603-643 & 645-699 KINGSTON ROAD MIXED-USE DEVELOPMENT

City of Pickering
Urban Transportation Considerations Update

Prepared For: Director Industrial Holdings Limited

October 2023

BA Group

45 St. Clair Avenue West, Suite 300
Toronto, ON M4V 1K9
www.bagroup.com

AUTHORSHIP

Date	Revision	Update
13/04/2020	Version 1 – Final Report	Initial OPA / ZBA Submission
23/10/2023	Version 2 – Final Report	OPA / ZBA Re-Submission #1

PREPARED BY

Tony Shih

Lead Author

Tony Chao-Wei Shih, P.Eng.
Associate

REVIEWED BY

S Krossey

Project Manager

Steve Krossey, P.Eng.
Principal

TABLE OF CONTENTS

TABLE OF APPENDICES

LIST OF TABLES

LIST OF FIGURES

FOREWORD AND RESPONSE TO COMMENTS

BA Group submitted an Urban Transportation Considerations Report entitled *603-643 & 645-699 Kingston Road, Mixed-Use Development*, dated April 2020, in support of an Official Plan Amendment (OPA) and Zoning By-law Amendment (ZBA) applications for the development proposal located at 603-643 & 645-699 Kingston Road in the City of Pickering.

BA Group is retained by the client – Director Industrial Holdings Limited – to provide an update to the aforementioned Urban Transportation Considerations Report given updates to the development proposal and to address comments provided by the City of Pickering, Durham Region, and Ministry of Transportation Ontario (MTO) in response to the application and to provide further review of the Site Plan.

The Urban Transportation Considerations Update Report contained herein is based upon the report submitted in April 2020, updated where appropriate to reflect changes to the development programme. At this time, the development considers in the order of 3,460 residential units, 2,474 m^2 of retail space GFA, and 3,475 m^2 of office space GFA.

Response to Comments

This section contains comments provided by the City of Pickering, the Durham Region and the MTO, and responses to the comments.

City of Pickering | Fire Department, September 23, 2020

Comment #1

I will need bit more information on the proposed fire route to tower 8. It appears as though it might be dead end that would not meet our development guidelines. Could you have the applicant illustrate the proposed fire route for that tower.

Response

The site plan has been revised, Tower 8 is now considered Tower 7. Fire route access to Tower 7 will be provided along Kingston Road and the CAFC room will be located within a 15 metre radius of the fire route access. The fire route access will be reviewed in further detail as part of the future SPA application process.

City of Pickering | Engineering Services, September 28, 2020

Comment #6 – Traffic Comments

In Figure 3 – Site Plan, the plan recommends a private condominium road from Steeple Hill Road to the new proposed access. The Kingston Road Intensification Study, recommends a public road from Steeple Hill Road to the new proposed access to the site.

Response

The site plan has been revised to provide a new north-south and east-west road extension from Kingston Road into the site. A new public road requested through this comment is still under discussion with City Planning. A functional road plan of the proposed road network is provided in **Appendix G**.

Comment #7 – Traffic Comments

A traffic analysis has been completed for AM and PM peak hours. Please confirm why Saturday traffic analysis has not been completed for the proposed site.

Response

The proposed development plan generally consists of residential and office uses which typically generate traffic during the weekday morning and afternoon peak hours. The proposed retail use will generally function and operate similarly to that of an at-grade ancillary retail use. Given the nature of the proposed retail, it is expected to primarily service residents and employees of the proposed development and residents within the surrounding neighbourhood. Therefore, it will generate primarily internal trips. It is not a big box retail or destination retail where significant amount of new external primary trips will be generated. It is anticipated that majority of the trips to / from the retail are expected to be pass-by trips.

Comment #8 – Traffic Comments

The proposed access on the west side of the site has been recommended as a right in – right out access. Please show it on the site plan.

Response

The site plan has been revised to illustrate the secondary site access along the western boundary of the property as a right-in / right-out access.

Comment #9 – Traffic Comments

A sightline review analysis should be included for both accesses.

Response

A sightline review analysis will be conducted in a subsequent submission to the City as part of the on-going approval process.

Comment #10 – Traffic Comments

All proposed road widths, access widths and their radii should be shown on Figure 3 – Site Plan.

Response

The site plan figure provided in the report is for illustrative and narrative purposes for the report, it is not intended to illustrate design details. The design details of the site plan have been illustrated in the architectural plans and are provided in **Appendix A** of this report.

Comment #11 – Traffic Comments

Figure 3 – Site Plan shows only through lane directional arrows at Steeple Hill Road. There should also be a north bound left turn arrow/lane at this intersection.

Response

The site plan figure provided in the report is for illustrative and narrative purposes for the report, it is not intended to illustrate design details. The design details of the site plan have been illustrated in the architectural plans and are provided in **Appendix A** of this report.

Comment #12 – Traffic Comments

An Autoturn diagram for the fire truck and the delivery vehicles should be included.

Response

Vehicle manoeuvring diagrams will be provided in a subsequent submission as part of the on-going application process.

Comment #13 – Traffic Comments

Show the signalized intersections on the site plan.

Response

The site plan figure has been revised to illustrate the signalized intersections. Please refer to **Figure 3** of this report.

Comment #14 – Traffic Comments

Add a Conclusion section at the end of the report.

Response

BA Group's April 2020 report provided an executive summary section at the beginning of the report that summarized the key findings of the transportation related aspects for the site. This section served as the Conclusion section for the report. The updated report has been revised to provide the Conclusion section at the end of the report. Please see **Section 13.0** of this report.

City of Pickering | City Development Department, December 21, 2020

Comment #6 – Traffic, Parking and Street Network and Design

As noted in the Region of Durham's comments, dated November 13, 2020, and the e-mails from the Ministry of Transportation, the submitted Transportation Impact Study (TIS) is required to be revised to address a number of deficiencies noted in their correspondence. The revised TIS shall be prepared in accordance with the City's and Durham Region's terms of reference. Please submit a copy of the terms of reference for the TIS to be reviewed and approved by the Region and the City. The submitted TIS may be peer reviewed. In accordance with the City's User Fee By-law, the applicant is responsible for reimbursing the City's full cost of the peer review.

Response

Noted. This report serves as an update to BA Group's April 2020 report.

Comment #7 – Traffic, Parking and Street Network and Design

This TIS shall include an analysis of whether the proposal will result in any significant traffic impacts and/or operational issues on Kingston Road, Whites Road, Whites Road/401 interchange, Steeple Hill/Kingston Road intersection and any other roads/intersections within the neighbourhood. Furthermore, the TIS shall include current traffic counts and historical data to ensure the Study reflects appropriate traffic counts given the recent changes in travel due to COVID-19. The study shall also provide recommendations of any road improvements that are required to implement the development along with the timing of those improvements. Any improvements to an existing roads and/or intersection to facilitate the development will be the responsibility of the applicant and will need to be appropriately secured prior to the issuance of any approvals.

Response

New traffic counts have been conducted and surveyed at the key intersections within the study area on Tuesday, May 16, 2023. The traffic forecasting and traffic analysis operations provided in this report has been revised and updated to reflect these new traffic count survey.

Comment #8 – Traffic, Parking and Street Network and Design

The Intensification Plan and the draft Urban Design Guidelines illustrate a public road travelling south from Steeple Hill and bending to the west through the subject lands to connect back to Kingston Road through the future redevelopment of the lands to the west of the subject properties. All public and private streets within the site are to be designed in accordance with the Intensification Plan and Draft Urban Design Guidelines. As illustrated in the Intensification Plan on Figure 90, Whites Precinct Streetscape Cross Section, the proposed future east-west street is identified as a Public Street having a right-of-way width ranging between 17.0 metres and 19.0 metres. Based on the volume of traffic to be accommodated on this street, the revised TIS shall provide a recommendation as to the ultimate right-of-way width. The right-of-way for the proposed public east-west street is to be designed as a complete street including cycling facilities and other elements such as enhanced landscaped boulevards, seating areas and street trees, possibly including on-street parking, and be designed as illustrated in the Draft Urban Design Guidelines.

The rationale for the proposed public street stems from the fact that the Intensification Plan seeks the provision of a new and improved road network for multiple modes of transportation, consolidation of driveways and accesses onto Kingston Road, providing access to multiple development blocks, and serving as right-of-ways (conduits) for underground municipal infrastructure, integrated with a secondary network of private roads and laneways. Further, upon discussion with the City's Engineering staff, this proposed public street would provide necessary relief for Kingston Road, serve as access to the proposed public park, support greater volumes of traffic, which are anticipated to be generated by a development of this *size, and support greater public access for non-residents and visitors coming to the area for the public park, office and commercial uses.*

Also, depending on the revised site configuration, if there are still to be a number of different buildings and uses proposed east of the proposed public street, consideration should be given to designing this portion of the road to a public road standard such that it could be conveyed to the City at a future date. Public roads provide logical and easy to follow addressing and numbering.

Please demonstrate that the redevelopment of the site will not preclude the ability to dedicate the primary access street as a municipal road. Further discussion is required regarding the design, construction and conveyance of this street to the City as a public street. Staff do not consider it to be appropriate for this development to be served solely by the proposed private street network.

Response

The site plan has been revised to provide a new north-south and east-west road extension from Kingston Road into the site. A new public road requested through this comment is still under discussion with City Planning. A functional road plan of the proposed road network is provided in **Appendix G**.

Comment #9 – Traffic, Parking and Street Network and Design

Staff are concerned that the parking supply proposed for resident, visitor and commercial uses may not be sufficient to support the development. The submitted TIS states that the City Centre Zoning By-law provisions are appropriate, including incorporating a shared parking formula. However, the parking ratios within the City Centre by-law provisions may not be appropriate for the proposed development given that the lands are located outside the City Centre and are not within convenient walking distance to higher-order transit services such as the GO station.

Please submit a Parking Justification Study with the next submission to support the proposed parking rates and shared parking formula. Please submit a copy of the Terms of Reference to be reviewed and approved by the City. The Parking Justification Study may be peer reviewed. In accordance with the City's User Fee By-law, the applicant is responsible for reimbursing the City's full cost of the peer review.

To support the proposed grade-related commercial uses, an appropriate amount of surface parking should be incorporated.

Response

The proposed parking supply rates have been revised to provide residents parking at a rate of 0.65 spaces per unit and residential visitors parking at a rate of 0.15 spaces per unit. Please refer to **Sections 6.3** and **6.4** of this report for the justification of the proposed parking supply rates.

Comment #10 – Traffic, Parking and Street Network and Design

Ensure accessible paths of travel throughout the site including pedestrian connections to street networks, public transit, parks and POPS.

Response

Noted.

Durham Region | Regional Works Department, October 30, 2020

Comment #1 – Urban Transportation Considerations

As discussed in the detailed comments that follow, there are several areas of the study that are not in compliance with the Region's Traffic Impact Study Guidelines. These include the apparent lack of field observations and use of non-standard and/or incorrect Synchro analysis parameters.

Response

The Synchro analysis parameters were adopted in accordance with the Region of Durham's standards in Chapter 9 of the *Design Specifications for Traffic Control Devices, Pavement Marking, Signage and Roadside Protection* guidelines, dated April 2017. These parameters generally included: lane widths, base ideal saturation flow rate, peak hour factors, heavy vehicles and signal timings. Lost time adjustment factor was the only parameter inconsistent with Durham Region's standards. A lost time adjustment factor of -1.0 seconds was adopted for the purposes of this assessment. To account for vehicles that complete a turning movement during amber or all-red times, a lost time adjustment of -1.0 seconds is applied for all movements at all signalized intersections. This is reflective of busy, urban intersections that operate at or near capacity, where drivers take advantage of as much of the green and amber time as possible to clear the intersection.

Comment #2 – Urban Transportation Considerations

The consultant did not follow the direction received from Region staff during pre-consultation to submit background growth rates related to traffic forecasting and Vissim modelling information for Region review prior to their application in the study.

Response

Noted.

Comment #3 – Urban Transportation Considerations

The consultant provides an outline of a Transportation Demand Management plan that includes measures that could reduce the vehicle trip-making associated with the development, and the Region will be seeking commitments from the proponent to follow through with implementing the components of the plan that are under their control.

Response

Noted. The TDM plan will be reviewed in detail as part of the future Site Plan Approval (SPA) application process.

Comment #4 – Urban Transportation Considerations

In the forecasting and Synchro operational analysis, the consultant omits a signalized intersection along the Kingston Road corridor within the study area – i.e. the Kingston Road/Delta Boulevard intersection. It is also omitted in the discussion of mid-block pedestrian crossing opportunities along the study area section of the Kingston Road corridor.

This omission should be addressed to provide the most accurate representation of the road network for the Synchro analysis and to correct the discussion of mid-block pedestrian crossing opportunities.

Response

The Kingston Road / Delta Boulevard intersection is a signalized intersection that provides primary access to two retail parcels. It is not anticipated site-related traffic volumes will travel to / from these retail parcels, majority of trips will be through volumes along Kingston Road and will have minimal impacts to the intersection. Notwithstanding, the traffic analysis conducted for this project has been revised and updated to include the Kingston Road / Delta Boulevard intersection.

Comment #5 – Urban Transportation Considerations

The consultant should review cycle lengths used for the analysis of future conditions to ensure that a common background cycle is being used for the Kingston Road corridor.

Response

Noted.

Comment #6 – Urban Transportation Considerations

The consultant has not presented the Synchro queue analysis results (other than providing the raw Synchro reports in the appendices) or assessed the design implications of the queuing associated with the proposed development. This omission should be addressed.

Response

Synchro queue analysis results were not presented in the report due to a full VISSIM model of the study area was provided that summarizes the queue analysis results. The VISSIM model provides a better representation of the queueing analysis results than a Synchro model. VISSIM is a microsimulation model that observes the queueing based on each individual vehicle travel behaviours, similar to real-life travel behaviours and experiences. Synchro is a macrosimulation model that calculates queueing based on constant parameter assumptions which is not representative of a person's travel behaviour. Therefore, the Synchro queue analysis results were not reported in detail as part of this report.

Comment #7 – Urban Transportation Considerations

There are omissions in the Vissim modelling and microsimulation analysis including identifying the horizon year that the modelling was carried out for, clarifying whether any field work was done as related to modelling existing conditions, clearly stating the criteria being used to define "significant" or "excessive" changes to the travel time performance metric, clarifying conclusions related to the impact of the proposed development, and providing comparisons of microsimulation analysis results with Synchro analysis results to demonstrate that the two analysis methodologies are compatible in terms of assessing impacts.

Response

The future background and future total scenarios horizon year has been clarified in Section 3.0 of the Microsimulation Model Calibration and Analysis Report provided in Appendix F. Existing conditions field work or sources of field data have been clarified in Section 2.0 of the Microsimulation Model Calibration and Analysis Report provided in Appendix F, and analysis conclusions have been clarified in Section 3.0 and Section 4.0 of the Microsimulation Model Calibration and Analysis Report provided in Appendix F.

The Vissim microsimulation model-based analysis is complimentary to the Synchro, Highway Capacity Manual based. The Synchro analysis provided in the Urban Transportation Considerations report focuses on future projected impacts at the intersection turning movement level, while the Vissim microsimulation analysis provides future projected impacts both network wide and on specific intersection operations (focusing on metrics that are not available with standard traffic capacity analysis methods).

Comment #2c) – Evolving Area Transportation Context (Section 4.0)

Note that there have been significant changes to existing DRT services since the study was completed. This should be reflected in the revised study.

Response

Noted.

Comment #2e) – Evolving Area Transportation Context (Section 4.0)

The description of the existing pedestrian network identifies the lack of mid-block crossing opportunities of Kingston Road and notes that a new controlled intersection between Steeple Hill and Rosebank Road should be subject to further study in conjunction with future development to the west of the subject site as per the Kingston Road Corridor and Specialty Retailing Node Intensification Study (and not specifically related to the subject development). We note that Figure 19 is used to highlight the walking distances between signalized intersections along Kingston Road, but it omits the existing traffic signal control at the Kingston Road/Delta Boulevard intersection to the east of Whites Road. As described, the enhancement of the sidewalk network, at-grade retail uses along Kingston Road, and the removal of the existing large surface parking areas should all improve opportunities for pedestrian travel within and adjacent to the subject site.

Response

Noted.

Comment #2f) – Evolving Area Transportation Context (Section 4.0)

The description of the future cycling network, which references the Durham Transportation Master Plan (2017), shows a number of improvements along the Kingston Road and Whites Road corridors that would be beneficial for cycling trips generated by the proposed development. The consultant should also refer to the City of Pickering Integrated Transportation Master Plan (ITMP), which makes recommendations for additional cycling connections in the City. Information on the proposed additional cycling facilities should be obtained from City staff.

Response

Noted.

Comment #3h) – Transportation Demand Management Strategy (Section 5.0, "TDM")

The use of current services such as Smart Commute Durham was noticeably absent from the list. Smart Commute Durham, as an employee-based program, would apply to workplaces that want to be members with 50+ employees. There is the potential for the office component of the development to have workplaces large enough to become members, but the retail and residential components would not be part of the program. TDM measures such as dissemination of information on Cycle Durham, DRT routes, preloaded Presto Cards and carpool lot mapping would be beneficial to residents and should be noted as part of the communication and promotion measures.

Response

Noted. The TDM plan will be reviewed in detail as part of the future Site Plan Approval (SPA) application process.

Comment #3i) – Transportation Demand Management Strategy (Section 5.0, "TDM")

There are no costs identified for the various TDM strategies, and responsibilities for implementation and on-going operation should be identified.

Response

Noted. The TDM plan will be reviewed in detail as part of the future Site Plan Approval (SPA) application process.

Comment #4c) – Vehicular Parking Considerations (Section 6.0)

While the parking rationale appears reasonable, it is assumed that City staff will review the proposed parking supply in more detail as this is primarily a City responsibility.

Response

Noted.

Comment #5b) – Bicycle Parking Considerations (Section 7.0)

As noted above, it is assumed that City staff will review the proposed bike parking supply in more detail as this is primarily a City responsibility.

Response

Noted.

Comment #6e) – Multi-Modal Travel-Demand Forecasting (Section 8.0)

There is no comparison provided by the consultant of the calculated trip rates versus other sources such as the ITE Trip Generation Manual or with proxy sites in Durham Region that are well-served by public transit. We find that the resultant trip rates are approximately 10 to 15% lower than general urban/suburban high-rise residential trip rates in the ITE manual, which demonstrates that there will be a significant reliance on TDM measures to achieve the lower vehicle trip generation for the proposed residential uses.

Response

Residential proxies provided are located in York Region, primarily Vaughan and Richmond Hill, in areas with similar transportation context as Kingston Road / Whites Road area. As requested by Durham Region, new residential proxy sites have recently been surveyed in Durham Region. Based on comparison of the York Region and Durham Region surveys, the Durham Region surveys resulted in a lower trip rates than the York Region trip rates. Therefore, the analysis conducted as part of the April 2020 Report was considered more conservative.

The ITE Trip Generation Manual is not considered an appropriate source for generating trips for development located in a context with access to significant transit. ITE Trip Generation Manual trip rates are based on proxy sites primarily surveyed in the United States where there are minimal transit and active transportation infrastructure provided and located in very auto-oriented areas. ITE also mentions that the auto mode split in their manual represents approximately 96%. Based on 2016 TTS data, the auto modal split for the site area represents approximately 80% to 85% which is approximately equivalent to the 10% to 15% reduction specified in the comments.

The residential trip generation rates have been revised and updated since the April 2020 Report to reflect recent travel patterns and behaviour. The residential trip generation rates are outlined in **Section 10.4** of this report.

Comment #6f) – Multi-Modal Travel-Demand Forecasting (Section 8.0)

The consultant develops office trip generation rates based on the average trip rates at three proxy sites, all presumed to be in Toronto since no municipality is listed in Table 16. The proxy site data showed that one of the sites had considerably lower trip rates (about 50%) than the other two sites and brought the average trip rate down. The selected rates are approximately 10 to 15% less than the ITE general office trip rate, and while the consultant states that the office trips will be generated primarily by automobile, it appears that there will be some significant reliance on other modes as well as internal synergies.

Response

The ITE Trip Generation Manual is not considered an appropriate source for generating trips for development located in a context with access to significant transit. ITE Trip Generation Manual trip rates are based on proxy sites primarily surveyed in the United States where there are minimal transit and active transportation infrastructure provided and located in very auto-oriented areas. ITE also mentions that the auto mode split in their manual represents approximately 96%. Based on 2016 TTS data, the auto modal split for the site area represents approximately 80% to 85% which is approximately equivalent to the 10% to 15% reduction specified in the comments.

Comment #6g) – Multi-Modal Travel-Demand Forecasting (Section 8.0)

The consultant develops retail trip generation rates based first on a reasonable assumption that the retail will primarily serve the other on-site uses and second by undertaking a first principles approach based on the anticipated use of the 78 parking spaces by the retail uses (typo in report also refers to 90 retail parking spaces). The resultant peak hour trip estimates appear reasonable given the development context.

Response

Noted.

Comment #7a) – Vehicle Travel Demands (Section 9.0)

In this section, the consultant develops background and total traffic estimates for 2024, 2029, and 2034 horizon years. It should be noted that the consultant did not follow the direction provided by Region staff during pre-consultation, as they did not submit proposed background growth rates for review and approval by Region staff prior to applying them in the study.

Response

Noted.

Comment #7c) – Vehicle Travel Demands (Section 9.0)

Field observations of peak hour traffic operations and documentation of same are a requirement of the Region's TIS Guidelines. The consultant has not included documentation of any field observations. For future studies, the Region will expect that this type of omission will be addressed.

Response

The Synchro analysis parameters were adopted in accordance with the Region of Durham's standards in Chapter 9 of the *Design Specifications for Traffic Control Devices, Pavement Marking, Signage and Roadside Protection* guidelines, dated April 2017. These parameters generally included: lane widths, base ideal saturation flow rate, peak hour factors, heavy vehicles and signal timings. Lost time adjustment factor was the only parameter inconsistent with Durham Region's standards. A lost time adjustment factor of -1.0 seconds was adopted for the purposes of this assessment. To account for vehicles that complete a turning movement during amber or all-red times, a lost time adjustment of -1.0 seconds is applied for all movements at all signalized intersections. This is reflective of busy, urban intersections that operate at or near capacity, where drivers take advantage of as much of the green and amber time as possible to clear the intersection.

Comment #7d) – Vehicle Travel Demands (Section 9.0)

We note that the Kingston Road/Delta Boulevard signalized intersection that is located between Whites Road and the Highway 401 westbound on/off ramps was not counted. There is no acknowledgment in the study of this omission. We also noted that Figure 21, which depicts existing lane configurations and traffic controls, does not include the Kingston Road/Delta Boulevard intersection.

Response

The Kingston Road / Delta Boulevard intersection is a signalized intersection that provides primary access to two retail parcels. It is not anticipated site-related traffic volumes will travel to / from these retail parcels, majority of trips will be through volumes along Kingston Road and will have minimal impacts to the intersection. Notwithstanding, the traffic analysis conducted for this project has been revised and updated to include the Kingston Road / Delta Boulevard intersection.

Comment #7e) – Vehicle Travel Demands (Section 9.0)

The background forecasts included two other developments – a car wash/convenience store/fast-food restaurant complex at 682 and 698 Kingston Road and an 82-unit residential development at 760-770 Kingston Road. While the consultant refers to these as "substantive area background developments", they are relatively low traffic generators.

Consistent with the terms of reference established with Region staff, the background traffic forecast did not include any assumptions for intensification on other nearby lands in the Kingston Road or Whites Road corridors.

Response

Noted. The area background developments have been revised.

Comment #7f) – Vehicle Travel Demands (Section 9.0)

The background forecasts also included estimated growth rates, which comprised 1.0% per year for the 2019-2024 period, and 0.5% per year for the 2024-2029 and 2029-2034 time periods. These are reasonable estimates considering the local context where intensification of development is planned but key intersections have existing capacity constraints, and there are no plans to increase their capacity.

Response

Noted.

Comment #7g) – Vehicle Travel Demands (Section 9.0)

Figure 24 shows the future background traffic volumes and again it is notable that the Kingston Road/Delta Boulevard signalized intersection is not included.

Response

The Kingston Road / Delta Boulevard intersection is a signalized intersection that provides primary access to two retail parcels. It is not anticipated site-related traffic volumes will travel to / from these retail parcels, majority of trips will be through volumes along Kingston Road and will have minimal impacts to the intersection. Notwithstanding, the traffic analysis conducted for this project has been revised and updated to include the Kingston Road / Delta Boulevard intersection.

Comment #7i) – Vehicle Travel Demands (Section 9.0)

Figures 26, 27, and 28 show the future total traffic volumes for 2024, 2029, and 2034, respectively. As noted previously, there are no forecasts shown for the Kingston Road/Delta Boulevard intersection. Figure 28 is missing the northbound AM and PM traffic volumes on Whites Road north of Bayly Street.

Response

The Kingston Road / Delta Boulevard intersection is a signalized intersection that provides primary access to two retail parcels. It is not anticipated site-related traffic volumes will travel to / from these retail parcels, majority of trips will be through volumes along Kingston Road and will have minimal impacts to the intersection. Notwithstanding, the traffic analysis conducted for this project has been revised and updated to include the Kingston Road / Delta Boulevard intersection.

Comment #8a) – Traffic Operations (Section 10.0)

The consultant lists the study area intersections that were analyzed as part of the study. Synchro software was used for the analysis and it is typical to build a model of the study area road network. In section 10.3, the consultant states that traffic analysis was undertaken at all signalized intersections within the study area. For this to be accurate, the Synchro model should have included the Kingston Road/Delta Boulevard intersection to provide the best representation of the network. This omission should be addressed.

Response

The Kingston Road / Delta Boulevard intersection is a signalized intersection that provides primary access to two retail parcels. It is not anticipated site-related traffic volumes will travel to / from these retail parcels, majority of trips will be through volumes along Kingston Road and will have minimal impacts to the intersection. Notwithstanding, the traffic analysis conducted for this project has been revised and updated to include the Kingston Road / Delta Boulevard intersection.

Comment #8b) – Traffic Operations (Section 10.0)

The consultant should review the cycle lengths used for future scenarios to ensure that a common background cycle is being used for the Kingston Road corridor, since there appear to be some anomalies.

Response

Noted.

Comment #8c) – Traffic Operations (Section 10.0)

The network parameters as listed are generally acceptable; however, the lost time adjustment of -1.0 second is not part of the Region's TIS Guidelines and supporting references. Any deviation from the Region's standard parameters must be justified and noted in the report.

Response

Noted.

Comment #8d) – Traffic Operations (Section 10.0)

There is a minor error in the section on signal timings where the consultant indicates that existing signal timings were obtained from the City of Pickering. The signal timing plans contained in Appendix D were provided by Durham Region staff.

Response

Noted.

Comment #8e) – Traffic Operations (Section 10.0)

Field observations of peak hour traffic operations and documentation of same are a requirement of the Region's TIS Guidelines. The consultant has not included documentation of any field observations, which are useful in interpreting analysis results, ensuring that all signalized intersections are included in an analysis, and confirming that the counted traffic volumes reasonably represent the demand volumes. For future studies, the Region will expect that this type of omission will be addressed.

Response

The Synchro analysis parameters were adopted in accordance with the Region of Durham's standards in Chapter 9 of the *Design Specifications for Traffic Control Devices, Pavement Marking, Signage and Roadside Protection* guidelines, dated April 2017. These parameters generally included: lane widths, base ideal saturation flow rate, peak hour factors, heavy vehicles and signal timings. Lost time adjustment factor was the only parameter inconsistent with Durham Region's standards. A lost time adjustment factor of -1.0 seconds was adopted for the purposes of this assessment. To account for vehicles that complete a turning movement during amber or all-red times, a lost time adjustment of -1.0 seconds is applied for all movements at all signalized intersections. This is reflective of busy, urban intersections that operate at or near capacity, where drivers take advantage of as much of the green and amber time as possible to clear the intersection.

Comment #8h) – Traffic Operations (Section 10.0)

There is an error in the Synchro representation of the Kingston Road/Rosebank Road intersection in all analyses where the westbound left turn lane is not included in the PM peak hour analysis.

Response

Noted.

Comment #8i) – Traffic Operations (Section 10.0)

The Synchro analysis includes an incorrect lane configuration at the intersection of Kingston Road and Whites Road for all scenarios.

Response

Noted.

Comment #8j) – Traffic Operations (Section 10.0)

The Existing AM Peak Hour Synchro analysis includes an incorrect lane configuration at the Whites Road/Highway 401 eastbound off-ramp intersection.

Response

Noted.

Comment #8k) – Traffic Operations (Section 10.0)

The existing timing at Bayly Street and Whites Road needs to be updated to show split-phase operation.

Response

Noted.

Comment #8l) – Traffic Operations (Section 10.0)

While Synchro queue reports were included in the appendix materials, the consultant did not provide a summary of queues or identify any potential issues or requirements associated with the queue results.

Response

Synchro queue analysis results were not presented in the report due to a full VISSIM model of the study area was provided that summarizes the queue analysis results. The VISSIM model provides a better representation of the queueing analysis results than a Synchro model. VISSIM is a microsimulation model that observes the queueing based on each individual vehicle travel behaviours, similar to real-life travel behaviours and experiences. Synchro is a macrosimulation model that calculates queueing based on constant parameter assumptions which is not representative of a person's travel behaviour. Therefore, the Synchro queue analysis results were not reported in detail as part of this report.

Comment #8m) – Traffic Operations (Section 10.0)

In focusing on the primary access to the subject site, i.e. the Kingston Road/ Steeple Hill intersection, we note that there are 95th percentile queues for the westbound left turn movement that exceed the available storage lane length by 80 to 85 metres in the pre-BRT scenario. The analysis shows that the 95th percentile queue is approximately 145 to 150 metres whereas the storage lane is approximately 65 metres. Under this scenario, the length of this storage lane is limited since it is back-to-back with the eastbound left turn lane on the Kingston Road approach to Whites Road. To increase the storage for one requires reducing the storage for the other. The Synchro analysis also includes cautionary notes for this movement indicating that the 95th percentile queue exceeds capacity and the queue may be longer and that the volume for the 95th percentile is metered by the upstream signal. These details were not addressed in the study.

Response

Synchro queue analysis results were not presented in the report due to a full VISSIM model of the study area was provided that summarizes the queue analysis results. The VISSIM model provides a better representation of the queueing analysis results than a Synchro model. VISSIM is a microsimulation model that observes the queueing based on each individual vehicle travel behaviours, similar to real-life travel behaviours and experiences. Synchro is a macrosimulation model that calculates queueing based on constant parameter assumptions which is not representative of a person's travel behaviour. Therefore, the Synchro queue analysis results were not reported in detail as part of this report.

Comment #8n) – Traffic Operations (Section 10.0)

Under the scenario with the BRT, the analysis results show that the 95th percentile queues for the westbound left turn movement in the PM peak hour would increase to 210 to 220 metres. If designing the left turn storage for the 95th percentile, this is problematic since there is only 265 metres between the stop bars of the westbound Kingston Road approach to Steeple Hill and the eastbound Kingston Road approach to Whites Road. As noted above, the details related to Synchro queue results were not addressed in the study.

Response

Synchro queue analysis results were not presented in the report due to a full VISSIM model of the study area was provided that summarizes the queue analysis results. The VISSIM model provides a better representation of the queueing analysis results than a Synchro model. VISSIM is a microsimulation model that observes the queueing based on each individual vehicle travel behaviours, similar to real-life travel behaviours and experiences. Synchro is a macrosimulation model that calculates queueing based on constant parameter assumptions which is not representative of a person's travel behaviour. Therefore, the Synchro queue analysis results were not reported in detail as part of this report.

Comment #9b) – Microsimulation Analysis (Section 11.0 and Appendix F)

We note that that although there is a typo in Figure 29 with regard to the illustration of signalized intersections in the Vissim study area (i.e. missing signal symbol at the Kingston Road/Highway 401 westbound off ramp intersection), the Vissim model does include the Kingston Road/Delta Boulevard intersection that was omitted from the Synchro analysis.

Response

Noted, Figure 29 has been updated in both the Urban Transportation Considerations Report and the Microsimulation Model Calibration and Analysis Report provided in Appendix F.

Comment #9c) – Microsimulation Analysis (Section 11.0 and Appendix F)

Our comments on the Vissim modelling are as follows:

- *It appears that aerial photography and street view imagery were used to determine the existing road alignment and intersection configurations, since there is no discussion of field work;*
- *It appears that vehicle travel times for the study area were obtained using Google Maps Distance Matrix API, since there is no discussion of conducting travel time runs in the field;*
- *While the model parameters related to vehicle and driver behaviour are acceptable, there is no documentation to indicated if a static routing or dynamic assignment was utilized;*
- *For the information provided, we find that the calibration of the model is within acceptable industry targets;*
- *For the future Vissim analysis and presentation of results, the consultant does not specify the horizon year; in contrast, the Synchro analysis results for the with BRT scenario are presented for the 2024, 2029, and 2034 forecasts;*
- *The consultant notes that travel time was selected as the performance metric, and states the rationale as, "… to ensure that the traffic impacts associated with the site redevelopment would not result in excessive travel time increases." The consultant's conclusion, "… it is projected that vehicular travel times will not increase significantly throughout the study area in both the weekday morning (AM) and afternoon (PM) peak hours due to the proposed redevelopment" is problematic since "significant" or "excessive" are not defined, and the comparison of travel times presented in the report is existing conditions versus forecast conditions including the proposed development. There is no Vissim analysis presented for future conditions without the development that would assist in identifying the effect on travel time of just the development; and*
- *To complement the Synchro analysis, queuing determined through the Vissim model should also have been used as performance metric. Similarly, delays determined through the Vissim model should also have been used to compare with the Synchro results.*

Response

- Noted, Section 1.3.1 of the Microsimulation Model Calibration and Analysis Report provided in Appendix F clarifies how the road alignment and intersection configurations were obtained. However, a combination of Bing Maps and Google Maps/Streetview imagery was indeed used to determine the existing road alignment and intersection configurations.
- Noted, Section 1.3.3 of the Microsimulation Model Calibration and Analysis Report provided in Appendix F clarifies how vehicle travel time data was collected. However, the Google Maps Distance Matrix API was indeed utilized to collect real-time travel time data.
- Noted, Section 1.4 of the Microsimulation Model Calibration and Analysis Report provided in Appendix F clarifies that the Vissim microsimulation model utilizes static vehicle inputs and routing decisions to assign turning movement volumes associated with the existing conditions, future background, and future total analysis scenarios.
- Noted.
- Noted, the future background and future total scenarios horizon year is 2039 and this has been clarified in Section 3.0 of the Microsimulation Model Calibration and Analysis Report provided in Appendix F.
- Noted, a future background scenario has been included in the analysis detailed in Section 3.0 of the Microsimulation Model Calibration and Analysis Report provided in Appendix F and includes a comparison of existing conditions, future background and future total scenarios analysis outputs.
- Noted, the Vissim microsimulation analysis provided in Section 3.0 of the Microsimulation Model Calibration and Analysis Report includes an analysis of vehicle travel times, vehicle queueing and vehicle delay model outputs.

  The Vissim microsimulation model-based analysis is complimentary to the Synchro, Highway Capacity Manual based. The Synchro analysis provided in the Urban Transportation Considerations report focuses on future projected impacts at the intersection turning movement level, while the Vissim microsimulation analysis provides future projected impacts both network wide and on specific intersection operations (focusing on metrics that are not available with standard traffic capacity analysis methods).

Ministry of Transportation, September 25, 2020

Comment #1

This is the report of a multi-modal project at a conceptual level.

Response

Noted.

Comment #2

This is Town oriented development (Pickering) and many assumptions are related to the Town's future planning. Can we confirm with the town that they are in agreement with the assumption made in this TIS regarding trip generation and modal split.

Response

Noted.

Comment #3

The trip distribution seems to be logical and I am in agreement with that.

Response

Noted.

Comment #4

For the existing conditions, Hwy 401 at Whites Rd W-N/S ramp terminal has been analysed with 2 left turning lanes and 1 right turning lane. This should be done with 1 left + 1 shared LR + 1 right as is.

Response

Noted.

Comment #5

For future conditions for the same intersection it is assumed that an additional RT lane will be in place as result of background traffic. I am not sure about it and we may need to confirm with our P&D folks.

Response

Noted.

Comment #6

The level of service at the ramp terminal will drop eventually; C to D in most cases and D to E in others. For E-N/S ramp terminal at Whites Rd the WBL will be over its maximum capacity as result of the development. There are no mitigation measures proposed.

Response

Noted.

Ministry of Transportation, September 30, 2020

Comment #1

We require at least one interchange east and west of the study area (Sheppard/Port Union and Liverpool) in the microsimulation. We want to assess the impact of the developments on the immediate interchange and adjacent interchanges.

Response

Given the interchanges to the east and west of the interchange at Whites Road are 2 to 3 kilometers away and the lack of east-west connecting streets through the study area and immediate area between these interchanges, aside from Kingston Road, there are no significant opportunities for east-west Highway 401 traffic diversion within close enough proximity to the site and study area. Therefore, expanding the model study area to include the interchanges at Sheppard/Port Union and Liverpool is not required to quantify the impacts associated with the proposed redevelopment.

Comment #2

We would like to see the operations on Highway 401 to assess the traffic impact of the proposed development. MTO will be able to provide volumes and travel time results instead of using Google.

Response

The site traffic associated with the proposed redevelopment is not projected to increase Highway 401 mainline traffic significantly.

During the weekday morning (AM) peak hour, eastbound mainline volumes are projected to increase by approximately 30 vehicles and westbound mainline volumes are projected to increase by approximately 195 vehicles.

During the weekday afternoon (PM) peak hour, eastbound mainline volumes are projected to increase by approximately 120 vehicles and westbound mainline volumes are projected to decrease by approximately 75 vehicles.

Given the projected increase/decrease in Highway 401 mainline volumes associated with the proposed redevelopment are minimal, expanding the model study area to include the Highway 401 mainline through the study area is not required to quantify the impacts associated with the proposed redevelopment.

Comment #3

Figure 29 of the report and Figure 1 of Appendix F – The Highway 401 WB off ramp at Kingston Road should also be signalized.

Response

Noted, the Figure in both **Section 12.0** of the updated Urban Transportation Considerations Report and in Section 1.2 of the Microsimulation Model Calibration and Analysis Report provided in Appendix F have been updated.

Comment #4

We require the microsimulation model files to complete the review to ensure the coding and input information is satisfactory. A snapshot of the model with focus on the arterial road is not enough to undertake a complete review.

Response

Noted, Vissim microsimulation models can be provided.

Comment #5

Can the consultant clarify what is the horizon year of the future traffic condition?

Response

Noted, the future background and future total scenarios horizon year is 2039 and this has been clarified in Section 3.0 of the Microsimulation Model Calibration and Analysis Report provided in Appendix F.

Comment #6

The consultant will have to comment on the calibration results on MTO infrastructures based on MTO calibration criteria as attached.

Response

Noted, Section 2.3.3 of the Microsimulation Model Calibration and Analysis Report provided in Appendix F details a model calibration evaluation using the MTO calibration criteria provided.

Comment #7

We would like to see MOE other than travel time (i.e. LOS, volume throughput, speed and etc.).

Response

Noted, the Vissim microsimulation model analysis now includes a review of vehicle travel times along study area road segments, and vehicle queuing and delays at key study area intersections. These are detailed in Section 3.0 of the Microsimulation Model Calibration and Analysis Report provided in Appendix F.

Comment #8

The consultant needs to clarify if any forecasting approach (i.e. macro model or forecasting) is used in the analysis and ensure all modes were included. The consultant will need to provide volumes in the report.

Response

Noted, Section 1.1 of the Microsimulation Model Calibration and Analysis Report provided in Appendix F clarifies that the intersection turning movement volumes for the existing conditions, future background and future total scenarios are based on the existing counts and traffic assignment prepared as part of the Synchro analysis presented in Section 9.2, Section 9.3, and Section 9.5 of the Urban Transportation Considerations Report.

1.0 INTRODUCTION

BA Group is retained by Director Industrial Holdings Limited to provide transportation consulting services related to a landmark mixed-use development (the "Project") located at 603-643 & 645-699 Kingston Road in the City of Pickering (the "Site").

1.1 This Study

This study includes a summary of our review of the urban transportation elements of the Project, including:

- A multi-modal travel assessment;
- Traffic impact and operations studies;
- Parking and loading studies; and
- Mobility Choice Travel Plan (Transportation Demand Management).

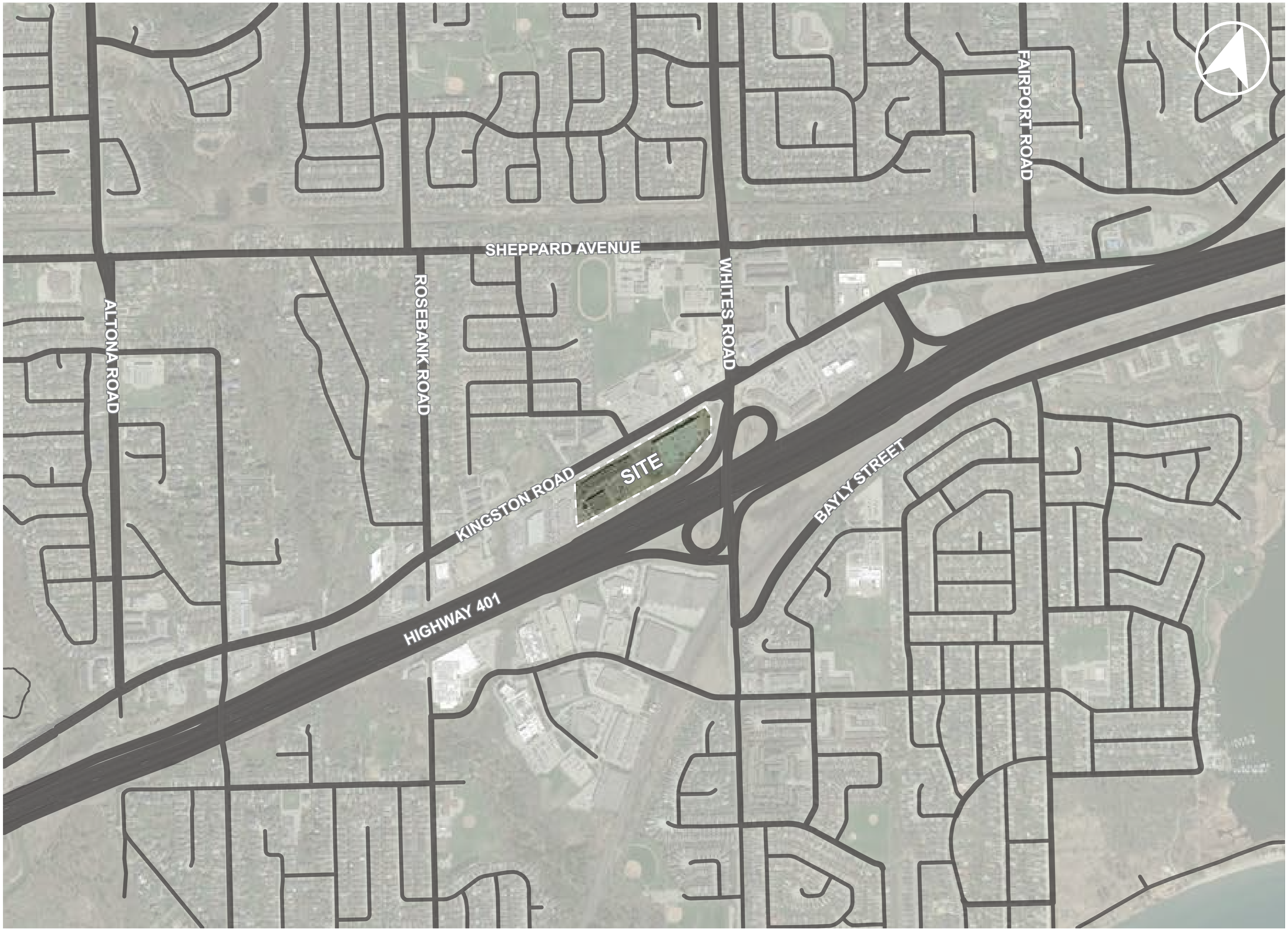
1.2 Existing Site

The Site is bounded by Kingston Road to the north, a car dealership to the west, Whites Road to the east, and Highway 401 to the south.

The Site's location is illustrated in **Figure 1.**

The Site is currently occupied by large retail stores and surface parking lots. The primary access to the Site is provided from a signalized intersection at Kingston Road and Steeple Hill, while there is a secondary access point provided from a site driveway along Kingston Road to the west of the primary access.

The site context is illustrated in **Figure 2**.



\\bafp02.tor.bagroup.com\data\WP\58\83\41\Graphics

FIGURE 1 SITE LOCATION

BA GROUP 5883-41

603 KINGSTON ROAD

\\bafp02.tor.bagroup.com\data\WP\58\83\41\Graphics

FIGURE 2 SITE CONTEXT

2.0 PROPOSED DEVELOPMENT CONCEPT

2.1 Overview

The Project consists of the following key elements:

1. Towers 1, 2 and 3 are located along the south property line, at the west side of the Site. The towers are 36 storeys, which are connected by a 4-storey podium (Podium 1).
2. Towers 4 and 5 are located along the south property line, near the centre of the Site. The towers are 36 storeys, which are connected by a 4-storey podium (Podium 2).
3. Tower 6 is located along the south property line, at the east side of the Site. The tower is 42 storeys, with a commercial area located with a 4-storey podium (Podium 3).
4. Tower 7 is located at the northeast corner of the Site. The tower is 24 storeys, with a commercial area located at-grade within a 4-storey podium (Podium 4).
5. Towers 8, 9 and 10 are each "U"-shaped buildings and are located along the north property line at the east, centre and west side of the Site, respectively. All three mid-rise towers are 14 storeys, with a commercial area located at-grade within each of the 6-storey podiums (Podium 5, Podium 6, and Podium 7).
6. An at-grade park will be provided along the north properly line, near the centre of the Site (between Towers 9 and 10).
7. A new road network with an access off of Kingston Road, forming a southerly connection of Steeple Hill Road and a new east-west road connection extending west from Steeple Hill Road, providing access to the below grade parking. The new road network can function either as a private or public road and will be determined in a future submission.
8. A private internal road network with a right-in / right-out access off of Kingston Road along the west side of the site and a connection extending east from Steeple Hill Road, providing access to the below grade parking.
9. The concept development includes two levels of underground parking, as well as parking in Podiums 1, 2 and 3. The below-grade parking beneath Podiums 1 and 2 only contains one level of parking.

