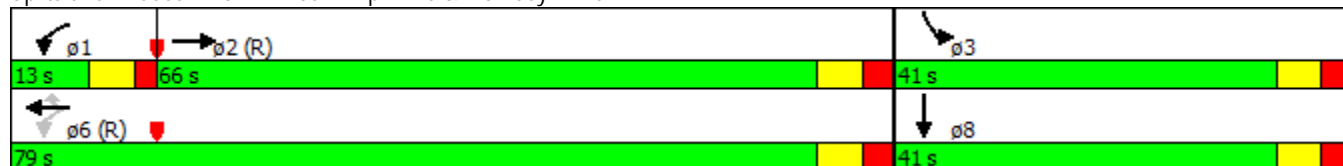
Analysis Period (min) 15

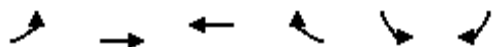
95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

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

Splits and Phases: 61: Prince Philip Drive & Morrissey Drive





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	21	1517	2135	274	265	83
Future Volume (vph)	21	1517	2135	274	265	83
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.0	4.0	4.0	4.0	3.0	3.0
Grade (%)		0%	0%		0%	
Storage Length (m)	50.0			0.0	60.0	0.0
Storage Lanes	1			0	1	1
Taper Length (m)	2.5				2.5	
Lane Util. Factor	1.00	0.95	0.95	0.95	1.00	1.00
Ped Bike Factor			1.00		1.00	0.98
Frt			0.983			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1652	3697	3623	0	1652	1478
Flt Permitted	0.048				0.950	
Satd. Flow (perm)	83	3697	3623	0	1645	1454
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			22			98
Link Speed (k/h)		70	70		50	
Link Distance (m)		204.4	289.0		276.1	
Travel Time (s)		10.5	14.9		19.9	
Confl. Peds. (#/hr)	2			2	2	2
Confl. Bikes (#/hr)						
Peak Hour Factor	0.90	0.90	0.96	0.96	0.85	0.85
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)		0%	0%		0%	
Adj. Flow (vph)	23	1686	2224	285	312	98
Shared Lane Traffic (%)						
Lane Group Flow (vph)	23	1686	2509	0	312	98
Turn Type	pm+pt	NA	NA		Prot	Perm
Protected Phases	5	2	6		8	
Permitted Phases	2					8
Total Split (s)	13.0	93.0	80.0		27.0	27.0
Total Lost Time (s)	6.0	6.0	6.0		6.0	6.0
Act Effect Green (s)	87.0	87.0	79.2		21.0	21.0
Actuated g/C Ratio	0.72	0.72	0.66		0.18	0.18
v/c Ratio	0.15	0.63	1.05		1.08	0.29
Control Delay	3.0	6.6	43.0		122.6	10.7
Queue Delay	0.0	0.0	3.3		0.0	0.0
Total Delay	3.0	6.6	46.3		122.6	10.7
LOS	A	A	D		F	B
Approach Delay		6.5	46.3		95.8	
Approach LOS		A	D		F	
Stops (vph)	5	1250	1686		222	14
Fuel Used(l)	1	136	210		37	3
CO Emissions (g/hr)	24	2527	3913		687	59



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
NOx Emissions (g/hr)	5	488	755		133	11
VOC Emissions (g/hr)	6	583	903		158	14
Dilemma Vehicles (#)	0	5	122		0	0
Queue Length 50th (m)	0.3	128.2	~187.0		~82.1	0.0
Queue Length 95th (m)	m0.3	m48.3 m#180.9			#125.2	12.5
Internal Link Dist (m)		180.4	265.0		252.1	
Turn Bay Length (m)	50.0				60.0	
Base Capacity (vph)	151	2680	2398		289	335
Starvation Cap Reductn	0	0	19		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.15	0.63	1.05		1.08	0.29

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 84 (70%), Referenced to phase 2:EBTL and 6:WBT, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.08

Intersection Signal Delay: 36.0

Intersection LOS: D

Intersection Capacity Utilization 92.5%

ICU Level of Service F

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

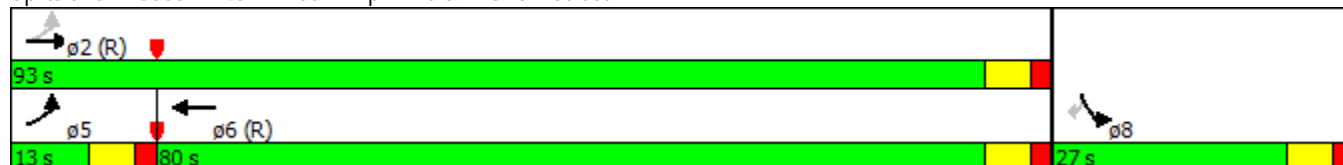
Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

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


















Splits and Phases: 40: Prince Philip Drive & Wicklow Street



MUN Area Traffic Study
Freshwater Road & Stamps Lane/ Oxen Pond Road

Scenario 4A - 2025 PM













07/07/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1831	424	0	1871	148	194	228	92	38	199	84
Future Volume (vph)	0	1831	424	0	1871	148	194	228	92	38	199	84
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (m)	3.5	3.5	3.5	4.0	4.0	4.0	3.0	3.0	3.0	2.6	2.9	2.9
Grade (%)		0%			0%			0%			0%	
Storage Length (m)	0.0		0.0	0.0		0.0	0.0		0.0	30.0		0.0
Storage Lanes	0		0	0		0	0		0	1		0
Taper Length (m)	2.5			2.5			2.5			2.5		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.972			0.989			0.976			0.955	
Flt Protected								0.981		0.950		
Satd. Flow (prot)	0	3402	0	0	3656	0	0	1633	0	1573	1618	0
Flt Permitted								0.739		0.404		
Satd. Flow (perm)	0	3402	0	0	3656	0	0	1230	0	669	1618	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		31			9			9			2	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		374.8			273.7			376.6			148.1	
Travel Time (s)		27.0			19.7			27.1			10.7	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.91	0.91	0.91	0.94	0.94	0.94	0.91	0.91	0.91	0.86	0.86	0.86
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	6%	3%	2%	4%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	2012	466	0	1990	157	213	251	101	44	231	98
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	2478	0	0	2147	0	0	565	0	44	329	0
Turn Type		NA			NA		Perm	NA		pm+pt	NA	
Protected Phases		8			4			2		1	6	
Permitted Phases							2			6		
Total Split (s)		61.0			61.0		43.0	43.0		16.0	59.0	
Total Lost Time (s)		6.0			6.0			6.0		6.0	6.0	
Act Effct Green (s)		55.0			55.0			41.8		53.0	53.0	
Actuated g/C Ratio		0.46			0.46			0.35		0.44	0.44	
v/c Ratio		1.57			1.28			1.30		0.12	0.46	
Control Delay		288.7			151.7			186.1		20.2	25.9	
Queue Delay		0.0			0.0			0.0		0.0	0.0	
Total Delay		288.7			151.7			186.1		20.3	25.9	
LOS		F			F			F		C	C	
Approach Delay		288.7			151.7			186.1			25.3	
Approach LOS		F			F			F			C	
Stops (vph)		1555			1594			365		22	192	
Fuel Used(l)		616			324			100		2	14	
CO Emissions (g/hr)		11459			6023			1863		30	259	

MUN Area Traffic Study
Freshwater Road & Stamps Lane/ Oxen Pond Road

Scenario 4A - 2025 PM

07/07/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
NOx Emissions (g/hr)		2212			1163			360		6	50	
VOC Emissions (g/hr)		2643			1389			430		7	60	
Dilemma Vehicles (#)		0			0			0		0	0	
Queue Length 50th (m)		~449.0			~335.4			~175.7		5.8	52.8	
Queue Length 95th (m)		m#443.5			m#259.3			#249.1		12.2	73.4	
Internal Link Dist (m)		350.8			249.7			352.6			124.1	
Turn Bay Length (m)										30.0		
Base Capacity (vph)		1576			1680			433		370	715	
Starvation Cap Reductn		0			0			0		0	0	
Spillback Cap Reductn		20			0			0		26	0	
Storage Cap Reductn		0			0			0		0	0	
Reduced v/c Ratio		1.59			1.28			1.30		0.13	0.46	

Intersection Summary

Area Type: Other

Cycle Length: 120

Actuated Cycle Length: 120

Offset: 73 (61%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.57

Intersection Signal Delay: 207.8

Intersection LOS: F

Intersection Capacity Utilization 123.1%

ICU Level of Service H

Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.

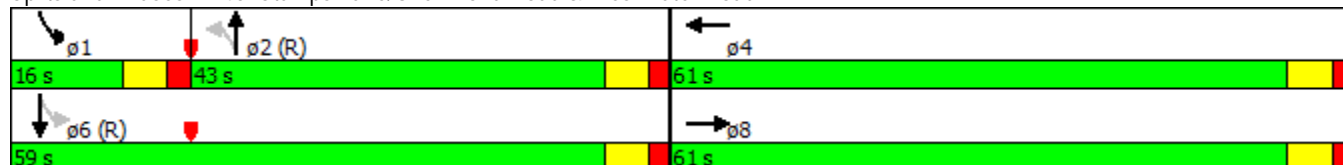
Queue shown is maximum after two cycles.

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

Queue shown is maximum after two cycles.

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

Splits and Phases: 46: Stamps Lane/Oxen Pond Road & Freshwater Road



Summary of All Intervals

Run Number	1	10	2	3	4	5	6
Start Time	4:30	4:30	4:30	4:30	4:30	4:30	4:30
End Time	6:00	6:00	6:00	6:00	6:00	6:00	6:00
Total Time (min)	90	90	90	90	90	90	90
Time Recorded (min)	60	60	60	60	60	60	60
# of Intervals	5	5	5	5	5	5	5
# of Recorded Intervals	4	4	4	4	4	4	4
Vehs Entered	15140	15008	15175	15493	15337	15013	15224
Vehs Exited	14825	14566	14681	15211	14930	14762	14833
Starting Vehs	1924	1909	1866	1974	1925	2029	1942
Ending Vehs	2239	2351	2360	2256	2332	2280	2333
Travel Distance (km)	27644	27652	27924	28179	28412	27914	27904
Travel Time (hr)	6609.4	6939.4	6954.9	6599.7	6315.4	6778.2	6960.1
Total Delay (hr)	6082.8	6413.2	6423.6	6062.3	5776.1	6246.7	6428.2
Total Stops	51423	52405	52881	53090	55348	52878	54483
Fuel Used (l)	7508.1	7783.8	7817.0	7527.9	7301.7	7650.5	7834.8

Summary of All Intervals

Run Number	7	8	9	Avg
Start Time	4:30	4:30	4:30	4:30
End Time	6:00	6:00	6:00	6:00
Total Time (min)	90	90	90	90
Time Recorded (min)	60	60	60	60
# of Intervals	5	5	5	5
# of Recorded Intervals	4	4	4	4
Vehs Entered	15383	12519	15607	14993
Vehs Exited	14849	10855	15105	14464
Starting Vehs	1853	2125	1827	1939
Ending Vehs	2387	3789	2329	2460
Travel Distance (km)	28078	19729	27928	27137
Travel Time (hr)	6781.5	8119.6	6368.5	6842.7
Total Delay (hr)	6246.2	7749.5	5835.5	6326.4
Total Stops	54063	37859	52210	51664
Fuel Used (l)	7673.3	8290.0	7320.4	7670.7

Interval #0 Information Seeding

Start Time	4:30
End Time	5:00
Total Time (min)	30
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording #1

Start Time	5:00
End Time	5:15
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	3806	3862	3819	3886	3834	3860	3837
Vehs Exited	3634	3612	3545	3771	3703	3631	3508
Starting Vehs	1924	1909	1866	1974	1925	2029	1942
Ending Vehs	2096	2159	2140	2089	2056	2258	2271
Travel Distance (km)	6893	6904	6891	7027	7236	7086	6792
Travel Time (hr)	1029.5	1066.0	1077.8	1048.6	988.5	1025.6	1081.7
Total Delay (hr)	897.8	934.4	946.8	914.1	851.5	891.0	952.7
Total Stops	12629	12609	12604	12520	13555	12600	12593
Fuel Used (l)	1339.7	1373.2	1380.6	1367.2	1325.9	1348.4	1380.2

Interval #1 Information Recording #1

Start Time	5:00
End Time	5:15
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	3859	3922	4047	3870
Vehs Exited	3617	3678	3776	3645
Starting Vehs	1853	2125	1827	1939
Ending Vehs	2095	2369	2098	2154
Travel Distance (km)	6978	7089	7066	6996
Travel Time (hr)	1067.9	1110.9	995.4	1049.2
Total Delay (hr)	934.9	976.4	860.6	916.0
Total Stops	12728	13645	12932	12839
Fuel Used (l)	1378.9	1425.0	1324.9	1364.4

Interval #2 Information Recording #2

Start Time	5:15
End Time	5:30
Total Time (min)	15
Volumes adjusted by PHF, Growth Factors.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	4125	4093	4154	4080	4130	4044	3971
Vehs Exited	3906	3748	3873	3925	3786	3848	3886
Starting Vehs	2096	2159	2140	2089	2056	2258	2271
Ending Vehs	2315	2504	2421	2244	2400	2454	2356
Travel Distance (km)	7074	7159	7227	7077	7136	7050	7092
Travel Time (hr)	1458.1	1522.4	1551.1	1471.1	1403.2	1508.1	1555.1
Total Delay (hr)	1322.7	1386.5	1413.3	1335.8	1267.5	1373.7	1419.4
Total Stops	13224	13498	13451	13433	13794	13770	13663
Fuel Used (l)	1719.8	1777.9	1810.5	1732.3	1680.4	1756.7	1809.5

Interval #2 Information Recording #2

Start Time	5:15
End Time	5:30
Total Time (min)	15
Volumes adjusted by PHF, Growth Factors.	

Run Number	7	8	9	Avg
Vehs Entered	4244	3881	4141	4086
Vehs Exited	3902	3394	3878	3814
Starting Vehs	2095	2369	2098	2154
Ending Vehs	2437	2856	2361	2429
Travel Distance (km)	7226	5839	7181	7006
Travel Time (hr)	1490.4	1614.1	1413.6	1498.7
Total Delay (hr)	1352.0	1504.3	1276.3	1365.1
Total Stops	13948	11245	13379	13342
Fuel Used (l)	1757.3	1773.2	1689.5	1750.7

Interval #3 Information Recording #3

Start Time	5:30
End Time	5:45
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	3701	3368	3546	3798	3723	3439	3711
Vehs Exited	3728	3537	3620	3760	3727	3590	3703
Starting Vehs	2315	2504	2421	2244	2400	2454	2356
Ending Vehs	2288	2335	2347	2282	2396	2303	2364
Travel Distance (km)	7044	6719	6993	7171	7142	6846	6982
Travel Time (hr)	1881.2	1991.0	1990.7	1892.3	1810.9	1958.3	2002.4
Total Delay (hr)	1747.4	1863.4	1858.2	1755.9	1675.0	1827.9	1868.9
Total Stops	13292	13004	13356	13712	14456	13257	13728
Fuel Used (l)	2082.8	2151.4	2168.8	2096.6	2029.6	2128.6	2182.6

Interval #3 Information Recording #3

Start Time	5:30
End Time	5:45
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	3671	2813	3696	3546
Vehs Exited	3613	2311	3747	3537
Starting Vehs	2437	2856	2361	2429
Ending Vehs	2495	3358	2310	2446
Travel Distance (km)	6914	4229	6925	6696
Travel Time (hr)	1941.6	2304.0	1815.0	1958.7
Total Delay (hr)	1810.1	2226.1	1683.4	1831.6
Total Stops	13723	7915	13021	12947
Fuel Used (l)	2121.1	2262.9	2016.2	2124.1

Interval #4 Information Recording #4

Start Time	5:45
End Time	6:00
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	1	10	2	3	4	5	6
Vehs Entered	3508	3685	3656	3729	3650	3670	3705
Vehs Exited	3557	3669	3643	3755	3714	3693	3736
Starting Vehs	2288	2335	2347	2282	2396	2303	2364
Ending Vehs	2239	2351	2360	2256	2332	2280	2333
Travel Distance (km)	6633	6870	6813	6904	6898	6933	7039
Travel Time (hr)	2240.6	2360.1	2335.4	2187.8	2112.8	2286.2	2320.9
Total Delay (hr)	2114.9	2229.0	2205.3	2056.4	1982.1	2154.1	2187.2
Total Stops	12278	13294	13470	13425	13543	13251	14499
Fuel Used (l)	2365.8	2481.4	2457.0	2331.8	2265.8	2416.9	2462.6

Interval #4 Information Recording #4

Start Time	5:45
End Time	6:00
Total Time (min)	15
Volumes adjusted by Growth Factors, Anti PHF.	

Run Number	7	8	9	Avg
Vehs Entered	3609	1903	3723	3483
Vehs Exited	3717	1472	3704	3463
Starting Vehs	2495	3358	2310	2446
Ending Vehs	2387	3789	2329	2460
Travel Distance (km)	6960	2572	6756	6438
Travel Time (hr)	2281.6	3090.6	2144.4	2336.0
Total Delay (hr)	2149.2	3042.7	2015.2	2213.6
Total Stops	13664	5054	12878	12535
Fuel Used (l)	2416.0	2828.9	2289.7	2431.6

1: Allandale Road & TCH NB Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.8	0.8
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	1.8	3.3	1.0
Total Delay (hr)	0.0	0.4	1.9	1.2	0.1	1.1	4.7
Total Del/Veh (s)	12.6	2.6	7.0	9.2	50.5	4.7	5.8
Stop Delay (hr)	0.0	0.2	0.3	0.2	0.1	0.1	0.9
Stop Del/Veh (s)	10.5	1.2	1.2	1.7	47.7	0.4	1.1

5: Clinch Crescent & New Connection Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Delay (hr)	1.0	2.4	0.0	0.0	0.0	0.0	3.4
Denied Del/Veh (s)	25.9	26.7	0.0	0.0	0.0	0.0	7.7
Total Delay (hr)	2.6	4.1	0.3	0.4	6.2	4.2	17.8
Total Del/Veh (s)	70.3	46.1	10.1	2.5	72.1	70.4	40.4
Stop Delay (hr)	2.4	3.8	0.2	0.2	5.8	4.0	16.4
Stop Del/Veh (s)	65.4	43.3	7.6	1.3	66.7	66.0	37.2

7: Allandale Road & Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	35.0	64.7	35.6	3.0	6.4	1.1	45.4	126.4	68.3	0.0	0.4	0.0
Denied Del/Veh (s)	298.1	298.6	311.1	47.0	36.8	40.0	612.2	645.2	677.2	2.4	2.1	0.5
Total Delay (hr)	37.5	14.8	16.9	81.1	126.5	18.0	19.2	25.1	1.6	3.4	28.1	0.9
Total Del/Veh (s)	345.5	78.6	168.6	986.0	596.9	549.6	323.6	172.1	23.2	186.9	155.5	11.8
Stop Delay (hr)	36.1	10.0	15.4	83.2	124.1	17.7	17.7	21.6	1.1	3.3	27.0	0.5
Stop Del/Veh (s)	332.0	52.8	153.9	1011.5	585.6	539.5	298.5	148.0	14.9	184.7	149.1	6.7

7: Allandale Road & Prince Philip Drive Performance by movement

Movement	All
Denied Delay (hr)	386.3
Denied Del/Veh (s)	286.7
Total Delay (hr)	373.1
Total Del/Veh (s)	293.0
Stop Delay (hr)	357.6
Stop Del/Veh (s)	280.8

9: Westerland Road/Clinch Crescent & Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	18.5	41.1	5.3	0.0	0.1	0.0	1.9	4.4	1.8	0.2	0.6	0.9
Denied Del/Veh (s)	174.5	175.8	145.6	0.0	0.6	0.0	48.2	40.0	38.0	6.4	5.2	8.6
Total Delay (hr)	38.3	23.5	4.2	5.3	60.5	8.1	5.1	11.0	3.4	1.5	7.8	3.1
Total Del/Veh (s)	361.0	107.8	125.4	251.7	233.6	251.6	126.0	97.7	73.0	48.1	63.2	30.0
Stop Delay (hr)	36.6	15.6	3.4	4.8	52.7	7.4	4.6	9.1	2.8	1.4	7.0	2.8
Stop Del/Veh (s)	345.3	71.9	103.5	226.2	203.5	228.8	111.5	81.3	59.7	45.4	56.5	27.6

9: Westerland Road/Clinch Crescent & Prince Philip Drive Performance by movement

Movement	All
Denied Delay (hr)	74.8
Denied Del/Veh (s)	66.6
Total Delay (hr)	171.8
Total Del/Veh (s)	152.5
Stop Delay (hr)	148.3
Stop Del/Veh (s)	131.6

10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.7	2.4	0.3	18.5	442.7	77.5	0.0	0.0	0.0
Denied Del/Veh (s)	0.5	0.2	0.0	24.0	18.2	13.6	1234.5	1203.8	1187.5	0.0	0.0	0.0
Total Delay (hr)	3.5	10.0	0.1	2.1	7.5	0.6	1.1	20.5	3.3	6.5	50.4	5.0
Total Del/Veh (s)	102.2	86.9	6.2	67.1	58.5	28.5	148.2	109.8	98.3	255.2	186.1	105.0
Stop Delay (hr)	3.1	8.5	0.1	1.9	6.7	0.6	1.0	16.5	2.6	5.8	42.9	4.2
Stop Del/Veh (s)	90.3	74.2	3.6	62.7	52.5	24.5	127.6	88.6	79.2	227.8	158.6	88.0

10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue Performance by movement

Movement	All
Denied Delay (hr)	542.2
Denied Del/Veh (s)	486.6
Total Delay (hr)	110.5
Total Del/Veh (s)	120.4
Stop Delay (hr)	93.9
Stop Del/Veh (s)	102.3

11: Mt. Scio Road & Allandale Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.4
Denied Del/Veh (s)	0.1	0.0	0.2	0.2	0.0	0.3	0.1	0.0	0.3	4.9	3.1	5.1
Total Delay (hr)	2.2	7.9	2.1	1.0	4.1	0.0	5.8	1.6	0.4	1.1	3.2	0.8
Total Del/Veh (s)	47.6	34.1	15.6	34.5	23.4	4.4	42.7	32.6	7.9	54.1	61.9	10.3
Stop Delay (hr)	1.8	5.6	0.8	0.8	3.0	0.0	4.9	1.3	0.2	1.0	2.9	0.5
Stop Del/Veh (s)	40.1	24.2	5.7	28.7	16.8	0.0	35.9	26.4	3.5	49.8	55.5	6.0