The overall Project is illustrated in **Figure 3**. The key elements are described in greater detail in the following sections.

Reduced scale architectural plans are included in **Appendix A**.

2.2 Building Summary

A summary of the Project is outlined in **Table 1** and the site plan is illustrated in **Figure 3**.

Table 1 Project Summary

Component	Description
Build Elements	
Retail	2,474 square metres of retail space located on the ground floor of Podium 4, 5, 6 and 7.
Office	3,475 square metres of office spaces located in the 4-storey of Podium 3.
Residential	3,460 residential units in ten towers.
Park	3,093 square metres of parkland is proposed centre of the Site, between the towers 9 and 10.
Transportation Elements	
Pedestrian Access	Multiple grade-related accesses from Whites Road, Kingston Road and the internal private road network. In addition, a multi-use path is provided along the south property line, within the 14.0 metre MTO setback.
Vehicular Access	• The existing signalized Kingston Road / Steeple Hill intersection will continue to provide vehicular access to the Site. The lane configuration of the Site access will be expanded to provide additional lanes. This intersection will be the primary access to the Project. • A driveway located at the northwest corner of the Site will be maintained to provide a secondary access point to the Project. This driveway will operate as right-in / right-out access point. • ***An internal road system will connect all parking accesses, the two vehicular access points, the residential drop-off, and the Project's loading areas.***
Bicycle Infrastructure	• Details to be provided through subsequent applications to the City of Pickering.
Parking Supply	• Approximately 2,768 parking spaces are proposed to accommodate the Project within two levels of below-grade parking and within Podium 1, 2 and 3. The parking plans will be refined through subsequent applications to the City of Pickering.
Loading	• Details to be provided through subsequent applications to the City of Pickering.

Note that the current development plan contemplates an overall of 3,460 residential units. Based on the traffic analysis operations conducted as part of this study, a total of 2,884 residential units can be accommodated on the area road network. As such, a future expansion up to 3,460 residential units will be contemplated as part of a future review, subject to additional improvements and mitigation measures.

For the purposes of this study, the site has been designed to accommodate the overall development of 3,460 residential units, but the traffic analysis has been completed based on 2,884 residential units.

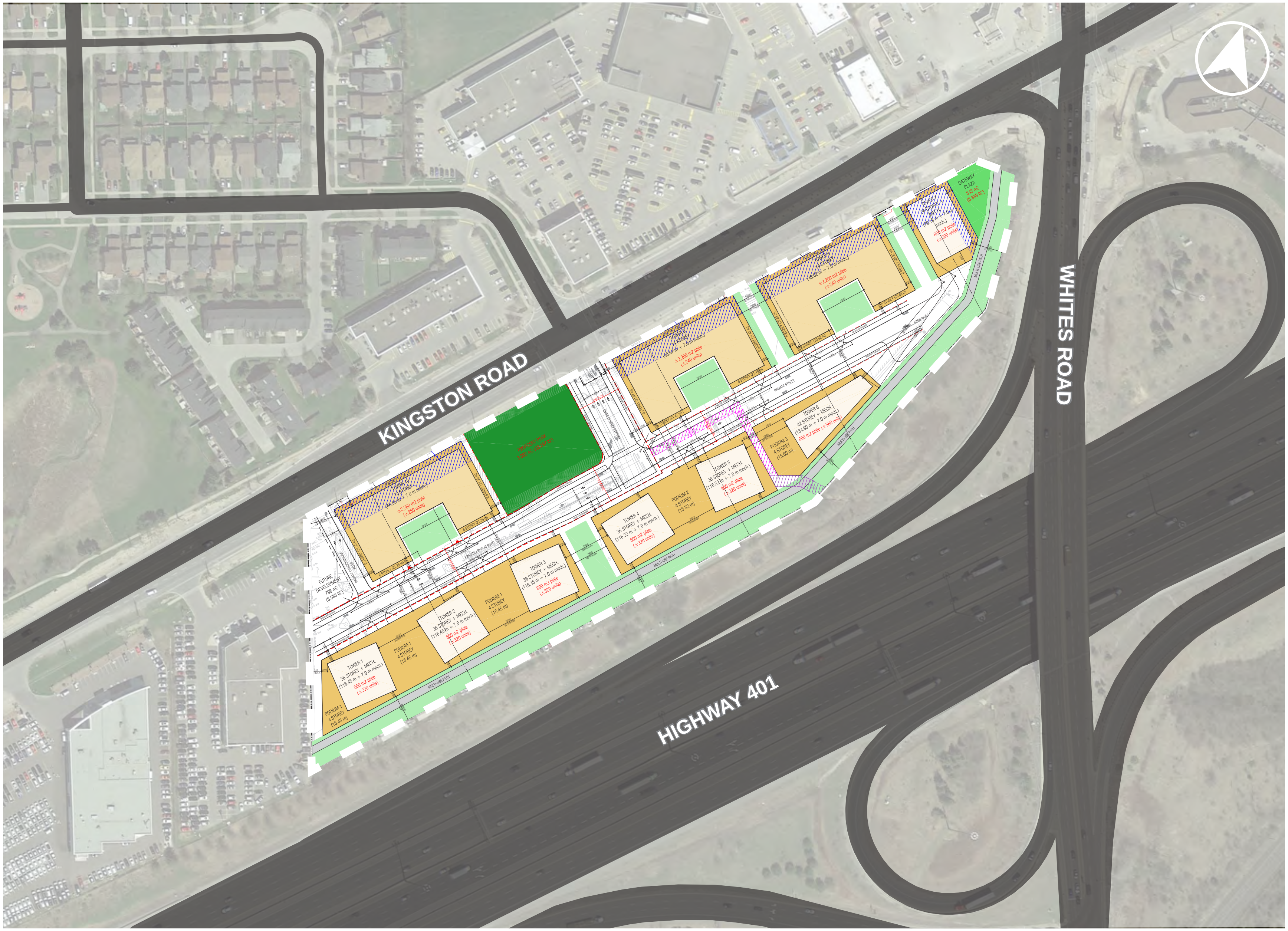


FIGURE 3 SITE PLAN

3.0 PLANNING & POLICY CONTEXT

3.1 Provincial and Regional Policy Framework and Directives

There are a number of provincial and regional policy documents related to transportation that pertain to the Site, including:

- The Planning Act;
- Provincial Policy Statement;
- Places to Grow: Growth Plan for the Greater Golden Horseshoe (2019);
- Ontario Ministry of Transportation Transit-Supportive Guidelines (2012);
- Metrolinx 2041 Regional Transportation Plan (2018);
- Durham Transportation Master Plan (2017); and
- Durham-Scarborough Bus Rapid Transit Study (2018).

The key transportation details of these policy documents are summarized below. The development proposal for the Site incorporates the policy direction of these documents by incorporating a mix of uses, greater density and reduced parking standards based on the Site's proximity to existing and planned transit corridors and the implementation of transportation demand management (TDM) strategies as part of the proposal.

3.1.1 Planning Act

The **Planning Act** directs municipalities to have regard to matters of provincial interest set out in Section 2 of the Planning Act, including:

> *(q) the promotion of development that is designed to be sustainable, to support public transit and to be oriented to pedestrians;*
>
> *(s) the mitigation of greenhouse gas emissions and adaptation to a changing climate.*

3.1.2 Provincial Policy Statement

Adopted in May 2020, the **Provincial Policy Statement (PPS)** provides policy direction to promote transportation demand management (TDM) strategies to be implemented for new developments to increase the efficiency of existing and planned transportation infrastructure (Section 1.6.7.2). Additionally, the PPS states that land use pattern, density, and mix of uses should be promoted to minimize the length and number of vehicle trips and support current and future use of transit and active transportation (Section 1.6.7.4). In summary, the PPS is supportive of the use of transportation demand management, such as reduced parking rates, to support and increase the efficiency of more sustainable transportation options.

3.1.3 Places to Grow: Growth Plan for the Greater Golden Horseshoe

The **Growth Plan for the Greater Golden Horseshoe (Growth Plan)** (as amended in 2020) aims to foster economic growth, provide greater housing supply and options, increase employment, and build communities for a healthier and more affordable life in the Greater Golden Horseshoe. As such, the Growth Plan outlines the importance of reducing reliance on the automobile and promoting transit and active transportation. In particular, the Growth Plan encourages transit-supportive policies, such as reduced parking standards, within major transit station areas (MTSAs), which are areas that are within an approximate 500 to 800 metre radius (i.e. 10-minute walk) of an existing or planned higher order transit station. The Site is located within 500 to 800 metres of a future Durham-Scarborough Bus Rapid Transit (BRT) stop, and is within 800 metres of a possible GO Transit station at Whites Road.

3.1.4 Ontario Ministry of Transportation (MTO) Transit-Supportive Guidelines

The **Ontario Ministry of Transportation Transit-Supportive Guidelines** are intended to assist with the implementation of policies and objectives set out in the PPS and the Growth Plan for the GGH, both of which provide key policy directives to manage future growth in the Greater Toronto Area and beyond.

The guidelines aim to create an environment that is supportive of transit, and to develop services and programs intended to increase transit ridership. The guidelines also support the use of TDM strategies, particularly in close proximity to transit routes. This may include the sharing of parking between Site uses, the use of on-street parking during off-peak hours, and the reduction of minimum and maximum parking requirements as TDM measures are adopted.

3.1.5 2041 Metrolinx Regional Transportation Plan

The **Metrolinx 2041 Regional Transportation Plan (2041 RTP)** – adopted in 2018 as an update to The Big Move (2008) – provides a framework to create an integrated, multi-modal, and regional transportation system to support the growth of healthy, complete, and sustainable communities.

The 2041 RTP contains strategies that integrate land use and transportation planning to identify areas for investment and build new connections. Strategy 4.8 specifically addresses parking management, encouraging the Province to adopt a region-wide policy that "provides guidelines and encourages best practice in parking management." The strategy states that "zoning standards should be reviewed, with the expectation that minimum parking requirements will be reduced, particularly in transit-supportive neighbourhoods", such as the area around and including the lands of the Project. The 2041 RTP also speaks to embedding TDM strategies in land use planning and development to prioritize cycling, walking and transit use.

3.1.6 Durham Transportation Master Plan

The **Durham Transportation Master Plan** includes plans to expand Whites Road north of Kingston Road to 6-7 lanes, as well as identifies the Whites Road / Highway 401 interchange for modifications and a future Ministry of Ontario Class Environmental Assessment Study.

One of the action items of the TMP is to create guidelines that support a Regional parking strategy, which could include amendments to zoning by-laws to reduce parking minimum, set maximum and allow shared parking.

3.1.7 Durham-Scarborough Bus Rapid Transit Study

The **Durham-Scarborough BRT Study** reviewed rapid transit alternatives for the future transit project and evaluated each alternative against the base case. The business case approach assessment recommended a hybrid alternative. The recommended design is now being studied further in the preliminary design phase of the transit project.

3.2 Local Area and Site-Specific Planning Policy

There are a number of local area policies and strategic framework documents pertaining to the Site, including:

- Pickering Official Plan (2018); and
- Kingston Road Corridor and Specialty Retailing Node Intensification Study (2019).

The key transportation details of these policy documents are summarized in the following sections.

3.2.1 Pickering Official Plan

The Pickering *Official Plan* states that City Council shall consider a reduction in the number of required car parking spaces where bicycle parking facilities or TDM measures are provided. It also encourages intensification along primary transit corridors and MTSAs, such as the Pickering GO Station, as identified in Metrolinx's RTP.

3.2.2 Kingston Road Corridor and Specialty Retailing Node Intensification Study

The *Kingston Road Corridor and Specialty Retailing Node Intensification Study* (the "intensification study") explored intensification opportunities along the Kingston Road corridor. The areas surrounding the Site is identified as the Whites Precinct. In the Whites Precinct, the intensification study recommends greater densities at the intersection of Kingston Road and White Road (i.e. the Site).The intensification study states that an increase in density within this precinct can result in a total of 7,622 residents and 2,536 jobs.

The intensification study also recommends creating new connections through the larger land parcels in the precinct, including a mid-block public road connection south of Kingston Road at Steeple Hill Road. It also recommends reducing the number of individual access points on Kingston Road.

The recommended intensification scenario for the Whites Precinct is illustrated in **Figure 4**.

\\bafp02.tor.bagroup.com\data\WP\58183\41\Graphics

FIGURE 4 WHITES - RECOMMENDED INTENSIFICATION SCENARIO

4.0 EVOLVING AREA TRANSPORTATION CONTEXT

4.1 Area Road Context

4.1.1 Existing Road Network

The Site is well located relative to the significant roadway connections provided across the City and the wider Durham Region. Together, the public road network surrounding the Site provides a hierarchy of road connections ranging from expressway to local roads. The existing area road network is illustrated in **Figure 5**.

Major east-west connections across the City are provided by the Highway 401 and Kingston Road corridors, which also link the Site with other municipalities in the Durham Region and Greater Toronto Area. A major north-south connection across the City is provided by the Whites Road corridor, which connects the Site to the nearest Highway 401 interchange.

A detailed description of the area road network surrounding the Site and the characteristics of the streets serving the downtown area of Pickering is provided in **Table 2**.

Table 2 Area Road Network

Type		Street Name	On-street Parking & Regulations	Roadway Limits	Description
Highway	Freeway	Highway 401	No parking or stopping permitted at any time.	Freeway extends from Windsor in the west to the Ontario-Quebec border in the east.	14-lane cross-section, 7 lanes in each direction between the express and collector lanes. Auxiliary lanes are provided at on- and off-ramps.
Type B Arterial	East-West	Kingston Road	No parking or stopping permitted at any time.	Roadway extends from Highway 2A in the west to Ajax in the east (where is becomes Dundas Street West, east of Lake Ridge Road).	5-lane cross section, 2 lanes in each direction and a center lane for left-turns, right-turns and storage. Key intersections have auxiliary turn lanes.
Type A Arterial	North-South	Whites Road	No parking permitted at any time.	Roadway extends from Petticoat Lane in the south to Taunton Road in the north.	In proximity to the Site, the corridor ranges from a 4-lane cross section to a 5-lane cross section with 2 lanes in each direction. North of Kingston Road, a center lane is provided for left-turns, right-turns and storage. South of Kingston Road, auxiliary lanes are provided for the on- and off-ramps to the Highway 401. Key intersections have auxiliary turn lanes.
Local Road	-	Steeple Hill	No parking permitted at any time along the south / west side of the street between Kingston Road to Edmund Drive.	Roadway extends from Kingston Road in the south and curves towards Lightfoot Place in the northwest.	2-lane cross-section, 1 lane in each direction. Key intersection at Kingston Road has auxiliary turn lanes.

4.1.2 Planned Road Network

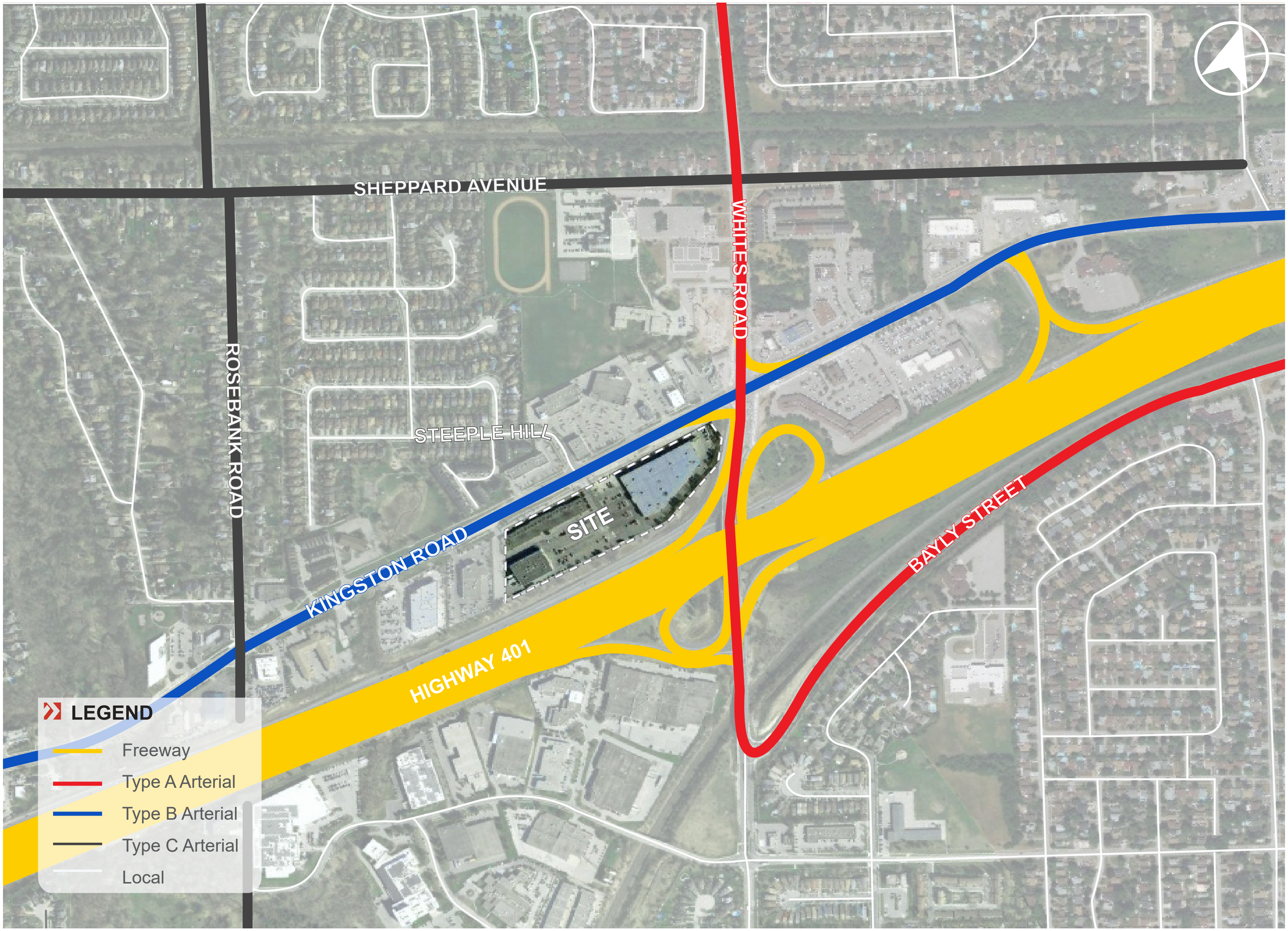
As previously mentioned, the Durham Transportation Master Plan (2017) outlines that Whites Road between Kingston Road to Finch Avenue will be widened from 5 to 6 lanes between 2022 and 2026. The Whites Road / Highway 401 interchange was also identified as an interchange for modification in the Provincial Class Environmental Assessment studies for Highway 401. However, detailed information on the proposed modification has not been provided.

The site plan includes new private roads from the existing site access points along Kingston Road (at Steeple Hill and the northwest corner of the Site). These two new roads are connected by an internal east-west road that will serve the uses on-site and provide access to the below-grade parking facilities.

4.1.3 Other Improvements for Consideration

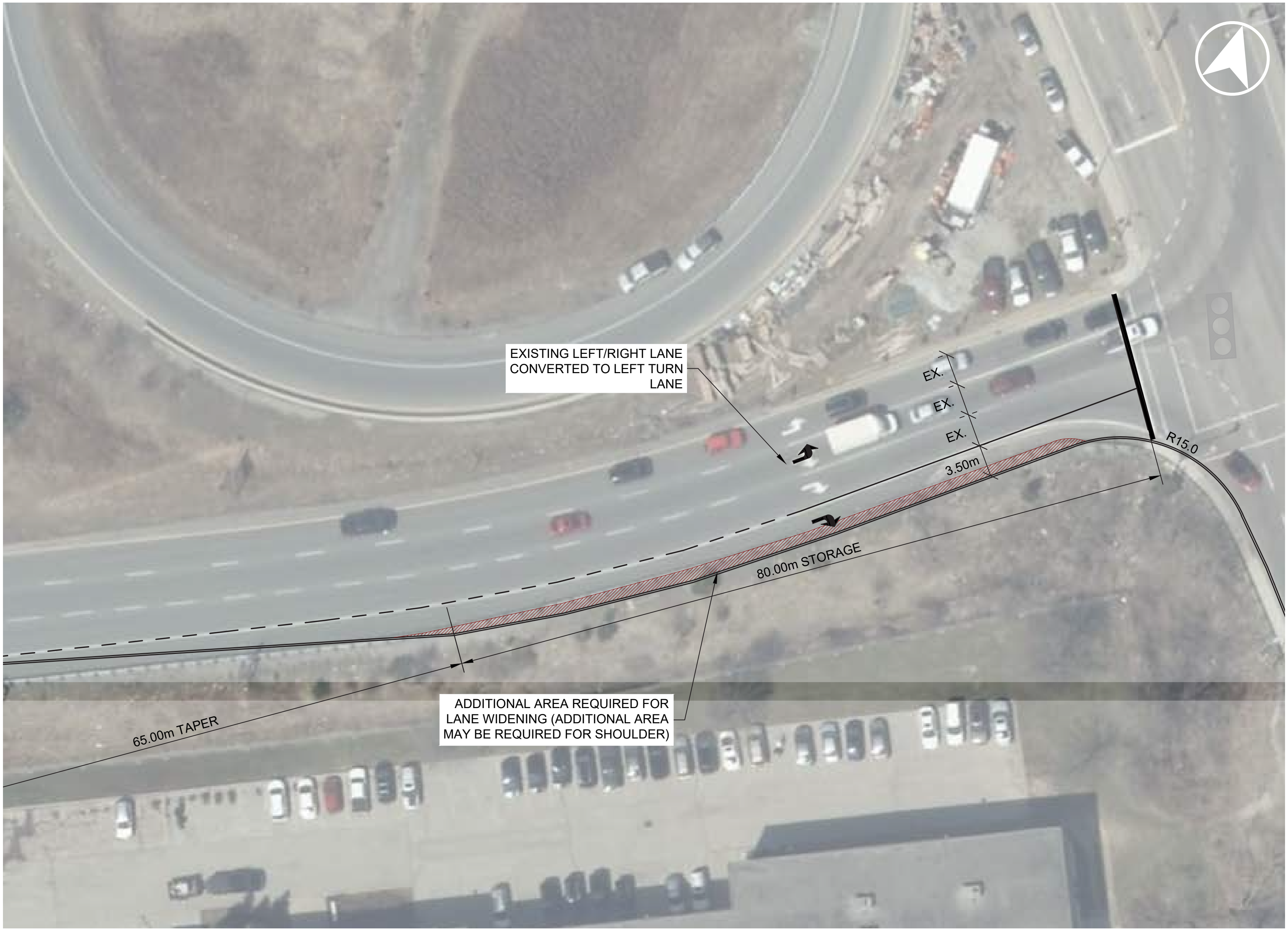
Another improvement that should be considered in order to enhance the carrying capacity of the road network is to expand the Highway 401 Eastbound off-ramp at Whites Road. The proposed improvement, which will be analyzed in the traffic analysis, is to add an additional eastbound right turn lane, and to convert the existing eastbound right/left turn lane into an exclusive left turn lane.

The proposed improvement to the 401 eastbound off-ramp that should be considered is illustrated in **Figure 6**.



\\bafp02.tor.bagroup.com\data\WP\5883\41\Graphics

FIGURE 5 EXISTING AREA ROAD NETWORK



\\bafp02.tor.bagroup.com\data\WP\58\83\41\Graphics

FIGURE 6 POTENTIAL EXPANSION OF THE 401 EASTBOUND OFF-RAMP AT WHITES ROAD

4.2 Area Transit Context

4.2.1 Existing Transit Network

The Site is located along important corridors, Kingston Road and Whites Road, located to the west of the Pickering City Centre. As a result, the Site is well serviced by surface transit that provide frequent and convenient access to local and regional transit services.

The existing area transit network is illustrated in **Figure 7** and details regarding existing transit options are included in **Table 3**.

The existing transit reach is illustrated in **Figure 12** in sections below. The existing transit reach highlights the destinations that can be reached within 60 minutes using transit services. The transit reach also illustrates how often these destinations can be reached within an hour based on the frequency of the transit services. Reaching certain destinations is time-dependent (i.e. the arrival at the destination within 60 minutes relies on a scheduled departure), while others are "guaranteed" or time-independent (i.e. the destinations can be reached frequently within 60 minutes and there is no need to schedule the departure).

The transit reach graphics are calculated using ESRI's ArcGIS Network Analyst software tool, which utilized schedules of the transit services, as well as walking distance from the transit services and transfer times, to calculate the distance that could be reached within the 60 minute time period. The process is outlined in greater detail in **Appendix B**.

Table 3 Area Transit Network

	Number / Name of Service Line	Headway	Closest Stop Location	Description
GO Transit	Lakeshore West	15 minutes during weekday peak periods 30 minutes during off peak periods	Pickering GO Station (3 km from the Site)	The Lakeshore East line operates bi-directionally service throughout the day, 7 days a week, excluding holidays. During weekdays, trains operate approximately 5-15 minutes during peak hours, & approximately every 30 minutes during off-peak hours. During weekends, trains operate every 30 minutes for most of the day and every hour in the morning and evening.
Durham Region Transit	110 Finch West	30 minutes during the weekday peak periods between all branches 30 to 60 minutes during the weekday off peak periods for the 110B branch 60 minutes during the weekend	Kingston Road / Whites Road (300 m from the Site, 4-5 min walk)	The route generally runs between Pickering Parkway Terminal and Pickering GO Station, circulating along Finch Avenue to Altona Road. The route has three branches – 110, 110A and 110B. The 110 and 110A branches are limited to peak time, and services Pickering GO Station. The 110B branch does not serve the Pickering GO Station and circles back along Kingston Road to return to Pickering Parkway Terminal.
	120 Whites	15-25 minutes during weekday peak periods	Kingston Road / Whites Road (300 m from the Site, 4-5 min walk)	The route runs from Pickering GO Station to the northwest along Whites Road.
	193 Pickering Community Route	The 193A branch runs 3 times on weekdays and Saturdays	Kingston Road / Whites Road (300 m from the Site, 4-5 min walk)	The route circulates throughout Pickering, stopping at Pickering Parkway Terminal. The route has two branches – 193A and 193B. The 193A branch serves the Site. Both routes are limited to peak time.
	DRT Pulse 900	7-8 minutes during weekday peak periods 10-30 minutes during weekday off peak periods 15-30 minutes on Saturdays and 30-60 minutes on Sundays	Kingston Road / Steeple Hill (Adjacent to the Site)	The route is high frequency service along Highway 2 between University of Toronto Scarborough and Downtown Oshawa. Bus only lanes have been constructed on portions of Kingston Road, including adjacent to the Site, to facilitate improved travel time and reliability for the BRT service. The bus only lanes are part of the Highway 2 Transit Priority initiative to provide BRT through the region.

4.2.2 Planned Transit Network

4.2.2.1 DURHAM-SCARBOROUGH BRT

As part of Metrolinx's 2041 Regional Transportation Plan for the Greater Toronto and Hamilton Area, the Durham-Scarborough BRT has been identified as a key part of the Regional Frequent Rapid Transit Network. The project is in the advanced stages of planning and design, as studied in the 2018 "Durham-Scarborough Bus Rapid Transit Study: Initial Business Case Report", and has $10 million in funding committed from the province through Metrolinx.

The primary route will generally run along Kingston Road, connecting Scarborough Centre and Downtown Oshawa. The route will have frequent 15-minute headway or better service, seven days a week, and will have reliable service due to separation from traffic and signal priority measures. The other branches of the route will connect to the Kingston / Lawrence / Morningside area.

The recommended Hybrid Alternative Concept from the 2018 study will alternate between centre median running way and curbside running way. Adjacent to the Site, the proposed route will be in the centre median. The proposed BRT design is illustrated in **Figure 8**.

Key Benefits of the BRT

Metrolinx has conducted a significant amount of analysis in order to examine the projected impacts of the BRT on the Kingston Road corridor and its surrounding areas. In order to understand the effects of the BRT on not only the Kingston Road corridor in its entirety, but on the Site in particular, BA Group conducted supplemental analysis that focused on additional aspects of the BRT and its potential impacts on travel demand to/from the proposed development.

First, this analysis reviewed TTS information to identify key areas to which a significant number of residents of the Kingston Road/Whites Road area currently travel. The review then determined which of those key areas will be served by the BRT and will therefore be well connected to the Site in the future via higher order transit. The key areas that are connect to the Site via the BRT are illustrated in **Figure 9**.

Second, the ESRI's ArcGIS Network Analyst software tool was used to compare the existing and future transit reaches of the Site. This comparison emphasized the significant improvement in the ease and convenience of travel via transit (i.e. no need to schedule departure times to coordinate with bus arrivals and transfers) to/from the Site that can be expected following the completion of the BRT. The existing and future "guaranteed" 30 minute transit reach is illustrated in **Figure 10**.

Finally, the analysis utilized the Google Maps API, as well as on GTFS live transit vehicle coordinates, to collect travel speeds along an existing proxy BRT corridor, Highway 7 in York Region. The travel speeds highlighted the lack of impact of private vehicle congestion on BRT bus travel speeds. The outputs of this analysis are shown in **Figure 11**.

The inputs and process of the analysis is outlined in greater detail in **Appendix B**.

In summary, BA Group conducted analysis to supplement the work undertaken to date by Metrolinx and focused on assessing the impact of the future BRT on travel demand to/from the Site. This analysis revealed that:

1. *The BRT will provide improved transit service to multiple key destinations for which travel demand to/from the proposed development will be significant;*
2. *The higher frequency service associated with the BRT will significantly expand the departure time-independent (i.e. guaranteed) transit reach to/from the Site, reducing the need for future residents to plan and coordinate their departure times with bus arrivals and transfers. This will greatly improve the ease and convenience of travelling to/from the Site via transit; and*

3. *In the event of congestion along the Kingston Rd corridor, the BRT will maintain relatively constant travel speeds, providing residents of the future development with reliable transit journey times. In addition, those travel speeds will be comparable to, and could potentially be higher than, those of private vehicles.*

Based on the foregoing, it can be concluded that:

The BRT will significantly improve the level of transit service provided to future residents of the proposed development. Moreover, the benefits afforded by the BRT will result in a significant share of travel to/from the proposed development, particularly travel to/from certain high-demand key areas, to be undertaken via transit.

4.2.2.2 REGIONAL EXPRESS RAIL

Metrolinx's Regional Express Rail (RER) is working on increasing GO Transit service through expansion and the electrification of the GO Transit rail network. As part of RER, GO Transit will offer more services and more stations. The City, Metrolinx and TTC have been working together to develop the RER in tandem with SmartTrack, an initiative to increase transit services between Etobicoke and Scarborough.

The new train technology / electrification will boost travel speeds on the Lakeshore East GO Transit line will provide all-day, two-way services with 15 minutes or better transit service. RER and SmartTrack will add new stations (East Harbour and Gerrard-Carlaw) on the Lakeshore East line as well.

The RER program is currently underway and is anticipated to be completed in 2024, according to Metrolinx's 2041 RTP.

The increased service and new stations will provide the Site with an increased transit reach. Additionally, the high frequency services will increase the number of destinations that are "guaranteed" or departure time-independent.

As the design and / or construction of the BRT and RER are both underway and funded, both services were assumed to be in place for the future transit reach. The future reach was calculated by factoring in the new transit travel speeds into the transit schedules that were input into the ESRI's ArcGIS Network Analyst software tool. The process is outlined in greater detail in **Appendix B**.

The existing 60 minute transit reach and 60 minute future transit reach are illustrated in **Figure 12** and **Figure 13**.

4.2.2.3 OTHER IMPROVEMENTS FOR CONSIDERATION

In a June 2016 report, Metrolinx examined a number of potential new stations locations across the seven existing GO Transit rail corridors in light of the planned RER and SmartTrack programs. The initial business case (IBC) approach analyzed each potential station based on a strategic and financial case.

The IBC reviewed a potential station at White Road and Granite Court, approximately 600 metres from the Site. The location of the potential Whites Road GO Station is illustrated in **Figure 14**. The report concluded that the Whites Road station did not satisfy enough of the strategic and financial case criteria to be considered for near-term consideration and potential implementation. The main criteria that Whites Road failed to satisfy were as follows:

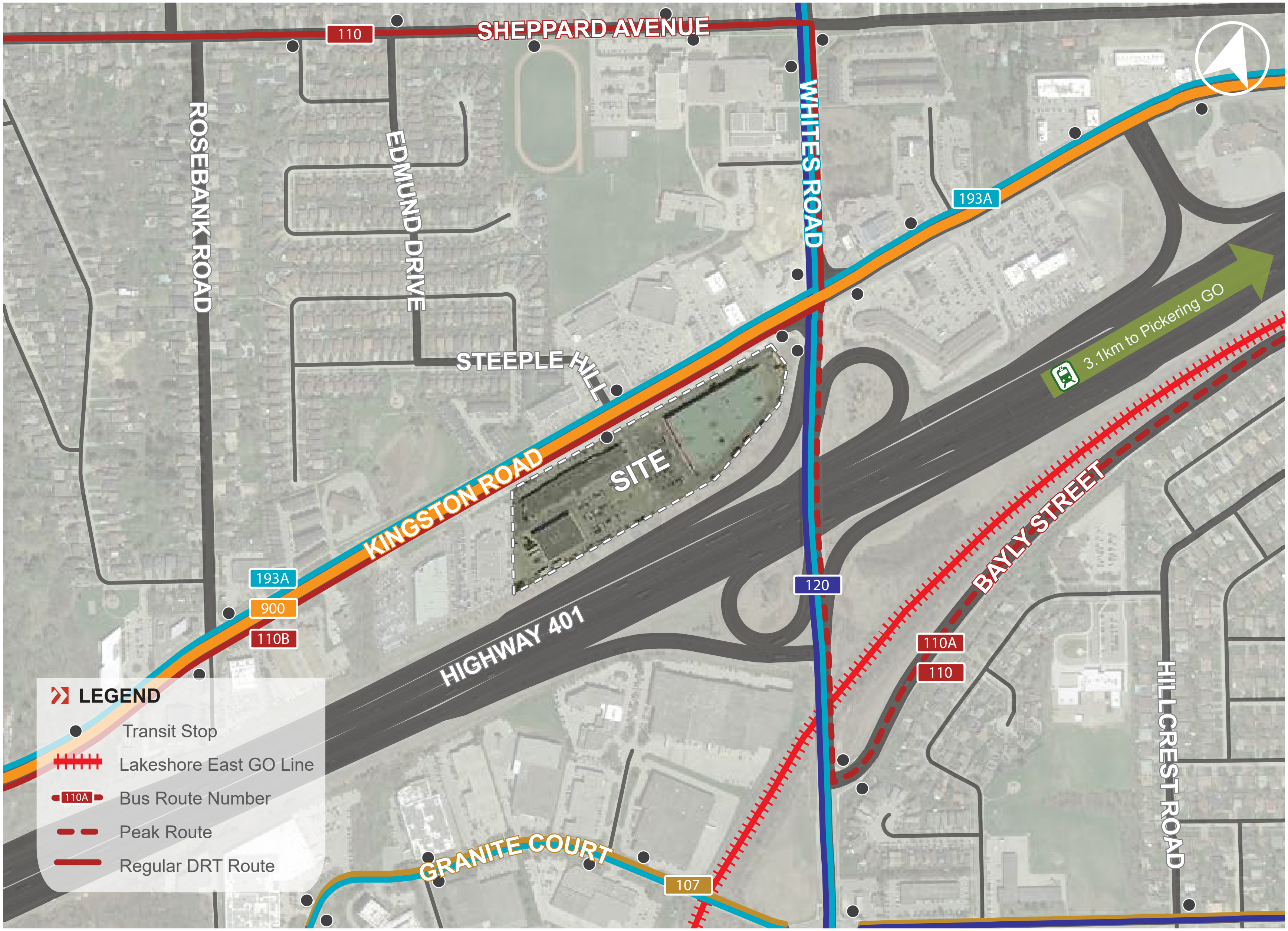
- The anticipated future density (approximately 30-40 people + jobs per hectare (P+J / Ha) within 800 metres) of the station did not meet Metrolinx's Mobility Hub density targets;
- The majority of trips at this station would be from existing customers that use the Pickering or Rouge Hill stations;
- The station would result in a net loss of trips due to negative time impacts to upstream riders; and
- A negative net present values is anticipated due to capital costs, annual station and train operation costs, and the anticipated net loss of fare revenue.

Since the release of the June 2016 IBC report, the City of Pickering released its intensification study in 2019. As previously discussed, the intensification study explored growth opportunities along the Kingston Road corridor and recommended increased densities in the vicinity of the Site (the "Whites Precinct"). The potential mixes of uses and densities proposed by the intensification study results in a total of 7,622 residents and 2,536 jobs on potential redevelopment sites within Whites Precinct, which could increase the number of riders and minimize the net loss of trips.

If the portions of Whites Precinct within 800 m of the station were assumed to currently have a similar density as the existing area around the potential station (i.e. 25 P+J/ha as of 2011)[1], and the increased density proposed as part of the site plan for the Site and intensification study for this portion of Whites Precinct were incorporated, the increased densities would add approximately 9,000 new people and jobs to the area. This would increase the density of the area within 800 m of the potential station to approximately 71 P+J/ha. Based on the above, the potential Whites Road station would satisfy the density target of 50 – 200 P+J/ha for areas served by Regional Rail, as outlined in the Metrolinx Mobility Hub Guidelines.

A comparison of the potential soft sites and future density reviewed in the IBC report, and the potential density based on the intensification study and proposed site plan is illustrated in **Figure 15** and **Figure 16**. The future transit reach of the area with the creation of the Whites Road station is illustrated in **Figure 17**. Based on the increase in density and the transit reach, the potential Whites Road station should be reconsidered.

[1] Metrolinx (June 2014). *RER New Station Initial Business Case – Whites Road Station:*



\\bafp02.tor.bagroup.com\data\WP\5883\41\Graphics

FIGURE 7 EXISTING AREA TRANSIT NETWORK

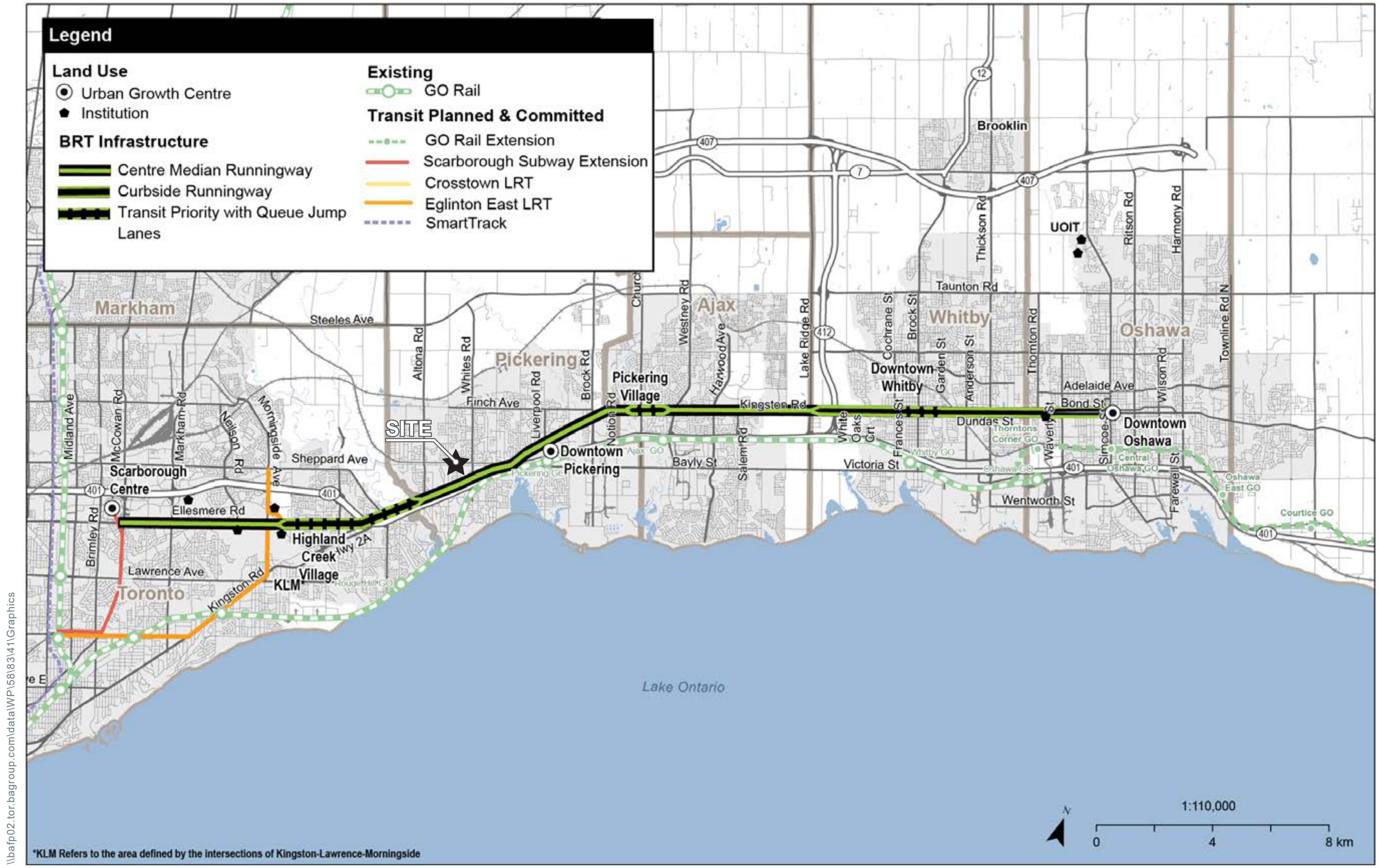


FIGURE 8 DURHAM-SCARBOROUGH BRT PROPOSED DESIGN

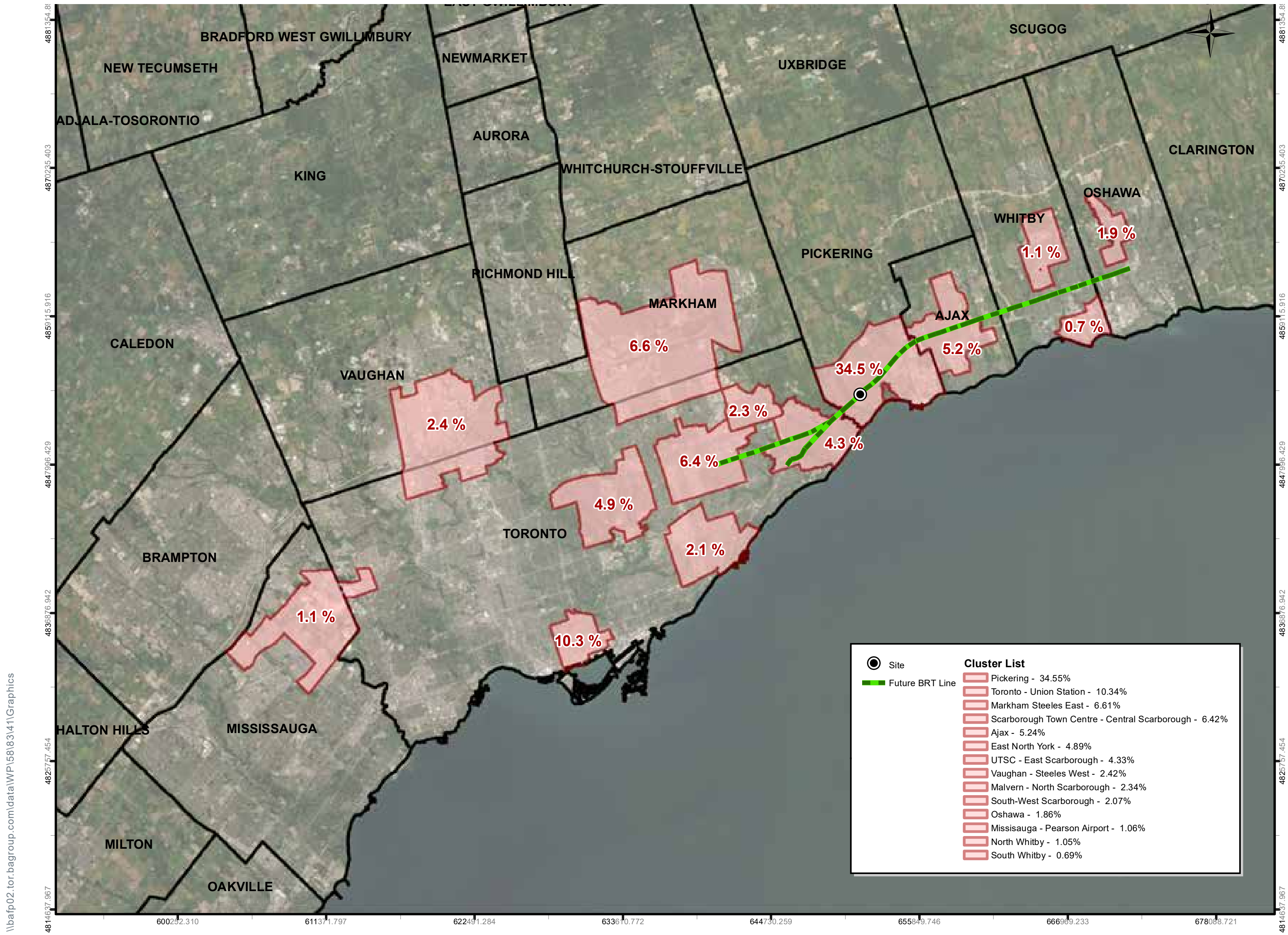
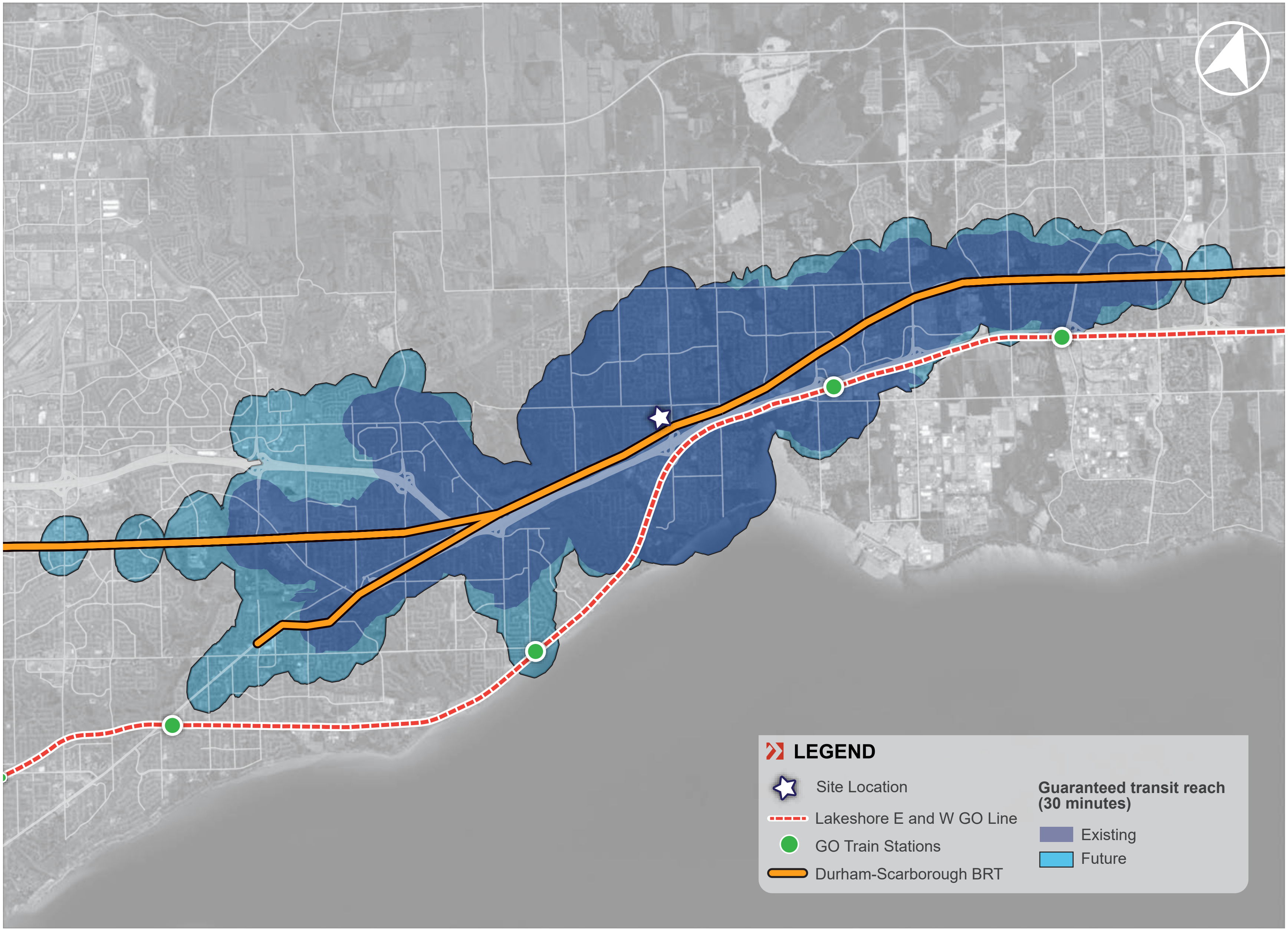
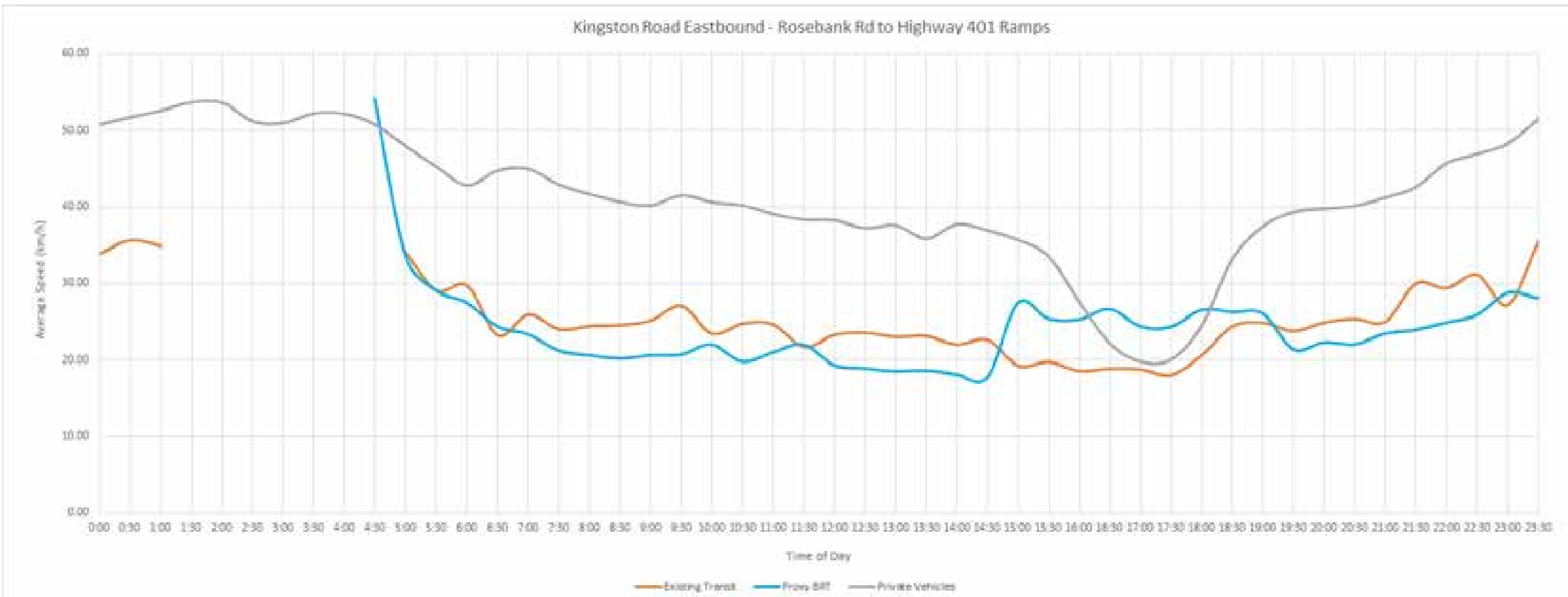