11: Mt. Scio Road & Allandale Road Performance by movement

Movement	All
Denied Delay (hr)	0.7
Denied Del/Veh (s)	0.7
Total Delay (hr)	30.3
Total Del/Veh (s)	29.9
Stop Delay (hr)	22.8
Stop Del/Veh (s)	22.4

13: New Connection & Mt. Scio Road Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Delay (hr)	0.1	0.1	0.0	0.0	0.0	0.0	0.2
Denied Del/Veh (s)	1.8	6.9	0.0	0.0	0.2	0.0	0.5
Total Delay (hr)	2.8	0.4	0.1	1.0	3.8	1.7	9.8
Total Del/Veh (s)	47.3	27.8	13.0	5.9	28.0	20.7	21.2
Stop Delay (hr)	2.6	0.4	0.1	0.4	2.8	1.0	7.2
Stop Del/Veh (s)	43.3	26.1	9.5	2.6	20.4	12.0	15.6

17: Allandale Road & TCH SB Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.1	0.1	0.0	0.2
Denied Del/Veh (s)	0.1	0.1	0.0	0.3	0.6	1.8	0.4
Total Delay (hr)	0.0	0.0	0.1	2.2	1.5	0.0	3.8
Total Del/Veh (s)	2.1	0.5	10.4	8.6	9.3	5.7	8.7
Stop Delay (hr)	0.0	0.0	0.0	0.0	0.9	0.0	1.0
Stop Del/Veh (s)	0.1	0.0	0.1	0.1	5.8	2.9	2.2

18: TCH SB Performance by movement

Movement	NBR	SBT	All
Denied Delay (hr)	0.1	0.0	0.2
Denied Del/Veh (s)	0.4	0.3	0.4
Total Delay (hr)	2.8	0.0	2.8
Total Del/Veh (s)	9.1	0.3	6.9
Stop Delay (hr)	0.0	0.0	0.0
Stop Del/Veh (s)	0.1	0.0	0.1

22: Allandale Road & Higgins Line Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	23.5	10.8	0.0	0.0	0.0	0.0	34.4
Denied Del/Veh (s)	164.9	166.8	0.0	0.1	0.1	0.0	45.1
Total Delay (hr)	15.9	3.7	0.8	0.9	1.5	3.3	26.1
Total Del/Veh (s)	134.5	67.2	5.3	7.7	15.0	17.3	35.7
Stop Delay (hr)	15.2	3.5	0.4	0.4	1.2	2.8	23.4
Stop Del/Veh (s)	128.4	63.7	2.9	3.1	11.9	14.6	32.1

24: Allandale Road & Confederation Building Lot Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	34.8	41.1	0.0	0.0	0.0	0.2	76.2
Denied Del/Veh (s)	476.4	482.0	0.0	0.1	0.0	1.0	105.6
Total Delay (hr)	13.7	1.5	3.3	0.3	1.8	28.6	49.2
Total Del/Veh (s)	256.4	23.7	15.8	5.2	35.7	117.2	72.0
Stop Delay (hr)	13.5	1.4	2.1	0.0	1.5	28.9	47.4
Stop Del/Veh (s)	253.4	21.8	9.9	0.2	30.1	118.5	69.4

29: Prince Philip Drive & Confederation Building Lot Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Delay (hr)	3.5	3.5	0.0	0.0	218.1	41.1	266.1
Denied Del/Veh (s)	42.9	44.6	0.1	0.0	644.5	654.8	318.3
Total Delay (hr)	4.9	8.4	1.1	1.7	33.5	1.8	51.3
Total Del/Veh (s)	60.0	107.8	17.6	7.9	163.0	46.4	75.3
Stop Delay (hr)	4.4	8.6	0.8	1.1	32.3	1.6	48.7
Stop Del/Veh (s)	54.1	110.5	13.5	4.9	157.0	40.9	71.5

34: Elizabeth Avenue & Westerland Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	5.2	2.6	0.0	0.0	0.0	7.9
Denied Del/Veh (s)	0.0	0.0	31.1	30.3	0.6	0.0	0.3	12.7
Total Delay (hr)	1.9	0.4	10.4	6.1	3.6	0.0	3.7	26.2
Total Del/Veh (s)	25.6	3.4	62.1	70.9	76.2	2.9	33.1	42.0
Stop Delay (hr)	1.5	0.2	9.4	5.6	3.3	0.0	2.8	22.8
Stop Del/Veh (s)	20.5	1.3	56.3	64.7	68.7	0.2	24.7	36.4

35: Prince Philip Drive & Clinch Crescent Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.1	0.4	0.5
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	2.8	2.2	0.5
Total Delay (hr)	1.8	1.7	5.9	0.2	1.6	2.5	13.7
Total Del/Veh (s)	30.1	5.8	16.1	10.9	57.3	14.9	14.7
Stop Delay (hr)	1.5	1.0	2.9	0.0	1.5	1.7	8.7
Stop Del/Veh (s)	25.2	3.5	8.0	2.0	52.4	10.3	9.3

37: Thorburn Road & Prince Philip Drive Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR	All
Denied Delay (hr)	104.9	237.1	66.6	3.8	17.1	6.2	0.1	0.0	248.4	598.0	500.5	1782.8
Denied Del/Veh (s)	666.2	663.6	669.6	63.1	51.0	60.0	0.6	0.2	1625.7	1608.9	1621.9	812.3
Total Delay (hr)	37.3	20.9	7.7	12.5	16.7	0.5	15.5	0.9	4.4	25.0	26.8	168.2
Total Del/Veh (s)	319.1	83.2	112.2	202.8	50.7	5.0	65.0	65.3	95.5	213.0	275.5	116.7
Stop Delay (hr)	35.9	14.4	7.2	12.2	13.2	0.1	13.2	0.8	4.0	22.5	24.7	148.1
Stop Del/Veh (s)	306.6	57.4	104.8	198.7	40.0	0.8	55.5	58.8	85.6	191.2	253.9	102.7

40: Prince Philip Drive & Wicklow Street Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.0	0.2	0.0	0.6	0.1	0.9
Denied Del/Veh (s)	0.0	0.0	0.4	0.6	7.4	3.8	0.9
Total Delay (hr)	0.1	0.7	9.9	1.3	7.5	1.2	20.8
Total Del/Veh (s)	33.0	2.3	21.7	23.6	98.9	53.7	22.7
Stop Delay (hr)	0.1	0.1	5.1	0.8	6.9	1.1	14.1
Stop Del/Veh (s)	30.9	0.2	11.3	14.3	91.2	48.9	15.4

46: Stamps Lane/Oxen Pond Road & Freshwater Road Performance by movement

Movement	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	2.1	0.3	9.0	11.0	4.0	0.2	1.1	0.5	28.1
Denied Del/Veh (s)	0.0	0.0	5.9	8.9	163.6	171.9	152.7	19.1	19.8	22.3	28.5
Total Delay (hr)	67.1	14.2	47.4	4.4	13.7	16.1	6.8	0.6	1.7	0.5	172.7
Total Del/Veh (s)	207.6	212.7	123.2	147.2	269.0	270.1	270.9	59.0	32.0	25.6	168.3
Stop Delay (hr)	57.7	12.4	39.6	3.9	13.2	15.4	6.5	0.6	1.4	0.5	151.3
Stop Del/Veh (s)	178.4	184.7	102.9	130.8	259.1	257.8	261.5	54.6	26.8	22.8	147.4

47: Freshwater Road & Thorburn Road Performance by movement

Movement	EBT	WBT	WBR	SBL	SBT	SBR	All
Denied Delay (hr)	545.8	11.3	12.9	9.0	0.0	5.6	584.6
Denied Del/Veh (s)	1177.3	46.3	51.3	59.9	0.0	59.3	483.7
Total Delay (hr)	42.5	4.3	21.1	16.2	0.2	1.3	85.5
Total Del/Veh (s)	188.3	17.7	83.7	105.7	35.2	14.0	88.3
Stop Delay (hr)	42.9	2.5	16.2	15.6	0.1	1.1	78.4
Stop Del/Veh (s)	189.9	10.4	64.3	101.9	32.2	11.4	81.0

51: Freshwater Road & Elizabeth Avenue Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	2.5	31.2	330.1	10.4	0.6	0.2	374.9
Denied Del/Veh (s)	119.7	145.1	991.9	1008.4	3.7	1.3	431.4
Total Delay (hr)	1.1	23.4	21.5	0.8	30.7	2.6	80.0
Total Del/Veh (s)	52.3	114.9	108.6	118.2	170.7	21.9	110.0
Stop Delay (hr)	1.0	21.0	17.7	0.6	27.0	1.6	69.0
Stop Del/Veh (s)	47.7	103.4	89.4	101.6	150.2	13.3	94.8

52: Elizabeth Avenue & Paton Street Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.5	0.4	1.0
Denied Del/Veh (s)	0.0	0.0	0.2	0.0	34.0	20.0	2.4
Total Delay (hr)	0.9	4.4	2.2	0.1	2.2	3.6	13.4
Total Del/Veh (s)	96.3	26.4	12.2	7.7	151.7	169.5	32.7
Stop Delay (hr)	0.8	3.8	1.9	0.1	2.2	3.6	12.4
Stop Del/Veh (s)	91.5	23.0	10.4	7.0	149.9	168.9	30.3

55: Anderson Avenue & Elizabeth Avenue Performance by movement

Movement	EBT	EBR	WBL	WBT	NBL	NBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	2.0	6.6	8.6
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	97.2	106.5	16.6
Total Delay (hr)	0.2	0.0	3.2	9.1	4.7	3.1	20.3
Total Del/Veh (s)	1.1	0.8	41.8	45.5	242.8	52.9	39.2
Stop Delay (hr)	0.0	0.0	2.7	8.2	4.7	2.9	18.5
Stop Del/Veh (s)	0.1	0.3	35.4	40.6	240.9	51.0	35.8

59: Clinch Crescent & Arctic Avenue Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	215.2	100.4	0.0	0.0	0.3	2.4	318.3
Denied Del/Veh (s)	1156.1	1173.0	0.0	0.0	19.6	15.3	460.7
Total Delay (hr)	30.0	2.3	1.4	0.5	0.3	9.8	44.3
Total Del/Veh (s)	304.6	55.1	11.0	4.0	15.3	61.5	78.7
Stop Delay (hr)	28.9	2.1	1.0	0.1	0.2	8.7	40.9
Stop Del/Veh (s)	293.1	50.2	7.9	0.6	12.5	54.1	72.7

61: Prince Philip Drive & Morrissey Drive Performance by movement

Movement	EBT	WBL	WBT	WBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	11.0	7.4	11.3	29.7
Denied Del/Veh (s)	0.0	0.1	0.0	0.0	165.0	162.8	168.6	38.5
Total Delay (hr)	7.6	0.2	5.8	1.0	12.6	8.5	12.3	48.1
Total Del/Veh (s)	26.0	25.0	24.3	19.0	188.6	191.2	182.9	62.2
Stop Delay (hr)	4.6	0.1	2.7	0.4	11.4	7.7	11.3	38.2
Stop Del/Veh (s)	15.7	14.1	11.1	6.9	171.6	173.0	167.4	49.4