FIGURE 9 BRT CONNECTIVITY - KEY DESIGNATIONS



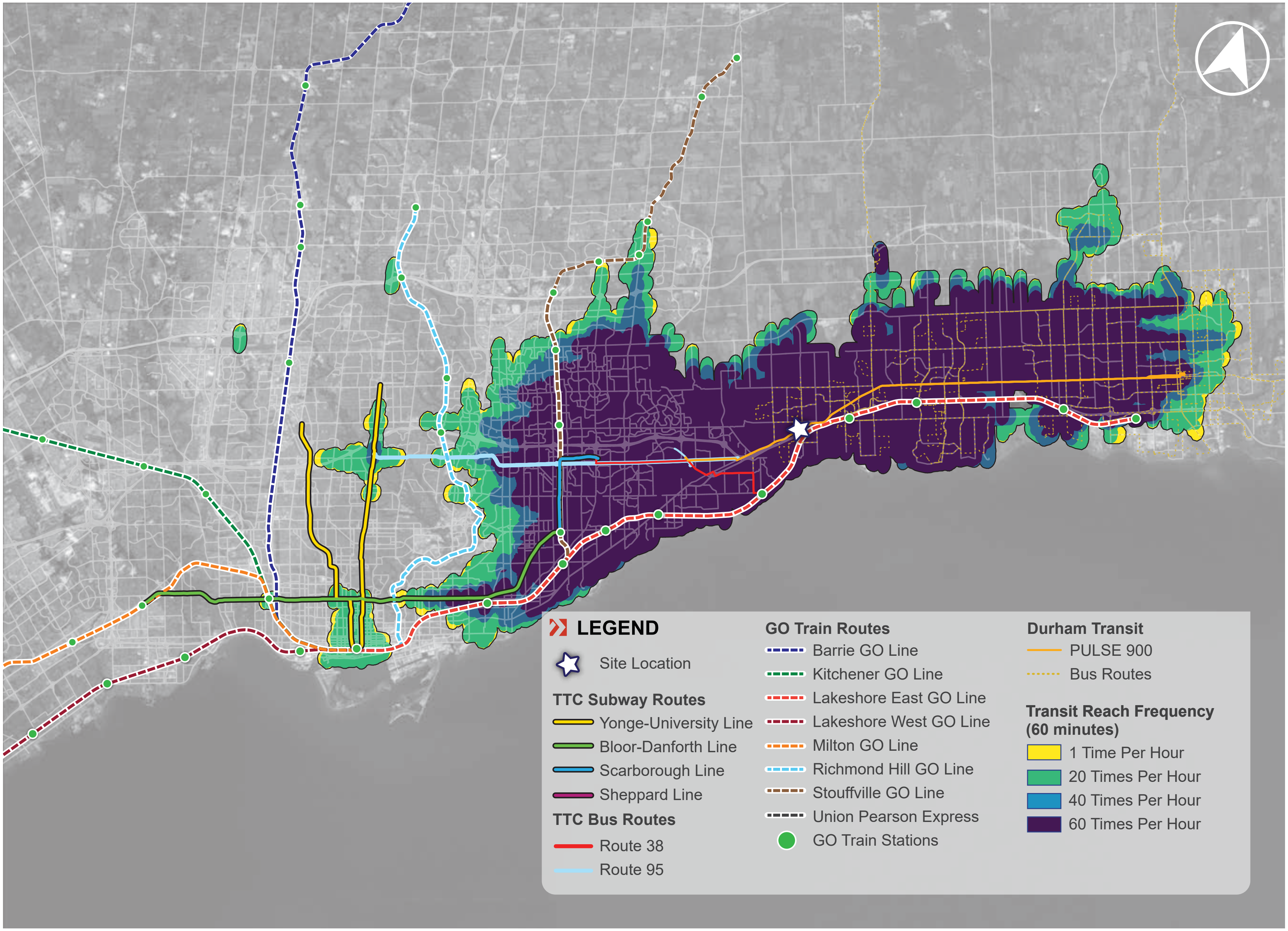
\\bafp02.tor.bagroup.com\data\WP\58\83\41\Graphics

FIGURE 10 EXISTING VS FUTURE BRT GUARANTEED 30 MINUTE TRANSIT REACH



\\bafp02.tor.bagroup.com\data\WP\5813\41\Graphics

FIGURE 11 PRIVATE VEHICLE AND BRT SPEED COMPARISON



\\bafp02.tor.bagroup.com\data\WP\58\83\41\Graphics

FIGURE 12 EXISTING 60 MINUTE TRANSIT REACH FREQUENCY

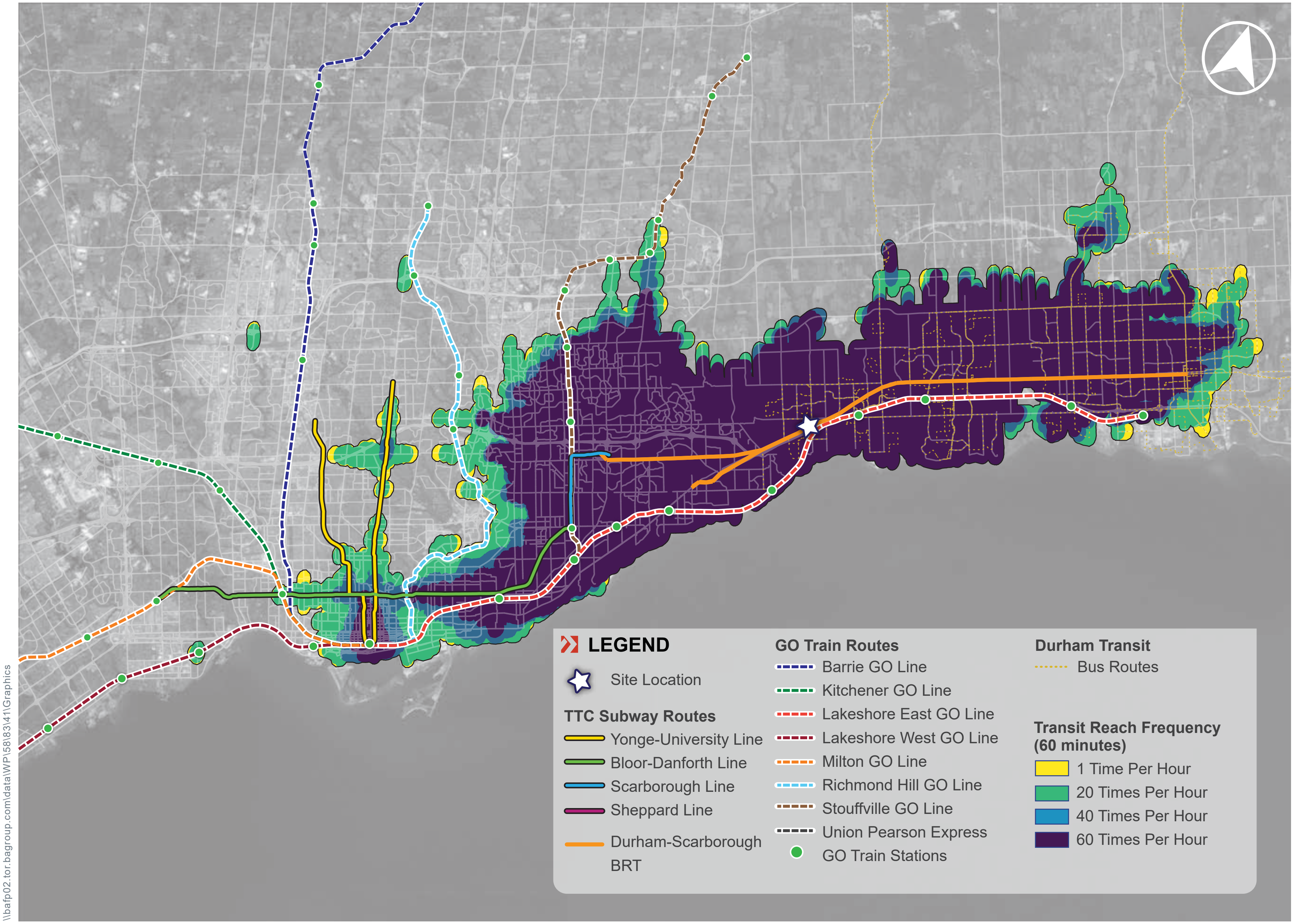
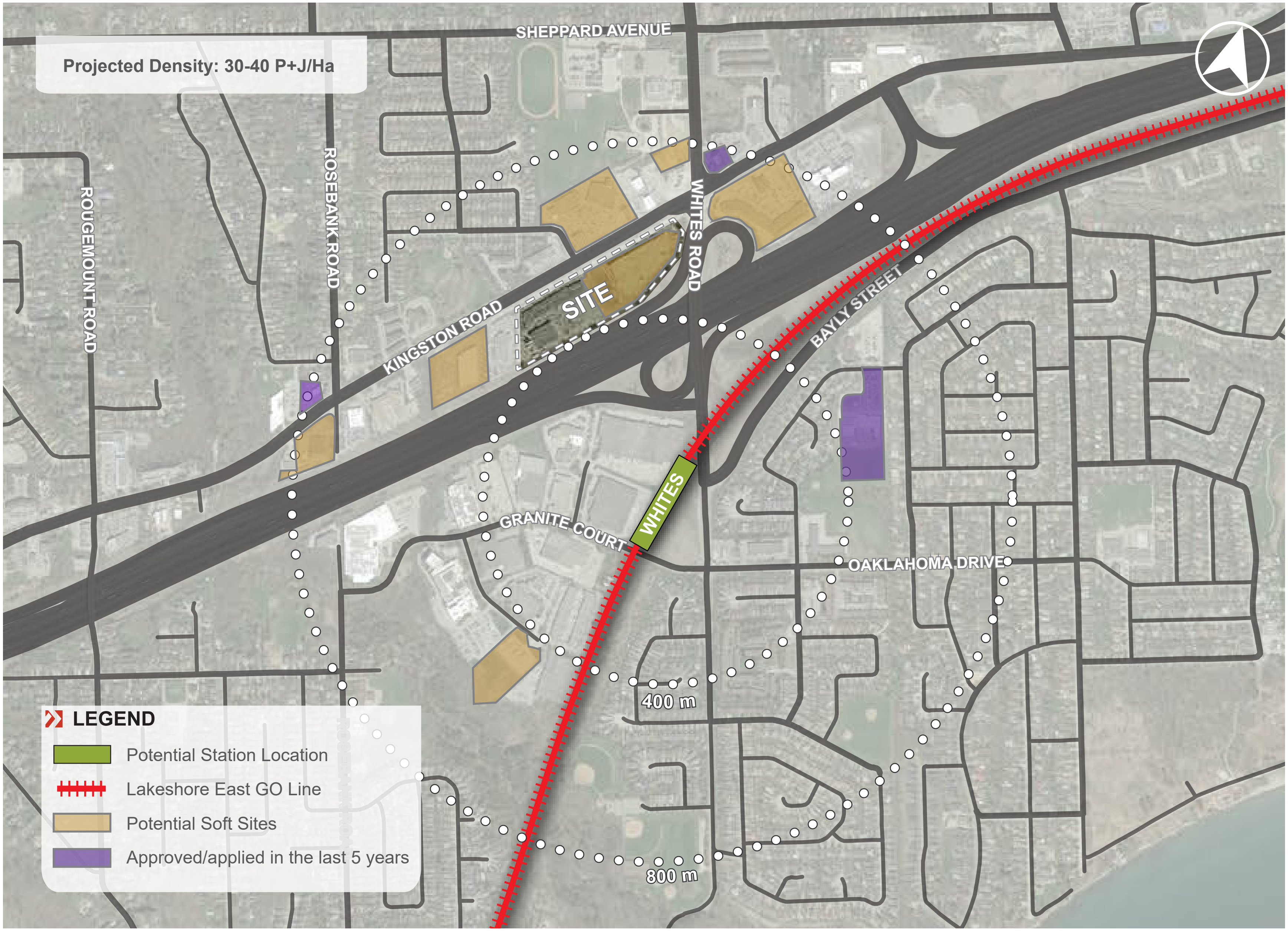


FIGURE 13 BRT & RER FUTURE 60 MINUTE TRANSIT REACH FREQUENCY

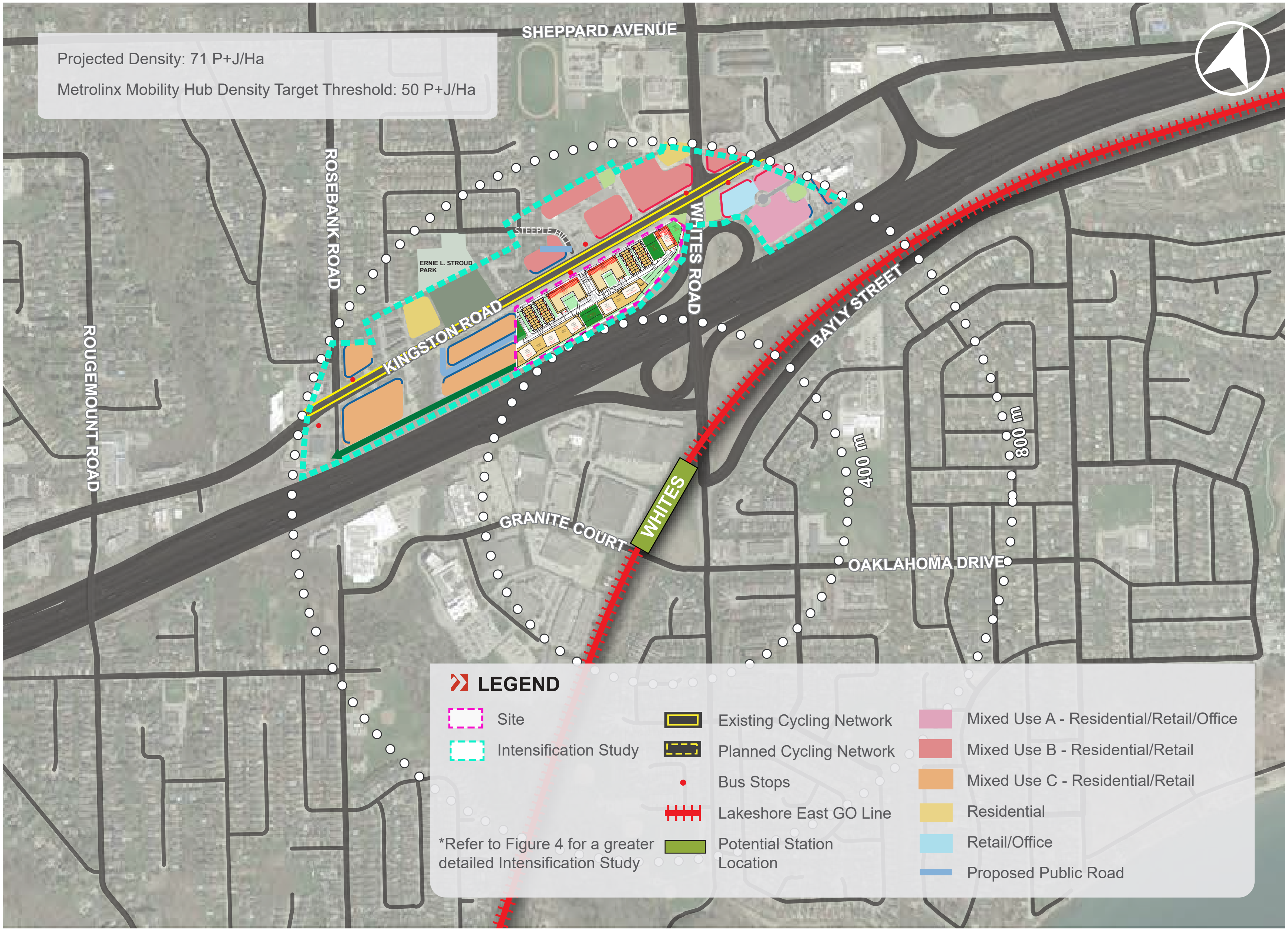
\\bafp02.tor.bagroup.com\data\WP\58\83\41\Graphics

FIGURE 14 FUTURE WHITES GO STATION



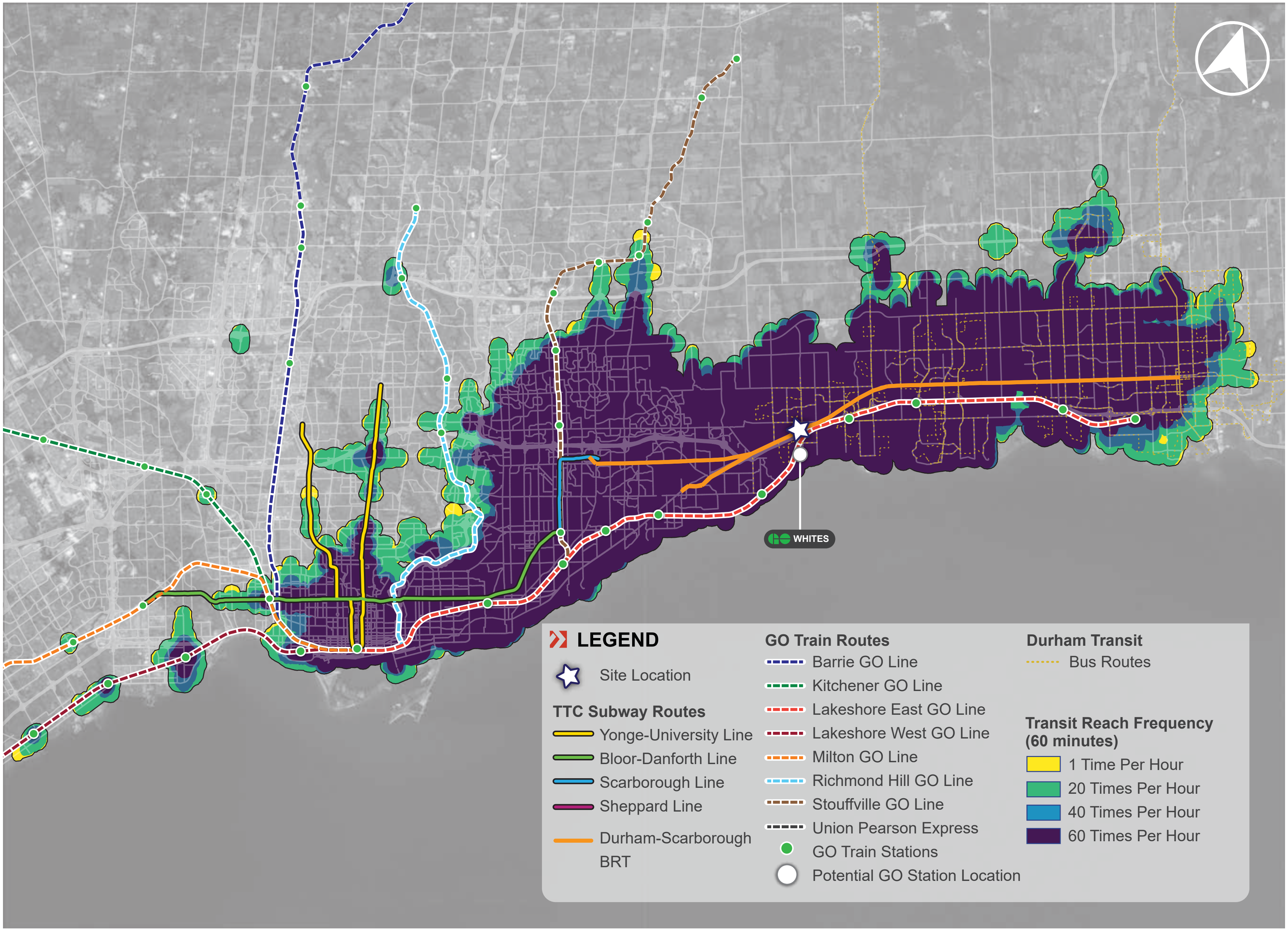
\\bafp02.tor.bagroup.com\data\WP\5883\41\Graphics

FIGURE 15 BUSINESS CASE REVIEW OF DENSITY SERVED BY WHITES GO STATION



\\bafp02.tor.bagroup.com\data\WP\5818\3\41\Graphics

FIGURE 16 INTENSIFICATION STUDY REVIEW OF DENSITY SERVED BY WHITES GO STATION



\\bafp02.tor.bagroup.com\data\WP\58\83\41\Graphics

FIGURE 17 WHITES GO STATION FUTURE 60 MINUTE TRANSIT REACH FREQUENCY

4.3 Area Pedestrian Context

4.3.1 Existing Pedestrian Network

The proposed redevelopment Site is centrally located along the Kingston Road corridor, just outside of the City Centre. There are a mix of uses along this corridor that can be accessed by walking, however, the vehicle-oriented design of the area (i.e. large surface parking lots and wide streets) does not prioritize pedestrian trips. Pedestrian destinations and the area context are illustrated in **Figure 18**.

Pedestrian Crossings

In the immediate area surrounding the Site, there are two signalized intersections with marked pedestrian crossings, which adequately facilitate pedestrian movement in a safe manner. Adjacent to the Site, the Kingston Road / Steeple Hill intersection is spaced approximately 315 to 620 metres from the nearest pedestrian crossings on Kingston Road. The lack of mid-block crossings hinders pedestrian mobility in the area.

Sidewalks

Sidewalks with a width of approximately 1.6 metres are provided on both sides of Kingston Road, and generally contain a landscaped buffer between the sidewalk and vehicular traffic lanes. However, the sidewalk on the south side discontinues west of the Site until Rosebank Road. Sidewalks are provided on both sides of Whites Road, but there generally is no buffer provided between the sidewalk and vehicular traffic.

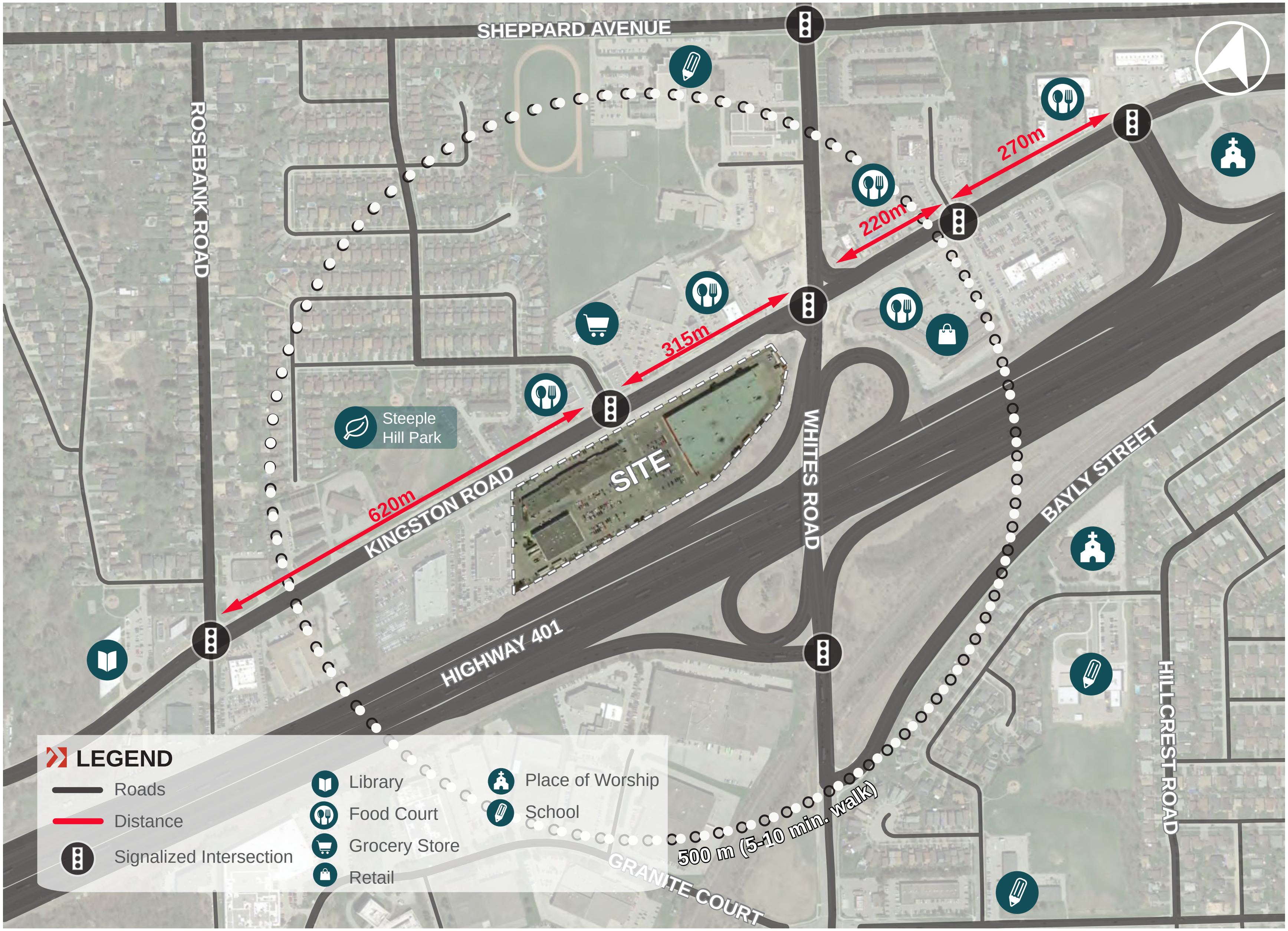
Currently, there are no pedestrian facilities that connect the commercial uses on the Site to the external sidewalk.

4.3.2 Planned Pedestrian Improvements

The intensification study (as seen in **Figure 4**) proposes numerous improvements for the pedestrian realm along Kingston Road within the Whites Precinct. A controlled intersection is proposed for further study between Steeple Hill and Rosebank Road, creating a potential new mid-block pedestrian crossing. This would help facilitate pedestrian mobility and make the area more porous for pedestrians.

Additionally, the intensification study proposes new park land within the precinct to create new pedestrian links from Kingston Road to the areas surrounding the corridor. Retail and secondary frontages along Kingston Road are also proposed to animate the public realm and provide more opportunities for pedestrian interactions at-grade.

The proposed site plan provides new sidewalk facilities along the internal road network that connect to the external sidewalk network. These sidewalks provide pedestrian connections between the new uses on-site and the wider pedestrian network and surrounding uses. The removal of the large surface parking lots and the proposed at-grade retail uses adjacent to Kingston Road creates an opportunity for pedestrian interaction and will improve the public realm.



\\bafp02.tor.bagroup.com\data\WP\5883\41\Graphics

FIGURE 18 EXISTING AREA PEDESTRIAN DESTINATIONS

4.4 Area Cycling Context

4.4.1 Existing Cycling Network

The Site is located along a portion of the Kingston Road bike lane that has been constructed. The bike lane provides cyclist with a designated lane that is marked on the pavement. The bike lane currently extends from west of the Site in the west to Delta Boulevard in the east.

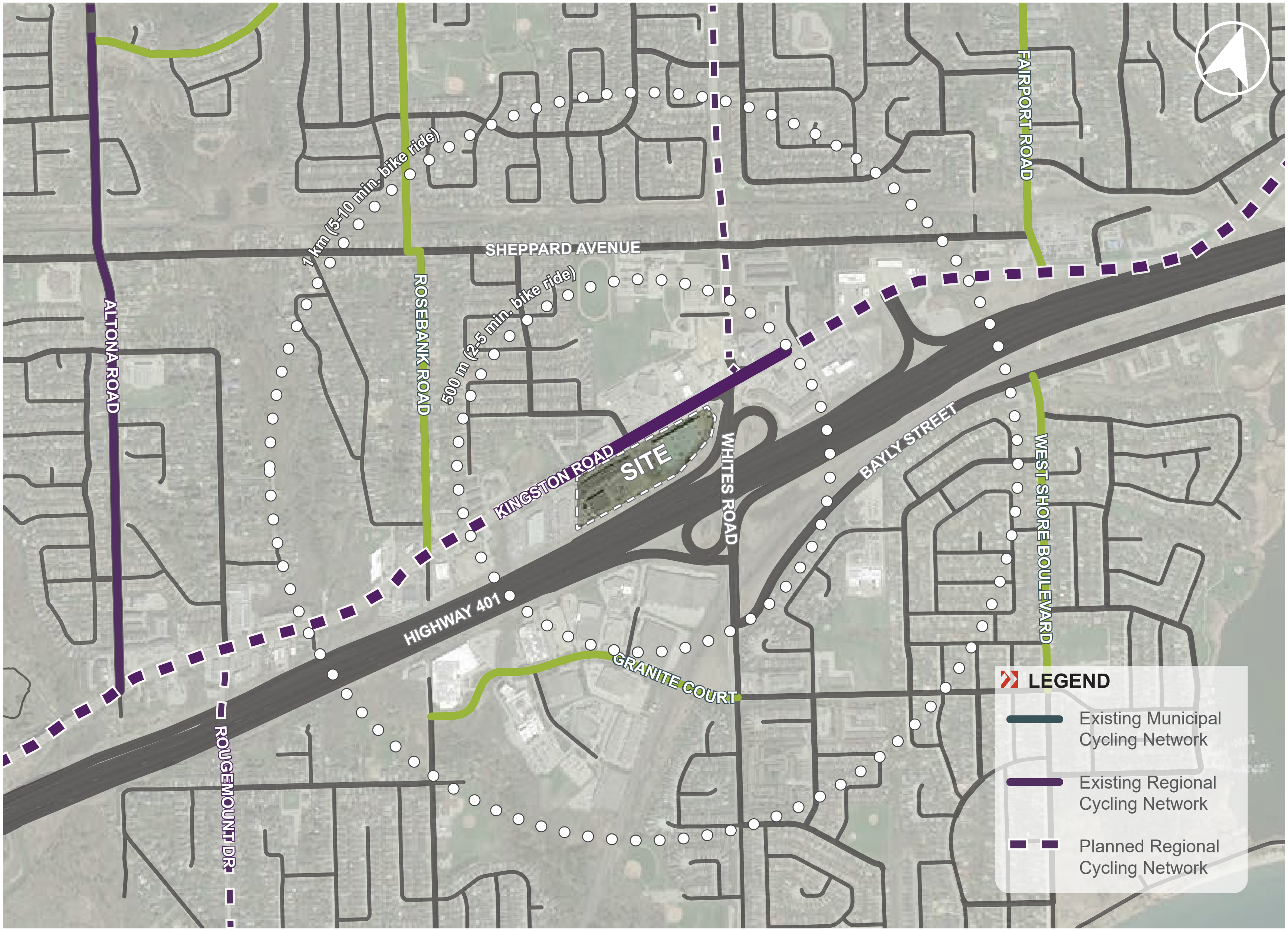
There are smaller municipal cycling infrastructure along Granite Court and Rosebank Road. However, these routes do not have direct connections to the Site.

4.4.2 Planned Cycling Network Improvements

The Durham Transportation Master Plan (2017) includes planned primary cycling routes within the vicinity of the Site. These include:

- Kingston Road: the cycling infrastructure on Kingston Road is proposed to be continuous, extending from Altona Road in the west to Highway 412 in the east where the cycling infrastructure will continue along Dundas Street.
- Whites Road: cycling infrastructure is proposed along this corridor, extending from Highway 7 in the north to Kingston Road in the south.
- Rougemount Drive: cycling infrastructure is proposed along this corridor, extending from Kingston Road in the north to the Waterfront Trail in the south.

The existing and planned cycling infrastructure network is illustrated in **Figure 19**.



\\bafp02.tor.bagroup.com\data\WP\5883\41\Graphics

FIGURE 19 EXISTING AND FUTURE AREA CYCLING NETWORK

5.0 TRANSPORTATION DEMAND MANAGEMENT STRATEGY

5.1 TDM Approach

The TDM Plan for the proposed development outlines the various TDM measures and strategies being advanced to reduce the number of private automobile-based trips made to / from the Site, to promote the use of more active and sustainable modes of transportation, and to play a role in responding to the mobility needs of employees, residents, and visitors of the proposed development.

The TDM Plan, combined with the physical attributes of the site plan – including the Site's location in the regional transit network, bicycle infrastructure, and pedestrian facilities – are intended to reduce auto-mode share to the greatest extent possible

Providing Mobility Choice

The proximity of transit services to the proposed development, combined with the integration of existing and planned active transportation infrastructure, is intended to ensure that people traveling to / from the Site are given viable and attractive transportation options. The provision of multi-modal transportation infrastructure will offer an enhanced level of mobility choice for perspective employees and residents.

Parking Provisions and Management

Limits to the accommodation of motorists based on establishing appropriate parking supplies and associated management programs, are intended to further reduce auto-mode share.

Parking supply and management elements are addressed further in **Section 6.0**.

5.2 TDM Objectives

TDM strategies include the application of various site design elements and property management/operational policies that have the goal of redistributing and reducing the travel demand of a project, specifically that of single occupancy private vehicles, with the primary objective of:

- reducing demand on road infrastructure, thereby minimizing road and parking capital expenditures;
- increasing travel efficiency;
- reducing climate change emissions;
- improving air quality; and
- improving overall health.

To ensure that the redevelopment sets a sustainable precedent of urban redevelopment and encourages the use of non-private automobile modes of travel, a comprehensive framework has been developed that will serve as a guideline for the implementation of effective TDM strategies.

5.3 TDM Measures

The proposed development includes a number of investments in transportation infrastructure, and notably the public realm and wider pedestrian network, to maximize mobility choice and connect with existing and planned active transportation and transit infrastructure. Through the Zoning By-law Amendment and future Site Plan Application processes, infrastructure and parking supply measures supportive of reducing reliance on single-occupant vehicles will be pursued and formalized. TDM measures proposed as part of the current development application are outlined in **Table 4**.

Table 4 Potential TDM Plan Strategies

	Intent	Implementation
PROMOTION OF TRANSIT USE	Support and promotion of area transit services for both short and long-distance travel by employees, residents, and visitors will reduce the overall use of vehicles and the need to own one. The development site's proximity to transit services, especially along Kingston Road, and access to local and regional transit services provides convenient access and connections across the City and Durham Region	• **provide convenient and accessible pedestrian connections from the Site to the nearby transit stops** • consideration will be given to providing a shuttle between the Site and Pickering GO Station to increase transit usage, which will be redirected to Whites Road GO Station should it be approved • consideration will be given to provide first time residents with a pre-loaded PRESTO card • facilitate accessible transit services at grade • increase the awareness, utility, practicality and viability of transit travel • capitalize on the already good, and improving, level of local transit accessibility afforded to the Site • enable the widespread use of transit
BICYCLE FACILITIES	Bicycle use is a convenient and viable travel alternative to the personal automobile. Bicycle lanes are provided along Kingston Road to link the proposed development with the wider City cycling network. The proximity of the Site to the Kingston Road route and future connections provide safe, reliable pathways to connect into other areas in the City.	• **shower and change facilities will be provided, if deemed necessary, to support cycling to and from non-residential uses on-site** • long-term bicycle parking will be located within secure and weather-protected areas within the parking garage at grade • short-term bicycle parking will be located near the primary entrances of the development to promote the use of bicycles • safe, clear and convenient access is provided to cyclists • cycling maintenance and repair facilities to be provided
PEDESTRIAN CONNECTIVITY	The quality of the public realm and pedestrian accessibility surrounding the Site influences the mobility choices of employees, residents, and visitors to the proposed development. A high-quality, safe, connection between transit stops, the public realm, and Site vicinity sidewalks encourages employees, residents and visitors to travel between the Site and surrounding neighbourhoods without the use of a vehicle.	• **provide high-quality, safe pedestrian-scale connections from the Site to the surrounding street and pedestrian pathway network** • maintain on-site pedestrian facilities to enable year-round pedestrian access • enhance the quality of the public realm through the provision of pedestrian-scale landscaping, appropriate sidewalk widths and parkland, and general improvement of the public realm along building frontages • enhance site porosity through the introduction of mid-block pedestrian routes, animated through the programming of retail and other uses

	Intent	Implementation
LAND USE INTEGRATION	Locate the Site with a variety of land uses in the surrounding area and introduce a variety of land uses within the redevelopment plan, that is easily accessible or provide space for supportive retail, restaurant, services, etc. This promotes and reduces overall vehicle trips as a result of the proximity and level of convenience offered by reducing the need to travel off-site for typical daily activity.	• **the site plan offers a range of mutually-supportive employment, retail, residential, recreational and amenity spaces on-site;** • provide connections to nearby buildings / retail spaces to reduce the need for employees and visitors to travel off-site or to utilize a vehicle for travel off-site to address daily needs;
REDUCE CAR USAGE	Provide options to reduce day-to-day use of private vehicles and promoted reduced vehicle ownership. Reducing the use and ownership of private vehicles reduces traffic demands on site accesses and the local street network, and reduces costly vehicle parking infrastructure while allowing opportunities to make more efficient use of vehicle parking that is provided.	• provide priority vehicle parking for car-pool and low-emission vehicles
PARKING SUPPLY AND MANAGEMENT	Reduced parking standards applied to the proposed development encourages employees and visitors to re-consider the use or ownership of a vehicle. The reduction of office parking standards will increase the potential for employees and visitors to utilize transit, car-sharing, cycling and pedestrian facilities within the surrounding area.	• **establish appropriate minimum parking supply standards for the proposed land uses that may be reduced compared to City by-law provisions to accommodate essential site related needs in this context.** • adopt a sharing of commercial office, residential visitor, and retail parking to maximize the efficient use of parking resources • locate parking underground to enhance the pedestrian realm and encourage use of non-auto means at grade

	Intent	Implementation
COMMUNICATION AND PROMOTION	The provision of transportation information and on-going promotional and educational programmes targeted to site employees, residents and visitors, to make travellers aware of various transportation options made available to arrive / depart the Site, where transportation services can be accessed, and recourses made available to those wanting to try more sustainable transportation options.	• **inclusion of transportation information screens located in accessible high-(foot) traffic locations to inform travellers**, on an on-going basis, the time, location, and travel schedules of various transportation options available on-site, including broader taxi / ride-share provider service networks, transit / bike share provisions and other transportation services. 

6.0 VEHICULAR PARKING CONSIDERATIONS

6.1 Zoning By-law Parking Requirements

6.1.1 Site-Specific By-laws No. 1810-84 & 2471-87

The Site is zoned by two site-specific by-laws, By-law No. 1810-84 and By-law No. 2471-87. By-law No. 1810-84 applies to the western portion of the Site, while By-law No. 2471-87 applies to the eastern portion of the Site. The gross floor area was conservatively utilized for the gross leasable area (GLA).

Under the site-specific by-laws, only non-residential uses are permitted on the Site, thus, the parking provisions only include minimum parking requirements for non-residential uses. For the purpose of this analysis, the residential parking requirements of the underlying By-law No. 3036 were applied to the Site.

The application of the minimum parking requirements to the proposed development is summarized in **Table 5**, resulting in a total requirement of 6,278 parking spaces, including 6,055 residential parking spaces and 223 non-residential parking spaces.