Total Network Performance

Movement	All
Denied Delay (hr)	4522.6
Denied Del/Veh (s)	718.9
Total Delay (hr)	1803.8
Total Del/Veh (s)	383.7
Stop Delay (hr)	1605.1
Stop Del/Veh (s)	341.4

Intersection: 1: Allandale Road & TCH NB

Movement	EB	WB	WB	NB	NB
Directions Served	LT	T	R	LT	R
Maximum Queue (m)	72.3	8.3	288.1	22.8	30.9
Average Queue (m)	5.7	0.3	22.9	1.9	1.2
95th Queue (m)	34.2	6.2	166.9	16.5	14.3
Link Distance (m)	145.7	331.3	331.3	138.9	
Upstream Blk Time (%)	0		0	0	
Queuing Penalty (veh)	1		1	0	
Storage Bay Dist (m)					100.0
Storage Blk Time (%)				0	0
Queuing Penalty (veh)				2	0

Intersection: 5: Clinch Crescent & New Connection

Movement	EB	EB	B39	NB	NB	SB	SB
Directions Served	L	R	T	LT	T	T	TR
Maximum Queue (m)	51.9	121.3	46.0	35.2	26.6	88.5	102.2
Average Queue (m)	25.0	52.4	6.1	13.9	5.3	36.3	46.2
95th Queue (m)	47.1	230.6	60.7	28.9	17.1	268.0	278.5
Link Distance (m)		525.1	261.4	157.0	157.0	711.6	711.6
Upstream Blk Time (%)		3	0			3	3
Queuing Penalty (veh)		14	0			9	9
Storage Bay Dist (m)	50.0						
Storage Blk Time (%)	1	7					
Queuing Penalty (veh)	3	12					

Intersection: 7: Allandale Road & Prince Philip Drive

Movement	EB	EB	EB	EB	WB	WB	WB	WB	B27	B27	NB	NB
Directions Served	L	T	T	R	L	T	T	R	T	T	L	T
Maximum Queue (m)	202.5	422.9	419.8	122.5	67.5	863.5	863.8	27.5	282.1	284.7	72.5	436.1
Average Queue (m)	200.7	333.0	313.1	94.0	67.3	852.4	853.1	18.7	262.0	263.2	71.3	377.5
95th Queue (m)	217.8	444.5	447.1	160.7	67.9	864.2	865.3	39.0	336.3	339.0	77.3	456.5
Link Distance (m)		438.1	438.1			834.7	834.7		270.6	270.6		440.5
Upstream Blk Time (%)		2	1			98	98		21	30		6
Queuing Penalty (veh)		20	11			739	736		160	230		39
Storage Bay Dist (m)	200.0			120.0	65.0			25.0			70.0	
Storage Blk Time (%)	76	29	18	47	90	21	71	1			60	16
Queuing Penalty (veh)	380	153	93	236	433	80	114	7			560	58

Intersection: 7: Allandale Road & Prince Philip Drive

Movement	NB	SB	SB	SB	SB	SB	B1123	B1123
Directions Served	R	L	T	T	R	R	T	T
Maximum Queue (m)	422.4	44.4	132.5	125.5	76.3	37.4	510.4	512.8
Average Queue (m)	202.2	34.4	121.8	119.4	13.1	2.8	463.4	465.5
95th Queue (m)	384.5	61.2	127.3	123.2	52.0	18.9	609.7	609.9
Link Distance (m)	440.5		104.4	104.4	104.4		500.7	500.7
Upstream Blk Time (%)	0		91	77	0		30	34
Queuing Penalty (veh)	2		394	329	0		197	224
Storage Bay Dist (m)		42.0				35.0		
Storage Blk Time (%)		4	89		6	0		
Queuing Penalty (veh)		17	72		11	0		

Intersection: 9: Westerland Road/Clinch Crescent & Prince Philip Drive

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	TR	L	T	R	L	T
Maximum Queue (m)	77.5	462.6	451.4	172.3	92.4	416.1	419.6	62.4	315.4	47.5	58.2	96.3
Average Queue (m)	74.7	363.0	341.6	50.4	51.8	322.2	327.1	42.1	182.8	34.6	23.1	85.1
95th Queue (m)	96.9	532.6	520.6	166.3	117.6	493.6	497.5	77.5	344.1	64.1	46.7	95.4
Link Distance (m)		571.8	571.8			469.7	469.7		350.2		83.1	83.1
Upstream Blk Time (%)		3	2			3	4		1		0	33
Queuing Penalty (veh)		21	19			22	30		6		0	210
Storage Bay Dist (m)	75.0			185.0	90.0			60.0		45.0		
Storage Blk Time (%)	74	44	14	0	5	67		6	43	1		38
Queuing Penalty (veh)	410	228	24	1	29	71		41	178	10		198

Intersection: 9: Westerland Road/Clinch Crescent & Prince Philip Drive

Movement	SB
Directions Served	R
Maximum Queue (m)	82.5
Average Queue (m)	66.1
95th Queue (m)	107.7
Link Distance (m)	
Upstream Blk Time (%)	2
Queuing Penalty (veh)	0
Storage Bay Dist (m)	80.0
Storage Blk Time (%)	3
Queuing Penalty (veh)	18

Intersection: 10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue

Movement	EB	EB	EB	B33	B33	WB	WB	WB	NB	NB	NB	SB
Directions Served	L	T	R	T	T	L	T	TR	L	T	R	L
Maximum Queue (m)	57.4	240.7	128.3	12.0	9.0	56.2	107.0	102.5	53.1	245.4	37.5	42.3
Average Queue (m)	38.3	142.4	19.6	1.3	0.9	24.9	62.2	57.9	12.3	238.2	20.4	23.0
95th Queue (m)	72.6	268.6	129.7	17.6	13.5	54.2	139.9	136.6	41.8	242.7	45.8	46.1
Link Distance (m)		321.8	321.8	553.8	553.8		285.8	285.8		232.6		
Upstream Blk Time (%)		2	1				3	3		64		
Queuing Penalty (veh)		9	3				0	0		0		
Storage Bay Dist (m)	55.0					55.0			55.0		35.0	40.0
Storage Blk Time (%)	3	39				1	9		2	53	0	1
Queuing Penalty (veh)	21	72				2	11		20	129	5	7

Intersection: 10: Bonaventure Avenue/Allandale Road & Elizabeth Avenue

Movement	SB	SB
Directions Served	T	R
Maximum Queue (m)	455.2	464.7
Average Queue (m)	443.4	454.6
95th Queue (m)	452.5	467.7
Link Distance (m)	440.5	440.5
Upstream Blk Time (%)	20	72
Queuing Penalty (veh)	171	628
Storage Bay Dist (m)		
Storage Blk Time (%)	49	
Queuing Penalty (veh)	61	

Intersection: 11: Mt. Scio Road & Allandale Road

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	NB
Directions Served	L	T	T	R	L	T	T	R	L	L	T	R
Maximum Queue (m)	77.4	138.5	145.4	52.5	45.9	69.5	60.0	5.2	62.2	105.6	76.8	27.5
Average Queue (m)	31.6	68.7	71.0	36.7	14.4	35.6	28.2	0.2	43.5	48.0	27.4	14.1
95th Queue (m)	70.1	121.3	130.6	75.7	31.4	61.5	51.3	5.3	67.6	86.6	60.4	35.1
Link Distance (m)		331.3	331.3			542.1	542.1			437.3	437.3	
Upstream Blk Time (%)		1	1									
Queuing Penalty (veh)		3	4									
Storage Bay Dist (m)	75.0			50.0	75.0			50.0	60.0			25.0
Storage Blk Time (%)	1	3	11	5		0	1	0	1	3	9	1
Queuing Penalty (veh)	3	5	52	18		0	0	0	5	12	22	3

Intersection: 11: Mt. Scio Road & Allandale Road

Movement	SB	SB	SB
Directions Served	L	T	R
Maximum Queue (m)	59.4	103.5	52.5
Average Queue (m)	17.2	49.4	27.0
95th Queue (m)	42.9	97.9	63.3
Link Distance (m)		97.5	
Upstream Blk Time (%)		5	
Queuing Penalty (veh)		0	
Storage Bay Dist (m)	60.0		50.0
Storage Blk Time (%)	0	10	2
Queuing Penalty (veh)	0	37	5

Intersection: 13: New Connection & Mt. Scio Road

Movement	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	L	T	T	T	T	R
Maximum Queue (m)	90.1	40.7	14.2	37.1	43.5	72.6	201.8	28.1
Average Queue (m)	39.1	8.4	4.0	12.6	12.7	20.2	35.0	2.1
95th Queue (m)	98.2	26.6	12.1	29.9	30.5	112.6	174.1	15.1
Link Distance (m)	303.1			711.6	711.6	437.3	437.3	
Upstream Blk Time (%)	1					1	1	
Queuing Penalty (veh)	0					2	6	
Storage Bay Dist (m)		50.0	100.0					100.0
Storage Blk Time (%)	2	3					2	0
Queuing Penalty (veh)	1	5					8	0

Intersection: 17: Allandale Road & TCH SB

Movement	EB	WB	SB	SB
Directions Served	LT	TR	L	R
Maximum Queue (m)	0.9	7.3	67.5	21.8
Average Queue (m)	0.0	0.3	27.7	4.0
95th Queue (m)	0.9	3.1	51.1	16.3
Link Distance (m)	158.6	145.7	127.1	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				20.0
Storage Blk Time (%)			14	0
Queuing Penalty (veh)			1	1

Intersection: 18: TCH SB

Movement
Directions Served
Maximum Queue (m)
Average Queue (m)
95th Queue (m)
Link Distance (m)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (m)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 22: Allandale Road & Higgins Line

Movement	WB	WB	WB	NB	NB	NB	B4	SB	SB	SB	B3	B3
Directions Served	L	L	R	T	T	R	T	L	T	T	T	T
Maximum Queue (m)	125.3	130.4	42.5	44.3	84.3	81.0	8.5	71.3	79.7	79.0	35.8	29.2
Average Queue (m)	97.1	94.5	33.7	10.4	16.2	25.5	0.4	40.3	29.9	28.4	2.3	2.0
95th Queue (m)	139.3	146.7	61.6	30.7	55.9	81.3	4.8	70.5	74.3	72.0	22.7	20.3
Link Distance (m)	117.4	117.4		101.8	101.8		147.6		73.6	73.6	178.6	178.6
Upstream Blk Time (%)	27	41			1			0	2	3		
Queuing Penalty (veh)	0	0			6			0	10	16		
Storage Bay Dist (m)			40.0			80.0		80.0				
Storage Blk Time (%)		56	10		0	2		0	2			
Queuing Penalty (veh)		132	26		2	7		0	7			

Intersection: 22: Allandale Road & Higgins Line

Movement	B2	B2
Directions Served	T	T
Maximum Queue (m)	54.1	280.1
Average Queue (m)	1.9	14.0
95th Queue (m)	55.2	158.2
Link Distance (m)	542.1	542.1
Upstream Blk Time (%)	0	0
Queuing Penalty (veh)	0	0
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 24: Allandale Road & Confederation Building Lot

Movement	WB	WB	WB	NB	NB	NB	B1123	SB	SB	SB	B4	B4
Directions Served	L	L	R	T	T	R	T	L	T	T	T	T
Maximum Queue (m)	47.5	96.9	96.4	68.4	94.4	20.1	11.3	132.5	171.2	169.8	113.0	111.3
Average Queue (m)	36.7	77.9	43.0	32.4	49.6	0.7	0.4	91.6	116.8	117.0	62.7	62.3
95th Queue (m)	62.2	116.9	101.1	59.0	85.1	13.4	11.5	180.4	229.8	227.7	144.8	143.7
Link Distance (m)		87.5	87.5	500.7	500.7		104.4		147.6	147.6	101.8	101.8
Upstream Blk Time (%)		65	11				0		54	62	19	22
Queuing Penalty (veh)		0	0				1		332	378	116	132
Storage Bay Dist (m)	45.0					110.0		130.0				
Storage Blk Time (%)	16	71			0	0		1	53			
Queuing Penalty (veh)	20	96			0	0		6	108			

Intersection: 29: Prince Philip Drive & Confederation Building Lot

Movement	EB	EB	NB	NB	NB	B27	SB	SB	SB
Directions Served	L	R	L	T	T	T	T	T	R
Maximum Queue (m)	119.1	120.7	58.5	59.1	56.1	426.9	162.8	163.9	102.5
Average Queue (m)	77.5	77.0	24.0	22.1	22.6	15.2	142.8	140.5	76.4
95th Queue (m)	130.7	141.0	45.2	47.7	46.4	201.8	188.6	194.5	149.6
Link Distance (m)	108.9	108.9		270.6	270.6	834.7	148.3	148.3	
Upstream Blk Time (%)	13	34				0	71	74	
Queuing Penalty (veh)	0	0				0	0	0	
Storage Bay Dist (m)			75.0						100.0
Storage Blk Time (%)			0	0				72	2
Queuing Penalty (veh)			0	0				170	15

Intersection: 34: Elizabeth Avenue & Westerland Road

Movement	EB	EB	EB	WB	WB	B33	B33	SB	SB
Directions Served	L	T	T	T	TR	T	T	L	R
Maximum Queue (m)	37.2	66.4	25.5	128.8	141.1	32.6	101.6	104.4	65.7
Average Queue (m)	26.5	14.9	7.0	76.9	82.9	16.6	19.2	55.7	12.6
95th Queue (m)	45.0	51.9	20.3	294.9	298.1	131.3	143.4	194.4	51.7
Link Distance (m)		393.0	393.0	553.8	553.8	321.8	321.8	350.2	
Upstream Blk Time (%)				6	6	4	4	7	
Queuing Penalty (veh)				22	23	16	17	60	
Storage Bay Dist (m)	35.0								70.0
Storage Blk Time (%)	13	1						0	8
Queuing Penalty (veh)	42	2						1	19

Intersection: 35: Prince Philip Drive & Clinch Crescent

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB
Directions Served	L	T	T	T	T	R	L	R	R
Maximum Queue (m)	60.9	28.2	26.8	106.2	110.4	7.2	70.8	125.4	52.5
Average Queue (m)	28.3	6.0	6.0	27.1	34.5	0.0	26.6	43.4	31.7
95th Queue (m)	52.4	41.5	41.2	101.5	107.9	0.0	54.3	95.9	59.7
Link Distance (m)		281.4	281.4	571.8	571.8			261.4	
Upstream Blk Time (%)				0	0				
Queuing Penalty (veh)				1	1				
Storage Bay Dist (m)	140.0					70.0	80.0		50.0
Storage Blk Time (%)		1			2	0	0	5	2
Queuing Penalty (veh)		4			2	0	0	25	10

Intersection: 37: Thorburn Road & Prince Philip Drive

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	B36	B36	B45
Directions Served	L	T	T	R	L	T	T	T	R	T	T	T
Maximum Queue (m)	177.5	324.3	319.6	315.6	112.5	153.7	139.0	115.5	54.4	110.4	112.4	19.9
Average Queue (m)	173.4	307.6	303.6	233.9	90.1	115.4	95.7	75.4	6.4	32.5	24.7	5.0
95th Queue (m)	216.3	383.1	357.6	427.2	139.7	173.3	151.2	118.2	34.3	127.4	104.0	55.3
Link Distance (m)		308.0	308.0	308.0		134.5	134.5	134.5	134.5	222.8	222.8	189.0
Upstream Blk Time (%)		89	23	11		30	1	1		3	0	2
Queuing Penalty (veh)		0	0	0		164	7	3		34	0	25
Storage Bay Dist (m)	175.0				110.0							
Storage Blk Time (%)	81	35			38	14						
Queuing Penalty (veh)	489	193			199	43						

Intersection: 37: Thorburn Road & Prince Philip Drive

Movement	B45	NB	NB	B43	B43	SB	SB	SB	SB
Directions Served	T	T	TR	T	T	L	L	T	TR
Maximum Queue (m)	18.9	129.7	130.5	11.3	11.6	54.7	383.4	386.9	152.5
Average Queue (m)	4.8	98.2	103.0	2.3	3.3	21.6	371.4	378.1	152.3
95th Queue (m)	53.5	144.9	147.4	13.9	17.2	46.4	418.6	383.3	153.6
Link Distance (m)	189.0	126.5	126.5	52.2	52.2		372.8	372.8	
Upstream Blk Time (%)	2	6	8				40	86	
Queuing Penalty (veh)	25	36	47				0	0	
Storage Bay Dist (m)						150.0			150.0
Storage Blk Time (%)							0	16	67
Queuing Penalty (veh)							1	230	359

Intersection: 40: Prince Philip Drive & Wicklow Street

Movement	EB	EB	EB	WB	WB	SB	SB
Directions Served	L	T	T	T	TR	L	R
Maximum Queue (m)	13.6	16.5	16.3	273.9	257.8	62.4	183.7
Average Queue (m)	3.2	3.2	3.1	72.0	86.7	54.0	70.6
95th Queue (m)	11.0	11.7	11.1	171.4	183.9	73.5	186.6
Link Distance (m)		189.0	189.0	281.4	281.4		264.8
Upstream Blk Time (%)				2	3		2
Queuing Penalty (veh)				24	32		0
Storage Bay Dist (m)	50.0					60.0	
Storage Blk Time (%)						32	3
Queuing Penalty (veh)						27	7

Intersection: 46: Stamps Lane/Oxen Pond Road & Freshwater Road

Movement	EB	EB	WB	WB	NB	SB	SB
Directions Served	T	TR	T	TR	LTR	L	TR
Maximum Queue (m)	366.4	367.8	292.7	292.4	380.3	32.2	92.8
Average Queue (m)	360.2	360.6	267.8	268.1	310.8	10.8	45.7
95th Queue (m)	364.0	365.1	364.2	351.4	469.5	28.7	90.1
Link Distance (m)	357.5	357.5	263.0	263.0	363.4		138.0
Upstream Blk Time (%)	33	35	46	84	58		3
Queuing Penalty (veh)	418	441	466	851	0		0
Storage Bay Dist (m)						30.0	
Storage Blk Time (%)						5	15
Queuing Penalty (veh)						12	6

Intersection: 47: Freshwater Road & Thorburn Road

Movement	EB	EB	WB	WB	WB	SB	SB	SB	B43	B43
Directions Served	T	T	T	T	R	L	L	R	T	T
Maximum Queue (m)	178.3	175.5	292.3	339.9	102.5	73.5	69.8	64.2	135.1	135.3
Average Queue (m)	167.2	166.6	120.2	246.0	96.7	66.8	65.3	19.6	100.1	107.2
95th Queue (m)	173.7	171.9	266.6	401.7	129.8	76.7	74.4	57.2	168.8	170.5
Link Distance (m)	160.8	160.8	357.5	357.5		52.2	52.2	52.2	126.5	126.5
Upstream Blk Time (%)	96	97		0		78	75	4	12	26
Queuing Penalty (veh)	0	0		0		443	427	21	99	217
Storage Bay Dist (m)					100.0					
Storage Blk Time (%)				18	54					
Queuing Penalty (veh)				216	317					

Intersection: 51: Freshwater Road & Elizabeth Avenue

Movement	WB	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	R	R	T	R	L	L	T
Maximum Queue (m)	270.1	269.6	52.5	215.3	52.4	52.4	272.8	278.3
Average Queue (m)	118.9	203.5	48.3	205.4	8.1	51.6	266.4	232.1
95th Queue (m)	306.0	339.6	70.8	210.5	34.8	54.4	278.9	345.3
Link Distance (m)	260.3	260.3		199.6			263.0	263.0
Upstream Blk Time (%)	5	14		68			24	5
Queuing Penalty (veh)	22	63		0			230	52
Storage Bay Dist (m)			50.0		50.0	50.0		
Storage Blk Time (%)		41	45	59	1	21	60	
Queuing Penalty (veh)		196	220	19	5	123	345	

Intersection: 52: Elizabeth Avenue & Paton Street

Movement	EB	EB	EB	WB	WB	SB
Directions Served	L	T	T	T	TR	LR
Maximum Queue (m)	22.6	53.9	48.0	41.7	50.4	119.7
Average Queue (m)	7.6	21.4	19.8	12.5	20.4	50.5
95th Queue (m)	22.5	125.1	123.4	41.9	52.6	193.8
Link Distance (m)		260.3	260.3	44.4	44.4	407.0
Upstream Blk Time (%)		6	6	9	15	4
Queuing Penalty (veh)		34	34	43	69	0
Storage Bay Dist (m)	30.0					
Storage Blk Time (%)	8	0				
Queuing Penalty (veh)	40	0				

Intersection: 55: Anderson Avenue & Elizabeth Avenue

Movement	EB	EB	WB	WB	WB	NB	NB
Directions Served	T	TR	L	T	T	L	R
Maximum Queue (m)	7.8	14.2	39.1	109.9	78.9	129.4	61.5
Average Queue (m)	0.4	1.9	17.7	39.6	41.6	56.8	17.9
95th Queue (m)	4.0	8.1	35.0	220.1	224.1	202.2	55.4
Link Distance (m)	44.4	44.4		393.0	393.0	321.2	
Upstream Blk Time (%)				8	8	8	
Queuing Penalty (veh)				50	50	0	
Storage Bay Dist (m)			40.0				100.0
Storage Blk Time (%)			0	9		12	0
Queuing Penalty (veh)			1	32		28	0

Intersection: 59: Clinch Crescent & Arctic Avenue

Movement	WB	WB	WB	NB	NB	NB	SB	SB	SB	B38	B38
Directions Served	L	L	R	T	T	R	L	T	T	T	T
Maximum Queue (m)	102.4	218.1	215.8	48.1	53.0	47.6	32.1	131.1	140.6	77.6	113.3
Average Queue (m)	65.2	208.8	207.0	21.5	19.1	4.9	9.6	42.9	94.9	17.6	28.4
95th Queue (m)	140.0	215.4	230.2	41.4	39.6	28.0	23.4	125.0	164.6	91.3	110.8
Link Distance (m)		204.0	204.0	83.1	83.1			123.0	123.0	157.0	157.0
Upstream Blk Time (%)		91	74					8	26	6	7
Queuing Penalty (veh)		0	0					29	94	24	24
Storage Bay Dist (m)	100.0					50.0	50.0				
Storage Blk Time (%)	0	85			0	0		0			
Queuing Penalty (veh)	1	253			0	1		0			