Table 5 Site-Specific By-laws No. 1810-84 & 2471-87 Parking Requirements

	Use	Units / GFA[1]	Rate (Minimum)	Requirement (Minimum)
PODIUM 1 + TOWER 1, 2 & 3	**Residential**			
	Multiple Family Vertical (Apartment)	960 units	1.75 spaces per unit[3]	1,680 spaces
	Subtotal	*960 units*		*1,680 spaces*
	Total			**1,680 spaces**
PODIUM 2 + TOWER 4 & 5	**Residential**			
	Multiple Family Vertical (Apartment)	640 units	1.75 spaces per unit[3]	1,120 spaces
	Subtotal	*640 units*		*1,120 spaces*
	Total			**1,120 spaces**
PODIUM 3 + TOWER 6	**Residential**			
	Multiple Family Vertical (Apartment)	380 units	1.75 spaces per unit[3]	665 spaces
	Subtotal	*380 units*		*665 spaces*
	Non-Residential			
	Western Portion of the Site	0 m^2	4.5 spaces per 100 m^2 of GLA[4]	0 spaces
	Eastern Portion of the Site	3,856 m^2	3.5 spaces per 93 m^2 of GLA[5]	145 spaces
	Subtotal	-		*145 spaces*
	Total			**810 spaces**

	Use	Units / GFA[1]	Rate (Minimum)	Requirement (Minimum)
PODIUM 4 + TOWER 7	**Residential**			
	Multiple Family Vertical (Apartment)	200 units	1.75 spaces per unit[3]	350 spaces
	Subtotal	*200 units*		*350 spaces*
	Non-Residential			
	Western Portion of the Site	0 m^2	4.5 spaces per 100 m^2 of GLA[4]	0 spaces
	Eastern Portion of the Site	676 m^2	3.5 spaces per 93 m^2 of GLA[5]	25 spaces
	Subtotal	-		*25 spaces*
	Total			**375 spaces**
PODIUM 5 + TOWER 8	**Residential**			
	Multiple Family Vertical (Apartment)	420 units	1.75 spaces per unit[3]	735 spaces
	Subtotal	*420 units*		*735 spaces*
	Non-Residential			
	Western Portion of the Site	0 m^2	4.5 spaces per 100 m^2 of GLA[4]	0 spaces
	Eastern Portion of the Site	676 m^2	3.5 spaces per 93 m^2 of GLA[5]	25 spaces
	Subtotal	-		*25 spaces*
	Total			**760 spaces**
PODIUM 6 + TOWER 9	**Residential**			
	Multiple Family Vertical (Apartment)	420 units	1.75 spaces per unit[3]	735 spaces
	Subtotal	*420 units*		*735 spaces*
	Non-Residential			
	Western Portion of the Site	0 m^2	4.5 spaces per 100 m^2 of GLA[4]	0 spaces
	Eastern Portion of the Site	742 m^2	3.5 spaces per 93 m^2 of GLA[5]	28 spaces
	Subtotal	-		*28 spaces*
	Total			**763 spaces**
PODIUM 7 + TOWER 10	**Residential**			
	Multiple Family Vertical (Apartment)	440 units	1.75 spaces per unit[3]	770 spaces
	Subtotal	*440 units*		*770 spaces*
	Total			**770 spaces**

	Use	Units / GFA[1]	Rate (Minimum)	Requirement (Minimum)
SITE	**TOTAL RESIDENT PARKING SPACES[2]**			**6,055 spaces**
SITE	**TOTAL NON-RESIDENT PARKING SPACES**			**223 spaces**
SITE	**TOTAL PARKING SPACES**			**6,278**

Notes:
1. Based upon statistics provided Graziani & Corazza Architects dated October 24, 2023.
2. According to the minimum parking requirements of the underlying By-law No. 3036.
3. Includes parking provisions for visitors.
4. According to the minimum parking requirements of By-law No. 1810-84.
5. According to the minimum parking requirements of By-law No. 2471-87.

6.1.2 Zoning By-law 7553-17

The City of Pickering has a zoning by-law for the City Centre that has reduced parking standards and permits parking to be shared between uses, acknowledging the transit accessibility of the City Centre and temporal patterns between differing uses.

As the Site is located along the future BRT corridor and has a mix of uses proposed on-site, it is our opinion that the City Centre parking standards are more appropriate for the Site. Additionally, the applicable zoning by-laws are considered outdate, as the by-laws were drafted over 30 years ago and the latest amendment to the parking requirements occurred in 2001.

The application of the City Centre By-law 7553-17 minimum parking requirements to the proposed development is summarized in **Table 6**. The sharing parking permissions results in a total parking requirement of 3,374 parking spaces, including 2,768 residential parking spaces and 606 non-residential parking spaces.

6.2 Proposed Parking Requirements

The proposed parking requirements are as follows:

- Apartment Dwelling: 0.65 parking spaces per unit
- Residential Visitors: 0.15 spaces per unit
- Office: no designated office parking will be provided, it will share the visitor parking
- Retail: no designated retail parking will be provided for retail space less than 1,000 m^2 GFA per building, it will share the visitor parking

The application of the proposed minimum parking requirements to the proposed development is summarized in **Table 7**. The application of the proposed minimum parking requirements results in a total parking requirement of 2,768 parking spaces, including 2,249 residential parking spaces and 519 non-resident parking spaces.

Currently, a total of 2,768 parking spaces in two levels of below-grade parking and within Podium 1, 2 and 3 are proposed to support the Project. Further details of the proposed development's parking supply and location will be provided in subsequent applications to the City through the approval process.

Table 6 City of Pickering By-law 7553-17 Parking Requirements

Use	Units / Floor Area[1]	Rate (Minimum)	Requirement (Minimum)	Requirement with Sharing							
				Weekday				Weekend			
				Morning	Noon	Afternoon	Evening	Morning	Noon	Afternoon	Evening
Residential											
Apartment Dwelling	3,460 units	0.80 spaces per unit	2,768 spaces	100%							
SUBTOTAL	**3,460 units**	**(0.80 spaces per unit)**	**2,768 spaces**	**2,768 spaces**							
Non-Residential											
Residential Visitors	3,460 units	0.15 spaces per unit	519 spaces	104 sps (20%)	104 sps (20%)	311 sps (60%)	519 sps (100%)	104 sps (20%)	104 sps (20%)	311 sps (60%)	519 sps (100%)
Office	3,475 m^2	2.5 spaces per 100 m^2 GLFA	87 spaces	87 sps (100%)	78 sps (90%)	83 sps (95%)	9 sps (10%)	9 sps (10%)	9 sps (10%)	9 sps (10%)	0 sps (0%)
Retail	2,474 m^2	3.5 spaces per 100 m^2 GLFA	87 spaces	57 sps (65%)	78 sps (90%)	78 sps (90%)	78 sps (90%)	70 sps (80%)	87 sps (100%)	87 sps (100%)	61 sps (70%)
SUBTOTAL			**693 spaces**	**248 sps**	**260 sps**	**472 sps**	**606 sps**	**183 sps**	**200 sps**	**407 sps**	**580 sps**
TOTAL (with sharing)[2]			**3,461 spaces**	**3,016 sps**	**3,028 sps**	**3,240 sps**	**3,374 sps**	**2,951 sps**	**2,968 sps**	**3,175 sps**	**3,348 sps**

Notes:
1. Based upon statistics provided Graziani & Corazza Architects dated October 24, 2023.
2. Sharing provision are in accordance with Zoning By-law 7553-17 Section 3.4.

Table 7 Recommended Minimum Parking Requirements

	Use	Units / GFA[1]	Rate (Minimum)	Requirement (Minimum)
PODIUM 1 + TOWER 1, 2 & 3	**Residential**			
	Apartment Dwelling	960 units	0.65 spaces per unit	624 spaces
	Subtotal	*960 units*		*624 spaces*
	Non-Residential			
	Residential Visitors	960 units	0.15 spaces per unit	144 spaces
	Subtotal	-		*144 spaces*
	Total			**768 spaces**
PODIUM 2 + TOWER 4 & 5	**Residential**			
	Apartment Dwelling	640 units	0.65 spaces per unit	416 spaces
	Subtotal	*640 units*		*416 spaces*
	Non-Residential			
	Residential Visitors	640 units	0.15 spaces per unit	96 spaces
	Subtotal	-		*96 spaces*
	Total			**512 spaces**
PODIUM 3 + TOWER 6	**Residential**			
	Apartment Dwelling	380 units	0.65 spaces per unit	247 spaces
	Subtotal	*380 units*		*247 spaces*
	Non-Residential			
	Residential Visitors	380 units	0.15 spaces per unit	57 spaces
	Retail	381 m^2	No minimum	0 spaces
	Office	3,475 m^2	No minimum	0 spaces
	Subtotal	-		*57 spaces*
	Total			**304 spaces**

	Use	Units / GFA[1]	Rate (Minimum)	Requirement (Minimum)
PODIUM 4 + TOWER 7	**Residential**			
	Apartment Dwelling	200 units	0.65 spaces per unit	130 spaces
	Subtotal	*200 units*		*130 spaces*
	Non-Residential			
	Residential Visitors	200 units	0.15 spaces per unit	30 spaces
	Retail	676 m^2	No minimum	0 spaces
	Subtotal	-		*30 spaces*
	Total			**160 spaces**
PODIUM 5 + TOWER 8	**Residential**			
	Apartment Dwelling	420 units	0.65 spaces per unit	273 spaces
	Subtotal	*420 units*		*273 spaces*
	Non-Residential			
	Residential Visitors	420 units	0.15 spaces per unit	63 spaces
	Retail	676 m^2	No minimum	0 spaces
	Subtotal	-		*63 spaces*
	Total			**336 spaces**
PODIUM 6 + TOWER 9	**Residential**			
	Apartment Dwelling	420 units	0.65 spaces per unit	273 spaces
	Subtotal	*420 units*		*273 spaces*
	Non-Residential			
	Residential Visitors	420 units	0.15 spaces per unit	63 spaces
	Retail	742 m^2	No minimum	0 spaces
	Subtotal	-		*63 spaces*
	Total			**336 spaces**

	Use	Units / GFA[1]	Rate (Minimum)	Requirement (Minimum)
PODIUM 7 + TOWER 10	**Residential**			
	Apartment Dwelling	440 units	0.65 spaces per unit	286 spaces
	Subtotal	*440 units*		*286 spaces*
	Non-Residential			
	Residential Visitors	440 units	0.15 spaces per unit	66 spaces
	Subtotal	-		*66 spaces*
	Total			**352 spaces**
SITE	**TOTAL RESIDENT PARKING SPACES**			**2,249 spaces**
	TOTAL NON-RESIDENT PARKING SPACES			**519 spaces**
	TOTAL PARKING SPACES			**2,768 spaces**

Notes:
1. Based upon statistics provided Graziani & Corazza Architects dated October 24, 2023.
2. Sharing provision are in accordance with Zoning By-law 7553-17 Section 3.4.

6.3 Appropriateness of Reduced Residential Parking Supply

In our opinion, the resident parking standards outlined in Site-Specific By-laws No. 1810-84 & 2471-87 overstate the parking needs of contemporary mixed-use buildings located in transit-accessible areas within the City of Pickering.

Adoption of a reduced residential parking standard is considered appropriate based upon the following considerations:

- Provincial and local policy / plan that direct municipalities to reduce or eliminate minimum parking requirements;
- The Site's transportation context, including its proximity to existing and planned transportation networks that provide non-automobile dependent travel connections across the City;
- A review of Zoning By-Law parking standards across the GTHA and eastern Ontario;
- Recent resident parking reduction approvals obtained for residential buildings located within close proximity to an existing surface transit;
- Parking sales trends in the City of Pickering for residential building located within close proximity to high-order transit stations and surface transit; and
- The TDM measures for the Site that will influence parking demand on-site and in the wider area.

The following provides an overview of the contextual factors influencing parking demand at mixed-use development in the Pickering area and the appropriateness of the proposed (reduced) minimum parking requirements in this instance.

6.3.1 Provincial & Local Parking Policy

As growth in cities increase, transit connections and access to alternative modes of transportation (e.g., walking, cycling, carpooling) become more critical in moving residents, visitors, and employees between home, work, and entertainment destinations. In addition, developments within major cities in North America are continuously recognizing that the location of a proposed development, in relation to transit services, pedestrian infrastructure, and cycling infrastructure plays an important role in decreasing auto ownership, and potentially alleviating traffic congestion.

In this way, increasing efforts and investments are being made to change travel behaviour, as shown through existing and evolving provincial, regional, and local policies as it pertains to parking management, parking requirements, and prioritizing more sustainable travel choices over automobiles.

As previously discussed in **Section 3.0**, there are many Provincial plans and local policies that provide a framework to guide development in Ontario municipalities. These plans and policies often contain direction with regards to development along transit corridors, commenting on parking standards and the future regulations of parking minimums. A brief overview of the Provincial and local plans and policies that support a reduced parking minimum are outlined below.

6.3.1.1 PLANNING ACT

The Planning Act directs municipalities to have regard to matters of provincial interest set out in Section 2 of the Planning Act, including:

> *(r) the promotion of development that is designed to be sustainable, to support public transit and to be oriented to pedestrians;*
>
> *(t) the mitigation of greenhouse gas emissions and adaptation to a changing climate.*

The proposed reduced parking standards have regard to matters of Provincial interest in that they will promote sustainable, transit-supportive development, and mitigate greenhouse gas emissions as well as support and encourage the use of existing or planned higher order public transit by discouraging automobile ownership and demand for single-occupant vehicle trips.

6.3.1.2 PROVINCIAL POLICY STATEMENT

Adopted in May 2020, the **Provincial Policy Statement (PPS)** provides policy direction to promote transportation demand management (TDM) strategies to be implemented for new developments to increase the efficiency of existing and planned transportation infrastructure (Section 1.6.7.2). As well, the PPS states that land use pattern, density, and mix of uses should be promoted to minimize the length and number of vehicle trips and support current and future use of transit and active transportation (Section 1.6.7.4). In summary, the PPS is supportive of the use of transportation demand management, such as reduced parking rates, to support and increase the efficiency of more sustainable transportation options.

The proposed reduction in parking rates associated with the development is consistent with the PPS and is an appropriate development standard to facilitate intensification and transit-supportive development as planned for the area.

6.3.1.3 PLACES TO GROW: GROWTH PLAN FOR THE GREATER GOLDEN HORSESHOE

The **Growth Plan for the Greater Golden Horseshoe (Growth Plan)** (as amended in 2020) aims to foster economic growth, provide greater housing supply and options, increase employment, and build communities for a healthier and more affordable life in the Greater Golden Horseshoe. As such, the Growth Plan outlines the importance of reducing reliance on the automobile and promoting transit and active transportation. In particular, the Growth Plan encourages transit-supportive policies, such as reduced parking standards, within major transit station areas (MTSAs), which are areas that are within an approximate 500 to 800 metre radius (i.e. 10-minute walk) of an existing or planned higher order transit station. The Site is located within 500 to 800 metres of a future Durham-Scarborough Bus Rapid Transit (BRT) stop, and is within 800 metres of a possible GO Transit station at Whites Road.

The Growth Plan encourages development in MTSAs to support transit and active transportation, as noted in Section 2.2.4.8:

> *All major transit station areas will be planned and designed to be transit-supportive and to achieve multimodal access to stations and connections to nearby major trip generators by providing, where appropriate:*
>
> a. *connections to local and regional transit services to support transit service integration;*
> b. *infrastructure to support active transportation, including sidewalks, bicycle lanes, and secure bicycle parking; and*
> c. *commuter pick-up/drop-off areas.*

Additionally, the Growth Plan explicitly states that development in MTSAs should provide alternative development standards such as reduced parking standards in Section 2.2.4.9:

> *Within all major transit station areas, development will be supported, where appropriate, by:*
>
> d. *planning for a diverse mix of uses, including additional residential units and affordable housing, to support existing and planned transit service levels;*
> e. *fostering collaboration between public and private sectors, such as joint development projects;*
> f. *providing alternative development standards, such as reduced parking standards; and*
> g. *prohibiting land uses and built form that would adversely affect the achievement of transit-supportive densities.*

In addition to MTSA-specific policies, Section 3.2.24 of the Growth Plan encourages municipalities to implement transportation demand management policies that would prioritize and improve sustainable transportation modes, further supporting a reduced parking standard for the proposed site:

> *Municipalities will develop and implement transportation demand management policies in official plans or other planning documents or programs to:*

a. *reduce trip distance and time;*
b. *increase the modal share of alternatives to the automobile, which may include setting modal share targets;*
c. *prioritize active transportation, transit, and goods movement over single-occupant automobiles;*
d. *expand infrastructure to support active transportation; and*
e. *consider the needs of major trip generators.*

In summary, the Growth Plan explicitly shows support for the reduction of parking standards within MTSAs, of which the site is located within a future Durham-Scarborough Bus Rapid Transit (BRT) stop, and within of a possible GO station at Whites Road. Thus, the proposed parking rates for the Subject Site are consistent with the Growth Plan and are considered appropriate.

6.3.1.4 ONTARIO MINISTRY OF TRANSPORTATION TRANSIT-SUPPORTIVE GUIDELINES

The Ontario Ministry of Transportation Transit-Supportive Guidelines are intended to assist with the implementation of policies and objectives set out in the PPS and the Growth Plan for the GGH, both of which provide key policy directives to manage future growth in the Greater Toronto Area and beyond.

The guidelines aim to create an environment that is supportive of transit, and to develop services and programs intended to increase transit ridership. The guidelines also support the use of TDM strategies, particularly in close proximity to transit routes. This may include the sharing of parking between Site uses, the use of on-street parking during off-peak hours, and the reduction of minimum and maximum parking requirements as TDM measures are adopted. **In this way, the proposed parking reduction proposed by the Subject Site is consistent with these provincial guidelines.**

6.3.1.5 2041 METROLINX REGIONAL TRANSPORTATION PLAN

The purpose of the 2041 RTP is to provide a framework that will create an integrated, multi-modal regional transportation system to support the growth of healthy, complete and sustainable communities. The RTP contains strategies that integrate land use and transportation planning to identify areas for investment and build new connections. One of these strategies specifically addresses parking management.

Strategy 4.8 rethinks the future of parking, encouraging the Province to adopt a region-wide policy that "*provides guidelines and encourages best practice in parking management."* The strategy states that "*zoning standards should be reviewed, with the expectation that minimum parking requirements will be reduced, particularly in transit-supportive neighbourhoods."*

The proposed parking reduction for the development is consistent with Metrolinx's policy.

6.3.1.6 DURHAM TRANSPORTATION MASTER PLAN

The TMP recommends Action 80 to support the goal of requiring new developments to support sustainable travel choices. The action item is to "*create guidelines that support a Regional parking strategy for strategic nodes and corridors, in partnership with the area municipalities. Actions could include amendments to zoning by-laws (e.g., to reduce parking minimums, set maximums and allow shared parking), identifying parking supply caps for key districts, and studying the feasibility and benefits of public parking authorities."* This aligns with the proposed (reduced) minimum parking requirements, and the applicant wants to work in partnership with the City of Pickering to amend the in force zoning by-laws.

6.3.1.7 PICKERING OFFICIAL PLAN

The Official Plan states that City Council shall encourage shared parking in mixed uses areas and shall consider a reduction in the parking requirement where TDM measures are provided. While this is stated in regards to the City Centre parking, it shows the direction that City policy is headed and it is our opinion that is should be applied to all areas of Pickering or at least the transit-accessible areas

6.3.2 Transportation Context

As outlined in **Section 4.0**, the Site is located in close proximity to existing transit services and planned transit services. The existing PULSE bus route, local bus routes and GO Transit services currently support non-automobile based travel, which ultimately supports a reduced parking standard.

A review of the 2016 Transportation Tomorrow Survey (TTS) for the area surrounding the Site revealed that while the majority of existing travel is conducted using an automobile, a considerable amount of home-based travel is conducted using transit and active transportation during the morning and afternoon peak periods.

TTS Zone 1046 (the area generally bounded by Whites Road, Highway 401, the Canadian National Railway line and Little Rouge Creek) were analyzed in order to determine peak period travel modes residents in the area. The data is summarized in **Table 8**.

Table 8 Area Peak Period Travel Mode Distribution

Weekday Peak Period	Auto Driver	Auto Passenger	Transit	Walk	Cycle	Total
AM	70%	16%	11%	3%	0%	100%
PM	74%	15%	7%	4%	0%	100%

Notes:
1. Travel mode split calculated for home-based trips within TTS 2001 Zones 1046

Based on the most recent 2016 Transportation Tomorrow Survey data, approximately 70-74% of all home-based trips taken during the weekday peak period in the Site's vicinity were undertaken by auto drivers. The provision of a parking space for 80% of apartment residents and 100% of townhouse residents (i.e. 0.80 spaces per unit and 1.00 spaces per unit) is above the upper range of the percent of areas residents that currently drive a vehicle to and from their home, based on 2016 data.

The 26-30% of area residents that carpool, use transit or use active transportation are supportive of a reduced parking standard, as it indicates that not all residents in the areas surrounding the Site depend on their own vehicle for their daily travel.

The future BRT and RER services will enhance the existing transit services, as will the future Whites Road GO Transit station, should it be reconsidered by Metrolinx. It is important to note that the transit reach of the Site is not dependent on the Whites Road station, as the planned BRT and RER services on their own increase the reliability / frequency of services across the City and wider region when compared to existing conditions, as outlined in **Section 4.2.2**.

Furthermore, the intensification study and TMPs for the area contain plans to expand the pedestrian and cycling networks. As such, the planned transportation networks and services, including the future transit, are anticipated to increase the percentage of area residents that carpool, use transit or use active transportation in their daily travel, further increasing support for reduced parking standards.

6.3.3 Zoning By-Law Review - Resident Parking Standards

A comprehensive Zoning By-law review has been undertaken which compares parking standards adopted across numerous municipalities across the GTHA and eastern Ontario with comparable transit access to the Subject Site. The selection of municipalities was primarily based on certain urban characteristics, including density and intensification patterns, conventionally auto-centric network, and a diversity of transit services available in the area. These minimum parking requirements reflect evolving transit contexts, mixed-use environments, and the emergence of alternative modes of travel.

A summary of resident Zoning By-law rates for comparable Ontario municipalities is provided in **Table 9**.

Table 9 Residential Parking Supply Ratio Requirements – Comparable Ontario Municipalities

Municipality	Zoning By-law	City Area	Land Use Category	Nearby Transit Service	Minimum Resident Parking Requirement
Proposed Development	--	**Mixed Corridors**	**Apartment Dwelling Unit**	• **DRT Local Bus Routes** • **Future Durham-Scarborough BRT** • **Potential GO station at Whites Road**	**0.65 spaces / unit**
Mississauga	By-law 0225-2007	Precinct 1	Condo / Rental Apartment	• MiWay Bus • Mississauga Transitway • MiWay Express Bus • GO Bus • Future Hazel McCallion LRT	**0.80 spaces / unit**
	Undergoing City staff investigation	Along future Hazel McCallion LRT	--		**In June 2023, City of Mississauga's Council has motioned to investigate the feasibility of reducing, and possibly eliminating altogether, minimum residential parking requirements along the future Hazel McCallion Light Rail Transit line.**
Vaughan	By-law 001-2021 (Passed)	VMC	Apartment Dwelling	• TTC Bus / Subway • GO Bus / Train • YRT Bus • YRT Viva BRT	**0.40 spaces / unit**
	Yonge-Steeles Corridor Secondary Plan, (approved by OLT hearing)	Yonge-Steeles	Apartment Dwelling	• TTC Bus • YRT Bus • Future TTC Subway • Future Steeles BRT	**No Minimum**
Toronto	By-law 569-2013	Parking Zone B	Mixed-Use Building	• TTC Bus / Subway / Streetcar • GO Bus / Train • Miway Bus • Future TTC Subway • Future TTC Streetcar • Future TTC BRT	**No Minimum**
Brampton	By-law 270-2004	Central Area / Downtown	Apartment Dwelling	• GO Bus / Train • Brampton Bus • Brampton ZUM BRT • Future Hazel McCallion LRT	**No minimum**

Municipality	Zoning By-law	City Area	Land Use Category	Nearby Transit Service	Minimum Resident Parking Requirement
Ottawa[1]	By-law 2008-250	Area "X"	Mixed-Use Building (within 300 metres of a rapid transit station)	• O-Train LRT • OC Transpo Rapid Bus • OC Transpo Frequent Bus	**0.0 to 0.5 spaces / unit**
Kingston	By-law 2022-62	Parking Area 1 (Downtown)	Mixed-Use Building	• Kingston Transit Express Bus • Kingston Transit Bus	**0.40 spaces / unit**
Kitchener	By-law 2019-051	Urban Growth Centre	Multiple Residential Buildings	• GO Bus / Train • GRT bus • GRT Ixpress Bus • GRT ION LRT	**No Minimum**

Notes:
1. Along select streets within Central Ottawa and where the nearest active entrance of a mixed-use building is within 400 metres or less of a rapid transit station, the City of Ottawa Zoning By-law 2008-250 has no minimum resident parking standards for mixed-use buildings. Otherwise, a minimum standard of 0.5 spaces per unit applies.

A number of municipalities (Brampton, Kitchener, Toronto, Ottawa) have adopted substantial reductions in their residential parking rates within their urban areas to align with goals of reducing non-auto modes of travel and promote existing and planned investments to transit, cycling, and pedestrian infrastructure. For example, the City of Brampton removed minimum resident parking requirements in the City's Central Area / Downtown with the passing of their most recent zoning by-law, and in June 2023 the City of Mississauga's Council directed City staff to investigate the feasibility of eliminating minimum parking requirements along the future Hazel McCallion LRT line.

Given that the level of existing and planned future transit service levels across the municipalities highlighted in **Table 9** are comparable to that of Pickering in the area of the Subject Site, it is evident that the minimum parking requirements stipulated in the prevailing Site Specific Zoning By-law 1810-84 & 2471-87 exceed what is otherwise considered appropriate in comparable municipalities with a similar transit context.

Specifically, the future operation of the Durham-Scarborough BRT will unlock a higher level of transit accessibility that is comparable to the context presented for Kitchener (Urban Growth Centre) and Toronto (Parking Zone B – lands within proximity to frequent surface transit), and exceeds the general level of transit service provided in Hamilton (Downtown Zone). At the time of implementation for the Durham – Scarborough BRT, there will be a diverse range of transportation services for area residents: BRT, Durham Transit buses, and extensive active transportation. In addition, the potential GO station at Whites Road will provide additional services for area residents including GO bus/train.

Collectively, the above indicates a general trend within municipalities across the GTHA and eastern Ontario to present a progressive outlook towards the provision of residential parking supply, particularly where transit and transportation context is, or is planned to be, conducive to non-automobile travel.

6.3.4 Residential Parking Reduction Trends across the GTHA

Approvals for reduced resident parking supply rates (lower than the in-force Zoning By-law) have become commonplace within municipalities across the GTHA through the advent of increased emphasis on sustainable travel behaviours, including transit and active travel modes, and through the continually rapid growth of its population and associated significant expansions to its regional transit system.

BA Group has reviewed approvals for sites for which reduced resident standards have been provided by City Council as part of the Zoning By-law Amendment process, by the Committee of Adjustment as part of Minor Variance applications, or at the Ontario Land Tribunal. The following sections provide an overview of reduced resident approval trends for:

- Approval trends in Pickering (from 2019 to 2023) with comparable transportation contexts as the Subject Site (**Section 6.3.4.1**); and
- Approval trends across the GTHA (from 2018 to 2023) with comparable transportation contexts as the Subject Site (**Section 6.3.4.2**).

6.3.4.1 RESIDENTIAL PARKING REDUCTION TRENDS IN PICKERING

As the City of Pickering's population continues to grow, and as the transit services levels continue to improve within its urban areas, trends towards decreasing parking supplies have been observed relative to the by-law requirement. There has been an observed trend in reductions for residential parking approvals around the high-order transit stations in Pickering. A review of these approvals, summarized in **Table 10** shows a significant decline in resident parking rates over the last four years (from 2019 to 2023 there has been a reduction of 0.19 spaces per unit).

It is anticipated that this trend will be similar and continue with progressively lower rates, particularly with the future introduction of the Durham-Scarborough BRT providing additional east-west rapid transit capacity in the vicinity of the Subject Site.

Table 10 Reductions in Residential Parking Supply Requirements (City of Pickering)

Address	Residential Rate	Permission Through	Nearest High-Order Transit Station	Year of Approval
Universal City 2 & 3 (Bayly St / Liverpool Rd)	0.74 spaces / unit	CoA Decision - P/CA 60/19	Pickering GO Station (540 m from site)	2019
Universal City 6 (Bayly St / Liverpool Rd)	0.71 spaces / unit	City of Pickering Zoning By-law No. 7810/21	Pickering GO Station (540 m from site)	2021
Universal City 4 & 5 (Bayly St / Liverpool Rd)	0.65 spaces / unit	City of Pickering Zoning By-law No. 7936/22	Pickering GO Station (540 m from site)	2022
Universal City 7 (Bayly St / Liverpool Rd)	0.65 spaces / unit	City of Pickering Zoning By-law No. 7924/22	Pickering GO Station (540 m from site)	2022
PTC Phase 1 (Kingston Rd / Liverpool Rd)	0.65 spaces / unit	Site specific By-law 7981/23	Pickering GO Station (750 m from site)	2023
1786-1790 Liverpool Road	0.55 spaces / unit	Site specific By-law 8023/23	Pickering GO Station (700 m from site)	2023

6.3.4.2 RESIDENTIAL PARKING REDUCTION TRENDS ACROSS GTHA

Consistent with the trend of declining residential parking supplies within the City of Pickering, there have been numerous parking supply reductions across the broader GTHA for sites with comparable transportation contexts as the Subject Site.

As summarized in **Table 11**, a trend towards reduced parking supplies over time generally exists in all municipalities examined. Reductions over time have been observed in the City of Pickering, the Toronto boroughs of Etobicoke and Scarborough, the City of Hamilton, City of Vaughan and the City of Mississauga. Each of the developments within these jurisdictions possess transportation contexts comparable to that of the Subject Site, and in some cases possess diminished transit access relative to the Site.

Table 11 Parking Supply Reductions Across GTHA with Comparable Transportation Contexts

Address	Residential Rate	Permission Through	Nearest GO Station	Year of Approval / Proposal
Approved Residential Parking Supply Reductions (GTHA)				
City of Pickering				
Universal City 2 & 3 (Bayly St / Liverpool Rd)	0.74 spaces / unit	CoA Decision - P/CA 60/19	Pickering GO Station (540 m from site)	2019
Universal City 6 (Bayly St / Liverpool Rd)	0.71 spaces / unit	City of Pickering Zoning By-law No. 7810/21	Pickering GO Station (540 m from site)	2021
Universal City 4 & 5 (Bayly St / Liverpool Rd)	0.65 spaces / unit	City of Pickering Zoning By-law No. 7936/22	Pickering GO Station (540 m from site)	2022
Universal City 7 (Bayly St / Liverpool Rd)	0.65 spaces / unit	City of Pickering Zoning By-law No. 7924/22	Pickering GO Station (540 m from site)	2022
PTC Phase 1 (previous SS)	0.65 spaces / unit	Site specific By-law 7981/23	Pickering GO Station (750 m from site)	2023
1786-1790 Liverpool Road	0.55 spaces / unit	Site specific By-law 8023/23	Pickering GO Station (700 m from site)	2023
City of Toronto				
Etobicoke				
5365 Dundas Street West (Bloor St W / Kipling Ave)	0.75 spaces / unit (effective Phase 2 & 3 rate)	Site-specific By-law 1268-2018	Kipling GO Station (550 m from site)	2018
5507 & 5509 Dundas Street West	0.57 spaces / unit	Site specific By-laws 55-2021 & 56-2021	Kipling GO Station (1.2 km from site)	2021
23 Buckingham Street	0.34 spaces / unit	Site specific By-law 682-2023(OLT)	Mimico GO Station (150 m from site)	2022
1 Audley Street & 8 Newcastle Street	0.34 spaces / unit	Site specific By-law 683-2023(OLT)	Mimico GO Station (200 m from site)	2022
2 & 10 Audley Street & 29, 31, 59, & 71 Portland Street	0.34 spaces / unit	Site specific By-law 684-2023(OLT)	Mimico GO Station (350 m from site)	2022
25 Audley Street	0.34 spaces / unit	Site specific By-law 685-2023(OLT)	Mimico GO Station (290 m from site)	2022

Address	Residential Rate	Permission Through	Nearest GO Station	Year of Approval / Proposal
Scarborough				
2200-2206 Eglinton Ave E	0.50 spaces / unit	OLT Decision: OLT-22-002268	Kennedy GO Station (1.3 km from site)	2022
City of Hamilton				
71 Rebecca Street	0.65 spaces / unit	Zoning By-law 18-293	West Harbour GO Station (1.4 km)	2018
600 James	0.58 spaces / unit	LPAT Case No. PL190517	West Harbour GO Station (900 m from site)	2021
City of Mississauga				
78 Park St E & 22-28 Ann St[1]	0.67 spaces / unit	CoA Decision - A413.20 & Site Specific By-law 0054-2020	Port Credit GO Station (80 m from site)	2020
151 City Centre Drive	0.67 spaces / unit	CoA Decision - "A" 355/21	Cooksville GO Station (2.4 km from site)	2021
3355 Hurontario Street	0.5 spaces / unit	MZO via O. Reg. 92/93	Planned Hazel McCallion LRT (50 m from site)	2023
5645 Hurontario Street	0.5 spaces / unit	MZO via O. Reg/ 92/93	Planned Hazel McCallion LRT (50 m from site)	2023
City of Vaughan				
VMC Block 2 (Interchange Way)	0.6 spaces / unit	Zoning By-law 052-2019	Vaughan Metropolitan Centre (Subway) (1 km from site)	2019
Transit City 4-6 (Jane Street & Portage Parkway)	0.41 spaces / unit	Zoning By-law 071-2019	Vaughan Metropolitan Centre (Subway) (650 m from site)	2019
VMC Block 3 South (Interchange Way and Commerce Street)	0.3 spaces / unit	Zoning By-law 147-2022	Vaughan Metropolitan Centre (Subway) (700 m from site)	2022
Proposed Residential Parking Supply Reductions				
City of Pickering				
1525 Pickering Parkway	0.65 spaces / unit	--	Pickering GO Station (1.2 km from site)	2022
City of Vaughan				
216 – 220 Doughton Road	0.5 spaces / unit	--	Vaughan Metropolitan Centre (Subway) (700 m from site)	2020
7700 Keele Street	0.4 spaces / unit	--	Proposed Concord GO Station (1.5 km from site)	2022
City of Toronto				
Etobicoke				

Address	Residential Rate	Permission Through	Nearest GO Station	Year of Approval / Proposal
10 – 18 Zorra Street	0.48 spaces / unit	Supported by staff in City comments	Mimico GO Station (3 km from site)	2023
City of Mississauga				
City Centre Block 8 (6625-57)	0.65 spaces / unit	--	Cooksville GO Station (2.4 km from site)	2023

Notes:

1. Provided residential parking rate is effective based on the unit mix obtained from the 2019 TIS. Unit-specific parking rates are as follows: 1-bd: 0.57 spaces /unit, 2-bd: 0.73 spaces / unit, 3-bd: 1.10 spaces / unit.

A summary of key observations is provided below:

- Reductions in parking supply rates over time are observed across all examined municipalities, as well as across the broader GTHA.
- A forecast of the trendline generated for all considered approved is approaching a rate of 0.40 spaces / unit and proposed resident parking reductions is near the higher end of the range with the proposed rate of 0.65 spaces / unit for the Site.
- Approvals in the City of Pickering from 2019 to 2023 have reduced from 0.74 spaces / unit to 0.55 spaces / unit, representing a significant reduction of 0.16 spaces / unit over a period of 4 years.
- Approvals in the City of Vaughan from 2019 to 2022 have reduced from up to 0.6 spaces / unit in 2019 to 0.3 spaces / unit in 2022. This represents a significant reduction of 0.3 spaces / unit over a period of 3 years.
- Two approvals were recently granted in Mississauga (via a Minister's Zoning Order process) at 0.50 spaces per unit for sites located along existing surface transit routes but in close proximity to a planned LRT line.
- Only sites within the City of Toronto (Etobicoke and Scarborough) with comparable transportation contexts have been included (in proximity to a primary higher-order transit service (subway, LRT, GO Train, etc.) and supplemented by local surface transit). A downward trend in parking has been observed from 0.75 spaces per unit in 2018 to as low as 0.34 spaces per unit in 2022. In 2023, the City of Toronto eliminated minimum resident parking requirements entirely.

The resident parking supply reductions reviewed above range from 2018 to 2023 and strongly demonstrate a decrease in the provision of parking over time within municipalities across the GTHA. The proposed rate of 0.65 spaces / unit for the Site is considered appropriate given the range of approved parking rates across the GTHA. These approvals indicate a broader shift within the region towards a progressive outlook toward parking in areas which are well supported by strong existing and planned transportation contexts, including higher order transit services.

The reduction of parking supply rates over time within the City of Toronto and across the broader GTHA is indicative of a deliberate shift in perspectives towards transportation that is sustainable and equitable, including transit and active transportation. This trend in reduced parking supply rates is expected to prevail as the transportation contexts of many municipalities within the GTHA continue to improve through the advent of investment in transit and active transportation infrastructure.

This shift in perspective is further identified in contemporary zoning by-laws across southern and eastern Ontario, where numerous municipalities permit as-of-right low resident parking supply rates or have eliminated minimum requirements entirely. Sites which currently possess, or will possess in the future, a strong transportation context consisting of proximate access to higher order transit and additional complimentary transit services, supplemented by active transportation connections to transit services and local area destinations should be considered candidates for reduced parking supply rates. Reduction of the resident parking supply rate for the Site is consistent with the observed trends in reductions to parking supply rates over time across the GTHA, and aligns with contemporary outlooks across the region to the provision of parking supplies for developments within areas possessing strong transportation contexts.

6.3.5 City of Pickering Parking Sales Trends

Condominium parking sales information for five sites within the City of Pickering (Universal City developments) was previously submitted to the City by BA Group in support of a parking reduction for the proposed development at 1786 – 1790 Liverpool Road. **Table 12** summarizes parking sales information for Universal City.

While it is acknowledged that sales information does not necessarily reflect ultimate demand information at condominium buildings, particularly within a multi-building development plan, it does provide a useful indication of current market demand for resident parking.

A review of the recorded parking sales information for the first few phases of the Universal City development indicates that demand for parking spaces were below the existing Zoning By-law 7553/17 resident parking requirement of 0.8 spaces / unit. The first three development blocks of the Universal City sold at overall rates of 0.79, 0.74 and 0.72 spaces per unit (declining trend over time). Sales trends at the most recent development blocks are showing a further decline in resident parking with uptake rates of 0.58 and 0.51 spaces per unit. This declining sales trend for resident parking is consistent with the approval trends discussed in **Section 6.3.4** and supports the proposed reduction for the Subject Site.

Table 12 Universal City Condominiums Parking Sales Data Summary

Location	% Units Sold	Resident Parking Supply	Current Parking Sold	Current Unsold Parking Spaces
UC1	100% (275 units)	223 spaces (0.81 spaces / unit)	216 spaces (0.79 spaces / unit)	7 spaces
UC2	100% (336 units)	271 spaces (0.81 spaces / unit)	248 spaces (0.74 spaces / unit)	23 spaces
UC3	96% (357 units)	277 spaces (0.78 spaces / unit)	257 spaces (0.72 spaces / unit)	20 spaces
UC6	95% (306 units)	230 spaces (0.72 spaces / unit)	185 spaces (0.58 spaces / unit)	45 spaces
The Grand	44% (211 units)	324 spaces (0.67 spaces / unit)	107 spaces (0.51 spaces / unit)	217 spaces
Total	**1,486 units**	**1,325 spaces (0.74 spaces / unit)**	**1,013 spaces (0.68 spaces / unit)**	**312 spaces**

Notes:
1. Unit and parking spaces sales based on data provided by Unique AT Management Inc. in March 2023.
2. Based on the number of spaces and units cold at the time that the sales data was recorded.

6.3.6 TDM Measures

As previously discussed in **Section 5.0**, a number of TDM measures are being contemplated as part of the development proposal that will support a reduced residential parking supply. While a reduced parking supply is a direct incentive to reduce automobile use and ownership, there are additional TDM measures proposed to complement and work in tandem with the reduced parking supply. These include, but are not limited to, the following:

- The development of a mixed-use site that allows people to live and work without the use of a vehicle;
- New pedestrian connections that are integrated into the proposed road plan for the Site, which will support active transportation as a viable mode of traveling to and from the Site;
- The provision of bicycle parking to support and encourage cycling;
- Consideration in providing a shuttle to the Pickering GO Station to add convenience and encourage transit use for daily commuting;
- Strong connectivity to the existing and planned transit terminals adjacent to the Site to facilitate and maximise transit usage;
- Providing new residents and commercial tenants with information on existing transportation options to promote alterative modes of travel to the single occupant vehicle; and
- Additional measures developed in consultation with the City of Pickering.

6.4 Appropriateness of Reduced Non-Residential Parking Supply

Similar to residential parking standards, non-residential parking standards outlined in Site-Specific By-laws No. 1810-84 & 2471-87 overstate the parking needs of contemporary mixed-use buildings located in transit-accessible areas within the City of Pickering.

Adoption of reduced non-residential parking standards should be considered based upon the following considerations:

- The mixed-use, urban nature of the proposed development, which will encourage shared parking and interactions between the uses;
- The local nature and size of the retail component; and
- A review of standard applicable to comparable uses and context in adjacent Ontario municipalities.

6.4.1 Mixed-Use Nature of the Proposed Development

The proposed development introduces a mix of land uses (residential, office, and retail) into the existing commercial node that is surrounded by residential uses. The provision of mutually-supportive land uses, such as those proposed as part of the site plan, fosters a relationship that allows each use to serve and support the others.

The proposed residential and commercial uses will encourage internal site trips, shortening trips and improving mobility across the Site and surrounding area. Ultimately, the most convenient, comfortable, and practical way to conduct such internal trips will be by foot. The need for residents, employees, and visitors to make trips outside of the Site and surrounding area to address daily needs will be reduced, thus, reducing the need to use a vehicle for daily trips. As a result, parking demand generated from each use on-site will be reduced.

Furthermore, the current applicable parking standards (i.e. site-specific by-laws) do not include shared parking provisions, which allows the required parking for mixed-use development projects to be reduced by taking into account the different temporal parking characteristics for each use. The City Centre shared parking standards acknowledge that parking demand for different uses peak at various times throughout the day and parking spaces can be shared amongst uses with varying peaks.

Therefore, it is proposed to adopt the shared parking provisions from the City Centre by-law. The sharing will maximize the efficiency of the parking supply, and both in turn will minimize parking supply excesses.

6.4.2 The Local Nature of the Retail Uses

The proposed retail component, (approximately 2,474 m^2), is required to provide 93 parking spaces for the proposed retail component, as per Zoning By-laws 1810-84 & 2471-87. This is considered to overstate the parking demand for the retail component, as the result use within the proposed development is anticipated to serve the residents and employees of the proposed development and residents within the immediate surrounding area, and would not be considered a “drive to” destination, which may otherwise generate a level of parking demand.

Based on the Site’s proximity to transit and the mix of uses in the neighborhood, the retail use is anticipated to primarily attract cycling and walking trips, and to serve the local market (i.e. the dwelling units of the proposed development, the employees of the office building within the Site, and the local neighbourhood). The evolving area’s transit and active transportation networks also support transit and cycling trips in order to reach the Site without the use of a private automobile. It is proposed, therefore, to provide zero parking spaces for the retail use, recognizing the size and context of the proposed retail use.

6.4.3 Review of Current Municipal Zoning By-law Parking Requirement for Residential Visitors

The current parking requirements for residential visitors are relatively high when compared to other surrounding municipalities. BA Group reviewed the residential visitor parking rates and parking approvals in the Cities of Vaughan, Mississauga and Toronto, which are similarly attempting to shift from an auto-oriented approach in order to promote more sustainable forms of development and appropriately acknowledge transit context, in order to determine appropriate parking standards to apply as part of the development proposal.

The City of Mississauga, specifically the City Centre, has a comparable transit context to the proposed development. It is well served by MiWay bus routes, GO Transit services, and Zum bus routes. Although, it is important to note that the Hurontario LRT is planned to serve the City Centre upon its construction.

The City of Vaughan's Vaughan Metropolitan Centre (VMC) is also comparable in many respects to the Site, as it is well served by York Region Transit bus routes (including Viva Rapid Transit routes), Toronto Transit Commission (TTC) services, GO Transit services, and Zum bus routes. The VMC is also targeted for mixed-use, urban intensification with supporting policies (including VMC specific parking standards within the City of Vaughan's Zoning By-Law 001-2021) to encourage this growth.

The City of Toronto's Comprehensive Zoning By-Law 569-2013 (as amended) provides a range of parking requirements that are intended to recognize the transit accessibility of the area. The City's bylaw rates for Parking Zone B (for avenues with surface transit) have been reviewed for this Site, given the Site's proximity to existing and future surface transit along the Kingston Road corridor and GO Transit Lakeshore East rail corridor. In addition, the former City of Toronto's Zoning By-law 569-2013 for Policy Area 4 has been provided for comparison purposes.

A comparison of the zoning by-laws for residential visitor parking standards is summarized in **Table 13**.

Table 13 Comparison of Municipal Parking Standards for Residential Visitor

Current Zoning (Site-Specific Zoning)	City of Pickering – City Centre (7553-17)	City of Mississauga	City of Vaughan VMC	City of Toronto Parking Zone B	Former City of Toronto Policy Area 4	Proposed Standards
Visitor parking included in the residential parking requirements of 1.75 spaces per unit	0.15 spaces per unit	City Centre Rates 0.15 spaces per unit[1] Non-City Centre Rates 0.25 spaces per unit	0.15 spaces per unit	2 spaces plus 0.05 spaces per unit	0.15 spaces per unit	0.15 spaces per unit

Notes:

1. The City of Mississauga Zoning By-law 0225-2007 allows visitor parking to be shared with non-residential parking based on the greater of the visitor parking requirement or the parking requirement for all non-residential uses (with some limits).

Based on the foregoing, the parking standards in these respective zoning by-laws recognize that reduced parking standards are appropriate in highly transit-accessible area with an intensive mix of uses and high-quality urban realm. Therefore, the proposed residential visitor parking rate of 0.15 spaces per unit is considered appropriate given the existing and evolving area's transportation context.

7.0 BICYCLE PARKING CONSIDERATIONS

7.1 Zoning By-law Bicycle Parking Requirements

The site-specific by-laws that apply to the Site, or the underlying Zoning By-law 3036, do not contain bicycle parking provisions.

7.2 Recommended Bicycle Parking Requirements

As such, it is recommended to apply the bicycle parking provisions of the City Centre Zoning By-law 7553-17. These bicycle parking standards reflect the bicycle parking supply required to support a site within a transit-accessible area. Furthermore, the provision of bicycle parking is a TDM measure, which is encourages in local and provincial policy, especially when contemplated a reduced parking supply.

The application of the minimum bicycle parking requirements of Zoning By-law 7553-17 to the proposed development is summarized in **Table 14**. The application of the bicycle parking requirements results in a total parking requirement of 1,740 parking spaces, including 1,730 residential parking spaces and 10 non-residential parking spaces.

Further details of the proposed development's bicycle parking supply and location will be provided in subsequent applications to the City through the approval process.