Intersection: 61: Prince Philip Drive & Morrissey Drive

Movement	EB	EB	WB	WB	WB	WB	SB	SB
Directions Served	T	T	L	T	T	R	L	TR
Maximum Queue (m)	113.0	117.2	28.3	82.7	90.3	32.5	42.4	292.3
Average Queue (m)	58.3	59.4	5.0	30.5	34.0	13.1	41.0	268.1
95th Queue (m)	101.6	106.1	18.6	82.1	88.5	32.5	49.4	340.0
Link Distance (m)	469.7	469.7		438.1	438.1			278.6
Upstream Blk Time (%)								67
Queuing Penalty (veh)								0
Storage Bay Dist (m)			70.0			30.0	40.0	
Storage Blk Time (%)				2	6	0	20	60
Queuing Penalty (veh)				1	18	2	80	141

Network Summary

Network wide Queuing Penalty: 18224

	AM					
	Queue (PCE)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
	A1 - 2025 S4-B					
PPD @ Allandale - Prince Philip Drive E	0.64	2.17	0.39	A	2.04	A
PPD @ Allandale - Allandale Road N	0.80	2.72	0.45	A		
PPD @ Allandale - Prince Philip Drive W	0.29	1.58	0.22	A		
PPD @ Allandale - Allandale Road S	0.42	1.69	0.30	A		
Westerland Road @ Elizabeth Avenue - Elizabeth Avenue E	1.12	7.12	0.52	A	9.11	A
Westerland Road @ Elizabeth Avenue - Westerland Road	0.39	3.90	0.28	A		
Westerland Road @ Elizabeth Avenue - Elizabeth Avenue W	3.19	12.21	0.76	B		
Freshwater Road @ Elizabeth Avenue - Elizabeth Avenue E	0.17	3.80	0.14	A	3.09	A
Freshwater Road @ Elizabeth Avenue - Freshwater Road N	1.07	3.05	0.52	A		
Freshwater Road @ Elizabeth Avenue - Freshwater Road S	0.34	2.64	0.25	A		
PPD @ Clinch 2 - PPD E	0.56	1.90	0.35	A	2.54	A
PPD @ Clinch 2 - Clinch Crescent	0.09	4.58	0.08	A		
PPD @ Clinch 2 - PPD W	1.53	2.52	0.60	A		
PPD @ Freshwater Rd - Freshwater Road	0.49	3.56	0.33	A	3.46	A
PPD @ Freshwater Rd - PPD E	0.62	2.19	0.38	A		
PPD @ Freshwater Rd - Thorburn Road	1.02	2.95	0.50	A		
PPD @ Freshwater Rd - Columbus	2.31	4.60	0.70	A		
Confederation @ PPD - PPD N	0.95	2.94	0.49	A	2.67	A
Confederation @ PPD - Confederation Building Lot	0.02	4.78	0.02	A		
Confederation @ PPD - PPD S	0.44	2.16	0.31	A		
Confederation @ Allandale - Allandale Road N	0.84	2.59	0.46	A	2.40	A
Confederation @ Allandale - Allandale Road S	0.34	2.00	0.26	A		
Confederation @ Allandale - Confederation Building	0.01	3.27	0.01	A		
Higgins @ Allandale - Allandale Road N	0.76	2.72	0.43	A	2.33	A
Higgins @ Allandale - Allandale Road S	0.20	1.81	0.17	A		
Higgins @ Allandale - Higgins Line	0.20	1.85	0.17	A		
PPD @ Clinch/ Westerland - Prince Philip Drive E	0.85	2.90	0.45	A	3.13	A
PPD @ Clinch/ Westerland - Clinch Crescent	0.28	2.43	0.22	A		
PPD @ Clinch/ Westerland - Prince Philip Drive W	1.25	2.54	0.55	A		
PPD @ Clinch/ Westerland - Westerland Road	1.01	5.61	0.50	A		
Clinch @ Arctic - Arctic Avenue	0.21	2.09	0.17	A	4.10	A
Clinch @ Arctic - Clinch Crescent N	0.38	2.22	0.27	A		
Clinch @ Arctic - Clinch Crescent S	2.38	5.25	0.71	A		
Mt. Scio @ Allandale - Allandale Road S	0.20	2.04	0.17	A	3.71	A
Mt. Scio @ Allandale - Mt. Scio Road N	0.21	2.02	0.17	A		
Mt. Scio @ Allandale - Allandale Road N	2.06	4.75	0.67	A		
Mt. Scio @ Allandale - Mt. Scio Road S	0.33	2.80	0.25	A		
Clinch @ New Connection - New Connection	0.46	2.24	0.31	A	2.95	A
Clinch @ New Connection - Clinch Crescent N	0.63	5.61	0.39	A		
Clinch @ New Connection - Clinch Crescent S	0.26	1.84	0.20	A		
New Connection @ Mt. Scio - Mt. Scio Road N	0.41	2.02	0.29	A	2.54	A
New Connection @ Mt. Scio - Mt. Scio Road W	0.34	5.52	0.25	A		
New Connection @ Mt. Scio - New Connection	0.16	1.71	0.14	A		
Allandale Road @ Elizabeth Avenue - Elizabeth Avenue E	0.38	2.88	0.27	A	2.87	A
Allandale Road @ Elizabeth Avenue - Allandale Road N	0.60	2.69	0.38	A		
Allandale Road @ Elizabeth Avenue - Elizabeth Avenue W	0.17	2.06	0.15	A		
Allandale Road @ Elizabeth Avenue - Bonaventure Avenue	1.01	3.21	0.50	A		

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

"D1 - 2025 S4-B, AM " model duration: 8:00 AM - 9:30 AM

"D2 - 2025 S4-B, PM" model duration: 4:30 PM - 6:00 PM

Run using Junctions 8.0.4.487 at 19/08/2015 3:30:09 PM

	PM					
	Queue (PCE)	Delay (s)	V/C Ratio	LOS	Intersection Delay (s)	Intersection LOS
A1 - 2025 S4-B						
PPD @ Allandale - Prince Philip Drive E	4.53	10.44	0.82	B	6.11	A
PPD @ Allandale - Allandale Road N	2.28	5.56	0.70	A		
PPD @ Allandale - Prince Philip Drive W	1.98	4.44	0.66	A		
PPD @ Allandale - Allandale Road S	1.97	4.91	0.67	A		
Westerland Road @ Elizabeth Avenue - Elizabeth Avenue E	4.36	16.95	0.82	C	14.81	B
Westerland Road @ Elizabeth Avenue - Westerland Road	2.86	12.63	0.75	B		
Westerland Road @ Elizabeth Avenue - Elizabeth Avenue W	3.51	14.54	0.78	B		
Freshwater Road @ Elizabeth Avenue - Elizabeth Avenue E	0.73	7.72	0.42	A	5.68	A
Freshwater Road @ Elizabeth Avenue - Freshwater Road N	2.09	4.86	0.68	A		
Freshwater Road @ Elizabeth Avenue - Freshwater Road S	1.48	5.09	0.59	A		
PPD @ Clinch 2 - PPD E	2.09	3.46	0.67	A	5.91	A
PPD @ Clinch 2 - Clinch Crescent	0.69	21.87	0.41	C		
PPD @ Clinch 2 - PPD W	1.50	2.52	0.60	A		
PPD @ Freshwater Rd - Freshwater Road	5.59	17.42	0.86	C	305.43	F
PPD @ Freshwater Rd - PPD E	129.49	189.74	1.13	F		
PPD @ Freshwater Rd - Thorburn Road	478.88	827.00	1.37	F		
PPD @ Freshwater Rd - Columbus	6.16	11.45	0.87	B		
Confederation @ PPD - PPD N	2.10	4.90	0.68	A	5.93	A
Confederation @ PPD - Confederation Building Lot	0.94	10.85	0.49	B		
Confederation @ PPD - PPD S	0.21	1.98	0.17	A		
Confederation @ Allandale - Allandale Road N	1.53	3.88	0.61	A	6.24	A
Confederation @ Allandale - Allandale Road S	3.20	6.51	0.76	A		
Confederation @ Allandale - Confederation Building	0.86	10.84	0.47	B		
Higgins @ Allandale - Allandale Road N	1.29	3.88	0.56	A	5.19	A
Higgins @ Allandale - Allandale Road S	3.22	6.87	0.77	A		
Higgins @ Allandale - Higgins Line	0.80	3.57	0.45	A		
PPD @ Clinch/ Westerland - Prince Philip Drive E	3.16	6.48	0.76	A	12.65	B
PPD @ Clinch/ Westerland - Clinch Crescent	1.87	9.32	0.66	A		
PPD @ Clinch/ Westerland - Prince Philip Drive W	2.85	4.87	0.74	A		
PPD @ Clinch/ Westerland - Westerland Road	9.53	42.63	0.93	E		
Clinch @ Arctic - Arctic Avenue	1.01	3.85	0.50	A	3.57	A
Clinch @ Arctic - Clinch Crescent N	0.88	3.49	0.47	A		
Clinch @ Arctic - Clinch Crescent S	1.25	3.42	0.56	A		
Mt. Scio @ Allandale - Allandale Road S	2.34	6.94	0.70	A	6.50	A
Mt. Scio @ Allandale - Mt. Scio Road N	0.98	6.14	0.50	A		
Mt. Scio @ Allandale - Allandale Road N	2.70	6.26	0.73	A		
Mt. Scio @ Allandale - Mt. Scio Road S	2.02	6.56	0.67	A		
Clinch @ New Connection - New Connection	0.38	2.09	0.28	A	5.94	A
Clinch @ New Connection - Clinch Crescent N	2.77	13.67	0.74	B		
Clinch @ New Connection - Clinch Crescent S	0.69	2.58	0.41	A		
New Connection @ Mt. Scio - Mt. Scio Road N	0.61	2.33	0.38	A	2.94	A
New Connection @ Mt. Scio - Mt. Scio Road W	0.48	5.99	0.33	A		
New Connection @ Mt. Scio - New Connection	0.70	2.61	0.41	A		
Allandale Road @ Elizabeth Avenue - Elizabeth Avenue E	0.76	4.36	0.43	A	11.18	B
Allandale Road @ Elizabeth Avenue - Allandale Road N	4.42	9.40	0.82	A		
Allandale Road @ Elizabeth Avenue - Elizabeth Avenue W	3.60	12.01	0.78	B		
Allandale Road @ Elizabeth Avenue - Bonaventure Avenue	6.02	15.62	0.87	C		

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

"D1 - 2025 S4-B, AM" model duration: 8:00 AM - 9:30 AM

"D2 - 2025 S4-B, PM" model duration: 4:30 PM - 6:00 PM

Run using Junctions 8.0.4.487 at 19/08/2015 3:29:42 PM

MEDIA RELEASE

City of St. John's
June 5, 2014

MUN AREA TRAFFIC STUDY MOVING FORWARD

The City of St. John's, the Government of Newfoundland and Labrador and Memorial University have partnered to complete a traffic study for the area surrounding Memorial University.

The City has retained Hatch Mott MacDonald as the consultant for the project to study traffic patterns in the area and seek public input through a variety of means.

"We are very pleased to move forward with this project," said Councillor Sandy Hickman, who represents council on the MUN Area Traffic Study Committee. "It is critical we conduct a proper study of traffic and other transportation issues in this area, particularly given the level of construction and growth that has taken place at both Memorial University and the Health Sciences Centre. I hope residents will take the opportunity to provide feedback throughout the process."