Table 14 Recommended (Zoning By-law 7553-17) Bicycle Parking Requirements

Uses	Unit / Floor Area[1]	Rate (Minimum)	Requirement
Podium 1 + Towers 1, 2 & 3			
Apartment Dwelling	960 units	0.50 spaces per unit	480 spaces
Total			*480 spaces*
Podium 2 + Towers 4 & 5			
Apartment Dwelling	640 units	0.50 spaces per unit	320 spaces
Total			*320 spaces*
Podium 3 + Tower 6			
Apartment Dwelling	380 units	0.50 spaces per unit	190 spaces
Non-residential Uses	3,856 m^2	The greater of 2 or 1.0 spaces per 1,000 m^2 of GLA	4 spaces
Total			*194 spaces*
Podium 4 + Tower 7			
Apartment Dwelling	200 units	0.50 spaces per unit	100 spaces
Non-residential Uses	676 m^2	The greater of 2 or 1.0 spaces per 1,000 m^2 of GLA	2 spaces
Total			*102 spaces*

Uses	Unit / Floor Area[1]	Rate (Minimum)	Requirement
Podium 5 + Tower 8			
Apartment Dwelling	420 units	0.50 spaces per unit	210 spaces
Non-residential Uses	676 m^2	The greater of 2 or 1.0 spaces per 1,000 m^2 of GLA	2 spaces
Total			*212 spaces*
Podium 6 + Tower 9			
Apartment Dwelling	420 units	0.50 spaces per unit	210 spaces
Non-residential Uses	742 m^2	The greater of 2 or 1.0 spaces per 1,000 m^2 of GLA	2 spaces
Total			*212 spaces*
Podium 7 + Tower 10			
Apartment Dwelling	440 units	0.50 spaces per unit	220 spaces
Total			*220 spaces*
Site			
Residential			**1,730 spaces**
Non-Residential			**10 spaces**
Total			**1,740 spaces**

Notes:
1. Based upon statistics provided Graziani & Corazza Architects dated October 24, 2023.

8.0 LOADING CONSIDERATIONS

BA Group has assessed the number of loading spaces as part of the on-going application to support the proposed development, as well as the possible locations of the loading facilities within the core of each building. The loading provisions on-Site will be reviewed in detail as part of subsequent submissions to the City through the on-going approval process.

The current site-specific by-laws and underlying by-law do not contain minimum loading requirements. The City Centre Zoning By-law 7553-17 does not contain minimum loading requirements either.

In order to determine the number of loading spaces that could adequately support the proposed development, the loading requirements of the City of Toronto Zoning By-law 569-2013 were applied to the Site. The minimum loading requirement of 14 parking spaces, utilizing shared loading provisions and arranging shared loading facilities that can serve more than one tower, is summarized in **Table 15**.

The City Centre Zoning By-law 7553-17 does contain minimum dimensions for loading spaces, which are:

- 3.5m width x 12.0m length x 4.2m vertical clearance

However, BA Group recommends designing the loading spaces in accordance with the City of Toronto's Zoning By-law 569-2013. The dimensions of each loading space type are described below:

- Type A: 3.5m width x 17.0m length x 4.4m vertical clearance
- Type B: 3.5m width x 11.0m length x 4.0m vertical clearance
- Type C: 3.5m width x 6.0m length x 3.0m vertical clearance
- Type G: 4.0m width x 13.0m length x 6.1m vertical clearance

The Type 'G' loading space that is used for residential loading spaces under Zoning By-law 569-2013 is larger than the loading space dimensions found in the City Centre Zoning By-law 7553-17. Thus, it will satisfy the City Centre requirements.

Table 15 Recommended (City of Toronto Zoning By-law 569-2013) Loading Requirements

Use	Unit / Floor Area[1]	Range	Type of Loading Spaces				
			A	B	C	G	Total
Towers 1, 2 & 3 + Podium 1							
Residential	960 units	400 units or more	-	-	1	1	2
TOTAL			-	-	1	1	2
Towers 4 & 5 + Podium 2							
Residential	640 units	400 units or more	-	-	1	1	2
TOTAL			-	-	1	1	2
Tower 6 + Podium 3							
Residential	380 units	31 to 399 units	-	-	-	1	1
Retail	381 m^2	0 to 499 m^2	-	-	-	-	0
Office	3,475 m^2	2,000 to 3,999 m^2	-	1	2	-	3
SUBTOTAL			-	1	2	1	4

Use	Unit / Floor Area[1]	Range	Type of Loading Spaces				
			A	B	C	G	Total
TOTAL (w/ sharing)			-	1	1	1	3
Tower 7 + Podium 4							
Residential	200 units	31 to 399 units	-	-	-	1	1
Retail	676 m^2	500 to 1,999 m^2	-	1	-	-	1
SUBTOTAL			-	1	-	1	2
TOTAL (w/ sharing)			-	-	-	1	1
Tower 8 + Podium 5							
Residential	420 units	400 units or more	-	-	1	1	2
Retail	676 m^2	500 to 1,999 m^2	-	1	-	-	1
SUBTOTAL			-	1	1	1	3
TOTAL (w/ sharing)			-	-	1	1	2
Tower 9 + Podium 6							
Residential	420 units	400 units or more	-	-	1	1	2
Retail	742 m^2	500 to 1,999 m^2	-	1	-	-	1
SUBTOTAL			-	1	1	1	3
TOTAL (w/ sharing)			-	-	1	1	2
Tower 10 + Podium 7							
Residential	440 units	400 units or more	-	-	1	1	2
TOTAL			-	-	1	1	2
SITE TOTAL			**-**	**1**	**6**	**7**	**14**

Notes:
1. Based upon statistics provided Based upon statistics provided Graziani & Corazza Architects dated October 24, 2023.
2. Sharing based on providing a shared loading facility with servicing corridors to both towers.
3. Shared based on the sharing provisions contained in the City of Toronto Zoning By-law 59-2013 Chapter 40.10.90.1(1).

Vehicle manoeuvring diagrams entering and exiting the proposed loading facilities on-site will be provided in a subsequent submission as part of the on-going application process.

9.0 MULTI-MODAL TRAVEL DEMAND FORECASTING

The following section summarizes the approach taken to estimate the multi-modal travel demand characteristics of the Site based upon first principles. This approach was then compared to other proxy sites with similar characteristics.

9.1 Forecasting Approach

As noted above, preliminary travel demand forecasts have been prepared, as part of this study, for the proposed development based upon the development programme outlined in **Section 2.0**. Multi-modal forecasts have been developed from a first principles approach using person trip making characteristics for the key component uses within the Site.

As summarized in **Table 16**, the existing area travel characteristics reflect a high level of automotive travel mode usage. Based on existing multi-modal travel characteristics the travel characteristics for the proposed development are anticipated to reflect a high level of automotive usage.

The existing residential modal split for the site area was determined from a review of the 2016 Transportation Tomorrow Survey (TTS) data and is summarized in **Table 16**.

For the purpose of this analysis, travel demand to and from the Site has been developed by applying modal split and time of travel assumptions to base person-density parameters provided by Transportation Tomorrow Survey (TTS). Travel information that forms on the basis of this analysis has been obtained from 2016 Transportation Tomorrow Survey (TTS) and data collected by BA Group.

Table 16 Existing Residential Modal Split

Mode	AM Peak	PM Peak
Auto-Driver	70%	74%
Auto-Passenger	16%	15%
Transit	11%	7%
Walk	3%	4%
Cycle	0%	0%
Total	**100%**	**100%**

Notes:
1. Based on 2016 TTS data for home-based trips to/from 2006 TTS Zones 1046, 1047 and 1049 during the typical weekday morning and afternoon peak hour periods.

Key technical assumptions used in establishing travel demand forecasts for the Site are outlined in the following sections.

9.2 Residential Site Travel Demands

Residential travel demand to / from the Site has been developed from 'first principles' based upon a review of the total number of residents anticipated to live on the Site combined with data of residential travel characteristics in the vicinity of the Site, particularly from the 2016 Transportation Tomorrow Survey (TTS) and data collected by BA Group/ Forecast travel demand for residential trips to / from the Site in the weekday morning and afternoon peak hours is summarized in **Table 17**.

Table 17 Residential Person-Based Trip Generation

Parameter			Peak Hour Travel Characteristics			
Residential Units			2,884 units			
Building Occupancy (Persons)			Assume 95% of units occupied at any given time @ Unit occupancy of 1.8 persons / units = 4,930 people			
Street Peak Hour Travel: Proportion of Resident			Assume 22% (AM) and 24% (PM) of peak period travel occurs during the peak hour = 1,085 (AM) and 1,185 (PM) people travelling during peak hours			
Trip Orientation			**Weekday AM**		**Weekday PM**	
			Inbound	**Outbound**	**Inbound**	**Outbound**
			21%	79%	59%	41%
Travel Demand (Vehicle / person trips)			Based upon modal share assumptions from the 2016 Transportation Tomorrow Survey (TTS) for zones 1046, 1047 and 1049			
Mode	**AM**	**PM**				
Auto	70%	74%	160	600	520	355
Passenger	16%	15%	40	135	105	75
Transit	11%	7%	25	95	50	35
Pedestrian	3%	4%	5	25	25	20
Cyclist	0%	0%	0	0	0	0
Total Trips	**100%**	**100%**	**230**	**855**	**700**	**485**
Resulting Vehicular Trips			**160**	**600**	**520**	**355**
Peak Hour Demand			**Trips**	**Rate**	**Trips**	**Rate**
Inbound			160	0.06	520	0.18
Outbound			600	0.21	355	0.12
Two-Way			**760**	**0.27**	**875**	**0.30**

Notes:
1. The yellow highlighting represents the non-auto residential travel demand.

Based on the foregoing, non-auto residential travel demand (i.e. the sum of the two-way transit, walking, and cycling trips outlined in **Table 17**) is forecast to be in the order 150 and 130 two-way trips in the weekday morning and afternoon peak hours, respectively.

Forecast vehicular residential site traffic generation, based on 'first principles' assessment, is in the order of 760 and 875 two-way trips in the weekday morning and afternoon peak hours, respectively. This represents trip generation rates of 0.27 and 0.30 two-way trips per unit in the weekday morning and afternoon peak hours, respectively.

BA Group has also reviewed the vehicular trip generation rates for the proposed residential use based on proxy site surveys at developments with similar area transportation characteristics. Vehicular trip generation rates adopted for the proposed residential use based upon the proxy site surveys is summarized in **Table 18**.

Based upon the proxy trip generation methodology, the proposed residential use will generate approximately 780 and 865 two-way vehicle trips during the weekday morning and afternoon peak hours, respectively.

Based on the 'first principles' methodology, the proposed residential use will generate approximately 760 and 875 two-way vehicle trips during the weekday morning and afternoon peak hours, respectively. By comparison, the trip developed from the 'first principles' methodology are comparable to the trips developed from the proxy site surveys. Therefore, the trips developed from the 'first principles' methodology is reasonable and has been adopted for the purposes of this analysis. As such, the proposed residential use is anticipated to generate approximately 780 and 875 two-way vehicle trips during the weekday morning and afternoon peak hours, respectively.

Table 18 Residential Proxy Site Trip Generation

Location	Date	# of units	AM Peak Hour			PM Peak Hour		
			In	Out	2-Way	In	Out	2-Way
Residential Condominium Apartment								
7420, 7440 & 7460 Bathurst Street	Thursday, January 25, 2018	594	0.08	0.21	0.29	0.19	0.12	0.31
88-100 Promenade Circle	Thursday, January 25, 2018	336	0.04	0.15	0.19	0.19	0.14	0.33
110-120 Promenade Circle	Thursday, January 25, 2018	45	0.08	0.15	0.23	0.19	0.11	0.30
11 & 23 Oneida Crescent	Wednesday, September 25, 2013	178	0.05	0.27	0.32	0.22	0.10	0.32
39 Oneida Crescent	Wednesday, September 25, 2013	349	0.04	0.16	0.20	0.14	0.06	0.20
185 Oneida Crescent	Wednesday, October 9, 2013	201	0.06	0.31	0.37	0.26	0.09	0.35
Average Trip Rates Per Unit			**0.05**	**0.22**	**0.27**	**0.20**	**0.10**	**0.30**
Overall Trip Generation								
Overall Residential Site Trip Rates Per Unit			**0.05**	**0.22**	**0.27**	**0.20**	**0.10**	**0.30**
Overall Residential Site Trips (2,884 units)			**145**	**635**	**780**	**575**	**290**	**865**

9.3 Office Site Travel Demands

Office vehicle travel demand to / from the Site has been developed based upon a review of vehicular trip generation rates of proxy site surveys at developments with similar area transportation characteristics and ITE 11th Edition Trip Generation Rates for Land Use Code 710 – General Office Building. Vehicular trip generation rates adopted for the proposed office use is summarized in **Table 19**.

The proposed office use will generate approximately 55 and 45 two-way vehicle trips during the weekday morning and afternoon peak hours, respectively.

Note that based on existing 2016 TTS information, it is anticipated that the office trips will primarily be generated by automobile and will have very minimal non-automobile trips. As such, no trips were developed for the non-auto mode shares (i.e. transit, walking and cycling) for the purposes of this assessment.

Table 19 Office Site Trip Generation

Location	Date	GFA (ft^2)	AM Peak Hour			PM Peak Hour		
			In	Out	2-Way	In	Out	2-Way
ITE 11th Edition Trip Generation Rates								
LUC 710 – General Office Building (37,401 ft^2)			1.69	0.23	1.92	0.33	1.63	1.96
Proxy Sites								
45 Innovation Drive	Wednesday, November 9, 2016	70,000	0.63	0.06	0.69	0.01	0.61	0.62
2450 Victoria Park Avenue	Thursday, May 3, 2012	92,000	1.42	0.40	1.82	0.16	1.07	1.23
2450 Victoria Park Avenue	Tuesday, November 1, 2016	92,000	1.37	0.12	1.49	0.12	1.16	1.28
Average Proxy Trip Rates per 1,000 ft^2			**1.14**	**0.19**	**1.33**	**0.10**	**0.95**	**1.05**
Overall Trip Generation								
Selected Trip Rates			**1.14**	**0.19**	**1.33**	**0.10**	**0.95**	**1.05**
Overall Office Site Trips (37,401 ft^2)			**45**	**10**	**55**	**5**	**40**	**45**

9.4 Retail Site Travel Demands

Given the size and nature of the proposed retail, it is expected to primarily service residents of the proposed building as well as residents within the surrounding neighbourhood. In this regard, the majority of travel to/from the retail is expected to be pass-by vehicle trips and vehicle travel associated with the retail is expected to be minimal.

Notwithstanding, BA Group has incorporated a level of retail-related vehicle activity. For the purpose of this assessment, retail trip generation was based on a review of proposed parking supply and a total of approximately 90 retail parking spaces are assumed to be available for non-residential visitors in the parking garage. The number of parking spaces occupied by the non-residential visitors was estimated based on the peak period parking occupancy outlined in the City of Pickering By-law 7553-17. The resultant number of parking spaces which may be available for the non-residential (i.e. retail) visitors are summarized in **Table 20**.

Table 20 Non-Residential Parking Availability

	Peak Period Parking Demand	
	AM Peak Hour	PM Peak Hour
Retail Parking Supply	92 spaces	89 spaces
Time of Day Occupancy Rate	65%	90%
Parking Spaces Occupied by Retail Visitors (Rounded)	**60 spaces**	**80 spaces**

The retail related traffic volumes were forecasted based on the application of trip generation rate applied on a per occupied parking space basis. For the purpose of this analysis, it is assumed that the non-residential uses on the Site will have a 60-minute occupancy per parking space which is equivalent to a trip generation rate of 1.00 two-way trips per occupied parking space. The traffic volumes forecasts for the proposed non-residential component of the Site are summarized in **Table 21**.

It has been assumed that the projected retail vehicle trips during the weekday morning and afternoon peak hours will be pass-by trips from vehicles already travelling on the area road network.

Table 21 Retail Vehicle Trip Generation

	AM Peak Hour			PM Peak Hour		
	In	Out	2-Way	In	Out	2-Way
Retail Trip Rates (per parking space occupied)	0.50	0.50	1.00	0.50	0.50	1.00
Forecast Traffic Volumes Vehicle Trips	**30**	**30**	**60**	**40**	**40**	**80**

The proposed retail use will generate approximately 60 and 80 two-way vehicle trips during the weekday morning and afternoon peak hours, respectively.

Note that based on 2016 TTS information, it is anticipated that the retail trips will primarily be generated by automobile and will have very minimal non-automobile trips. As such, no trips were developed for the non-auto mode shares (i.e. transit, walking and cycling) for the purposes of this assessment

9.5 Summary of Site Travel Demand

The combined multi-modal travel demand for the site is the sum of the demand contributions from the proposed residential, office and retail land uses and is summarized in **Table 22**.

Table 22 Site Multi-Modal Trip Summary

	AM Peak Hour			PM Peak Hour		
	In	Out	2-Way	In	Out	2-Way
Auto	235	640	875	565	435	1,000
Passenger	40	135	175	105	75	180
Transit	25	95	120	50	35	85
Pedestrian	5	25	30	25	20	45
Cyclist	0	0	0	0	0	0
Total	**305**	**895**	**1,200**	**745**	**565**	**1,310**

Overall, the site is forecast to generate in the order of 1,200 and 1,310 two-way person trips during the weekday morning and afternoon peak hours, respectively.

10.0 VEHICLE TRAVEL DEMANDS

10.1 Traffic Analysis Scenarios and Design Periods

Traffic operations analyses have been undertaken during the weekday morning and afternoon peak hours under the following conditions:

- Existing traffic – traffic activity level under current conditions;
- Future background traffic – traffic activity in the future which include allowances for corridor growth and background developments; and
- Future total traffic – traffic activity in the future with the full build-out of the Site and projected site generate traffic added to the future road network.

Traffic projections for future scenarios have been prepared for a five-year (2029), ten-year (2034), and fifteen-year (2039) study horizon consistent with MTO reporting requirements.

10.2 Existing Traffic Volumes

10.2.1 Existing Baseline Traffic Volumes

Existing baseline traffic and pedestrian volumes were established at intersections within the study area for the weekday morning and afternoon peak hour periods using traffic count information obtained from surveys undertaken by Spectrum Traffic Data Inc. on Tuesday, May 16, 2023.

A listing of the traffic count data and sources are provided in **Table 23**. Existing traffic count data are included in **Appendix C**.

Table 23 Existing Traffic Data Resources

Intersection	Date	Data Source
Kingston Road / Rosebank Road	Tuesday, May 16, 2023	Spectrum Traffic Data Inc.
Kingston Road / Steeple Hill & Site Access Driveway		
Kingston Road / Highway 401 WB Ramps		
Whites Road / Kingston Road		
Whites Road / Highway 401 EB Off-Ramp		
Whites Road / Bayly Street		
Kingston Road / Site Access Driveway		

The existing turning movement counts were reviewed in detail to ensure a general consistency in the traffic volumes on roadways between intersections. Where necessary, minor adjustments were made to balance traffic volumes between intersections to create a representative traffic volume base for the purposes of the traffic operations analyses undertaken as part of this study.

The existing and future road network and lane configurations are illustrated in **Figure 20** and **Figure 21**, respectively. Existing, balanced baseline area traffic volumes for the weekday morning and afternoon peak hours are summarized in **Figure 22**.

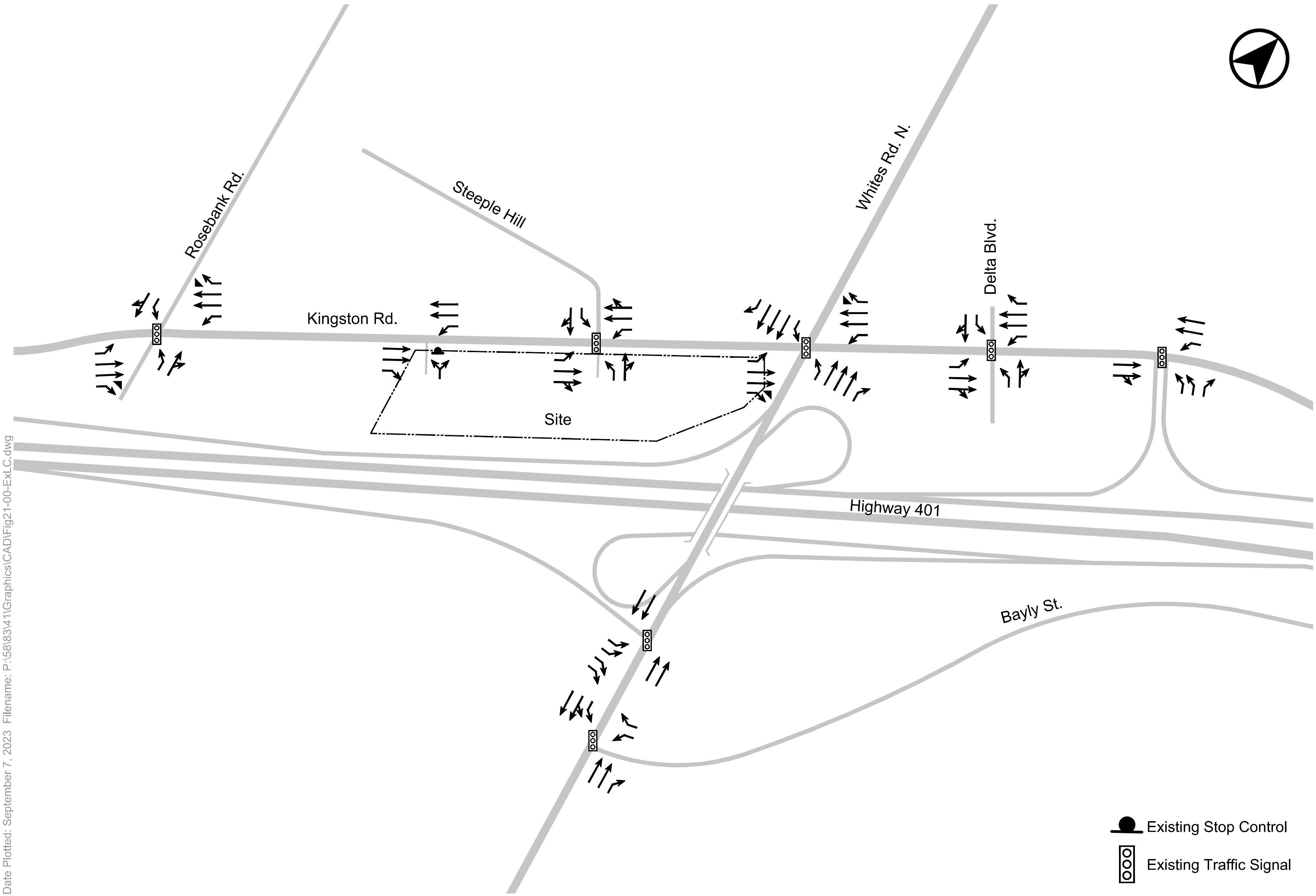
10.2.2 Existing Site Traffic Volumes

Existing site related traffic volumes were collected during the weekday morning and afternoon peak hour periods at the existing site driveways on Tuesday, May 16, 2023 by Spectrum Traffic Data Inc. on behalf of BA Group and are summarized in **Table 24**.

The existing site, as surveyed, generates approximately 70 and 430 two-way vehicle trips during the weekday morning and afternoon peak hours, respectively. Note the existing site will be removed as part of the proposed development programme. The removal of existing site traffic volumes during the weekday morning and afternoon peak hours are summarized in **Figure 23**.

Table 24 Existing Site Traffic Volumes

Driveway Access	AM Peak Hour			PM Peak Hour		
	In	Out	2-Way	In	Out	2-Way
Kingston Road / Steeple Hill & East Site Access	35	25	60	155	195	350
Kingston Road / West Site Access	5	5	10	50	30	80
Total Existing Site Traffic	**40**	**30**	**70**	**205**	**225**	**430**



Date Plotted: September 7, 2023 Filename: P:\58\83\41\Graphics\CAD\Fig21-00-ExLC.dwg

FIGURE 20 EXISTING LANE CONFIGURATIONS

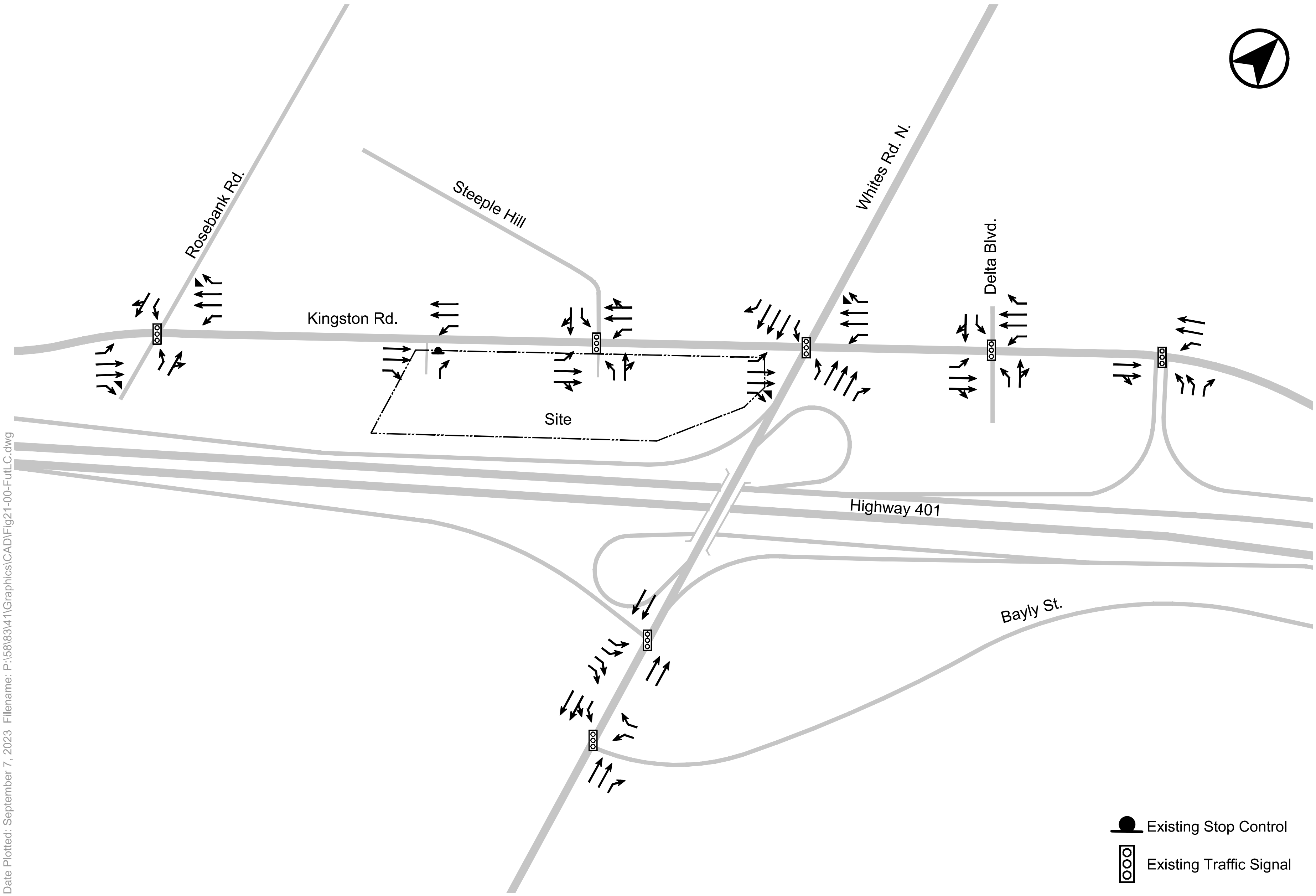


FIGURE 21 FUTURE LANE CONFIGURATIONS

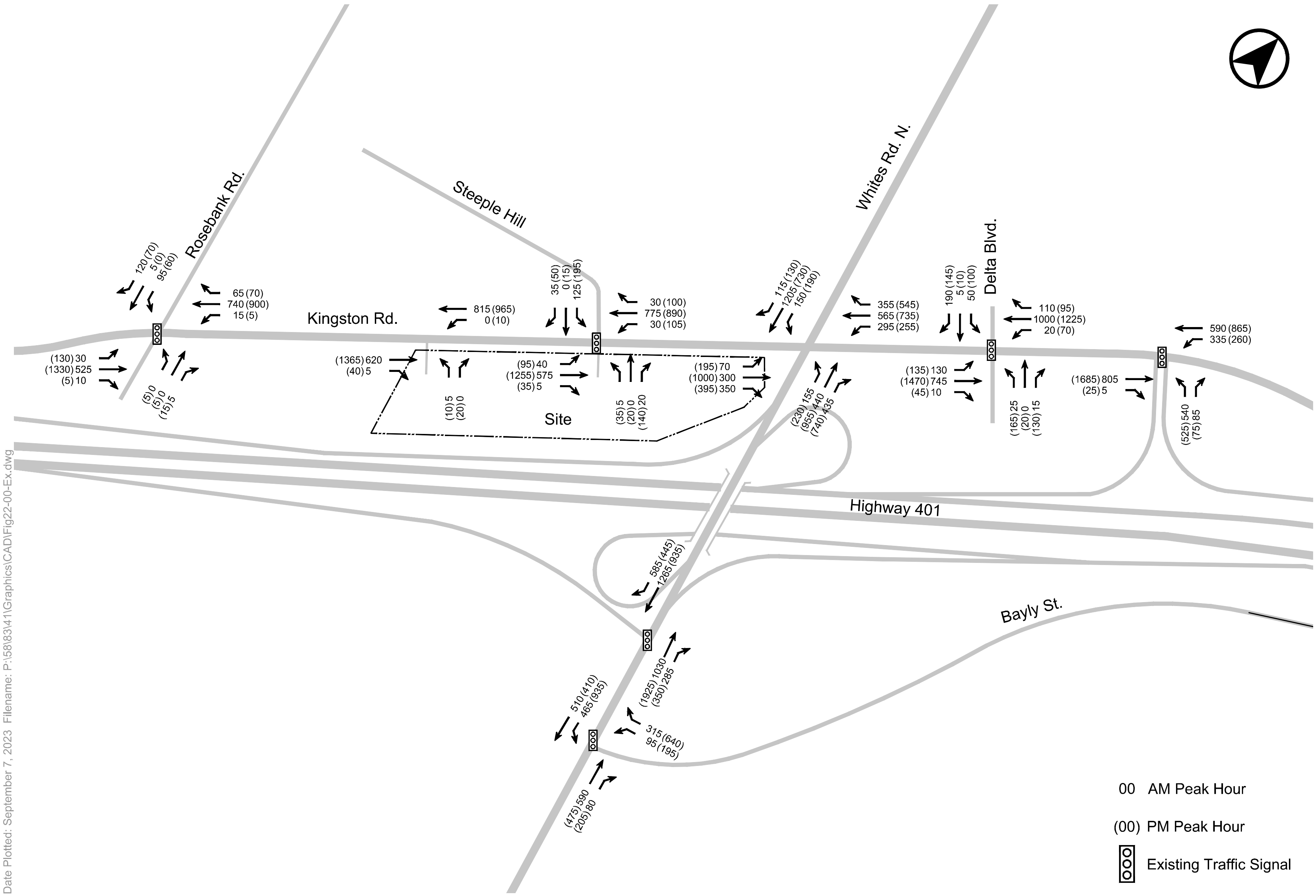


FIGURE 22 EXISTING TRAFFIC VOLUMES

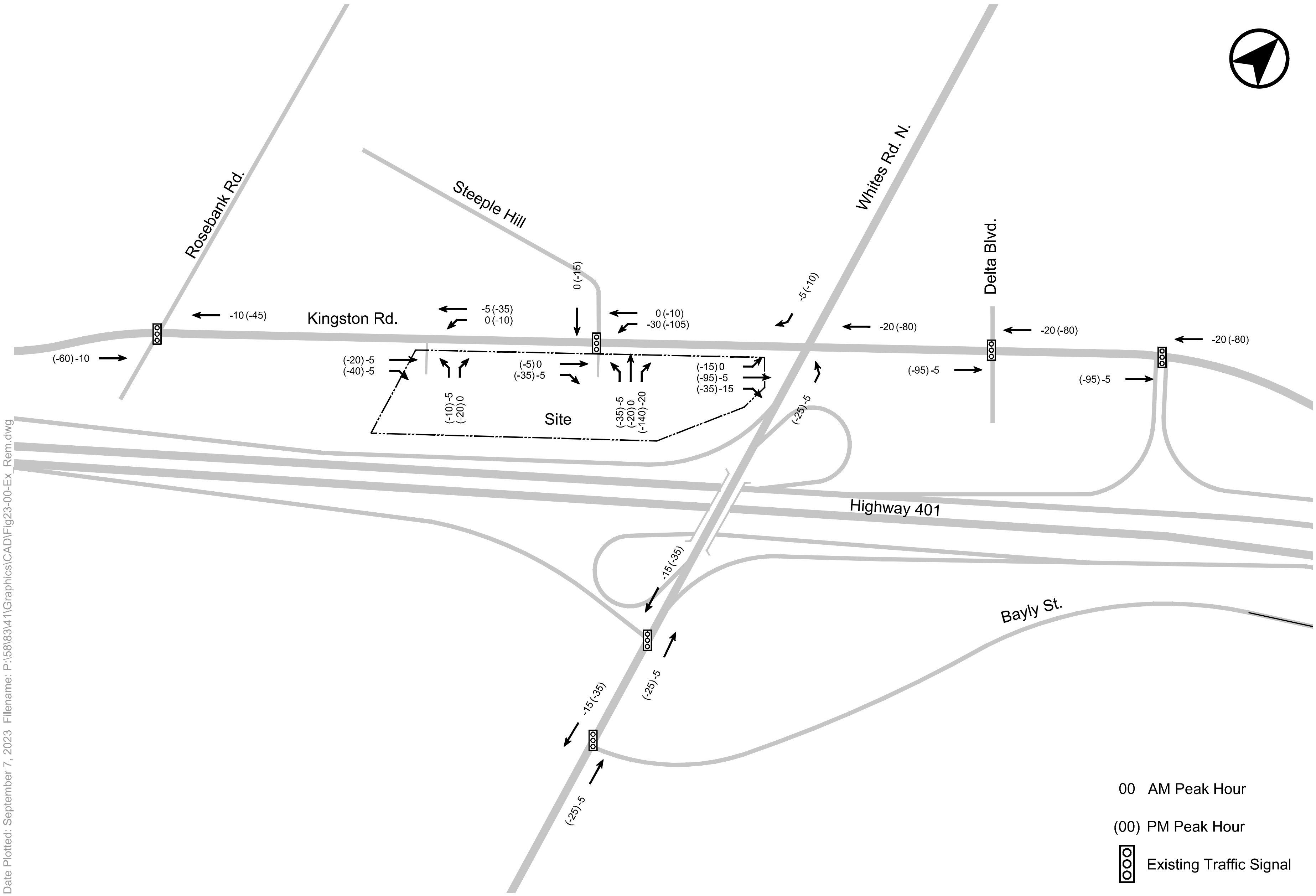


FIGURE 23 EXISTING SITE TRAFFIC REMOVAL

10.3 Future Background Traffic Volumes

A series of traffic allowances have been considered in accounting for possible traffic growth on the area road network based on an assessment of historical traffic volumes within the study area and traffic generated by other specific developments in the study area.

10.3.1 Corridor Growth Traffic Volumes

Traffic allowances have been made for general corridor growth on major corridors (i.e. Kingston Road and Whites Road). Given the lack of available 10-year historical traffic data along these major corridors, annual corridor traffic growth rates was adopted for the weekday morning and afternoon peak hours.

An annual growth rate of 1.0% was applied to the through movements along Kingston Road and Whites Road for a 5-year horizon to the 2029 horizon year.

The Kingston Road and Whites Road corridors are operating at close to capacity today, particularly the intersection of Kingston Road / Whites Road. In urban parts of the GTA, where road networks are nearing or at capacity within a mature road network, traffic corridor growth tends to slow down and even stop or reverse (i.e. decrease). The composition of traffic on the road tends to change too, evolving over time to serve more local traffic rather than pass-through or longer-distance traffic. Based on existing capacity constraints on Kingston Road and Whites Road, it is expected that future corridor growth rates would be lower than past growth rates, or even decrease to zero (i.e. no more growth).

Based on the foregoing, beyond the 2029 horizon year, a reduced corridor growth rate of 0.5% has been adopted for the purpose of this analysis. This growth was applied to the through movements along Kingston Road and Whites Road for a 5-year and 10-year horizon beyond the full build-out of the Site (overall 10-year and 15-year study horizon).

10.3.2 Background Development Traffic Volumes

Traffic volume allowances have been made to account for substantive area background developments that are proposed or approved and / or under construction in the vicinity of the Site.

Area developments that have been considered as part of this study are summarized in **Table 25**. This table also summarizes the traffic generation source adopted for the purposes of this study, as well as the development status.

Background developments identified in the site area comprise approximately 917 residential units and 1,532 m2 of retail space.

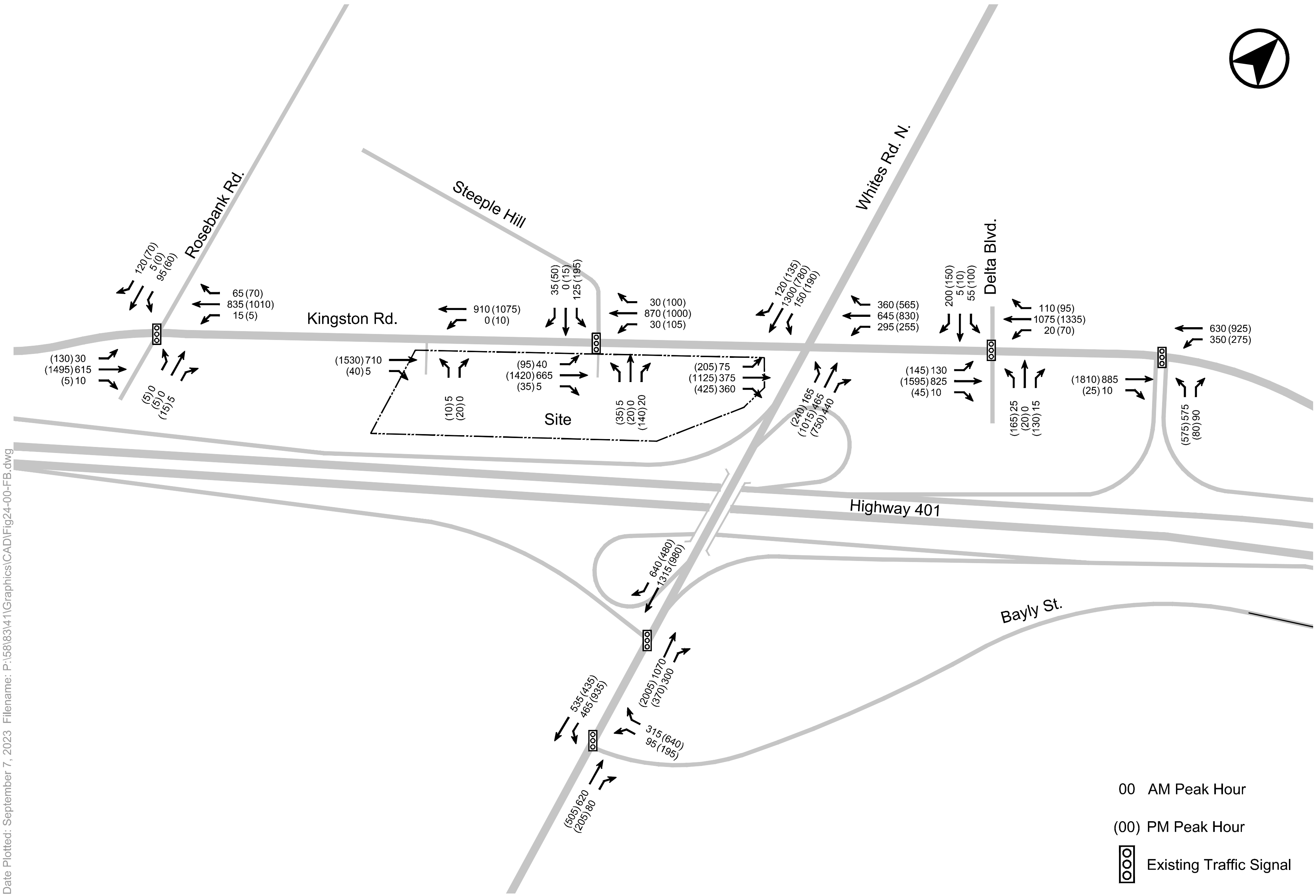
Table 25 Area Background Developments

Site Location	Development Statistics	Trip Generation Notes / Sources
760-770 Kingston Road	82 residential units	Stantec, May 2019
375 Kingston Road	580 residential units 1,532 m2 retail	C.F. Crozier & Associates Inc., December 2021
346-364 Kingston Road	28 residential units	No TIS
1475 Whites Road	227 residential units	No TIS

10.3.3 Future Background Traffic Volumes

Future background traffic volumes have been established for the weekday morning and afternoon peak hours as the sum of the existing traffic volumes and specific area development traffic allowances.

The total future background traffic volumes are illustrated in **Figure 24**.



Date Plotted: September 7, 2023 Filename: P:\58\83\41\Graphics\CAD\Fig24-00-FB.dwg

FIGURE 24 FUTURE BACKGROUND TRAFFIC VOLUMES

10.4 Site Traffic Volumes

10.4.1 Trip Generation

Vehicular site traffic was developed for two scenarios – Scenario 1 assumes that the bus rapid transit route along Kingston Road is not operational at any point within the study horizons assessed, while Scenario 2 assumes that the route is complete and operational at and beyond the full build-out of the Site.

The resultant vehicle trip generation for the overall proposed development for Scenario 1 is summarized in **Table 26**.

Table 26 Proposed Site Vehicle Traffic (Scenario 1)

	AM Peak Hour			PM Peak Hour		
	In	Out	2-Way	In	Out	2-Way
Existing Site Traffic[1]	40	30	70	205	225	430
Forecast Site Traffic						
New Residential-Related Site Traffic[2] (2,884 units)	160	600	760	520	355	875
New Office-Related Site Traffic (3,475 m^2)	45	10	55	5	40	45
New Retail-Related Site Traffic (2,474 m^2)	30	30	60	40	40	80
Total New Site Traffic	235	640	875	565	435	1,000
Forecast Net-New Site Traffic						
Forecast Net-New Site Traffic	**195**	**610**	**805**	**360**	**210**	**570**

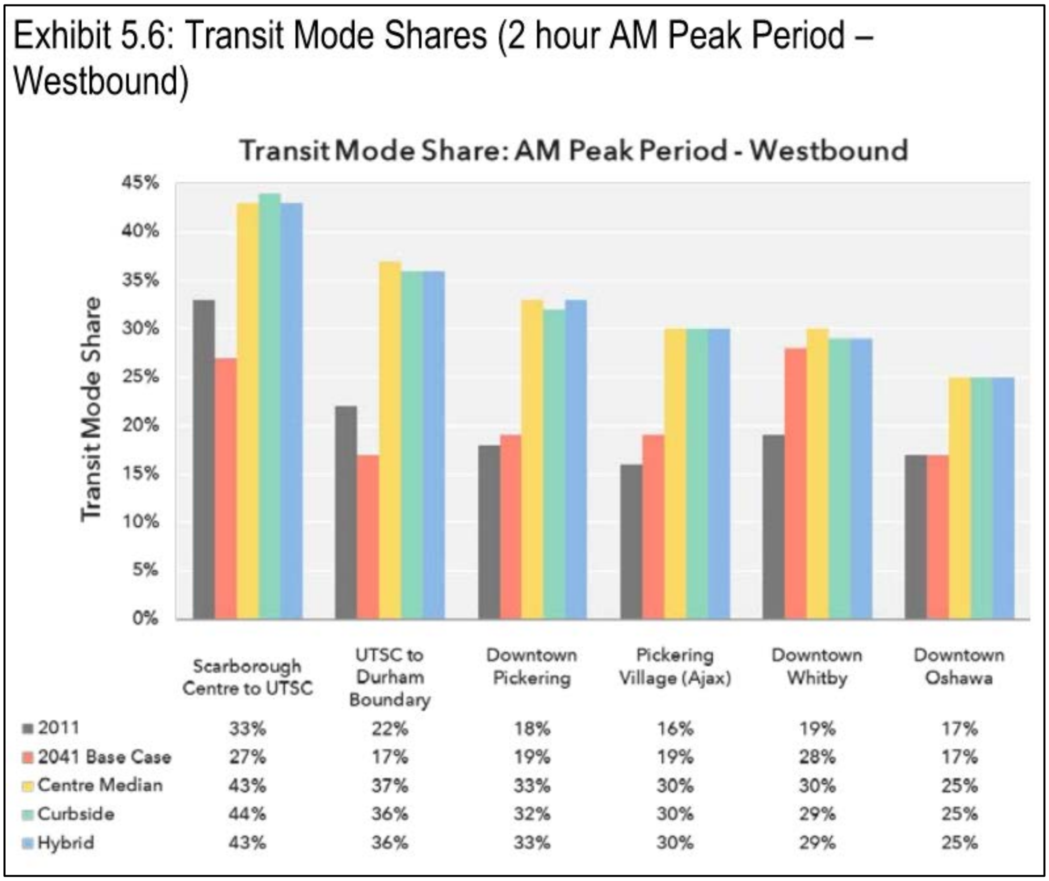
Notes:
1. Based upon traffic counts conducted at existing site access driveways by Spectrum Data on behalf of BA Group on Tuesday, May 16, 2023.
2. Trips are generated based on the initial rates shown in **Table 17**.
3. All trips rounded to the nearest 5.

Based on the foregoing, under Scenario 1, the Site is anticipated to generate in the order of 805 and 570 net-new two-way trips during the weekday morning and afternoon peak hours, respectively.

In Scenario 2, it is assumed that the Durham-Scarborough BRT line will be aligned with the Kingston Road right-of-way near the Site. As a result, it is expected that the Project will generate fewer vehicular trips than the projected trip generation calculated for Scenario 1. To reflect residential trip generation characteristics with the inclusion of the Durham-Scarborough BRT line, trip generation projections for the Site have been examined.

Residential trip generation rates were initially determined based on a series of proxy trip generation surveys conducted by BA Group in the past at similar residential developments located within walking distance of a GO Train station. Rates were then refined by adjusting the existing mode split to reach a target of 28% transit usage in future. The 28% was assumed via linear interpolation between 2016 TTS survey results (20 to 21%) and the target for 2041 (33% for centre median BRT in Downtown Pickering) assumed in IBI Group's Spring 2018 report titled *IBI Group Final Report Durham-Scarborough Bus Rapid Transit Study*. An excerpt of the IBI Group transit mode share estimations is shown below in **Exhibit A**.

Exhibit A – IBI Group Mode Share Estimations (2018)



Source: *IBI Group Final Report Durham-Scarborough Bus Rapid Transit Study, 2018*

Table 27 summarizes the vehicular trip generation rates which includes an adjustment for future mode split assumptions based on the findings summarized in **Exhibit A**.

Table 27 Revised Site Trip Generation Forecast

Location	Date	# of units	AM Peak Hour			PM Peak Hour		
			In	Out	2-Way	In	Out	2-Way
Residential Condominium Apartment								
7420, 7440 & 7460 Bathurst Street	Thursday, January 25, 2018	594	0.08	0.21	0.29	0.19	0.12	0.31
88-100 Promenade Circle	Thursday, January 25, 2018	336	0.04	0.15	0.19	0.19	0.14	0.33
110-120 Promenade Circle	Thursday, January 25, 2018	45	0.08	0.15	0.23	0.19	0.11	0.30
11 & 23 Oneida Crescent	Wednesday, September 25, 2013	178	0.05	0.27	0.32	0.22	0.10	0.32
39 Oneida Crescent	Wednesday, September 25, 2013	349	0.04	0.16	0.20	0.14	0.06	0.20
185 Oneida Crescent	Wednesday, October 9, 2013	201	0.06	0.31	0.37	0.26	0.09	0.35
1215-1235 Bayly Street	Wednesday, May 10, 2023	444	0.05	0.12	0.17	0.14	0.07	0.21
1245-1255 Bayly Street	Wednesday, May 3, 2023	263	0.07	0.17	0.25	0.21	0.10	0.31
Average Trip Rates Per Unit			**0.06**	**0.19**	**0.25**	**0.19**	**0.10**	**0.29**
Adopted Trip Generation Rate (post-BRT with transit mode share increased to 28%)			**0.05**	**0.17**	**0.22**	**0.15**	**0.08**	**0.23**
Overall Trip Generation								
Overall Residential Site Trip Rates Per Unit			**0.05**	**0.17**	**0.22**	**0.15**	**0.08**	**0.23**
Overall Residential Site Trips (2,884 units)			**145**	**490**	**635**	**435**	**230**	**665**

It is noted that additional proxy sites near the Site were also surveyed, with lower rates observed at the recently surveyed sites compared to the rates observed at the initial proxy sites. The adopted rates and assumptions are also consistent with those utilized for the proposed Phase 1 redevelopment of Pickering Town Centre in assessing the future traffic operations along the Kingston Road corridor.

For the purposes of this study, the site has been designed to accommodate the overall development of 3,460 residential units, but the traffic analysis has been completed based on 2,884 residential units.

Based on the foregoing, under Scenario 2, the Site is anticipated to generate in the order of 680 and 360 net-new two-way trips during the weekday morning and afternoon peak hours, respectively.

10.4.2 Trip Distribution and Assignment

Residential / Office Use

The trip distribution pattern for the residential use and office use was established based upon a review of 2016 Transportation Tomorrow Survey (TTS) for home-based trips to / from the surrounding area during the weekday morning and afternoon peak periods. General direction of approach and routing is summarized in **Table 28**.

Retail Use

As previously discussed, given the size and ancillary nature of the proposed retail, it is expected to primarily serve the residents internal and external to the Site. As such, the majority of travel to / from the retail is expected to be pass-by trips. The trip distribution pattern for the retail component of the Site was established based upon a review of existing area traffic patterns during the weekday morning and afternoon peak periods. The proposed directional distribution of site related traffic considers the orientation and configuration of the area street system, local access characteristics and movement restrictions.

The directional distribution of vehicle trips made to and from the Site has been based upon a review of information obtained from the 2016 Transportation Tomorrow Survey (TTS). The net-new site traffic assignment of the proposed development for the weekday morning and afternoon peak hours is shown in **Figure 25**.

Table 28 Site Traffic Assignment

To / From	Orientation to / from Site	Inbound	Outbound
Residential Traffic Distribution			
Whites Road	North	5%	5%
Whites Road	South	0%	0%
Highway 401	East	0%	15%
Highway 401	West	40%	50%
Kingston Road	East	35%	5%
Kingston Road	West	30%	20%
Bayly Street	East	0%	5%
	Total	**100%**	**100%**
Office Traffic Distribution			
Whites Road	North	10%	10%
Whites Road	South	0%	0%
Highway 401	East	0%	45%
Highway 401	West	15%	20%
Kingston Road	East	60%	10%
Kingston Road	West	10%	10%
Bayly Street	East	5%	5%
	Total	**100%**	**100%**

Notes:

1. Residential (home-based trips) and office (work-related trips) trip distribution is based on 2016 TTS data for vehicle trips to and from 2006 TTS traffic zones 10476-1049 and 1051 during the morning and afternoon peak hours.

10.5 Future Total Traffic Volumes

Future total traffic volumes, which represents the summation of baseline existing traffic volumes, corridor growth, traffic associated with area background developments, and forecast net-new Site-associated traffic volumes, are illustrated in **Figure 26** through **Figure 28**.

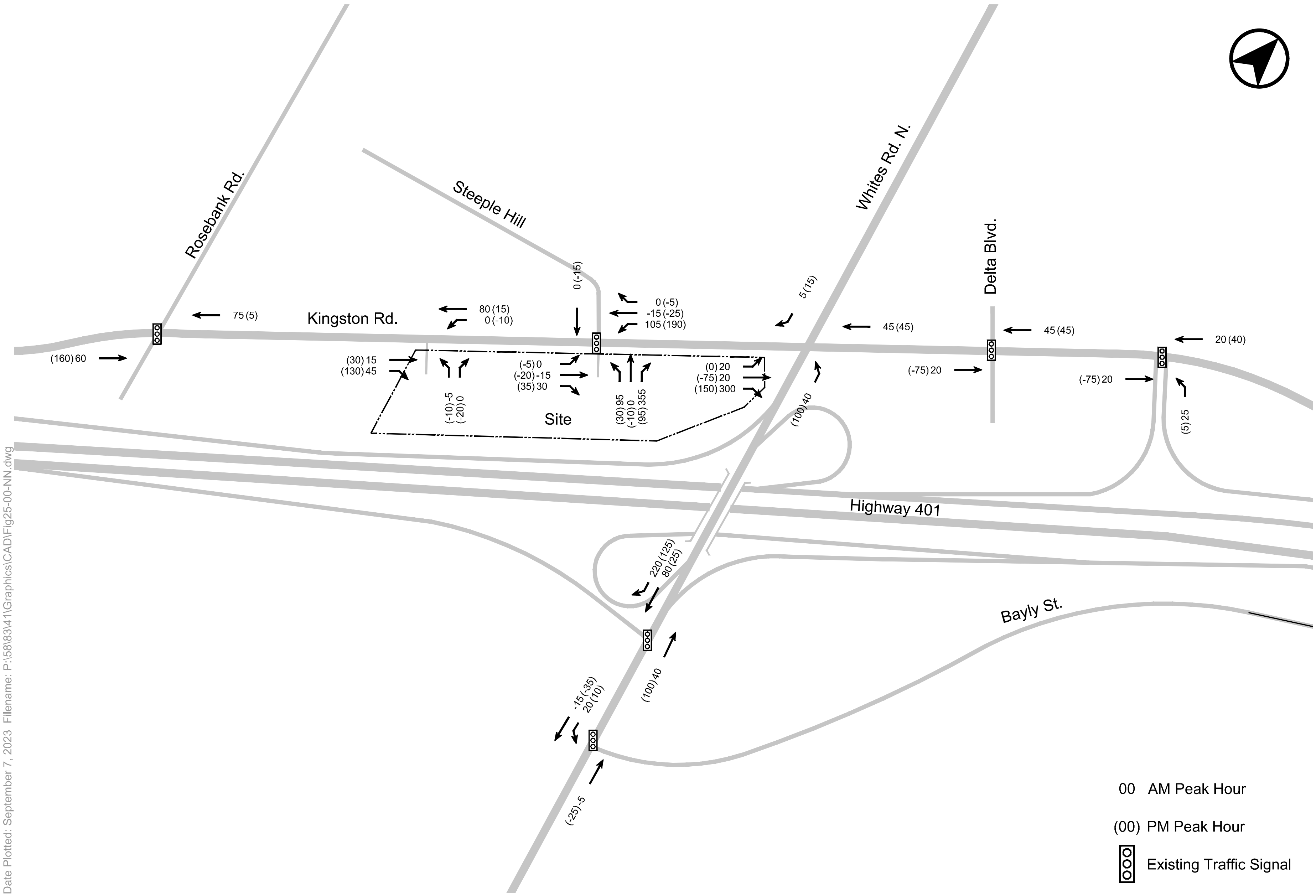


FIGURE 25 FORECAST NET-NEW SITE TRAFFIC VOLUMES

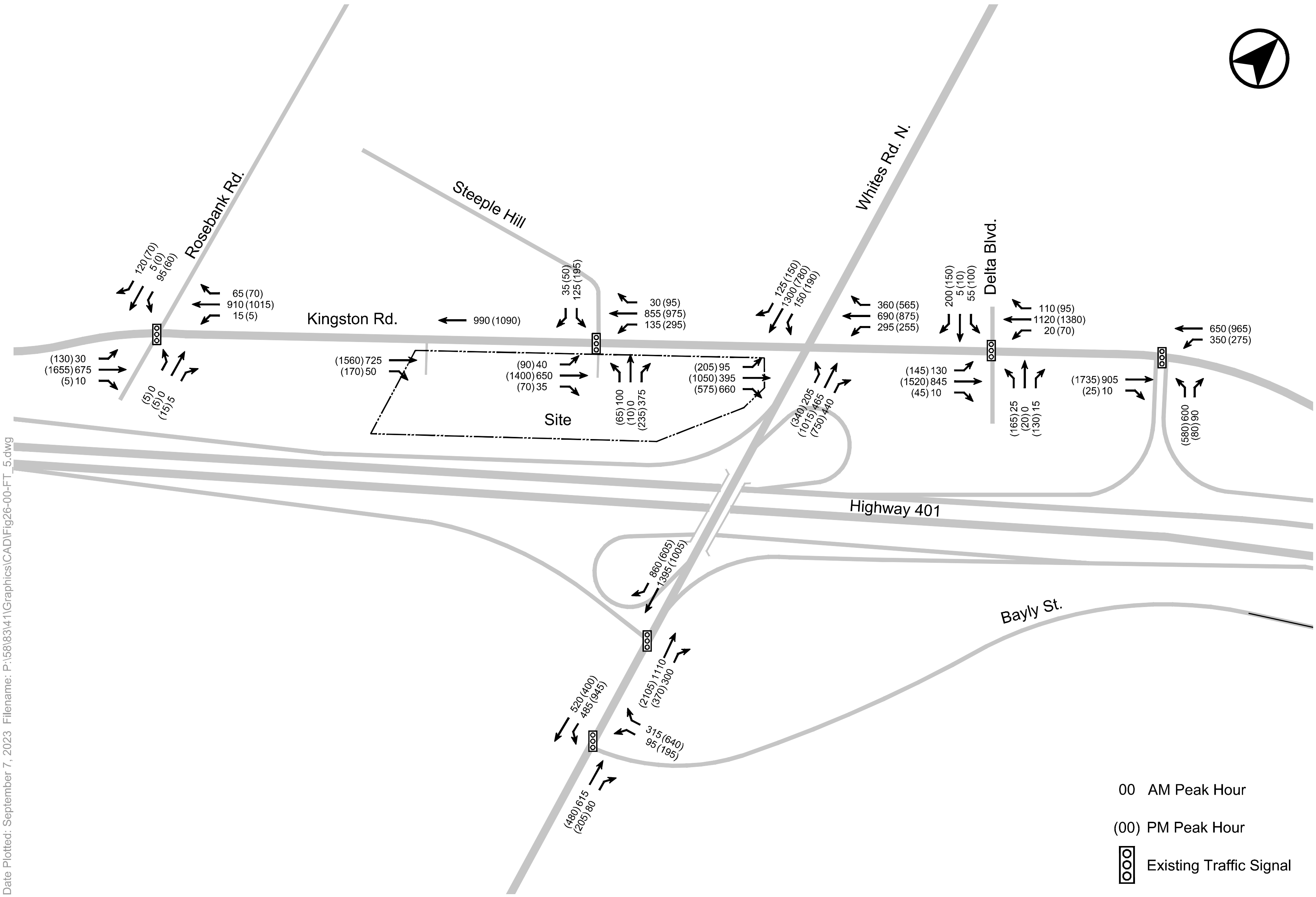


FIGURE 26 FUTURE TOTAL (5 YEARS) TRAFFIC VOLUMES

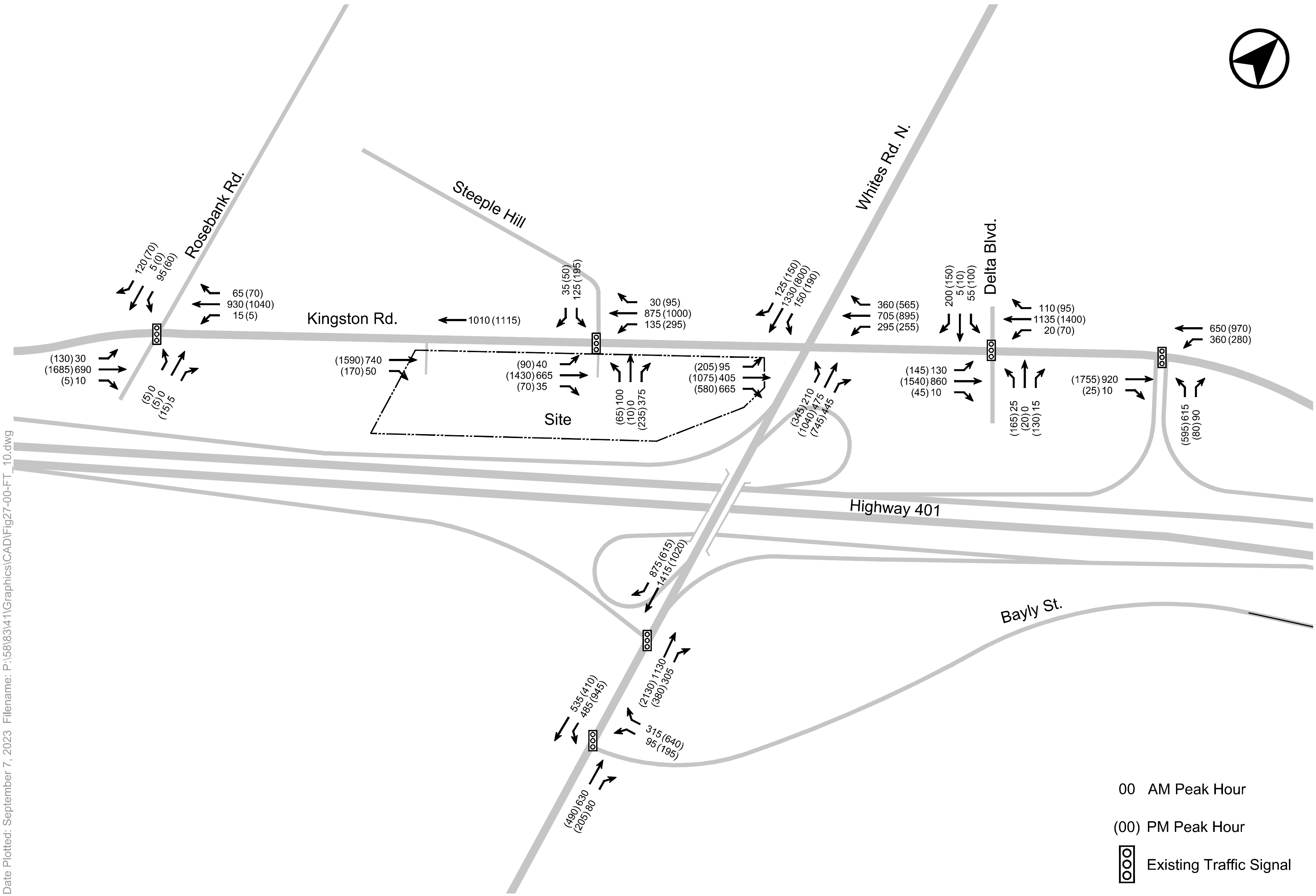


FIGURE 27 FUTURE TOTAL (10 YEARS) TRAFFIC VOLUMES

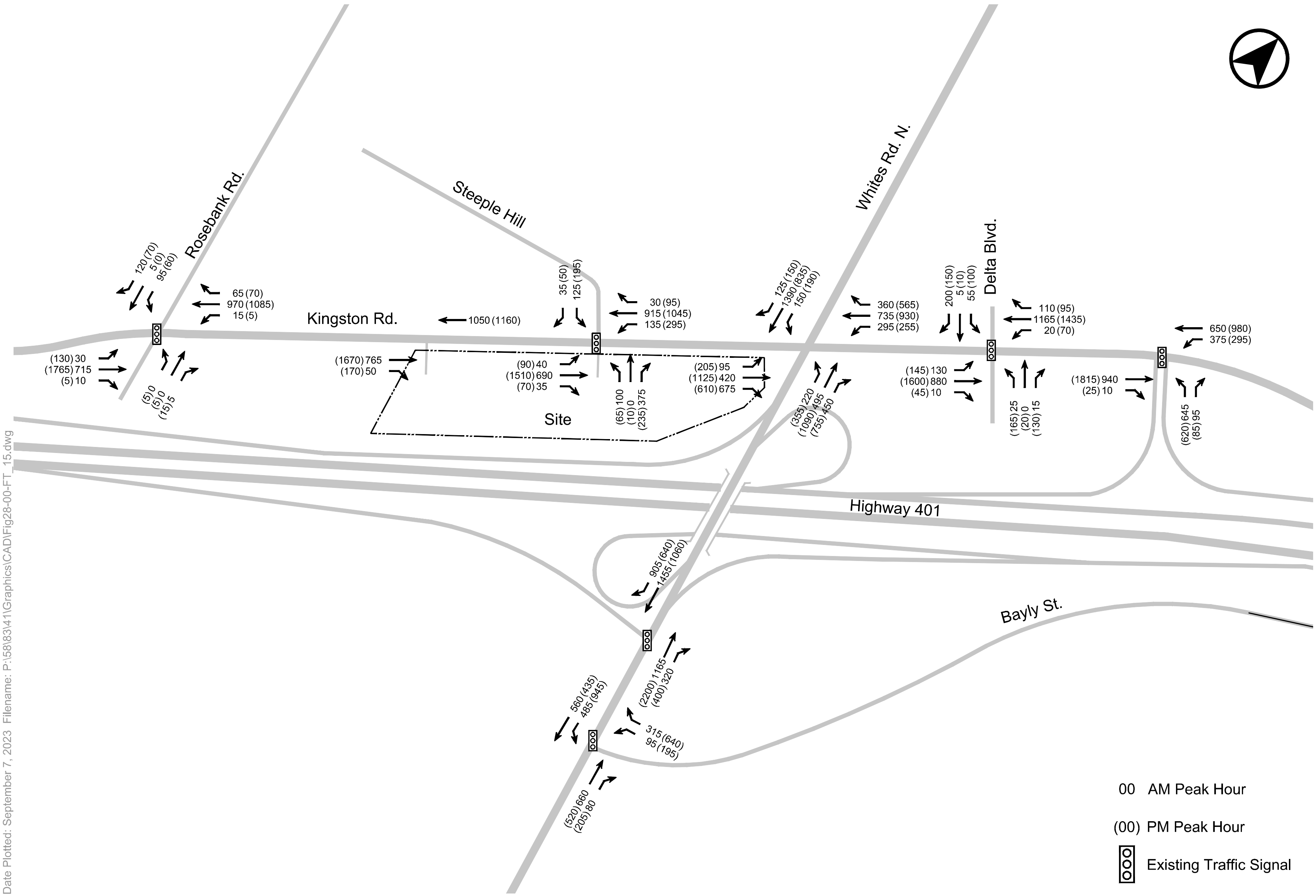


FIGURE 28 FUTURE TOTAL (15 YEARS) TRAFFIC VOLUMES

11.0 TRAFFIC OPERATIONS ANALYSIS

Traffic volume forecasts, intersection and driveway operations, and new Site traffic related impacts have been reviewed at the following area intersections as part of this study:

Signalized Intersections

- Kingston Road / Rosebank Road
- Kingston Road / Steeple Hill & Site Access Driveway
- Kingston Road / Highway 401 Westbound Ramps
- Kingston Road / Delta Road
- Whites Road / Kingston Road
- Whites Road / Highway 401 Eastbound Off-Ramp
- Whites Road / Bayly Street

Unsignalized Intersections

- Kingston Road / Site Access Driveway

Analyses have been undertaken at these intersections during the weekday morning and afternoon peak hours and for 5-year (2039), 10-year (2044), and 15-year (2049) study horizons.

11.1 Analysis Methodology

Traffic operation analyses have been undertaken at the area intersections listed above using standard capacity analysis procedures as outlined below:

11.1.1 Signalized Intersection Methodology

Signalized intersection analyses have been carried out using standard capacity analysis for intersection operating under traffic signal control.

Analyses were conducted using the Synchro Version 11 traffic analysis software, which evaluates intersection performance based upon the methodologies outlined in the Highway Capacity Manual (HCM, 2000). One of the key output parameters of these analyses is a volume to capacity ratio (or v/c) which provides a relative measure of the level of capacity available to accommodate turning movement volumes at an intersection. A v/c ratio of 1.0 reflects "at or near capacity" conditions.

Another key output parameter of these analyses is a level of service (LOS) designation, ranging from LOS of A to F, which provides an indication of the level of delay (in seconds) experienced by motorists completing a turning manoeuvre at an intersection. LOS A indicates conditions of little delay and LOS F reflects conditions where more extended delays can be expected.

11.1.2 Unsignalized Intersection Methodology

Analyses were conducted using the Synchro Version 11 traffic analysis software, which evaluates intersection performance based upon the methodologies outlined in the Highway Capacity Manual (HCM 2000). Unsignalized intersection analysis have been carried out using standard capacity procedures for intersections operating under "Two-Way" and "All-Way" STOP control and in accordance with the methodologies outlined in the Highway Capacity Manual (HCM 2000).

The product of these analyses is a level of service (LOS) designation, ranging from LOS A to F, which provides a relative indication of the level of delay that may be experienced by motorists completing a turning manoeuvre at an intersection. LOS A represents conditions under which motorists would experience little delay and LOS F reflects conditions where more extended delays can be expected.

HCM level of service (LOS) criteria for unsignalized intersections is as follow:

- LOS A: Control Delay ≤ 10s
- LOS B: 10s < Control Delay ≤ 15s
- LOS C: 15s < Control Delay ≤ 25s
- LOS D: 25s < Control Delay ≤ 35s
- LOS E: 35s < Control Delay ≤ 50s
- LOS F: Control Delay > 50s

11.2 Network-Wide Parameters

The following section outlines the key parameters and assumptions adopted in the assessment of operational characteristics of the area road network for the following proposed development.

11.2.1 Base Saturation Flow Rates

A base saturation flow rate of 1,900 passenger cars per hour of green time per lane (pcphgpl) has been adopted as the base assumption within all Synchro analysis detailed in this study.

11.2.2 Heavy Vehicle Assumptions

Heavy and medium truck percentages incorporated into the analyses were based upon information obtained from observations made during existing intersection turning movement counts.

The relative proportion of heavy vehicles within the general traffic stream was used as the basis for the heavy vehicle adjustment factor inputs adopted within the Synchro analysis for both existing and future scenarios.

11.2.3 Lost Time Adjustments

To account for vehicles that complete a turning movement during amber or all-red times, a lost time adjustment of -1.0 seconds is applied for all movements at all signalized intersections. This is reflective of busy, urban intersections that operate at or near capacity, where drivers take advantage of as much of the green and amber time as possible to clear the intersection. Therefore, a base lost time adjustment factor of -1.0 seconds (i.e. a total loss time per phase equal to the amber plus all-red time minus 1 second) was adopted for the purposes of this assessment.

11.2.4 Signal Timings

Existing signal timings, phasing plans, and cycle lengths were obtained from the City of Pickering. These parameters were adopted for the analysis of existing conditions at all intersections and have been optimized where necessary under the five-year study horizon.

Existing signal timing plans have been provided in **Appendix D**.

11.2.5 Road Network

The existing road network configuration was assumed for this analysis and is consistent across all future scenarios. The existing and future road network intersection lane configurations are shown in **Figure 20** and **Figure 21**, respectively.

11.2.6 Peak Hour Factors

The peak hour factors (PHFs) calculated from the existing turning movement counts are adopted in the Synchro analysis. Where peak hours factors were not available, a PHF of 0.92 was assumed for both peak hours in accordance with Durham Region's analysis guidelines. The calculated peak hour factors are summarized in **Table 29**.

Table 29 Peak Hour Factors

Intersection	AM Peak Hour	PM Peak Hour
Signalized Intersections		
Kingston Road / Rosebank Road	0.88	0.94
Kingston Road / Steeple Hill & Site Access Driveway	0.85	0.95
Kingston Road / Highway 401 WB Ramps	0.87	0.95
Kingston Road / Delta Road	0.83	0.98
Whites Road / Kingston Road	0.91	0.97
Whites Road / Highway 401 EB Off-Ramp	0.95	0.91
Whites Road / Bayly Street	0.90	0.90
Unsignalized Intersections		
Kingston Road / Site Access Driveway	0.87	0.96

11.2.7 Analysis of Kingston Road

The analysis has been updated to include build-out of the DBRT system along Kingston Road – with lane configurations adapted for a centre median BRT and two through lanes in each direction. East-west left-turn movements along Kingston Road were also converted to “protected only” to ensure the BRT service can function with high efficiency.

11.3 Traffic Operations Results

The traffic operation analysis results for the area signalized and unsignalized intersections are discussed in the following sections. The Synchro reports are provided in **Appendix E**.

11.3.1 Signalized Intersection Analysis – Scenario 1

Traffic analyses were undertaken at all signalized intersections during the weekday morning and afternoon peak hours within the study area under Scenario 1 and are summarized in **Table 30**.

Kingston Road / Rosebank Road

Under existing conditions, the Kingston Road / Rosebank Road signalized intersection operates acceptably with an overall v/c ratio of 0.39 and 0.50 in the morning and afternoon peak hours, respectively.

Under future background conditions, the Kingston Road / Rosebank Road intersection continues to operate acceptably with overall v/c ratios of 0.43 and 0.56 in the morning and afternoon peak hours, respectively.

Under future total conditions at full build-out of the Site, with added Site traffic activity, the intersection continues to operate acceptably with overall v/c ratios of 0.47 and 0.59 in the morning and afternoon peak hours, respectively.

Kingston Road / Steeple Hill & Site Access Driveway

Under existing conditions, the Kingston Road / Steeple Hill & Site Access Driveway signalized intersection operates acceptably with an overall v/c ratio of 0.43 and 0.69 in the morning and afternoon peak hours, respectively.

Under future background conditions, the intersection operates acceptably with morning and afternoon peak hour v/c ratios of 0.46 and 0.75, respectively. Note that the signal timings and cycle length were adjusted in the morning and afternoon peak hours.

Under future total conditions at full build-out of the Site, with added Site traffic activity, the intersection continues to operate acceptably with an overall v/c ratio of 0.83 and 0.96 during the respective weekday morning and afternoon peak hours. It is conservatively assumed that all right turns in and out of the Site will occur at this intersection to assess the 'worst case' scenario; in actuality, the operating conditions at the eastbound right and northbound right movements should experience a slight improvement over the reported results as a result of Site trips utilizing the western Site access.

Kingston Road / Highway 401 WB Ramps

Under existing conditions, the Kingston Road / Highway 401 WB Ramps signalized intersection operates acceptably with an overall v/c ratio of 0.67 and 0.90 in the morning and afternoon peak hours, respectively.

Under future background conditions, the intersection operates acceptably in the morning and afternoon peak hours with overall v/c ratios of 0.75 and 0.95, respectively. Note that the signal timing and cycle length were adjusted in the afternoon peak hours.

Under future total conditions, with added site traffic activity, the intersection continues to operate acceptably with an overall v/c ratio of 0.78 and 0.93 during the respective weekday morning and afternoon peak hours.

As part of the Ministry of Transportation (MTO) Traffic Impact Study Guidelines, further analyses were conducted for an additional five-year and ten-year horizon years beyond the initial five-year build-out horizon. Under future total 2034 traffic conditions, the intersection operates with overall v/c ratios of 0.81 and 0.95 during the weekday morning and afternoon peak hours. Under future total 2039 traffic conditions, the intersection operates with overall v/c ratios of 0.85 and 0.99 during the weekday morning and afternoon peak hours.

Kingston Road / Delta Road

Under existing conditions, the Kingston Road / Delta Road signalized intersection operates acceptably with an overall v/c ratio of 0.49 and 0.70 in the morning and afternoon peak hours, respectively.

Under future background conditions, the intersection operates acceptably with morning and afternoon peak hour v/c ratios of 0.54 and 0.75, respectively.

Under future total conditions at full build-out of the Site, with added Site traffic activity, the intersection continues to operate acceptably with an overall v/c ratio of 0.55 and 0.73 during the respective weekday morning and afternoon peak hours. Under future total 2034 traffic conditions, the intersection operates with overall v/c ratios of 0.56 and 0.74 during the respective weekday morning and afternoon peak hours. Under future total 2039 traffic conditions, the intersection operates with overall v/c ratios of 0.58 and 0.76 during the respective weekday morning and afternoon peak hours.

Whites Road / Kingston Road

Under existing conditions, the Whites Road /Kingston Road signalized intersection operates acceptably with an overall v/c ratio of 0.63 and 0.90 in the morning and afternoon peak hours, respectively.

Under future background conditions, the intersection operates acceptably in the morning and afternoon peak hours with overall v/c ratios of 0.67 and 0.96, respectively. Note that the signal timing and cycle length were adjusted in the morning and afternoon peak hour.

Under future total conditions at full build-out of the Site, with added Site traffic activity, the intersection continues to operate acceptably with an overall v/c ratio of 1.00 and 0.98 during the respective weekday morning and afternoon peak hours.

As part of the Ministry of Transportation (MTO) Traffic Impact Study Guidelines, further analysis was conducted for an additional five-year and ten-year horizon years beyond the five-year build-out horizon. Under future total 2034 traffic conditions, the intersection operates with overall v/c ratios of 1.03 in both the morning and afternoon peak hours. Under 2039 traffic conditions, the intersection operates with overall v/c ratios of 1.06 during both the weekday morning and afternoon peak hours.

Whites Road / Highway 401 EB Off-Ramp

Under existing conditions, the Whites Road / Highway 401 EB Off-Ramp signalized intersection operates acceptably with an overall v/c ratio of 0.52 and 0.88 in the morning and afternoon peak hours, respectively.

Under future background conditions, the intersection continues to operate acceptably in the morning and afternoon peak hours with overall v/c ratios of 0.52 and 0.88, respectively. Note that it has been recommended that the eastbound approach operates with a dual left and a dual right turn in order to provide additional capacity to the eastbound approach.

Under future total conditions at full build-out of the Site, with added Site traffic activity, the intersection continues to operate acceptably with an overall v/c ratio of 0.55 and 0.92 during the respective weekday morning and afternoon peak hours.

As part of the Ministry of Transportation (MTO) Traffic Impact Study Guidelines, further analyses were conducted for an additional five-year and ten-year horizon years beyond the five-year build-out horizon. Under future total 2034 traffic conditions, the intersection operates with overall v/c ratios of 0.56 and 0.96 during the respective weekday morning and afternoon peak hours. Under future total 2039 traffic conditions, the intersection operates with overall v/c ratios of 0.58 and 1.00 during the respective weekday morning and afternoon peak hours.

Whites Road / Bayly Street

Under existing conditions, the Whites Road / Bayly Street signalized intersection operates acceptably with an overall v/c ratio of 0.57 and 0.73 in the morning and afternoon peak hours, respectively.

Under the future background condition, the White Road / Bayly Street intersection continues to operate acceptably with overall v/c ratios of 0.59 and 0.75 in the morning and afternoon peak hours, respectively.

Under future total conditions at full build-out of the Site, with added Site traffic activity, the intersection continues to operate acceptably with an overall v/c ratio of 0.59 and 0.74 during the respective weekday morning and afternoon peak hours.

As part of the Ministry of Transportation (MTO) Traffic Impact Study Guidelines, further analyses were conducted for an additional five-year and ten-year horizon years beyond the five-year build-out horizon. Under future total 2034 traffic conditions, the intersection operates with overall v/c ratios of 0.60 and 0.74 during the respective weekday morning and afternoon peak hours. Under future total 2039 traffic conditions, the intersection operates with overall v/c ratios of 0.62 and 0.76 during the respective weekday morning and afternoon peak hours.

Overall, the proposed development as planned can be appropriately accommodated at the area signalized intersections; no mitigation measures are required on the area street network within the five-year study horizon.

Table 30 Signalized Intersection Analysis Summary – Scenario 1

Intersection / Traffic Movement	Existing		Future Background		Future Total (2029)		Future Total (2034)		Future Total (2039)	
	v/c	LOS	v/c	LOS	v/c	LOS	v/c	LOS	v/c	LOS
Kingston Road / Rosebank Road										
EBL	0.09 (0.36)	A (A)	0.10 (0.41)	A (A)	0.12 (0.42)	A (A)	0.12 (0.43)	A (A)	0.13 (0.46)	A (A)
EBTR	0.24 (0.51)	A (A)	0.28 (0.57)	A (A)	0.30 (0.60)	A (A)	0.30 (0.62)	A (A)	0.31 (0.65)	A (A)
WBL	0.03 (0.02)	A (A)	0.03 (0.03)	A (A)	0.03 (0.03)	A (A)	0.04 (0.03)	A (A)	0.04 (0.04)	A (A)
WBTR	0.36 (0.37)	A (A)	0.40 (0.41)	A (A)	0.45 (0.42)	A (A)	0.46 (0.43)	A (A)	0.48 (0.45)	A (A)
NBL	0.00 (0.04)	A (D)	0.00 (0.04)	A (D)	0.00 (0.04)	A (D)	0.00 (0.04)	A (D)	0.00 (0.04)	A (D)
NBTR	0.00 (0.04)	D (D)	0.00 (0.04)	D (D)	0.00 (0.04)	D (D)	0.00 (0.04)	D (D)	0.00 (0.04)	D (D)
SBL	0.56 (0.47)	D (D)	0.56 (0.47)	D (D)	0.56 (0.47)	D (D)	0.56 (0.47)	D (D)	0.56 (0.47)	D (D)
SBTR	0.11 (0.05)	D (D)	0.11 (0.05)	D (D)	0.18 (0.05)	D (D)	0.20 (0.05)	D (D)	0.24 (0.05)	D (D)
Overall	**0.39 (0.50)**	**A (A)**	**0.43 (0.56)**	**A (A)**	**0.47 (0.59)**	**A (A)**	**0.48 (0.61)**	**A (A)**	**0.49 (0.63)**	**A (A)**
Kingston Road / Steeple Hill & Site Access Driveway										
EBL	0.13 (0.35)	A (B)	0.14 (0.37)	A (B)	0.35 (0.45)	D (C)	0.37 (0.45)	D (C)	0.41 (0.47)	D (C)
EBTR	0.29 (0.66)	A (B)	0.33 (0.70)	A (B)	0.70 (0.96)	D (D)	0.71 (1.04)	D (E)	0.73 (1.10)	D (F)
WBL	0.07 (0.44)	A (C)	0.08 (0.46)	A (D)	0.67 (0.83)	D (E)	0.69 (1.28)	D (F)	0.71 (1.29)	E (F)
WBTR	0.37 (0.45)	A (A)	0.40 (0.47)	A (A)	0.64 (0.47)	C (A)	0.65 (0.50)	C (A)	0.68 (0.52)	C (C)
NBL	0.03 (0.12)	D (D)	0.03 (0.27)	D (E)	0.33 (0.48)	C (E)	0.33 (0.43)	C (E)	0.33 (0.42)	C (E)
NBTR	0.02 (0.20)	D (D)	0.02 (0.22)	D (E)	0.66 (0.65)	C (E)	0.66 (0.76)	C (E)	0.66 (0.76)	C (E)
SBL	0.65 (0.84)	D (E)	0.70 (0.97)	E (F)	0.99 (1.01)	F (F)	0.99 (0.98)	F (F)	0.99 (1.01)	F (F)
SBTR	0.03 (0.07)	D (D)	0.03 (0.08)	D (D)	0.03 (0.03)	C (D)	0.03 (0.03)	C (D)	0.03 (0.03)	C (F)
Overall	**0.43 (0.69)**	**B (B)**	**0.46 (0.75)**	**B (C)**	**0.83 (0.96)**	**D (D)**	**0.84 (1.25)**	**D (E)**	**0.85 (1.27)**	**D (E)**
Kingston Road / Highway 401 WB Ramps										
EBTR	0.58 (0.95)	C (D)	0.70 (0.99)	C (D)	0.74 (0.95)	C (D)	0.79 (0.97)	D (D)	0.83 (1.01)	D (E)
WBL	0.79 (0.90)	C (E)	0.84 (0.89)	D (E)	0.86 (0.89)	D (E)	0.88 (0.90)	D (E)	0.93 (0.91)	E (E)
WBT	0.29 (0.37)	A (A)	0.32 (0.38)	A (A)	0.33 (0.40)	A (A)	0.33 (0.41)	B (A)	0.33 (0.41)	B (A)
NBL	0.77 (0.78)	D (D)	0.79 (0.93)	D (E)	0.80 (0.93)	D (E)	0.80 (0.95)	D (E)	0.82 (0.99)	D (F)
NBR	0.19 (0.17)	D (D)	0.19 (0.21)	D (D)	0.19 (0.21)	C (D)	0.19 (0.22)	C (D)	0.20 (0.23)	C (D)
Overall	**0.67 (0.90)**	**C (C)**	**0.75 (0.95)**	**C (D)**	**0.78 (0.93)**	**C (D)**	**0.81 (0.95)**	**C (D)**	**0.85 (0.99)**	**D (D)**

Continued on Next Page

Intersection / Traffic Movement	Existing		Future Background		Future Total (2029)		Future Total (2034)		Future Total (2039)	
	v/c	LOS	v/c	LOS	v/c	LOS	v/c	LOS	v/c	LOS
Kingston Road / Delta Boulevard										
EBL	0.41 (0.42)	A (A)	0.43 (0.49)	A (B)	0.45 (0.52)	A (B)	0.46 (0.53)	A (B)	0.47 (0.54)	A (B)
EBT	0.36 (0.69)	A (B)	0.40 (0.75)	A (B)	0.42 (0.72)	A (B)	0.43 (0.73)	A (B)	0.44 (0.76)	A (B)
EBR	0.01 (0.03)	A (A)	0.01 (0.03)	A (A)	0.01 (0.03)	A (A)	0.01 (0.03)	A (A)	0.01 (0.03)	A (A)
WBL	0.06 (0.31)	A (B)	0.06 (0.35)	A (B)	0.06 (0.33)	A (B)	0.07 (0.33)	A (B)	0.07 (0.36)	A (B)
WBT	0.51 (0.60)	A (B)	0.56 (0.66)	B (B)	0.58 (0.70)	B (B)	0.59 (0.71)	B (B)	0.61 (0.72)	B (B)
WBR	0.10 (0.07)	A (A)	0.10 (0.08)	A (B)	0.10 (0.08)	A (B)	0.10 (0.08)	A (B)	0.10 (0.08)	A (B)
NBL	0.44 (0.79)	D (E)	0.44 (0.79)	D (E)	0.44 (0.79)	D (E)	0.44 (0.79)	D (E)	0.44 (0.79)	D (E)
NBTR	0.01 (0.15)	D (D)	0.01 (0.14)	D (D)	0.01 (0.14)	D (D)	0.01 (0.14)	D (D)	0.01 (0.14)	D (D)
SBL	0.38 (0.47)	D (D)	0.39 (0.46)	D (D)	0.39 (0.46)	D (D)	0.39 (0.46)	D (D)	0.39 (0.46)	D (D)
SBTR	0.40 (0.13)	D (D)	0.47 (0.13)	D (D)	0.48 (0.13)	D (D)	0.48 (0.13)	D (D)	0.49 (0.13)	D (D)
Overall	**0.49 (0.70)**	**B (B)**	**0.54 (0.75)**	**B (C)**	**0.55 (0.73)**	**B (C)**	**0.56 (0.74)**	**B (C)**	**0.58 (0.76)**	**B (C)**
Whites Road / Kingston Road										
EBL	0.29 (0.64)	C (C)	0.25 (0.79)	B (D)	0.43 (0.87)	C (E)	0.44 (0.90)	C (E)	0.46 (0.94)	C (E)
EBT	0.29 (0.88)	C (D)	0.27 (1.06)	C (F)	0.33 (0.99)	C (E)	0.34 (1.02)	C (E)	0.35 (1.07)	C (E)
EBR	0.52 (0.56)	C (C)	0.41 (0.51)	C (D)	1.05 (0.88)	E (E)	1.18 (0.88)	F (E)	1.20 (0.95)	F (C)
WBL	0.76 (0.92)	D (E)	0.66 (0.89)	C (E)	0.76 (0.89)	D (E)	0.77 (0.89)	D (E)	0.79 (0.88)	D (E)
WBT	0.50 (0.56)	C (C)	0.43 (0.67)	C (D)	0.52 (0.72)	C (D)	0.53 (0.73)	C (D)	0.55 (0.76)	C (D)
WBR	0.37 (0.77)	C (D)	0.36 (0.74)	C (D)	0.41 (0.76)	C (D)	0.42 (0.77)	C (D)	0.43 (0.78)	C (D)
NBL	0.64 (0.80)	C (D)	0.77 (0.69)	D (C)	0.80 (0.96)	D (E)	0.85 (1.22)	D (F)	0.88 (1.28)	D (F)
NBT	0.24 (0.57)	C (C)	0.34 (0.64)	D (D)	0.31 (0.64)	D (D)	0.32 (0.66)	D (D)	0.33 (0.70)	D (D)
NBR	0.45 (0.92)	C (D)	0.52 (0.94)	D (E)	0.53 (0.94)	C (E)	0.55 (0.94)	C (E)	0.57 (0.96)	C (E)
SBL	0.38 (0.87)	C (E)	0.49 (0.70)	C (D)	0.41 (0.70)	C (D)	0.41 (0.70)	C (D)	0.42 (0.72)	C (D)
SBT	0.71 (0.45)	C (C)	1.00 (0.51)	E (D)	0.99 (0.56)	E (D)	0.98 (0.58)	E (D)	1.03 (0.60)	F (D)
SBR	0.09 (0.11)	C (C)	0.14 (0.15)	D (D)	0.15 (0.22)	D (D)	0.15 (0.22)	D (D)	0.15 (0.22)	D (D)
Overall	**0.63 (0.90)**	**C (D)**	**0.67 (0.96)**	**D (D)**	**1.00 (0.98)**	**D (E)**	**1.03 (1.03)**	**D (E)**	**1.06 (1.06)**	**E (E)**
Whites Road / Highway 401 EB Off-Ramp										
EBL	0.75 (0.88)	D (C)	0.74 (0.87)	D (C)	0.76 (0.94)	D (C)	0.76 (1.01)	D (D)	0.77 (1.05)	D (E)
EBR	0.42 (0.89)	C (D)	0.17 (0.52)	C (B)	0.18 (0.50)	C (B)	0.20 (0.50)	C (B)	0.23 (0.50)	C (B)
NBT	0.42 (0.86)	A (C)	0.43 (0.88)	A (D)	0.45 (0.89)	A (D)	0.46 (0.91)	A (D)	0.48 (0.93)	A (D)
SBT	0.29 (0.50)	A (C)	0.29 (0.52)	A (C)	0.31 (0.52)	A (C)	0.31 (0.53)	B (C)	0.32 (0.55)	B (C)
Overall	**0.52 (0.88)**	**B (C)**	**0.52 (0.88)**	**B (C)**	**0.55 (0.92)**	**B (C)**	**0.56 (0.96)**	**B (D)**	**0.58 (1.00)**	**B (D)**

Continued on Next Page

Intersection / Traffic Movement	Existing		Future Background		Future Total (2029)		Future Total (2034)		Future Total (2039)	
	v/c	LOS	v/c	LOS	v/c	LOS	v/c	LOS	v/c	LOS
Whites Road / Bayly Street										
WBL	0.51 (0.69)	D (D)	0.51 (0.69)	D (D)	0.51 (0.69)	D (D)	0.51 (0.69)	D (D)	0.51 (0.69)	D (D)
WBR	0.31 (0.64)	B (B)	0.32 (0.65)	B (B)	0.32 (0.64)	B (B)	0.32 (0.64)	B (B)	0.33 (0.65)	B (B)
NBT	0.74 (0.66)	D (D)	0.75 (0.68)	D (D)	0.75 (0.66)	D (D)	0.75 (0.67)	D (D)	0.76 (0.69)	D (D)
NBR	0.09 (0.17)	C (C)	0.10 (0.19)	C (C)	0.10 (0.17)	C (C)	0.10 (0.18)	C (C)	0.10 (0.20)	C (C)
SBL	0.48 (0.76)	C (C)	0.50 (0.77)	C (D)	0.51 (0.78)	C (C)	0.52 (0.78)	C (D)	0.54 (0.79)	C (D)
SBLT	0.47 (0.68)	C (C)	0.49 (0.71)	C (C)	0.49 (0.68)	B (C)	0.50 (0.69)	C (C)	0.53 (0.72)	C (C)
Overall	**0.57 (0.73)**	**C (C)**	**0.59 (0.75)**	**C (C)**	**0.59 (0.74)**	**C (C)**	**0.60 (0.74)**	**C (C)**	**0.62 (0.76)**	**C (C)**

Notes:
1. XX (XX) – Weekday Morning Peak Hour (Weekday Afternoon Peak Hour)

11.3.2 Unsignalized Intersection Analysis – Scenario 1

Traffic operations analysis results for the area unsignalized intersections are summarized in **Table 31**.

Table 31 Unsignalized Traffic Analysis Intersection Summary – Scenario 1

Intersection / Traffic Movement	Existing		Future Background		Future Total (2029)		Future Total (2034)		Future Total (2039)	
	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS
Kingston Road / Site Access Driveway										
WBL	0.0 (12.9)	A (B)	0.0 (14.2)	A (B)	Prohibited.					
NBLR	23.7 (36.7)	C (E)	29.2 (54.8)	D (F)	0.0 (0.0)	A (A)	0.0 (0.0)	A (A)	0.0 (0.0)	A (A)

Notes:
1. XX (XX) – Weekday Morning Peak Hour (Weekday Afternoon Peak Hour).

The unsignalized intersection of Kingston Road / Site Access Driveway operates acceptably during the existing traffic conditions, with individual traffic movements operating with a level of service (LOS) of LOS E during weekday peak hours.