The consultant will examine and make recommendations on the area road network, capacity, pedestrian safety, public transit and other traffic related issues. An important part of the consultant's work will include engaging with the public. The public can take a survey or offer feedback on the consultant's website at <http://muntrafficstudy.ca/>. There will also be public information sessions at Memorial University on Thursday, June 12, 2014 from 2 – 4 p.m. and 7 – 9 p.m. in the Junior Common Room (R. Gushue Hall).

"Traffic volume on the roads around Memorial's St. John's campus has increased significantly over the past number of years," said Darrell Miles, director of Memorial's Facilities Management division. "The university is looking forward to the completion of this study so that measures can be taken to address the issues created both on and off campus by this increased traffic volume."

The study area includes Prince Phillip Drive from Thorburn Road to the East entrance to the Confederation Building on Prince Philip Drive, Elizabeth Avenue and Freshwater Road from Kenmount Road to Allandale Road and Allandale Road from the Outer Ring Road to Elizabeth Avenue. It also includes areas and roadways on the St. John's campus.

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ST. JOHN'S

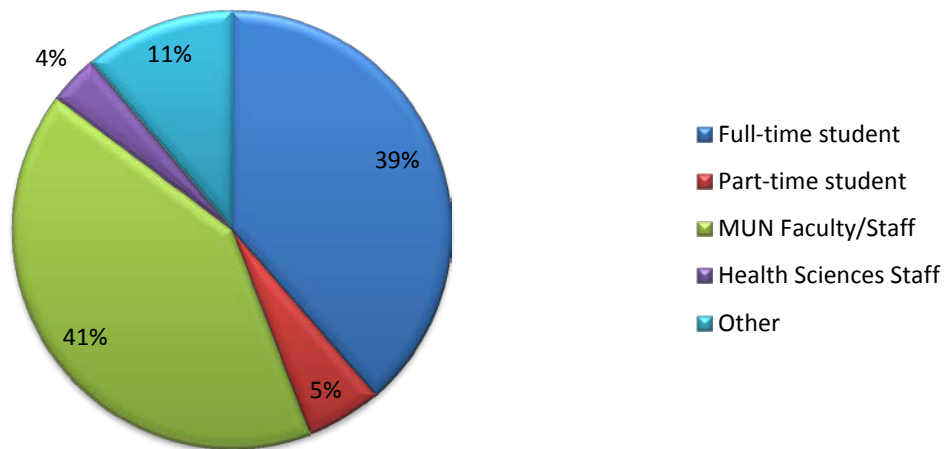
MUN Area Traffic Study

Which of the following best describes you?

Answer Options	Response Percent	Response Count
Full-time student	38.6%	160
Part-time student	5.6%	23
MUN Faculty/Staff	41.1%	170
Health Sciences Staff	3.6%	15
Other	11.1%	46
<i>answered question</i>		368
<i>skipped question</i>		46

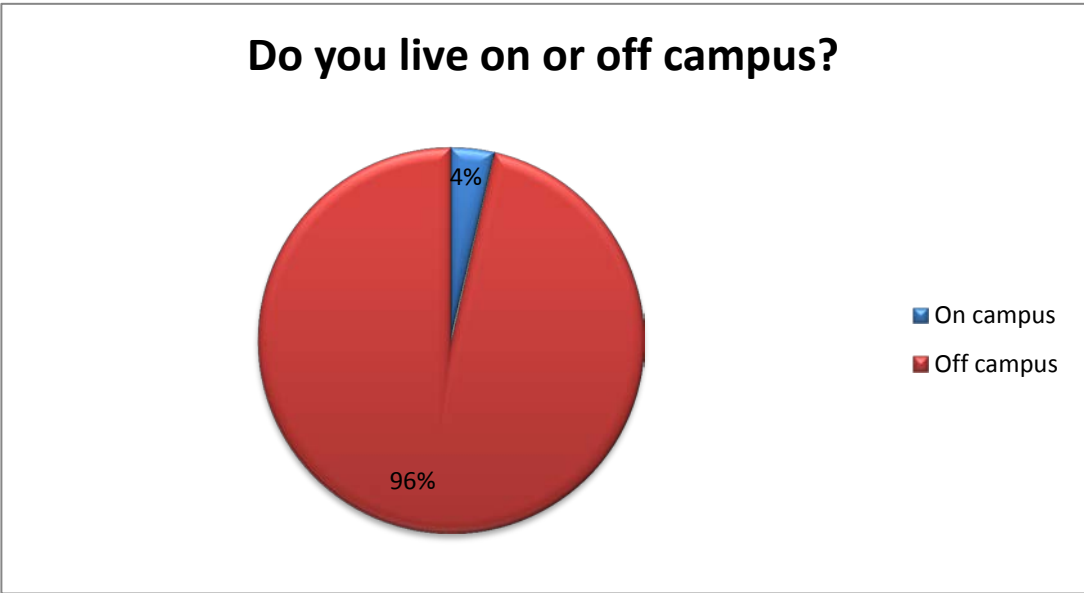
Other includes Alumni, Aquarena/A.C. Hunter Library Users, Nearby Community Residents, Retirees, Construction and Other Faculty Workers, Drivers Through the Area, and Visitors.

Which of the following best describes you?



MUN Area Traffic Study

Do you live on or off campus?		
Answer Options	Response Percent	Response Count
On campus	3.6%	15
Off campus	96.4%	399
answered question		414
skipped question		0

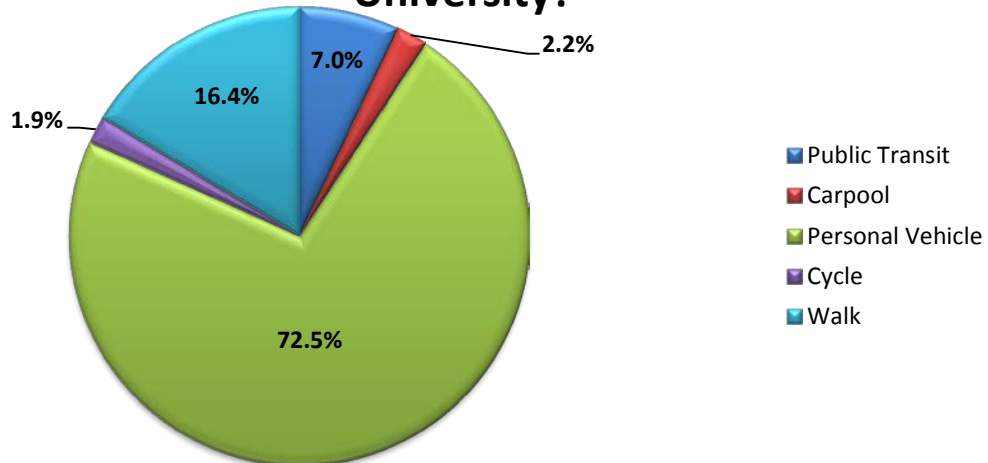


MUN Area Traffic Study

How do you usually travel to/from the University?

Answer Options	Response Percent	Response Count
Public Transit	7.0%	29
Carpool	2.2%	9
Personal Vehicle	72.5%	300
Cycle	1.9%	8
Walk	16.4%	68
<i>answered question</i>		414
<i>skipped question</i>		0

How do you usually travel to/from the University?



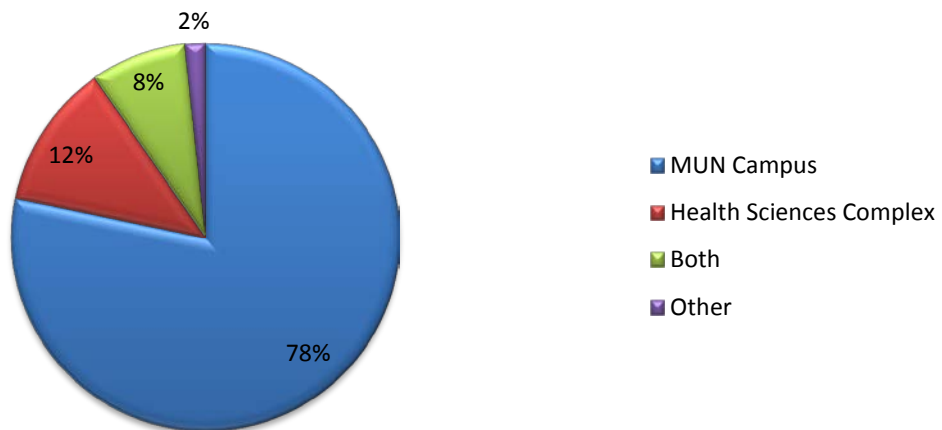
MUN Area Traffic Study

On your last trip to the University, where did you go?

Answer Options	Response Percent	Response Count
MUN Campus	78.3%	324
Health Sciences Complex	12.1%	50
Both	8.0%	33
Other	1.7%	7
<i>answered question</i>		407
<i>skipped question</i>		7

Other includes Aquarena, A.C. Hunter Library, NRC, The Works, and Unknown

On your last trip to the University, where did you go?



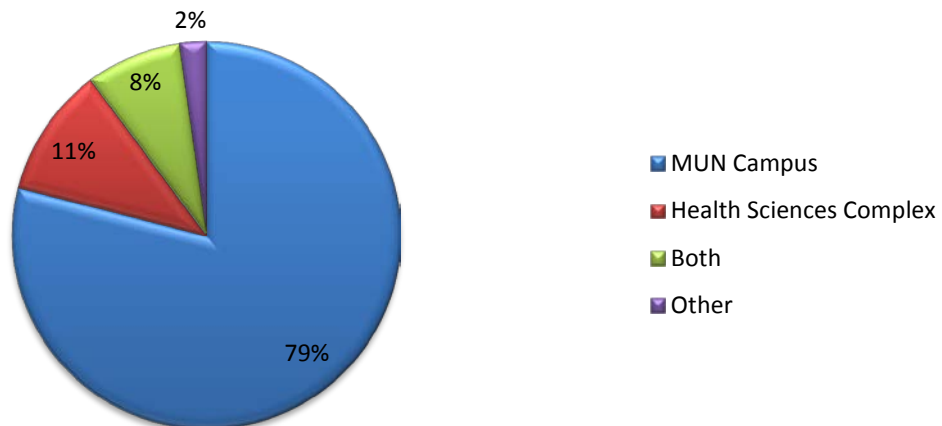
MUN Area Traffic Study

Which of the following destinations on campus would you usually visit on a typical day?

Answer Options	Response Percent	Response Count
MUN Campus	79.0%	327
Health Sciences Complex	10.9%	45
Both	8.0%	33
Other	2.2%	9
<i>answered question</i>		405
<i>skipped question</i>		9

Other includes Aquarena, UC bus stop, A.C. Hunter Library, NRC, Unknown and don't visit everyday.

Which of the following destinations on campus would you usually visit on a typical day?

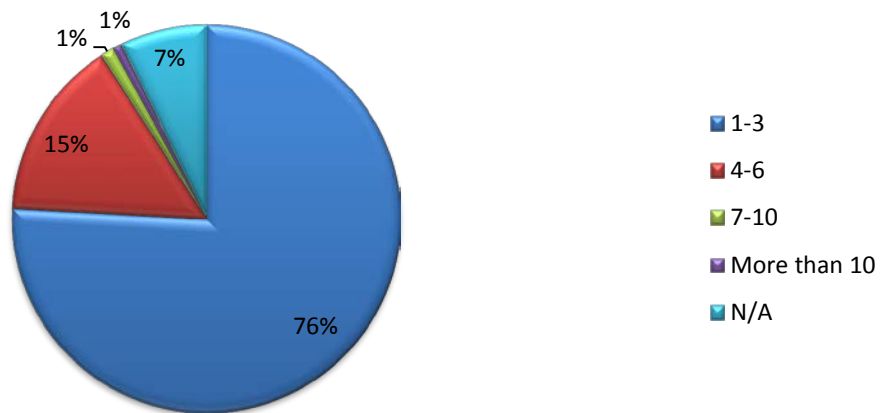


MUN Area Traffic Study

How often do you cross Prince Philip Drive on an average day?

Answer Options	Response Percent	Response Count
1-3	75.8%	314
4-6	15.0%	62
7-10	1.2%	5
More than 10	0.7%	3
N/A	7.2%	30
<i>answered question</i>		414
<i>skipped question</i>		0

How often do you cross Prince Philip Drive on an average day?



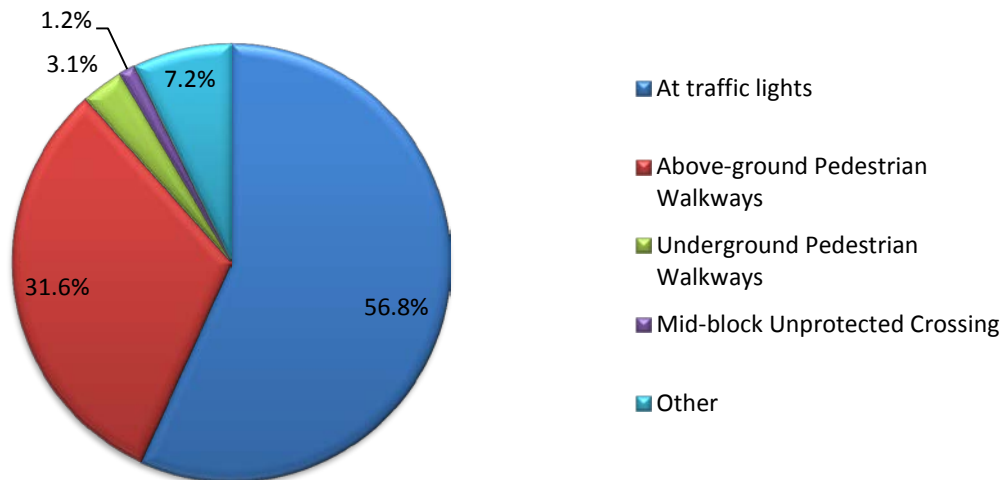
MUN Area Traffic Study

Where do you usually cross Prince Philip Drive?

Answer Options	Response Percent	Response Count
At traffic lights	56.8%	235
Above-ground Pedestrian Walkways	31.6%	131
Underground Pedestrian Walkways	3.1%	13
Mid-block Unprotected Crossing	1.2%	5
Other	7.2%	30
<i>answered question</i>		384
<i>skipped question</i>		30

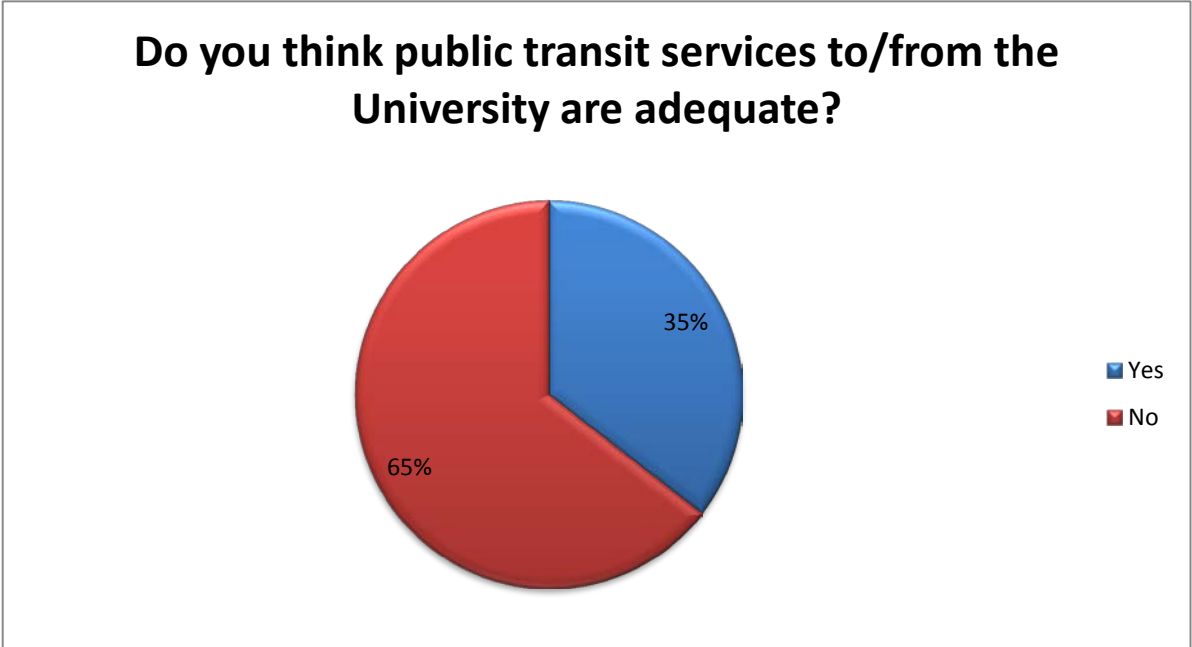
Other includes all options listed, only accessing one side of campus and no need to cross street, community member that only drives the street, and unknown/ not listed.

Where do you usually cross Prince Philip Drive?



MUN Area Traffic Study

Do you think public transit services to/from the University are adequate?		
Answer Options	Response Percent	Response Count
Yes	35.5%	147
No	64.5%	267
answered question		414
skipped question		0

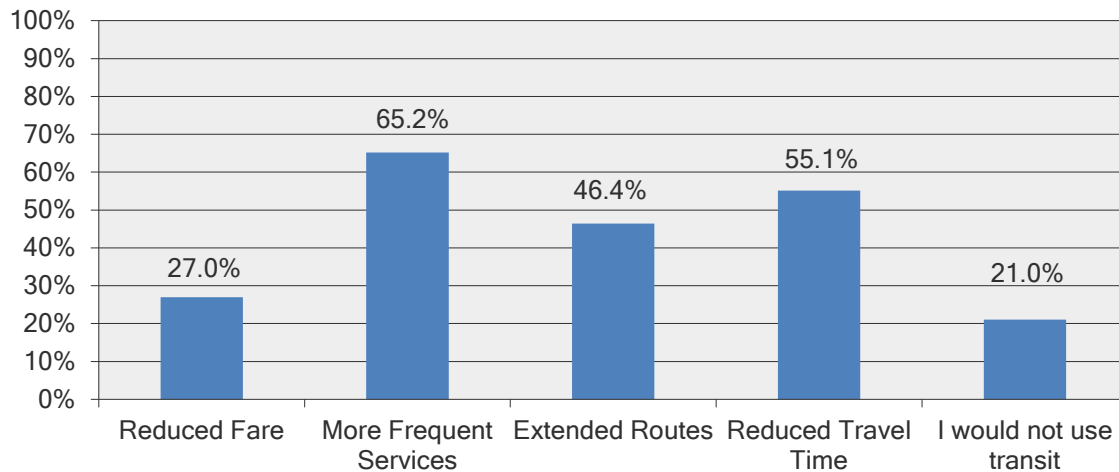


MUN Area Traffic Study

Which of the following would encourage you to use public transit? (Check all that apply)

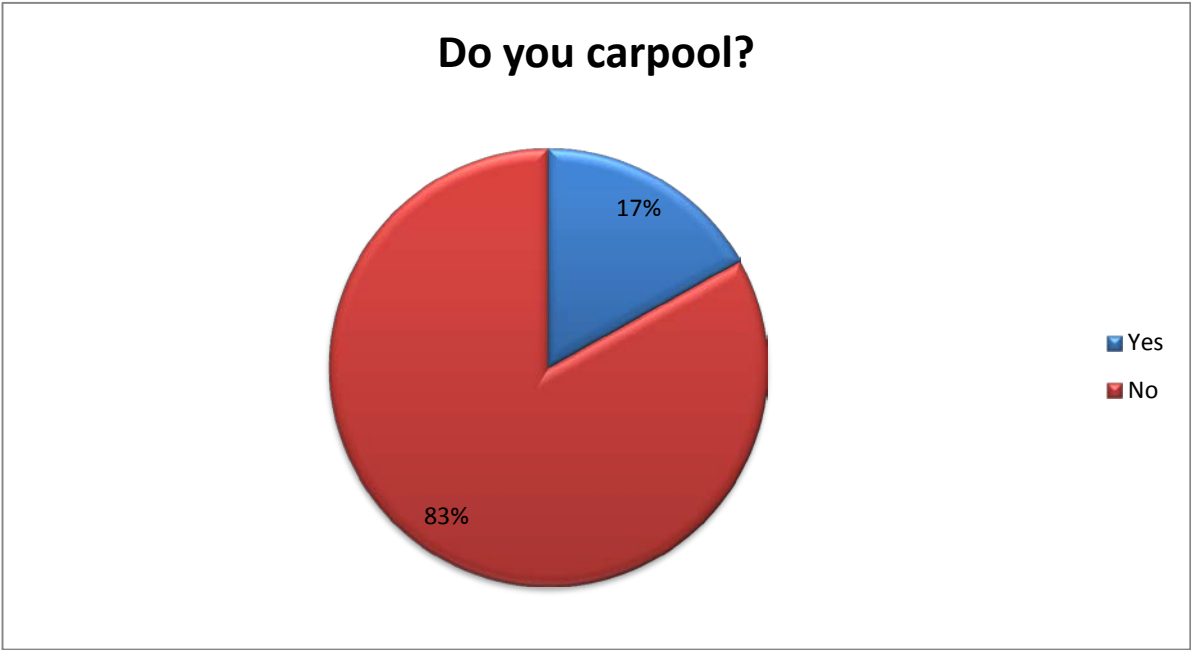
Answer Options	Response Percent	Response Count
Reduced Fare	27.0%	72
More Frequent Services	65.2%	174
Extended Routes	46.4%	124
Reduced Travel Time	55.1%	147
I would not use transit	21.0%	56
<i>answered question</i>		267
<i>skipped question</i>		147

Which of the following would encourage you to use public transit?
(Check all that apply)



MUN Area Traffic Study

Do you carpool?		
Answer Options	Response Percent	Response Count
Yes	16.9%	70
No	83.1%	344
answered question		414
skipped question		0



MUN Area Traffic Study

Which of the following would encourage you to carpool? (Check all that apply)

Answer Options	Response Percent	Response Count
More Accessible Carpooling Information	20.9%	72
Discount on Parking Permits	29.4%	101
Preferred Carpool Parking	31.7%	109
Gift Certificates	8.1%	28
I would not carpool	53.8%	185
<i>answered question</i>		344
<i>skipped question</i>		70

Which of the following would encourage you to carpool?
(Check all that apply)