Under future background traffic conditions, the traffic analysis herein indicates a modest increase in average delay. Additional delay of 18 seconds or less can be anticipated during the weekday morning and afternoon peak hours, respectively, relative to the existing condition. However, it is noted that northbound traffic is minimal during the peak hour (in the order of 10-20 turning vehicles).

Under future total traffic conditions, the existing access point abutting Kingston Road will be maintained as a right-in / right-out (RIRO) access with prohibited inbound and outbound left turns. For the purpose of the analysis, it is assumed that right turn manoeuvres out of the Site will occur at the signalized intersection of Kingston Road / Steeple Hill & Site Access Driveway to assess the ‘worst case’ scenario at the intersection given that Site trips are expected to be accommodated at the unsignalized Site access. Moreover, it is assumed that Site-related traffic travelling eastbound will exit the Site via the easternmost Site access.

Based on the foregoing, the Site driveway will operate acceptably with the redevelopment of the Site under Scenario 1 within the five-year study horizon.

11.3.3 Signalized Intersection Analysis – Scenario 2

Traffic analyses were undertaken at all signalized intersections during the weekday morning and afternoon peak hours within the study area under Scenario 2 and are summarized in **Table 32**.

<u>Kingston Road / Rosebank Road</u>

Under existing conditions, the Kingston Road / Rosebank Road signalized intersection operates acceptably with an overall v/c ratio of 0.39 and 0.50 in the morning and afternoon peak hours, respectively.

Under future background conditions, the Kingston Road / Rosebank Road intersection continues to operate acceptably with overall v/c ratios of 0.43 and 0.56 in the morning and afternoon peak hours, respectively.

Under future total conditions at full build-out of the Site, with added Site traffic activity, the intersection continues to operate acceptably with overall v/c ratios of 0.50 and 0.68 in the morning and afternoon peak hours, respectively.

<u>Kingston Road / Steeple Hill & Site Access Driveway</u>

Under existing conditions, the Kingston Road / Steeple Hill & Site Access Driveway signalized intersection operates acceptably with an overall v/c ratio of 0.43 and 0.69 in the morning and afternoon peak hours, respectively.

Under future background conditions, the intersection operates acceptably with morning and afternoon peak hour v/c ratios of 0.46 and 0.75, respectively. Note that the signal timings and cycle length were adjusted in the morning and afternoon peak hours.

Under future total conditions at full build-out of the Site, with added Site traffic activity, the intersection continues to operate acceptably with an overall v/c ratio of 0.78 and 0.96 during the respective weekday morning and afternoon peak hours. It is conservatively assumed that all right turns in and out of the Site will occur at this intersection to assess the 'worst case' scenario; in actuality, the operating conditions at the eastbound right and northbound right movements should experience a slight improvement over the reported results as a result of Site trips utilizing the western Site access.

<u>Kingston Road / Highway 401 WB Ramps</u>

Under existing conditions, the Kingston Road / Highway 401 WB Ramps signalized intersection operates acceptably with an overall v/c ratio of 0.67 and 0.90 in the morning and afternoon peak hours, respectively.

Under future background conditions, the intersection operates acceptably in the morning and afternoon peak hours with overall v/c ratios of 0.75 and 0.95, respectively. Note that the signal timing and cycle length were adjusted in the afternoon peak hours.

Under future total conditions, with added site traffic activity, the intersection continues to operate acceptably with an overall v/c ratio of 0.84 and 0.96 during the respective weekday morning and afternoon peak hours.

As part of the Ministry of Transportation (MTO) Traffic Impact Study Guidelines, further analyses were conducted for an additional five-year and ten-year horizon years beyond the initial five-year build-out horizon. Under future total 2034 traffic conditions, the intersection operates with overall v/c ratios of 0.85 and 0.98 during the weekday morning and afternoon peak hours. Under future total 2039 traffic conditions, the intersection operates with overall v/c ratios of 0.88 and 1.02 during the weekday morning and afternoon peak hours.

<u>Kingston Road / Delta Road</u>

Under existing conditions, the Kingston Road / Delta Road signalized intersection operates acceptably with an overall v/c ratio of 0.49 and 0.70 in the morning and afternoon peak hours, respectively.

Under future background conditions, the intersection operates acceptably with morning and afternoon peak hour v/c ratios of 0.54 and 0.75, respectively.

Under future total conditions at full build-out of the Site, with added Site traffic activity, the intersection continues to operate acceptably with an overall v/c ratio of 0.61 and 0.75 during the respective weekday morning and afternoon peak hours. Under future total 2034 traffic conditions, the intersection operates with overall v/c ratios of 0.62 and 0.75 during the respective weekday morning and afternoon peak hours. Under future total 2039 traffic conditions, the intersection operates with overall v/c ratios of 0.63 and 0.77 during the respective weekday morning and afternoon peak hours.

Whites Road / Kingston Road

Under existing conditions, the Whites Road / Kingston Road signalized intersection operates acceptably with an overall v/c ratio of 0.63 and 0.90 in the morning and afternoon peak hours, respectively.

Under future background conditions, the intersection operates acceptably in the morning and afternoon peak hours with overall v/c ratios of 0.67 and 0.96, respectively. Note that the signal timing and cycle length were adjusted in the morning and afternoon peak hour.

Under future total conditions at full build-out of the Site, with added Site traffic activity, the intersection continues to operate acceptably with an overall v/c ratio of 0.83 and 0.97 during the respective weekday morning and afternoon peak hours.

As part of the Ministry of Transportation (MTO) Traffic Impact Study Guidelines, further analysis was conducted for an additional five-year and ten-year horizon years beyond the five-year build-out horizon. Under future total 2034 traffic conditions, the intersection operates with overall v/c ratios of 0.85 and 0.98 in the morning and afternoon peak hours, respectively. Under 2039 traffic conditions, the intersection operates with overall v/c ratios of 0.87 and 1.01 during both the weekday morning and afternoon peak hours, respectively.

Whites Road / Highway 401 EB Off-Ramp

Under existing conditions, the Whites Road / Highway 401 EB Off-Ramp signalized intersection operates acceptably with an overall v/c ratio of 0.52 and 0.88 in the morning and afternoon peak hours, respectively.

Under future background conditions, the intersection continues to operate acceptably in the morning and afternoon peak hours with overall v/c ratios of 0.52 and 0.88, respectively. Note that it has been recommended that the eastbound approach operates with a dual left and a dual right turn in order to provide additional capacity to the eastbound approach.

Under future total conditions at full build-out of the Site, with added Site traffic activity, the intersection continues to operate acceptably with an overall v/c ratio of 0.55 and 0.91 during the respective weekday morning and afternoon peak hours.

As part of the Ministry of Transportation (MTO) Traffic Impact Study Guidelines, further analyses were conducted for an additional five-year and ten-year horizon years beyond the five-year build-out horizon. Under future total 2034 traffic conditions, the intersection operates with overall v/c ratios of 0.56 and 0.93 during the respective weekday morning and afternoon peak hours. Under future total 2039 traffic conditions, the intersection operates with overall v/c ratios of 0.58 and 0.96 during the respective weekday morning and afternoon peak hours.

It is advisable for the City to coordinate with the Region to construct an eastbound off-ramp at the intersection of Liverpool Road and Highway 401 to alleviate future congestion at the intersection of Whites Road and Kingston Road. At this time, there is no eastbound off-ramp connection to Liverpool Road which forces motorists to exit Highway 401 via Whites Road or Brock Road further to the east of the Site. Given the number of area background developments along the vicinity of the Kingston Road corridor and the existing conditions of the area off-ramps operating near theoretical capacity in the afternoon peak hour periods, addressing potential off-ramp congestion should be a priority item for the City and Region in a future edition of the TMP in addressing safety and redistributing traffic to other off-ramp connections in the area.

Whites Road / Bayly Street

Under existing conditions, the Whites Road / Bayly Street signalized intersection operates acceptably with an overall v/c ratio of 0.57 and 0.73 in the morning and afternoon peak hours, respectively.

Under the future background condition, the White Road / Bayly Street intersection continues to operate acceptably with overall v/c ratios of 0.59 and 0.75 in the morning and afternoon peak hours, respectively.

Under future total conditions at full build-out of the Site, with added Site traffic activity, the intersection continues to operate acceptably with an overall v/c ratio of 0.59 and 0.74 during the respective weekday morning and afternoon peak hours.

As part of the Ministry of Transportation (MTO) Traffic Impact Study Guidelines, further analyses were conducted for an additional five-year and ten-year horizon years beyond the five-year build-out horizon. Under future total 2034 traffic conditions, the intersection will continue operating with overall v/c ratios of 0.59 and 0.74 during the respective weekday morning and afternoon peak hours. Under future total 2039 traffic conditions, the intersection operates with overall v/c ratios of 0.61 and 0.76 during the respective weekday morning and afternoon peak hours.

Overall, the proposed development as planned can be appropriately accommodated at the area signalized intersections within the five-year study horizon; no mitigation measures are required on the area street network.

Table 32 Signalized Intersection Analysis Summary – Scenario 2

Intersection / Traffic Movement	Existing		Future Background		Future Total (2029)		Future Total (2034)		Future Total (2039)	
	v/c	LOS	v/c	LOS	v/c	LOS	v/c	LOS	v/c	LOS
Kingston Road / Rosebank Road										
EBL	0.09 (0.36)	A (A)	0.10 (0.41)	A (A)	0.32 (0.56)	D (D)	0.32 (0.56)	D (D)	0.32 (0.56)	D (D)
EBTR	0.24 (0.51)	A (A)	0.28 (0.57)	A (A)	0.34 (0.69)	A (A)	0.34 (0.71)	A (A)	0.36 (0.74)	A (B)
WBL	0.03 (0.02)	A (A)	0.03 (0.03)	A (A)	0.25 (0.12)	D (D)	0.25 (0.12)	D (D)	0.25 (0.12)	D (D)
WBTR	0.36 (0.37)	A (A)	0.40 (0.41)	A (A)	0.51 (0.55)	B (B)	0.52 (0.56)	B (B)	0.54 (0.58)	B (B)
NBL	0.00 (0.04)	A (D)	0.00 (0.04)	A (D)	0.00 (0.04)	A (D)	0.00 (0.04)	A (D)	0.00 (0.04)	A (D)
NBTR	0.00 (0.04)	D (D)	0.00 (0.04)	D (D)	0.00 (0.04)	D (D)	0.00 (0.04)	D (D)	0.00 (0.04)	D (D)
SBL	0.56 (0.47)	D (D)	0.56 (0.47)	D (D)	0.56 (0.47)	D (D)	0.56 (0.47)	D (D)	0.56 (0.47)	D (D)
SBTR	0.11 (0.05)	D (D)	0.11 (0.05)	D (D)	0.11 (0.05)	D (D)	0.11 (0.05)	D (D)	0.11 (0.05)	D (D)
Overall	**0.39 (0.50)**	**A (A)**	**0.43 (0.56)**	**A (A)**	**0.50 (0.68)**	**B (B)**	**0.51 (0.69)**	**B (B)**	**0.53 (0.72)**	**B (B)**

Continued on Next Page

Intersection / Traffic Movement	Existing		Future Background		Future Total (2029)		Future Total (2034)		Future Total (2039)	
	v/c	LOS	v/c	LOS	v/c	LOS	v/c	LOS	v/c	LOS
Kingston Road / Steeple Hill & Site Access Driveway										
EBL	0.13 (0.35)	A (B)	0.14 (0.37)	A (B)	0.68 (0.57)	F (E)	0.68 (0.57)	F (E)	0.68 (0.57)	F (E)
EBTR	0.29 (0.66)	A (B)	0.33 (0.70)	A (B)	0.63 (0.98)	D (E)	0.64 (1.00)	D (E)	0.66 (1.06)	D (E)
WBL	0.07 (0.44)	A (C)	0.08 (0.46)	A (D)	0.71 (0.79)	E (D)	0.71 (0.79)	E (E)	0.71 (0.80)	E (D)
WBTR	0.37 (0.45)	A (A)	0.40 (0.47)	A (A)	0.59 (0.57)	B (D)	0.60 (0.58)	B (B)	0.63 (0.60)	B (D)
NBL	0.03 (0.12)	D (D)	0.03 (0.27)	D (E)	0.31 (0.44)	C (E)	0.31 (0.44)	C (E)	0.31 (0.44)	C (E)
NBTR	0.02 (0.20)	D (D)	0.02 (0.22)	D (E)	0.28 (0.47)	C (E)	0.28 (0.48)	C (E)	0.28 (0.49)	C (E)
SBL	0.65 (0.84)	D (E)	0.70 (0.97)	E (F)	1.00 (0.98)	F (F)	1.00 (0.98)	F (F)	1.00 (1.01)	F (F)
SBTR	0.03 (0.07)	D (D)	0.03 (0.08)	D (D)	0.03 (0.03)	C (D)	0.03 (0.03)	C (D)	0.03 (0.03)	C (D)
Overall	**0.43 (0.69)**	**B (B)**	**0.46 (0.75)**	**B (C)**	**0.78 (0.96)**	**D (D)**	**0.79 (0.97)**	**D (D)**	**0.80 (1.00)**	**D (E)**
Kingston Road / Highway 401 WB Ramps										
EBTR	0.58 (0.95)	C (D)	0.70 (0.99)	C (D)	0.79 (0.98)	D (D)	0.80 (0.99)	D (D)	0.82 (1.03)	D (E)
WBL	0.79 (0.90)	C (E)	0.84 (0.89)	D (E)	0.96 (0.95)	E (F)	1.01 (0.98)	F (F)	1.09 (1.03)	F (F)
WBT	0.29 (0.37)	A (A)	0.32 (0.38)	A (A)	0.33 (0.39)	A (A)	0.33 (0.40)	B (A)	0.33 (0.40)	B (A)
NBL	0.77 (0.78)	D (D)	0.79 (0.93)	D (E)	0.80 (0.93)	D (E)	0.80 (0.95)	D (E)	0.82 (0.99)	D (F)
NBR	0.19 (0.17)	D (D)	0.19 (0.21)	D (D)	0.19 (0.21)	C (D)	0.19 (0.22)	C (D)	0.20 (0.23)	C (D)
Overall	**0.67 (0.90)**	**C (C)**	**0.75 (0.95)**	**C (D)**	**0.84 (0.96)**	**D (D)**	**0.85 (0.98)**	**D (D)**	**0.88 (1.02)**	**D (E)**
Kingston Road / Delta Boulevard										
EBL	0.41 (0.42)	A (A)	0.43 (0.49)	A (B)	0.59 (0.60)	D (D)	0.59 (0.60)	D (D)	0.59 (0.60)	D (D)
EBT	0.36 (0.69)	A (B)	0.40 (0.75)	A (B)	0.41 (0.75)	A (B)	0.42 (0.76)	A (B)	0.43 (0.79)	A (C)
EBR	0.01 (0.03)	A (A)	0.01 (0.03)	A (A)	0.01 (0.03)	A (A)	0.01 (0.03)	A (A)	0.01 (0.03)	A (A)
WBL	0.06 (0.31)	A (B)	0.06 (0.35)	A (B)	0.36 (0.47)	D (D)	0.36 (0.47)	D (D)	0.36 (0.47)	D (D)
WBT	0.51 (0.60)	A (B)	0.56 (0.66)	B (B)	0.64 (0.74)	B (C)	0.65 (0.75)	B (C)	0.67 (0.77)	B (C)
WBR	0.10 (0.07)	A (A)	0.10 (0.08)	A (B)	0.10 (0.08)	A (B)	0.10 (0.08)	A (B)	0.10 (0.08)	A (B)
NBL	0.44 (0.79)	D (E)	0.44 (0.79)	D (E)	0.44 (0.79)	D (E)	0.44 (0.79)	D (E)	0.44 (0.79)	D (E)
NBTR	0.01 (0.15)	D (D)	0.01 (0.14)	D (D)	0.01 (0.14)	D (D)	0.01 (0.14)	D (D)	0.01 (0.14)	D (D)
SBL	0.38 (0.47)	D (D)	0.39 (0.46)	D (D)	0.39 (0.46)	D (D)	0.39 (0.46)	D (D)	0.39 (0.46)	D (D)
SBTR	0.40 (0.13)	D (D)	0.47 (0.13)	D (D)	0.48 (0.13)	D (D)	0.48 (0.13)	D (D)	0.49 (0.13)	D (D)
Overall	**0.49 (0.70)**	**B (B)**	**0.54 (0.75)**	**B (C)**	**0.61 (0.75)**	**B (C)**	**0.62 (0.75)**	**B (C)**	**0.63 (0.77)**	**B (C)**

Continued on Next Page

Intersection / Traffic Movement	Existing		Future Background		Future Total (2029)		Future Total (2034)		Future Total (2039)	
	v/c	LOS	v/c	LOS	v/c	LOS	v/c	LOS	v/c	LOS
Whites Road / Kingston Road										
EBL	0.29 (0.64)	C (C)	0.25 (0.79)	B (D)	0.61 (0.84)	E (F)	0.61 (0.84)	E (F)	0.61 (0.84)	E (F)
EBT	0.29 (0.88)	C (D)	0.27 (1.06)	C (F)	0.45 (0.97)	D (D)	0.47 (1.00)	D (E)	0.48 (1.04)	D (D)
EBR	0.52 (0.56)	C (C)	0.41 (0.51)	C (D)	0.48 (0.39)	A (A)	0.48 (0.39)	A (A)	0.49 (0.41)	A (A)
WBL	0.76 (0.92)	D (E)	0.66 (0.89)	C (E)	0.94 (0.97)	F (F)	0.94 (0.97)	F (F)	0.94 (0.97)	F (F)
WBT	0.50 (0.56)	C (C)	0.43 (0.67)	C (D)	0.57 (0.78)	D (D)	0.58 (0.80)	D (D)	0.60 (0.83)	D (D)
WBR	0.37 (0.77)	C (D)	0.36 (0.74)	C (D)	0.26 (0.38)	A (A)	0.26 (0.38)	A (A)	0.26 (0.38)	A (A)
NBL	0.64 (0.80)	C (D)	0.77 (0.69)	D (C)	0.95 (1.01)	E (F)	0.97 (1.04)	E (F)	1.01 (1.10)	F (F)
NBT	0.24 (0.57)	C (C)	0.34 (0.64)	D (D)	0.31 (0.67)	D (D)	0.31 (0.69)	D (D)	0.33 (0.72)	D (D)
NBR	0.45 (0.92)	C (D)	0.52 (0.94)	D (E)	0.51 (0.94)	C (E)	0.52 (0.94)	C (E)	0.53 (0.95)	C (E)
SBL	0.38 (0.87)	C (E)	0.49 (0.70)	C (D)	0.45 (0.75)	C (D)	0.46 (0.76)	C (D)	0.47 (0.79)	C (D)
SBT	0.71 (0.45)	C (C)	1.00 (0.51)	E (D)	0.96 (0.56)	E (D)	0.99 (0.58)	E (D)	1.03 (0.60)	F (D)
SBR	0.09 (0.11)	C (C)	0.14 (0.15)	D (D)	0.11 (0.24)	D (D)	0.11 (0.24)	D (D)	0.11 (0.24)	D (D)
Overall	**0.63 (0.90)**	**C (D)**	**0.67 (0.96)**	**D (D)**	**0.83 (0.97)**	**D (D)**	**0.85 (0.98)**	**D (D)**	**0.87 (1.01)**	**D (D)**
Whites Road / Highway 401 EB Off-Ramp										
EBL	0.75 (0.88)	D (C)	0.74 (0.87)	D (C)	0.76 (0.93)	D (C)	0.76 (0.94)	D (C)	0.77 (0.98)	D (D)
EBR	0.42 (0.89)	C (D)	0.17 (0.52)	C (B)	0.18 (0.50)	C (B)	0.19 (0.50)	C (B)	0.22 (0.50)	C (B)
NBT	0.42 (0.86)	A (C)	0.43 (0.88)	A (D)	0.45 (0.89)	A (D)	0.46 (0.90)	A (D)	0.48 (0.93)	A (D)
SBT	0.29 (0.50)	A (C)	0.29 (0.52)	A (C)	0.30 (0.51)	B (C)	0.31 (0.52)	B (C)	0.32 (0.55)	B (C)
Overall	**0.52 (0.88)**	**B (C)**	**0.52 (0.88)**	**B (C)**	**0.55 (0.91)**	**B (C)**	**0.56 (0.93)**	**B (C)**	**0.58 (0.96)**	**B (C)**
Whites Road / Bayly Street										
WBL	0.51 (0.69)	D (D)	0.51 (0.69)	D (D)	0.51 (0.69)	D (D)	0.51 (0.69)	D (D)	0.51 (0.69)	D (D)
WBR	0.31 (0.64)	B (B)	0.32 (0.65)	B (B)	0.32 (0.64)	B (B)	0.32 (0.64)	B (B)	0.33 (0.65)	B (B)
NBT	0.74 (0.66)	D (D)	0.75 (0.68)	D (D)	0.75 (0.66)	D (D)	0.75 (0.67)	D (D)	0.76 (0.69)	D (D)
NBR	0.09 (0.17)	C (C)	0.10 (0.19)	C (C)	0.10 (0.17)	C (C)	0.10 (0.18)	C (C)	0.10 (0.20)	C (C)
SBL	0.48 (0.76)	C (C)	0.50 (0.77)	C (D)	0.50 (0.77)	C (C)	0.51 (0.77)	C (C)	0.54 (0.79)	C (D)
SBLT	0.47 (0.68)	C (C)	0.49 (0.71)	C (C)	0.49 (0.68)	B (C)	0.50 (0.69)	C (C)	0.52 (0.72)	C (C)
Overall	**0.57 (0.73)**	**C (C)**	**0.59 (0.75)**	**C (C)**	**0.59 (0.74)**	**C (C)**	**0.59 (0.74)**	**C (C)**	**0.61 (0.76)**	**C (C)**

Notes:
1. XX (XX) – Weekday Morning Peak Hour (Weekday Afternoon Peak Hour)

11.3.4 Unsignalized Intersection Analysis – Scenario 2

Traffic operations analysis results for the area unsignalized intersections are summarized in **Table 33**.

Table 33 Unsignalized Traffic Analysis Intersection Summary – Scenario 2

Intersection / Traffic Movement	Existing		Future Background		Future Total (2029)		Future Total (2034)		Future Total (2039)	
	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS
Kingston Road / Site Access Driveway										
WBL	0.0 (12.9)	A (B)	0.0 (14.2)	A (B)	Prohibited.					
NBLR	23.7 (36.7)	C (E)	29.2 (54.8)	D (F)	0.0 (0.0)	A (A)	0.0 (0.0)	A (A)	0.0 (0.0)	A (A)

Notes:

1. XX (XX) – Weekday Morning Peak Hour (Weekday Afternoon Peak Hour).

The unsignalized intersection of Kingston Road / Site Access Driveway operates acceptably during the existing traffic conditions, with individual traffic movements operating with a level of service (LOS) of LOS E during weekday peak hours.

Under future background traffic conditions, the traffic analysis herein indicates a modest increase in average delay. Additional delay of 18 seconds or less can be anticipated during the weekday morning and afternoon peak hours, respectively, relative to the existing condition. However, it is noted that northbound traffic is minimal during the peak hour (in the order of 10-20 turning vehicles).

Under future total traffic conditions, the existing access point abutting Kingston Road will be maintained as a right-in / right-out (RIRO) access with prohibited inbound and outbound left turns. For the purpose of the analysis, it is assumed that right turn manoeuvres out of the Site will occur at the signalized intersection of Kingston Road / Steeple Hill & Site Access Driveway to assess the 'worst case' scenario at the intersection given that Site trips are expected to be accommodated at the unsignalized Site access. Moreover, it is assumed that Site-related traffic travelling eastbound will exit the Site via the easternmost Site access.

Based on the foregoing, the Site driveway will operate acceptably with the redevelopment of the Site under Scenario 2 within the five-year study horizon.

12.0 MICROSIMULATION ANALYSIS

12.1 *Vissim* Model Development

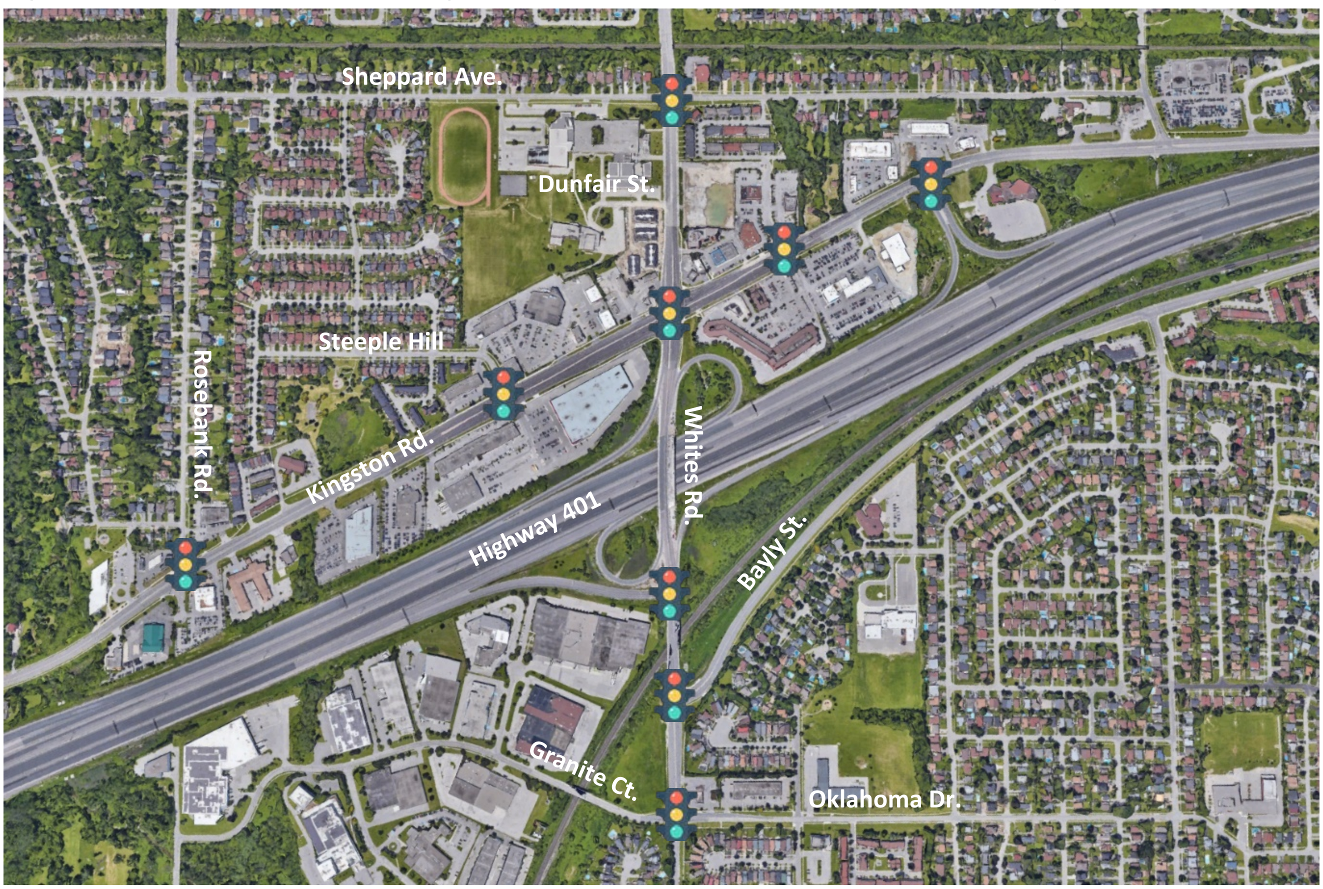
To best assess whether the proposed redevelopment of 603-643 & 645-699 Kingston Road, could be appropriately accommodated without undue impacts on the local transportation network, especially given future proposed changes including background traffic growth due to intensification along Kingston Road, as well as new transit facilities including the proposed Durham-Scarborough bus rapid transit (BRT) line, a *Vissim* modelling, and microsimulation analysis exercise has been conducted. This analysis focuses on the existing and future conditions along Kingston Road and Whites Road, and is detailed in the *603-643 & 645-699 Kingston Road Mixed-Use Development, Microsimulation Model Calibration and Analysis Report* (herein referred to as the "Microsimulation Model Calibration and Analysis Report") in **Appendix F**.

The model development details, specifically the extent of the model, the field data collected, and the coding standards applied are briefly summarized below and provided in detail in **Section 1 of the Microsimulation Model Calibration and Analysis Report in Appendix F**.

12.1.1 Extent of the *Vissim* Model and Study Area

The *Vissim* traffic microsimulation model includes the Kingston Road corridor from Rosebank Road to the Highway 401 ramps, and the Whites Road corridor from Sheppard Avenue to Oklahoma Drive/Granite Court, including the Highway 401 eastbound off-ramp. The area covered by the *Vissim* traffic microsimulation model is illustrated in **Figure 29**.

Figure 29: 603-643 & 645-699 Kingston Road *Vissim* Microsimulation Model Study Area



The *Vissim* microsimulation model utilizes static vehicle inputs and routing decisions to assign turning movement volumes associated with the existing conditions, future background, and future total analysis scenarios. The intersection turning movement volumes for the different scenarios are based on the existing counts and traffic assignment prepared as part of the Synchro analysis presented in **Section 9.2**, **Section 9.3**, and **Section 9.5**.

Finally, the future conditions *Vissim* traffic microsimulation model incorporates the Durham-Scarborough BRT corridor as proposed in the *Durham-Scarborough Bus Rapid Transit Study Initial Business Case Report* (dated spring 2019), including two stops proposed within the study area along Kingston Road, at Rosebank Road and Whites Road.

12.1.2 Data Collection and Information Gathering

In order to develop a representative model of traffic conditions on the surrounding area road network, several different pieces of information were gathered and incorporated into the Vissim microsimulation model including:

- Existing road alignment and intersection lane configurations determined primarily through Bing Maps aerial photographs, as well as Google Street View imagery of the study area;
- Future configuration of Kingston Road after the construction of the Durham-Scarborough BRT which was determined from the details provided in the Initial Business Case;
- Signal timing plans at all signalized intersections located within the study area provided by the Regional Municipality of Durham;
- Turning movement counts at all signalized and some unsignalized intersections through the study area which were obtained from field data collection exercises conducted during the weekday morning (AM) and afternoon (PM) peak periods; and
- Vehicle travel times along the Kingston Road corridor, the Whites Road corridor and along the Highway 401 eastbound off-ramp at Whites Road, obtained using the Google Maps Distance Matrix API.

Detailed turning movement count data summary sheets are provided in **Appendix C**, while signal timing plans are included in **Appendix D**.

12.2 Existing Conditions Model Calibration

The general objective of calibrating the Kingston Road and Whites Road *Vissim* traffic microsimulation model was, as is the case with every calibration exercise, to ensure that the model could sensibly replicate today's existing traffic conditions as a starting point, from which predictions and forecasts regarding future traffic operations on the area road network would be obtained.

The outcome of the calibration exercise was therefore a model of existing conditions which, when used in conjunction with travel demand forecasts derived by BA Group, could credibly produce private vehicle, transit, and pedestrian-related predictions regarding future multi-modal traffic operations throughout the study area.

The following provides a brief summary of the existing conditions model calibration process and is provided in greater detail in **Section 2 of the Microsimulation Model Calibration and Analysis Report in Appendix F**.

12.2.1 Model Calibration Process and Target Metrics

Data pertaining to two types of metrics describing existing traffic operations throughout the study area's transportation network were collected, summarized, and used to establish targets to be replicated by the calibrated *Vissim* model.

Simulation runs were conducted and outputs corresponding to each metric were extracted and compared to their target values. Model parameters were then adjusted, and simulation sets were re-run and performance metrics re-outputted and compared to their target values. This process was repeated iteratively until model outputs were determined to match existing network metrics. The existing conditions models were calibrated with intersection turning movement count data and vehicle travel time data.

Turning movement count data was collected via turning movement counts conducted at all signalized intersections and significant unsignalized intersections located throughout the study area. Vehicle travel time data was obtained with the Google Maps Distance Matrix API along the Kingston Road corridor, the Whites Road corridor, and the Highway 401 eastbound off-ramp at Whites Road.

The outputs (of 10 simulations) from the calibrated Kingston Road and Whites Road *Vissim* existing conditions model were summarized and compared with the collected turning movement count and vehicle travel time data and model calibration was evaluated with the Ministry of Transportation Ontario calibration criteria ("MTO calibration criteria").

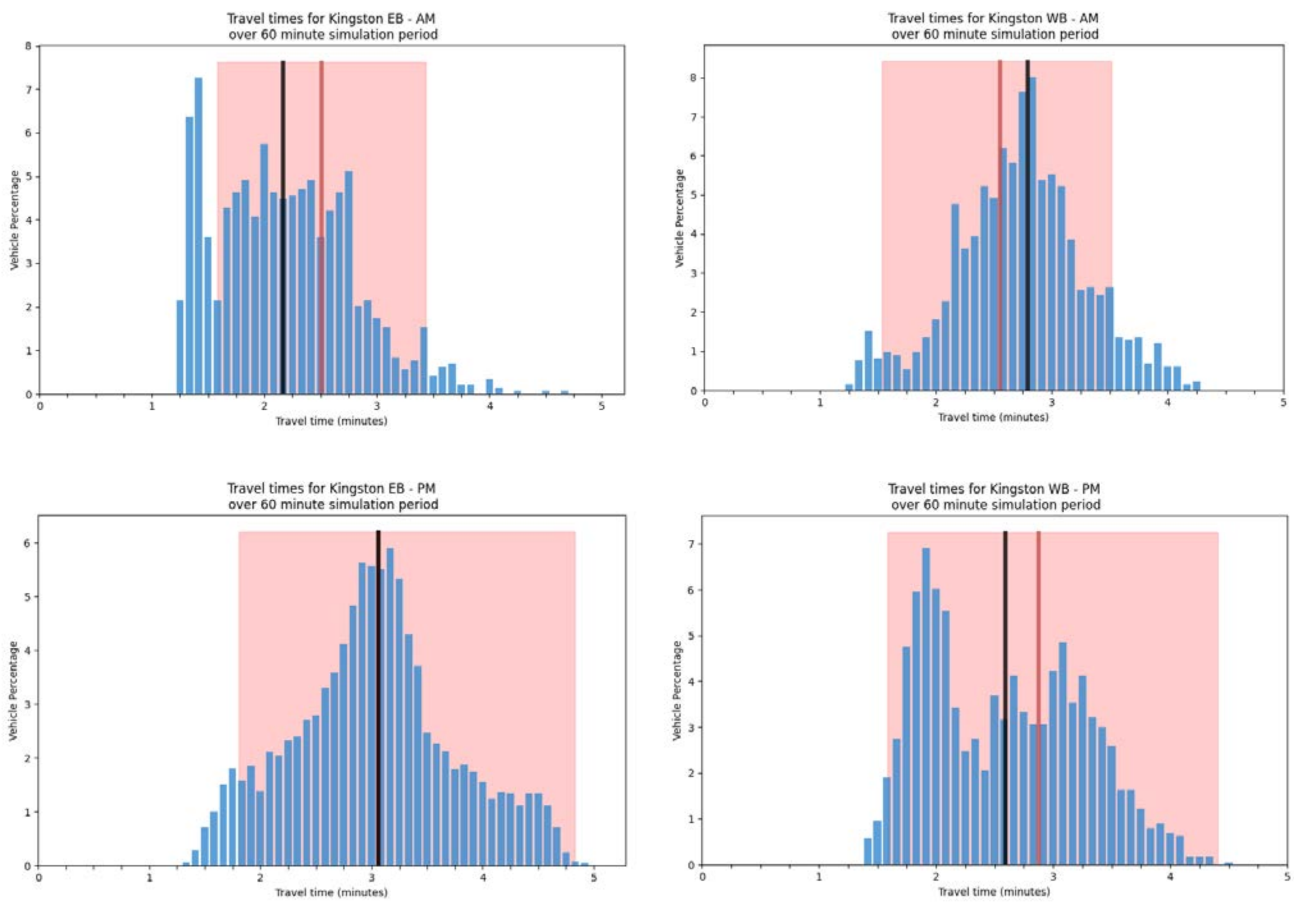
12.2.2 Model Calibration Results

Turning movement counts were conducted at all intersections throughout the study area, and outputs from the calibrated Kingston Road and Whites Road *Vissim* existing conditions model are detailed in **Section 2.3.1 of the Microsimulation Model Calibration and Analysis Report in Appendix F**. As illustrated in **Table 1 of the Microsimulation Model Calibration and Analysis Report in Appendix F**, all turning movements in the *Vissim* model accurately reflects data collected in the field, as demonstrated by the low (i.e. less than 3.0) GEH values corresponding to all individual turning movements throughout the study area.

Model simulation travel time outputs along the Kingston Road corridor, the Whites Road corridor, and the Highway 401 eastbound off-ramp at Whites Road, were compared to data extracted from the Google Maps Distance Matrix API. As detailed in **Section 2.3.2 of the Microsimulation Model Calibration and Analysis Report in Appendix F**. As illustrated in **Table 2** and **Figure 3** through **Figure 8 of the Microsimulation Model Calibration and Analysis Report in Appendix F**, vehicle travel times output from the *Vissim* model accurately reflect the travel time data collected with the Google Maps Distance Matrix API, as demonstrated by the low (i.e. less than 15%) percent differences between the *Vissim* model and target average vehicle travel times, and by the *Vissim* model vehicle travel time ranges falling within or closely reflecting those of the target vehicle travel time ranges.

Figure 30 provides travel time calibration plots for Kingston Road. Whites Road and the Highway 401 eastbound off-ramp travel time calibration plots are also provided in **Section 2.3.2 of the Microsimulation Model Calibration and Analysis Report in Appendix F**.

Figure 30: Kingston Road Eastbound and Westbound - Existing Model Calibration Travel Times (AM/PM)



In addition to the discussion provided in **Section 2.3.1 and Section 2.3.2 of the Microsimulation Model Calibration and Analysis Report in Appendix F**, calibration of the existing conditions *Vissim* model was also evaluated with the MTO calibration criteria. The weekday morning (AM) and afternoon (PM) existing conditions peak hour models meet the volume focused evaluation criteria thresholds, specifically those related to the model demand input, corridor screenline volumes, and turning movement volumes as illustrated in **Table 3, Table 4, and Table 5 of the Microsimulation Model Calibration and Analysis Report in Appendix F** respectively. The weekday morning (AM) and afternoon (PM) existing conditions peak hour models also meet the model travel time evaluation criteria thresholds as illustrated in **Table 6 of the Microsimulation Model Calibration and Analysis Report in Appendix F**.

The calibration results and evaluation provided in **Section 2 of the Microsimulation Model Calibration and Analysis Report in Appendix F**, demonstrate that the *Vissim* simulation model of existing conditions is well calibrated and accurately reflects current traffic operations throughout the study area during the weekday morning (AM) and weekday afternoon (PM) peak hours. Therefore, the model is considered to be a suitable tool for evaluating the impact of different projected future traffic scenarios on the road network surrounding the 603-643 & 645-699 Kingston Road redevelopment.

12.3 Future Conditions Model Analysis

The calibrated *Vissim* microsimulation model was used to analyze and quantify the projected impacts of the 603-643 & 645-699 Kingston Road redevelopment on both the weekday morning (AM) and weekday afternoon (PM) peak hours.

Vissim microsimulation models were developed for both future background and future total scenarios. The future background model represents future conditions (i.e. accounting for future growth and local background developments) without the 603-643 & 645-699 Kingston Road redevelopment while the future total represents the future conditions with the 603-643 & 645-699 Kingston Road redevelopment. The future background and future total *Vissim* models represent a 2039 horizon year and traffic volumes are consistent with those provided in **Section 9.3** and **Section 9.5**.

As detailed in **Section 4.1.3**, network improvements have been proposed to accommodate future traffic conditions and operations associated with the Durham-Scarborough BRT (illustrated as modeled in **Figure 31**). Proposed network improvements include signal timing modifications along Kingston Road and Whites Road in both the future background and future total scenario models and an additional turn lane at the Highway 401 eastbound off-ramp and Whites Road intersection resulting in an eastbound approach lane configuration of 2 dedicated left-turn lanes and 2 dedicated right-turn lanes in only the future total scenario model.

The projected impact of the 603-643 & 645-699 Kingston Road redevelopment were primarily assessed through this modelling exercise with vehicle travel times along study area road segments, and vehicle queuing and delays at key study area intersections to ensure that the traffic impacts associated with the site redevelopment can be accommodated by the road network. The following provides a brief summary of the future conditions model analysis results and is provided in greater detail in **Section 3 of the Microsimulation Model Calibration and Analysis Report in Appendix F**.

Figure 31: Durham-Scarborough BRT at Kingston Road and Whites Road

12.3.1 Travel Time Analysis Results

Travel time analysis is provided through a comparison of existing conditions corridor travel times, and projected future background and future total corridor travel times. Future background and future total scenario travel time outputs are provided in **Table 7 of the Microsimulation Model Calibration and Analysis Report in Appendix F**.

EXISTING AND FUTURE BACKGROUND COMPARISONS

Comparisons between the existing and future background *Vissim* model scenarios, demonstrate that average travel times are projected to increase along Kingston Road in both the eastbound and westbound directions in the order of 6 to 37 seconds during the morning (AM) peak hour and 21 to 26 seconds during the afternoon (PM) peak hour.

Average travel times along Whites Road are projected to vary for both the northbound and southbound directions with a decrease in the order of 8 to 20 seconds during the morning (AM) peak hour and an increase in the order of 2 to 25 seconds during the afternoon (PM) peak hour.

Travel time increases on Kingston Road and Whites Road are the result of the future operations associated with background traffic growth and the implementation of the future Durham-Scarborough BRT line.

Finally, when comparing existing and future background travel times along the Highway 401 eastbound off-ramp, an increase in travel times is observed only during the morning (AM) peak hour of approximately 30 seconds, due to proposed signal timing adjustments to accommodate traffic increases at the intersection.

FUTURE BACKGROUND AND FUTURE TOTAL COMPARISONS

When comparing the future background and future total *Vissim* model scenarios, average travel times are projected to increase along Kingston Road in both the eastbound and westbound directions in the order of 11 to 43 seconds during the morning (AM) peak hour and 14 to 15 seconds during the afternoon (PM) peak hour.

Average travel times are also projected to increase along Whites Road in both the northbound and southbound directions in the order of 23 to 43 seconds during the morning (AM) peak hour and 14 to 19 seconds during the afternoon (PM) peak hour.

Travel time increases on Kingston Road and Whites Road in the future total scenario are due to the additional site traffic along these corridors. These travel time increases are less than 45 seconds for all segments when comparing to the existing conditions, with the exception of the eastbound direction on Kingston Rd during the morning (AM) peak hour, due to an increase in both background and site traffic travelling towards the Highway 401 westbound on-ramp at Kingston Road.

Finally, a comparison of the future background and future total travel times along the Highway 401 eastbound off-ramp illustrate a projected increase of 22 seconds during the weekday morning (AM) peak hour and a decrease of 15 seconds during the weekday afternoon (PM) peak hour, despite volumes increasing by 125 vehicles in the weekday morning (AM) peak hour and by 220 vehicles in the weekday afternoon (PM) peak hour, as a result of the proposed additional eastbound right-turn lane and signal timing adjustments at the intersection.

Overall, the future total model analysis results provided, including the travel time comparison plots, demonstrate that corridor travel times throughout the study area are not projected to increase significantly. Specifically, travel time increases are all less than 45 seconds across the study area road segments and therefore, the projected vehicle travel time impacts of the proposed 603-643 & 645-699 Kingston Road redevelopment can be appropriately accommodated by the future road network. **Figure 32** and **Figure 33** provide travel time comparison plots for Kingston Road. Whites Road and the Highway 401 eastbound off-ramp travel time comparison plots are also provided in **Section 3.2.1 of the Microsimulation Model Calibration and Analysis Report in Appendix F**.

Figure 32: Kingston Road Eastbound - Travel Time Comparison Plots (AM and PM)

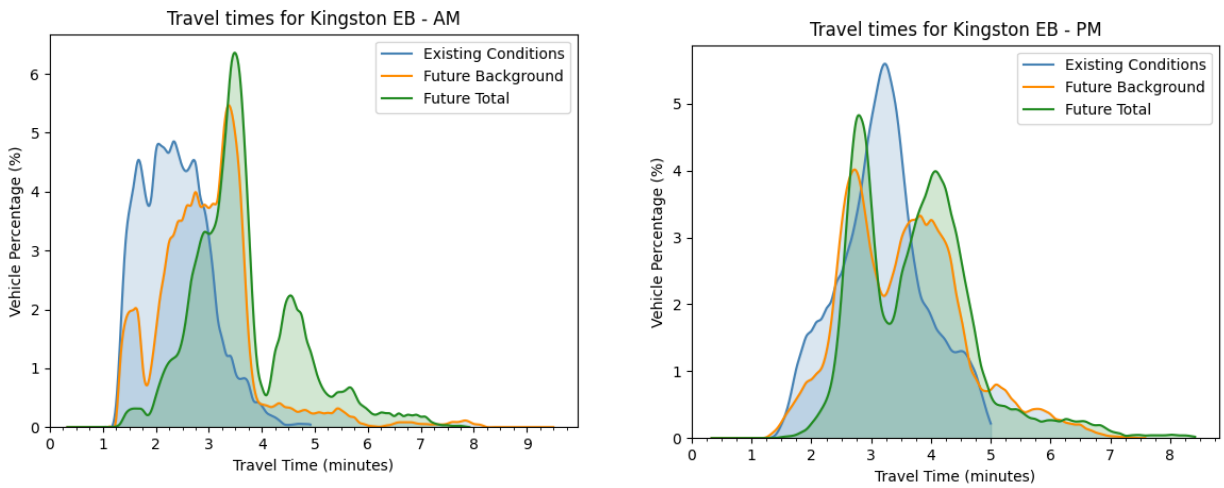
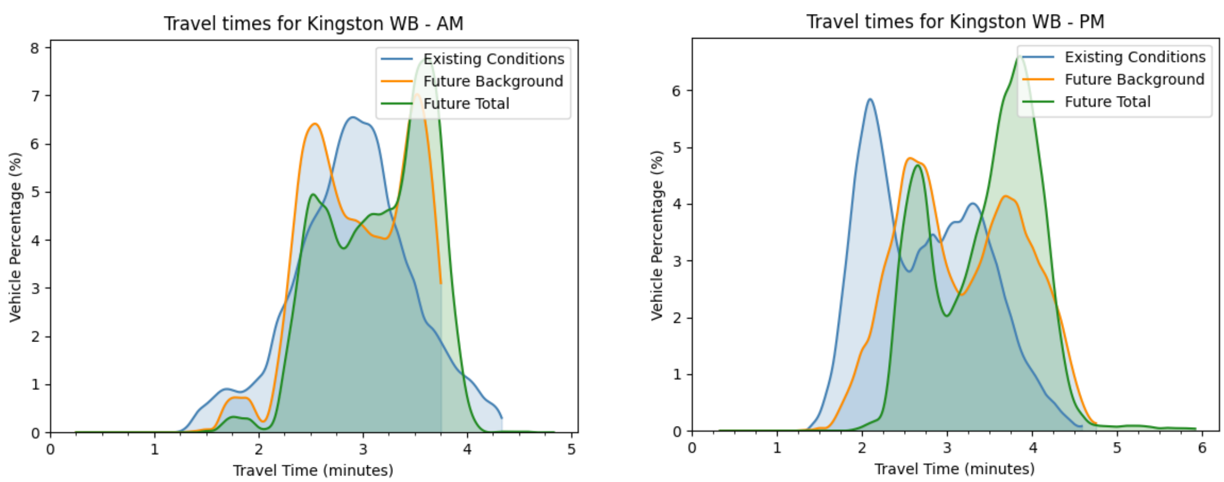


Figure 33: Kingston Road Westbound - Travel Time Comparison Plots (AM and PM)



12.3.2 Queuing Analysis Results

Queueing analysis is provided through a comparison of existing conditions intersection vehicle queueing, and projected future background and future total intersection vehicle queueing. Existing, future background and future total scenario vehicle queue outputs and their associated storage areas are provided in **Table 8 of the Microsimulation Model Calibration and Analysis Report in Appendix F**.

EXISTING AND FUTURE BACKGROUND COMPARISONS

Most notable queueing increases between the existing and future background scenarios occur during the afternoon (PM) peak hours along the Kingston corridor in the eastbound direction for the following movements:

- EBT/EBR at Kingston Road and Steeple Hill/East Site Access of approximately 67 metres.
- EBL at Kingston Road and Whites Road of approximately 53 metres.
- EBT at Kingston Road and Whites Road of approximately 88 metres.
- NBR at Kingston Road and Whites Road of approximately 43 metres.
- EBT/EBR at Kingston Road and Highway 401 Ramps of approximately 86 metres.

Projected vehicle queuing increases in the future background scenario are due to the reduction in eastbound and westbound vehicle capacity along Kingston Road associated with the implementation of the future Durham-Scarborough BRT line. Although vehicle queues are projected to increase, the projected queues are contained within available storage areas and are not expected to cause intersection spillbacks and/or congestion.

FUTURE BACKGROUND AND FUTURE TOTAL COMPARISONS

Between the future background and future total scenarios, queueing is expected to increase in response to the addition of the proposed site traffic.

During the weekday morning (AM) peak hour, vehicle queuing increases are observed at the following intersection turning movements:

- WBL at Kingston Road and Steeple Hill/East Site Access of approximately 36 metres.
- EBT at Kingston Road and Whites Road of approximately 40 metres.
- EBR at Kingston Road and Whites Road of approximately 57 meters.
- SBT at Kingston Road and Whites Road of approximately 79 metres.

The intersection turning movements where morning (AM) peak hour vehicle queuing increases are observed align with turning movements where volumes have increased due to the addition of proposed site traffic to the network. The resulting morning (AM) peak hour queues remain contained within available storage areas and continue to not be expected to cause intersection queue spillbacks and/or congestion.

During the weekday afternoon (PM) peak hour, vehicle queuing increases are observed at the following intersection turning movements:

- WBL at Kingston Road and Steeple Hill/East Site Access of approximately 48 metres.
- EBL at Kingston Road and Whites Road of approximately 66 metres.
- EBT at Kingston Road and Whites Road of approximately 80 metres.
- NBL at Kingston Road and Whites Road of approximately 50 metres.
- NBL at Kingston Road and Highway 401 Westbound off-ramp of approximately 56 metres.
- NBR at Kingston Road and Highway 401 Westbound off-ramp of approximately 56 metres.

The intersection turning movements where afternoon (PM) peak hour vehicle queuing increases are observed once again align with turning movements where volumes have increased due to the addition of proposed site traffic to the network. The resulting afternoon (PM) peak hour queues remain contained within available storage areas and continue to not be expected to cause intersection queue spillbacks and/or congestion.

Overall, the future conditions model analysis results provided, demonstrate that projected future vehicle queues are not expected to increase significantly and can be accommodated within available storage areas. Therefore, the projected vehicle queuing impacts of the proposed 603-643 & 645-699 Kingston Road redevelopment can be appropriately accommodated by the future road network.

12.3.3 Intersection Turn Delay Results

Average vehicle delay is provided through a comparison of existing conditions vehicle delay, and projected future background and future total vehicle delay. Existing, future background and future total scenario average vehicle turn delay outputs are provided in **Table 9 of the Microsimulation Model Calibration and Analysis Report in Appendix F**.

EXISTING AND FUTURE BACKGROUND COMPARISONS

Average vehicle delay increases between the existing and future background scenarios are observed along Kingston Road due to the reduction in eastbound and westbound vehicle capacity along Kingston Road associated with the implementation of the future Durham-Scarborough BRT line.

Average vehicle delay increases are projected for the following intersection turning movements during the weekday morning (AM):

- EBL at Kingston Road and Steeple Hill/East Site Access of approximately 39 seconds.
- WBL at Kingston Road and Steeple Hill/East Site Access of approximately 69 seconds.
- EBL at Kingston Road and Whites Road of approximately 33 seconds.
- EBT at Kingston Road and Whites Road of approximately 33 seconds.

Average vehicle delay increases are projected for the following intersection turning movements during the weekday afternoon (PM):

- EBL at Kingston Road and Steeple Hill/East Site Access of approximately 26 seconds.
- EBT/EBR at Kingston Road and Steeple Hill/East Site Access of approximately 18 seconds.
- EBL at Kingston Road and Whites Road of approximately 23 seconds.

FUTURE BACKGROUND AND FUTURE TOTAL COMPARISONS

Average vehicle delays are projected to increase for a few intersections turning movements due to the addition of proposed site traffic to the network in both the weekday morning (AM) and afternoon (PM) peak hours.

Average vehicle delay increases are projected for the following intersection turning movements during the weekday morning (AM):

- EBT at Kingston Road and Whites Road of approximately 22 seconds.
- EBR at Kingston Road and Whites Road of approximately 18 seconds.
- SBT at Kingston Road and Whites Road of approximately 22 seconds.
- SBR at Kingston Road and Whites Road of approximately 20 seconds.

Average vehicle delay increases are projected for the following intersection turning movements during the weekday afternoon (PM):

- NBL at Kingston Road and Highway 401 Westbound off-ramp of approximately 46 seconds.

The future conditions model analysis results provided, demonstrate that projected future average vehicle delays are not expected to increase significantly with increases typically less than 25 seconds. Where average vehicle delays are observed exceeding 25 seconds, these are due to signal timing adjustments required to accommodate traffic volume increases at intersections and are not expected to have significant impacts on intersection performance. Overall, the projected vehicle delay impacts of the proposed 603-643 & 645-699 Kingston Road redevelopment can be appropriately accommodated by the future road network.

12.3.4 Vehicle Average Travel Speed Plots

Network vehicle average travel speed plots, a valuable set of traffic operation metrics that aggregates the previously discussed detailed attributes (i.e. vehicle travel times, queuing, delays, etc.) into all-encompassing values provide an overall snapshot of study area traffic conditions. Existing conditions, future background and future total scenario vehicle average travel speed plots are included in **Figure 34** and **Figure 35** for both the weekday morning (AM) and afternoon (PM) peak hours, respectively.

As expected, there exists vehicle average travel speed reductions observed along Kingston Road in the future background and future total scenarios resulting from the reduction in eastbound and westbound vehicle capacity along Kingston Road associated with the implementation of the future Durham-Scarborough BRT line. Furthermore, a comparison between future background and future total vehicle average travel speed plots illustrates the negligible impacts on overall network performance associated with the addition of the proposed site traffic.

Figure 34: Vehicle Average Travel Speed Plots (AM)

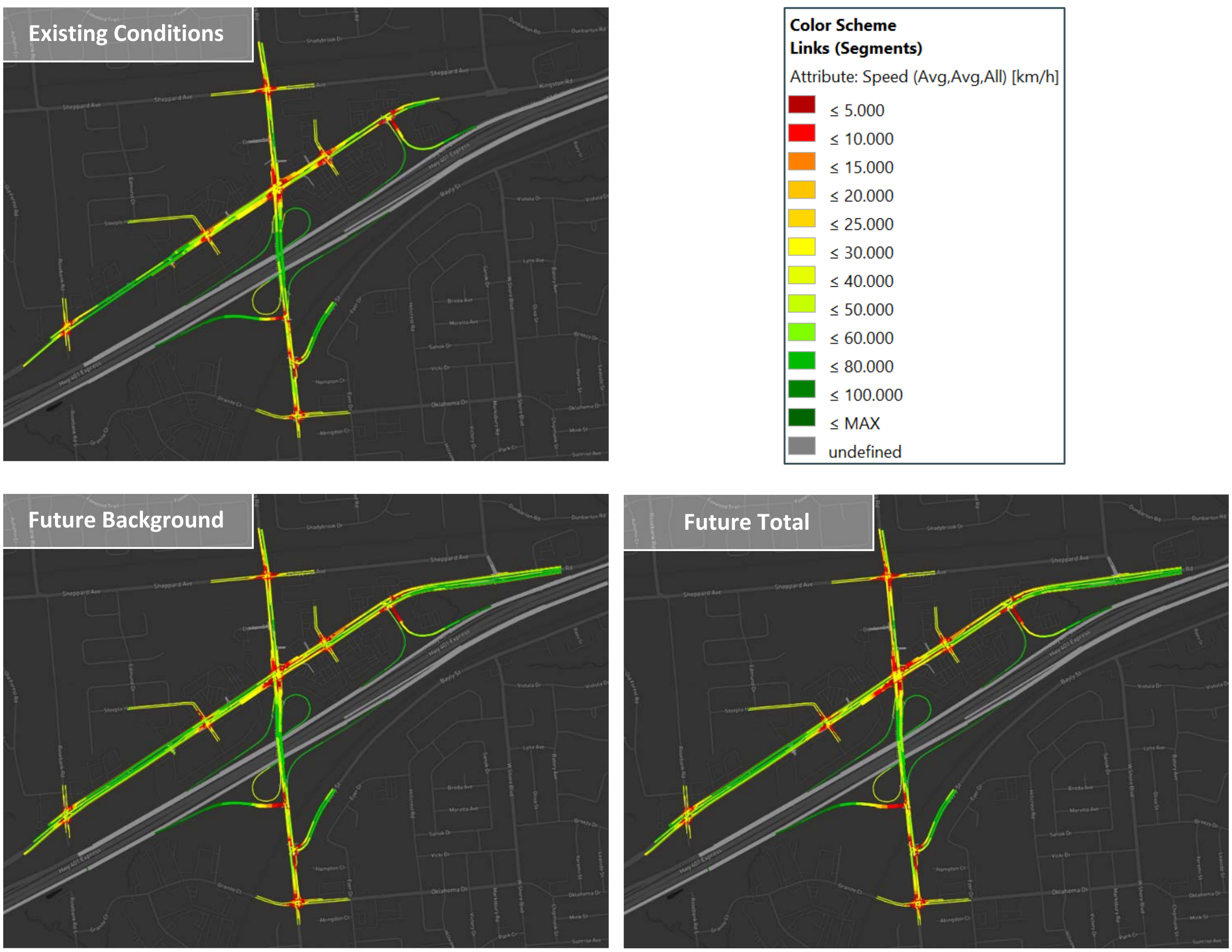
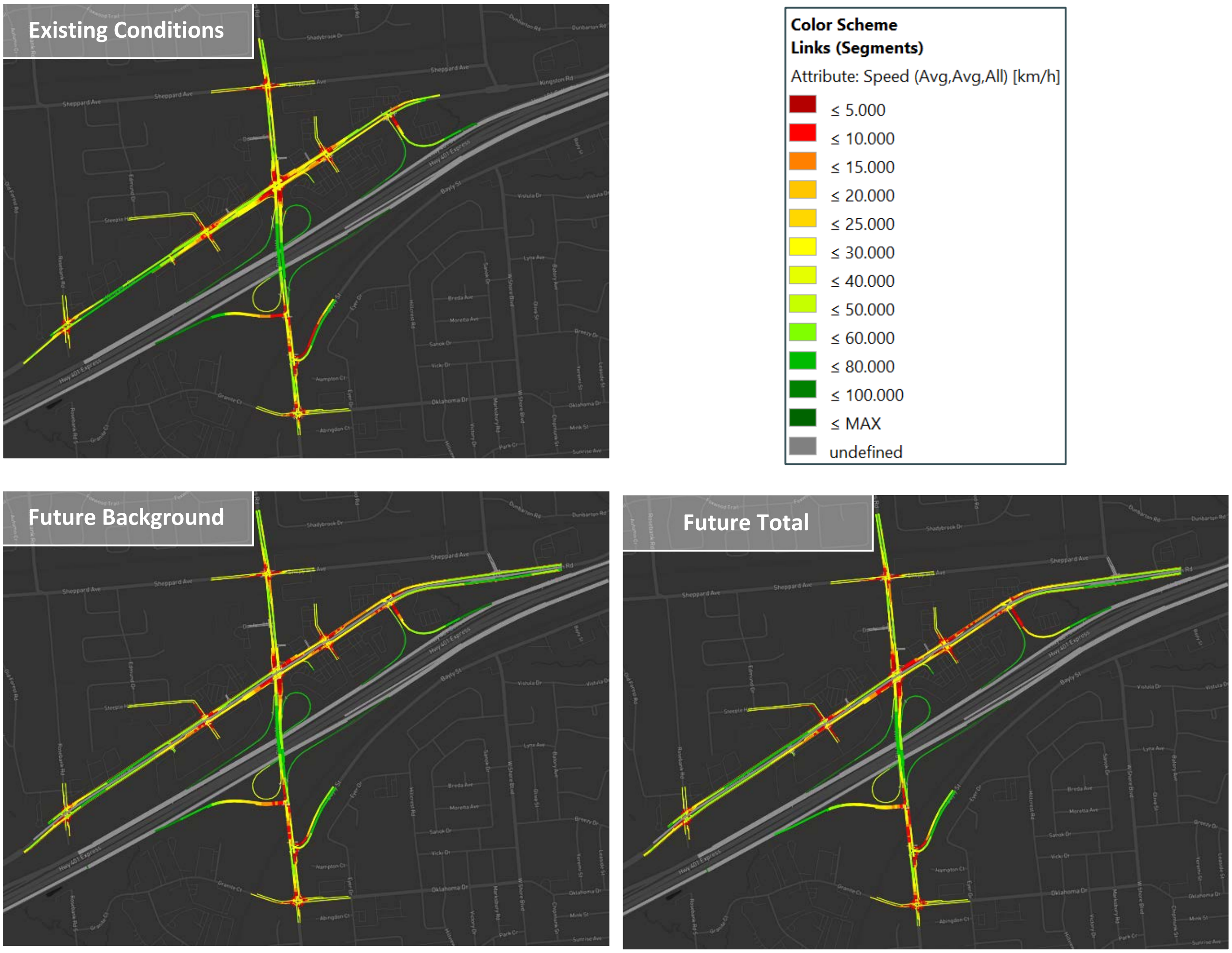


Figure 35: Vehicle Average Speed Plots (PM)



12.4 *Vissim* Conclusions and Recommendations

A *Vissim* microsimulation traffic model was developed, calibrated, and utilized to assess whether the area road network could appropriately accommodate the transportation-related impacts of background growth and local study area background developments, the proposed redevelopment, network improvements (i.e. signal timing adjustments along Kingston Road and Whites Road and an additional turn lane at the Highway 401 eastbound off-ramp and Whites Road intersection) and the planned Durham-Scarborough BRT line.

Overall, the *Vissim* microsimulation model analysis results demonstrate that study area travel times, intersection vehicle queueing, and turn delays are not projected to increase significantly along Kingston Road, Whites Road, the Highway 401 eastbound off-ramp, and the Highway 401 westbound on/off-ramp during the weekday morning (AM) and afternoon (PM) peak hours due to the proposed redevelopment, and that the projected impacts of the proposed 603-643 & 645-699 Kingston Road redevelopment can be appropriately accommodated by the future road network.

13.0 SUMMARY AND CONCLUSIONS

BA Group is retained by Director Industrial Holdings Limited to provide transportation consulting services related to the mixed-use development (the "Project") located at 603-643 & 645-699 Kingston Road in the City of Pickering (the "Site").

The current development concept, as represented in the conceptual site plan drawings and development statistics prepared by Graziani + Corazza Architects, dated October 24, 2023, enclosed with this submission, is preliminary in nature and is subject to change.

The current development concept, which represents a high-level master plan for a new mixed-use community, is primarily intended to form the basis of the proposed Draft Official Plan Amendment, which is required to facilitate the proposed density and Floor Space Index on the subject lands, as well as the proposed Draft Zoning By-law Amendment which is required to establish a new site-specific zoning framework that will implement the City's current land use vision for the subject lands.

This proposed Official Plan and Zoning By-law Amendment framework is intended to provide flexibility in order to ensure that the development of the lands responds to market conditions and can result in the implementation of plans and alternative plans to achieve intensification based on good planning and urban design principles.

As such, it is anticipated that the development concept as presented in this report be considered conceptual and will be revised, as necessary, to account for new and/or evolving considerations related to the master-planned community.

Proposed Development

1. The proposed development includes six high-rise towers, two mid-rise towers, and four townhouse blocks. A total of 3,460 residential units are proposed.

2. Three of the high-rise buildings contain approximately 2,474 square metres of retail uses, primarily at-grade along Kingston Road. Podium 3 of one of the high-rise buildings contains approximately 3,475 square metres of office uses.

3. Approximately 3,093 square metres of parkland is proposed within three parks provided between the buildings on-site.

4. The Site will be served by two vehicular access points and an internal road network. The new road network can function either as a private or public road and will be determined in a future submission.

5. Note that the current development plan contemplates an overall of 3,460 residential units. Based on the traffic analysis operations conducted as part of this study, a total of 2,884 residential units can be accommodated on the area road network. As such, a future expansion up to 3,460 residential units will be contemplated as part of a future review, subject to additional improvements and mitigation measures.

6. For the purposes of this study, the site has been designed to accommodate the overall development of 3,460 residential units, but the traffic analysis has been completed based on 2,884 residential units.

Planning Context

7. There are a number of local, regional, and provincial policy documents that support and encourage transportation demand management (TDM) strategies to be incorporated into new developments and reduced minimum parking standards, especially for developments in areas well served by transit services.

8. The Metrolinx 2041 Regional Transportation Plan includes plans for the Durham-Scarborough Bus Rapid Transit (BRT), which will provide reliable transit services adjacent to the Site. The initial design of the BRT has been established in the Durham-Scarborough Bus Rapid Transit Study. The recommended initial BRT design has been incorporated in a sensitivity analysis as part of the report's traffic review.

9. The City of Pickering's Kingston Road Corridor and Speciality Retail Node Intensification Study (the "intensification study") recommends intensification scenarios along the Kingston Road corridor. The intensification study sets the framework for development in the area surrounding the Site, and will create greater densities in the area, which will be discussed later with regards to the potential Whites Road GO Transit station.

Transportation Context

10. The Site is well located relative to the significant roadway connections provided across the City and the wider Durham Region, with access to a nearby expressway.

11. The Site is located in close proximity (approximately 300 metres) to four bus routes, including the Durham Region Transit Pulse services that is a bus rapid transit (BRT) service. Some of these bus routes connect the Site to Pickering GO Station, providing the Site with access to provincial transit services as well.

12. A number of planned transit improvements will enhance the transit reach and quality of service afforded to the Site, including the future Durham-Scarborough BRT and Metrolinx's Regional Express Rail (RER).

13. The key benefits of the BRT for the Site and surrounding area are; it provides transit service to multiple key destinations, the frequency of the BRT will reduce departure time dependency, and the BRT will maintain relatively constant travel speeds and reliable travel times even during times of congestion.

14. The RER, in combination with the BRT, will improve the transit reach of the Site and surrounding area, as well as reduce departure time dependency when traveling to key destinations.

15. While Metrolinx's 2016 initial business case concluded that a new GO Transit station should not be constructed at Whites Road, a review of the potential density for the area based on the City of Pickering's intensification study and proposed site plan concluded that the forecast densities for the area would satisfy the Metrolinx Mobility Hub Guidelines' density target of 50 – 200 P+J/ha for areas served by Regional Rail. Therefore, the potential Whites Road station should be reconsidered, which would provide enhanced regional service for the Site and complement the BRT.

16. The area surrounding the Site is largely vehicle-oriented in design with its large surface parking lots, wide streets, limited pedestrian crossing opportunities, and discontinuous / lack of sidewalks.

17. The intensification study proposed new pedestrian crossing opportunities and connections. The study also plans new retail and secondary frontages along Kingston Road to animate the public realm and pedestrian interactions in the area.

18. Additionally, the site plan provides new pedestrian facilities along the internal road network that connect the wider pedestrian network and surrounding uses to the new uses on-site. The removal of surface parking and provision of at-grade retail uses along Kingston Road provide an opportunity to animate the public realm.

19. The existing cycling network in the vicinity of the Site includes portions of the Kingston Road bike lane, and cycling infrastructure along Granite Court and Rosebank Road. A number of planned improvements will foster enhance the cycling network, including a continuous bike lane along Kingston Road, and cycling infrastructure along Whites Road and Rougemount Drive.

Mobility Choice Travel Plan

20. A mobility choice travel plan is pursued to advance Transportation Demand Management (TDM), to the extent possible, within the context of the proposed redevelopment.

21. A number of TDM strategies and measures are proposed as part of the plan, their primary objectives are as follows:

    Providing Mobility Choice:

    - Major Transit Infrastructure Investments and Transit Strategy
    - Bicycle Infrastructure and Amenities
    - Pedestrian Facilities

    Transportation Demand Management:

    - Automobile Use Management
    - Land Use and Building Infrastructure
    - Coordination, Communication and Promotion

22. The TDM measures proposed as part of the Project include the consideration of providing a transit shuttle, bicycle parking, shower and change facilities, new pedestrian connections on-site, a mix of uses on-site, and raising awareness of the travel options available to new residents and employees.

Vehicular Parking Considerations

23. The application of the site-specific by-laws, By-law No. 1810-84 and By-law No. 2471-87. By-law No. 1810-84 to the development programme results in a requirement of 6,278 parking spaces, including 6,055 residential parking spaces and 223 non-residential parking spaces.

24. The application of the City's City Centre zoning by-law, By-law 7553-17, to the development proposal results in a requirement of 3,374 parking spaces, including 2,768 residential parking spaces and 606 non-residential parking spaces. For an effective residential parking supply ratio of 0.85 spaces per unit.

25. It is proposed to provide parking at the following supply ratios:

    - Residential: 0.65 parking spaces per unit
    - Residential Visitors: 0.15 parking spaces per unit
    - Office: no designated office parking will be provided, it will share the visitor parking
    - Retail: no designated retail parking will be provided for retail space less than 1,000 m^2 GFA per building, it will share the visitor parking

    The resulting recommended supply is 2,768 parking spaces, including 2,249 residential parking spaces and 519 non-resident parking spaces.

26. The recommended parking requirements is considered appropriate based on provincial and local policy, the Site's transportation context, area parking sales data, recently approved parking rates, a review of other municipalities zoning by-law parking requirements, and elements of the Project.

27. Currently a total of 2,768 parking spaces in below-grade and podium parking are proposed to support the Project. Further details of the proposed development's parking supply and location will be provided in subsequent applications to the City through the approval process.

Bicycle Parking Considerations

28. The site-specific by-laws that apply to the Site, or the underlying Zoning By-law 3036, do not contain bicycle parking provisions.

29. It is recommended to apply the bicycle parking provisions of the City Centre zoning by-law.

30. The application of the City's City Centre zoning by-law, By-law 7553-17, to the development proposal results in a requirement of 1,740 parking spaces, including 1,730 residential parking spaces and 10 non-residential parking spaces.

31. Further details of the proposed development's bicycle parking supply and location will be provided in subsequent applications to the City through the approval process.

Loading Considerations

32. The current site-specific by-laws and underlying by-law do not contain minimum loading requirements. The City Centre Zoning By-law 7553-17 does not contain minimum loading requirements either.

33. The loading provisions on-Site will be reviewed in detail as part of subsequent submissions to the City through the on-going approval process.

34. In order to determine the number of loading spaces that could adequately support the proposed development, the loading requirements of the City of Toronto Zoning By-law 569-2013 were applied to the Site. The minimum loading requirement of 14 loading spaces utilizes shared loading provisions and shared loading facilities that can serve more than one tower.

Multi-Modal Travel Demand Forecasting

35. BA Group has established travel demand forecasts for auto-based and non-auto-based trips for the Site.

36. Travel demand forecasts for residential-related person trips have been developed from a "first principles" approach using person trip making characteristics. Based on the unit occupancy, non-auto residential travel demand (i.e. transit, walking, and cycling trips) is forecast to be in the order of 150 and 130 two-way trips in the weekday morning and afternoon peak hours respectively.

37. Based on existing 2016 TTS information, it is anticipated that the office trips will primarily be generated by automobile and will have very minimal non-automobile trips. As such, no trips were developed for the non-auto mode shares (i.e. transit, walking and cycling) for the purposes of this assessment. It is anticipated that the office use will generate in the order of 70 and 55 two-way vehicle trips in the morning and afternoon peak hours, respectively.

38. Understanding the nature of proposed retail uses and the expected travel characteristics associated with retail-related person trips, the analysis herein assumes that the projected retail trips during the weekday morning and afternoon peak hours will be pass-by trips from vehicles already travelling on the area road network. It is anticipated that the retail use will generate in the order of 50 and 70 two-way vehicle trips in the morning and afternoon peak hours, respectively.

39. In summary, 1,205 and 1,310 two-way person trips are forecasted for the proposed development during the weekday morning and afternoon peak hours, respectively.

40. A total of 880 two-way vehicles trips are anticipated during the weekday morning peak hour, and 1,000 two-way vehicle trips are anticipated during the weekday afternoon peak hour.

Vehicle Travel Demands

41. The existing Site currently generates approximately 80 and 295 trips at the existing Site driveway during the weekday morning and afternoon peak hours, respectively.

42. Background developments to the 2024 (5-year) planning horizon identified in the Site area (i.e. other developments that will be completed and occupied by 2024) comprise approximately 82 residential units, 194 sq. m. of car-wash facility GFA, 211 sq. m. of convenience store GFA, and 112 sq. m. of fast-food restaurant GFA. In addition, as a conservative measure, a 1% per annum traffic growth rate was assumed along the Kingston Road and Whites Road corridor during the weekday morning peak hour, as part of the traffic operations analysis prepared herein.

43. The net new Site vehicular trips generated by the proposed development are in the order of 805 and 570 two-way vehicle trips during the weekday morning and afternoon peak hours, respectively.

Traffic Operations Review

44. Traffic operations analyses were undertaken during the weekday morning and afternoon street peak hours under the following traffic conditions:

    - Existing traffic conditions – traffic activity level under current conditions;
    - Future background traffic conditions – Anticipated traffic volumes within the planning horizon which include allowances for corridor growth and background developments; and
    - Future total traffic conditions – Forecast traffic volumes on the area street network, including net new Site-related traffic demands.

    Traffic projections for future scenarios have been prepared for a 2024, 2029 and 2034 horizon years consistent with MTO reporting requirements.

45. Under existing traffic conditions, all signalized intersections in the study area operate at a busy, but acceptable level of service with overall v/c ratios of 0.74 or better in the weekday morning and 0.87 or better in the weekday afternoon peak hours.

46. Under future background traffic conditions, all signalized intersections in the study area continue to operate at a busy, but acceptable level of service with overall v/c ratios of 0.78 or better in the weekday morning and 0.89 or better in the weekday afternoon peak hours.

47. Under future total traffic conditions, all signalized intersections in the study area continue to operate at a busy, but acceptable level of service with overall v/c ratios of 0.83 or better in the weekday morning and 0.90 or better in the weekday afternoon peak hours.

48. BA Group recommends a dual left and dual right turning lane at the Whites Road / Highway 401 WB Off-Ramp signalized intersection in order to provide additional capacity to the eastbound approach.

49. Under existing, future background and future total traffic conditions, unsignalized intersections and site driveway access in the study area operate acceptably, with turning movement level of service generally in the LOS A to LOS B range during the weekday morning and afternoon peak hours.

50. A future BRT will impact traffic operations and travel characteristics in the immediate study area. As such, a preliminary traffic operations analysis was undertaken to quantify, at a high level, these impacts within the site environs. This review considered the operations study area signalized intersections along the Kingston Road corridor.

51. The analysis results indicated that the signalized intersections along the Kingston Road operate at busy conditions with v/c ratios above theoretical capacity. However, considering the BRT expansion is a significant transit upgrade over existing services, it is anticipated that a travel mode shift for vehicles travelling along Kingston Road within the

site environs will occur. As a result of an increase in ridership using the BRT and a commensurate drop in passenger vehicle activity, intersections along Kingston Road would operate at acceptable conditions (i.e. below theoretical capacity) with the Durham-Scarborough BRT implemented.

52. Based upon the above, the proposed development plan can be reasonably accommodated from a traffic operations perspective.

Appendix A:
Reduced Scale Architectural Plans

PROJECT STATISTICS

OCT.25.2023

	Permitted / Required	Proposed	
01. SITE AREA			
Development Block		39,615 m2	3.96 ha
		426,411 ft2	9.79 ac
Private / Public Road		5,033 m2	0.50 ha
		54,177 ft2	1.24 ac
Proposed Park		3,093 m2	0.31 ha
		33,298 ft2	0.76 ac
Future Development Block		798 m2	4.85 ha
		8,585 ft2	11.99 ac
Total Site Area		**48,539 m2**	**9.63 ha**
		522,471 ft2	**23.79 ac**
02. N.F.A.	**MEASURED FROM INTERIOR FACES OF EXTERIOR WALLS**		
RESIDENTIAL			
Podium 1 + Tower 1, 2 & 3			
Podium 1		± 982 m2	± 10,573 ft2
Tower 1		± 22,731 m2	± 244,670 ft2
Tower 2		± 22,731 m2	± 244,670 ft2
Tower 3		± 22,731 m2	± 244,670 ft2
Subtotal		**± 69,174 m2**	**± 744,582 ft2**
Podium 2 + Tower 4 & 5			
Podium 2		± 499 m2	± 5,367 ft2
Tower 4		± 22,730 m2	± 244,659 ft2
Tower 5		± 22,731 m2	± 244,670 ft2
Subtotal		**± 45,959 m2**	**± 494,696 ft2**
Podium 3 + Tower 6			
Podium 3		± 784 m2	± 8,437 ft2
Tower 6		± 26,662 m2	± 286,987 ft2
Subtotal		**± 27,446 m2**	**± 295,425 ft2**
Podium 4 + Tower 7			
Podium 4		± 679 m2	± 7,311 ft2
Tower 7		± 14,196 m2	± 152,800 ft2
Subtotal		**± 14,875 m2**	**± 160,111 ft2**
Podium 5 + Tower 8			
Podium 5		± 12,868 m2	± 138,512 ft2
Tower 8		± 16,666 m2	± 179,390 ft2
Subtotal		**± 29,534 m2**	**± 317,902 ft2**
Podium 6 + Tower 9			
Podium 6		± 12,868 m2	± 138,512 ft2
Tower 9		± 16,666 m2	± 179,390 ft2
Subtotal		**± 29,534 m2**	**± 317,902 ft2**
Podium 7 + Tower 10			
Podium 7		± 13,029 m2	± 140,244 ft2
Tower 10		± 17,134 m2	± 184,429 ft2
Subtotal		**± 30,163 m2**	**± 324,672 ft2**
RESIDENTIAL SUBTOTAL		**± 246,685 m2**	**± 2,655,290 ft2**
RETAIL			
Podium			
Podium 1		± 0 m2	± 0 ft2
Podium 2		± 0 m2	± 0 ft2
Podium 3		± 375 m2	± 4,031 ft2
Podium 4		± 676 m2	± 7,273 ft2
Podium 5		± 676 m2	± 7,273 ft2
Podium 6		± 742 m2	± 7,984 ft2
Subtotal		**± 2,468 m2**	**± 26,561 ft2**
RETAIL SUBTOTAL		**± 2,468 m2**	**± 26,561 ft2**
OFFICE			
Podium			
Podium 3		± 3,430 m2	± 36,923 ft2
Subtotal		**± 3,430 m2**	**± 36,923 ft2**
OFFICE SUBTOTAL		**± 3,430 m2**	**± 36,923 ft2**
Total		**± 252,582 m2**	**± 2,718,773 ft2**
03. F.S.I	**N.F.A./TOTAL SITE AREA**		
RESIDENTIAL FSI		**± 5.1**	
NON RESIDENTIAL FSI		**± 0.1**	
Total		**± 5.2**	
04. LANDSCAPED AREA			
Proposed Park		± 3,093 m2	± 33,298 ft2
Gateway Plaza		± 543 m2	± 5,839 ft2
Total		**± 3,636 m2**	**± 39,137 ft2**

PROJECT STATISTICS

OCT.25.2023

	Permitted / Required	Proposed
05. UNIT COUNT		
Podium 1 + Tower 1, 2 & 3		
Podium 1		± 0
Tower 1		± 320
Tower 2		± 320
Tower 3		± 320
Subtotal		**± 960**
Podium 2 + Tower 4 & 5		
Podium 2		± 0
Tower 4		± 320
Tower 5		± 320
Subtotal		**± 640**
Podium 3 + Tower 6		
Podium 3		± 0
Tower 6		± 380
Subtotal		**± 380**
Podium 4 + Tower 7		
Podium 4		± 0
Tower 7		± 200
Subtotal		**± 200**
Podium 5 + Tower 8		
Podium 5		± 180
Tower 8		± 240
Subtotal		**± 420**
Podium 6 + Tower 9		
Podium 6		± 180
Tower 9		± 240
Subtotal		**± 420**
Podium 7 + Tower 10		
Podium 7		± 190
Tower 10		± 250
Subtotal		**± 440**
Total		**± 3,460**
06. Parking		
Podium 1 + Tower 1, 2 & 3		± 730
Podium 2 + Tower 4 & 5		± 578
Podium 3 + Tower 6		± 233
Podium 4 + Tower 7		± 130
Podium 5 + Tower 8		± 303
Podium 6 + Tower 9		± 310
Podium 7 + Tower 10		± 484
Total		**± 2768**
07. Building Heights		
Podium 1		4 Storey ± 15.45 m (from avg. grade 104.95 m to 5th floor)
Tower 1		36 Storey + mech. ± 123.45 m (116.45 m + 7.0 m mech.) (from avg. grade 104.95 m to top of roof)
Tower 2		36 Storey + mech. ± 123.45 m (116.45 m + 7.0 m mech.) (from avg. grade 104.95 m to top of roof)
Tower 3		36 Storey + mech. ± 123.45 m (116.45 m + 7.0 m mech.) (from avg. grade 104.95 m to top of roof)
Podium 2		4 Storey ± 15.32 m (from avg. grade 105.38 m to 5th floor)
Tower 4		36 Storey + mech. ± 123.32 m (116.32 m + 7.0 m mech.) (from avg. grade 105.38 m to top of roof)
Tower 5		36 Storey + mech. ± 123.32 m (116.32 m + 7.0 m mech.) (from avg. grade 105.38 m to top of roof)
Podium 3		4 Storey ± 15.60 m (from avg. grade 105.55 m to 5th floor)
Tower 6		42 Storey + mech. ± 141.90 m (134.90 m + 7.0 m mech.) (from avg. grade 105.55 m to top of roof)
Podium 4		4 Storey ± 15.20 m (from avg. grade 107.20 m to 5th floor)
Tower 7		24 Storey + mech. ± 86.15 m (79.15 m + 7.0 m mech.) (from avg. grade 107.20 m to top of roof)
Podium 5		6 Storey ± 20.82 m (from avg. grade 107.03 m to 7th floor)
Tower 8		14 Storey + mech. ± 55.02 m (48.02 m + 7.0 m mech.) (from avg. grade 107.03 m to top of roof)
Podium 6		6 Storey ± 21.47 m (from avg. grade 106.38 m to 7th floor)
Tower 9		14 Storey + mech. ± 55.67 m (48.67 m + 7.0 m mech.) (from avg. grade 106.38 m to top of roof)
Podium 7		6 Storey ± 21.35 m (from avg. grade 105.60 m to 7th floor)
Tower 10		14 Storey + mech. ± 55.55 m (48.55 m + 7.0 m mech.) (from avg. grade 105.60 m to top of roof)

1. All calculations are approximate and preliminary
2. Not yet deducted: 5% for inset balconies
3. Unit count and breakdown subject to market condition

GENERAL NOTES

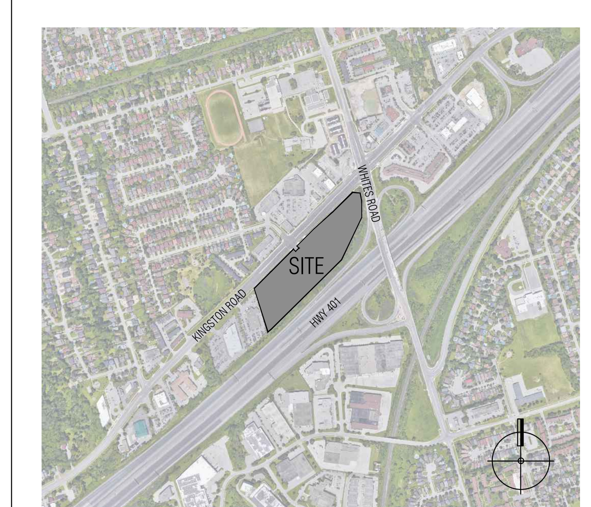
1. This drawing to be read in conjunction with all other drawings comprising the complete set of approved drawings for this development.
2. All roads have been designed to meet the Canadian Highway Bridge Code, CAN/CSA S6 and will be surfaced in order to be accessible under all climate conditions.
3. For Landscaping, refer to landscape drawings.
4. For proposed grading, refer to landscape/grading drawings.
5. All perimeter existing information indicated taken from survey.
6. All work to be done in conformance with the 2012 Ontario Building Code (O.B.C., as amended).

SURVEY INFORMATION

BOUNDARY AND TOPOGRAPHICAL SURVEY OF
PART OF LOTS 29, RANGE 3
BROKEN FRONT CONCESSION
(GEOGRAPHIC TOWNSHIP OF PICKERING)
CITY OF PICKERING
REGIONAL MUNICIPALITY OF DURHAM

R. AVIS SURVEYING INC.
SUITE 203
235 YORKLAND BOULEVARD
TORONTO, ONTARIO
M2J 4Y8
TEL.: (416) 490-8352
FAX: (416) 491-6206
www.ravissurveying.com

KEYPLAN



LIST OF DRAWINGS

01.	APR.2020	ISSUED FOR REZONING	E.C.
02.	OCT.25.2023	REISSUED FOR REZONING	E.C.

issued for revisions

GRAZIANI + CORAZZA ARCHITECTS
8400 JANE STREET, BUILDING D-SUITE 300 CONCORD, ONTARIO L4K 4L8
T.905.795.2601 F.905.795.2844 WWW.GC-ARCHITECTS.COM

PROPOSED MIXED USE DEVELOPMENT

603 - 643 & 645 - 699 Kingston Road

Director Industrial Holdings Limited

PICKERING ONTARIO

PROJECT ARCHITECT:	E.CORAZZA
ASSISTANT DESIGNER:	L.WONG
DRAWN BY:	L.WONG/O.HADI/W.CHIU
CHECKED BY:	D.BIASE
PLOT DATE:	OCT.25.2023
JOB #	1682.19

STATISTICS AND GENERAL NOTES

N.T.S. A.101

TITLEBLOCK SIZE: 610 x 950

THIS DRAWING, AS AN INSTRUMENT OF SERVICE, IS PROVIDED BY AND IS THE PROPERTY OF GRAZIANI+CORAZZA ARCHITECTS INC. THE CONTRACTOR MUST VERIFY AND ACCEPT RESPONSIBILITY FOR ALL DIMENSIONS AND CONDITIONS ON SITE AND MUST NOTIFY GRAZIANI+CORAZZA ARCHITECTS INC. OF ANY VARIATIONS FROM THE SUPPLIED INFORMATION. GRAZIANI+CORAZZA ARCHITECTS INC. IS NOT RESPONSIBLE FOR THE ACCURACY OF SURVEY, STRUCTURAL, MECHANICAL, ELECTRICAL, AND OTHER ENGINEERING INFORMATION SHOWN ON THIS DRAWING. REFER TO THE APPROPRIATE ENGINEERING DRAWINGS BEFORE PROCEEDING WITH THE WORK. CONSTRUCTION MUST CONFORM TO ALL APPLICABLE CODES AND REQUIREMENTS OF THE AUTHORITIES HAVING JURISDICTION. UNLESS OTHERWISE NOTED, NO INVESTIGATION HAS BEEN UNDERTAKEN OR REPORTED ON BY THIS OFFICE IN REGARDS TO THE ENVIRONMENTAL CONDITION OF THIS SITE.

THIS DRAWING IS NOT TO BE SCALED. ALL ARCHITECTURAL SYMBOLS INDICATED ON THIS DRAWING ARE GRAPHIC REPRESENTATIONS ONLY.

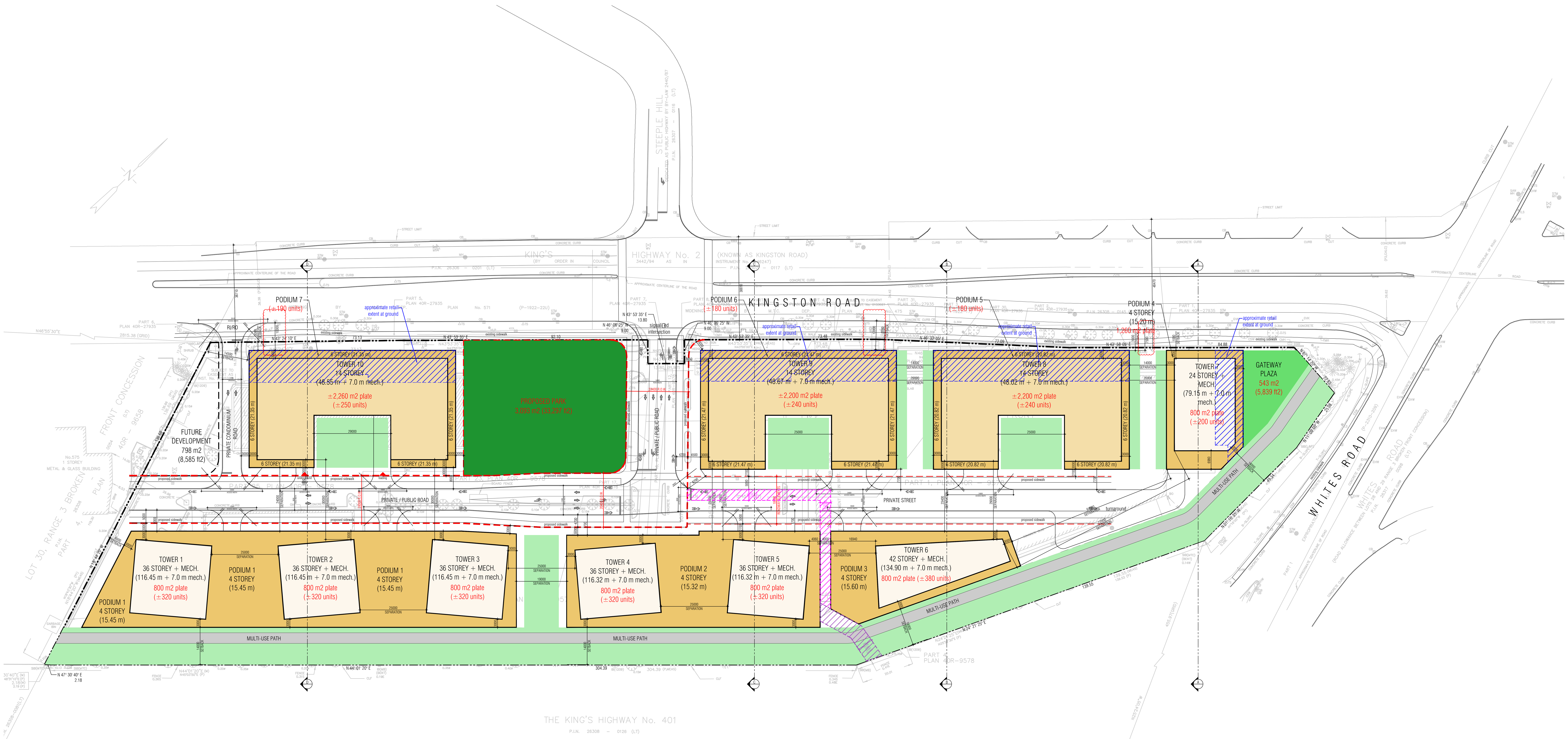
CONDITIONS FOR ELECTRONIC INFORMATION TRANSFER:

ELECTRONIC INFORMATION IS SUPPLIED TO THE OTHER ASSOCIATED FIRMS TO ASSIST THEM IN THE EXECUTION OF THEIR WORK / REVIEW. THE RECIPIENT FIRMS MUST DETERMINE THE COMPLETENESS / APPROPRIATENESS / RELEVANCE OF THE INFORMATION IN RESPECT TO THEIR PARTICULAR RESPONSIBILITY.

GRAZIANI+CORAZZA ARCHITECTS INC. SHALL NOT BE RESPONSIBLE FOR:

1. ERRORS, OMISSIONS, INCOMPLETENESS DUE TO LOSS OF INFORMATION IN WHOLE OR PART WHEN INFORMATION IS TRANSFERRED.
2. TRANSMISSION OF ANY VIRUS OR DAMAGE TO THE RECEIVING ELECTRONIC SYSTEM WHEN INFORMATION IS TRANSFERRED.

01.	APR.2020	ISSUED FOR REZONING	E.C.
02.	OCT.19.2023	REISSUED FOR REZONING	E.C.



issued for revisions

GRAZIANI + CORAZZA ARCHITECTS

8400 JANE STREET, BUILDING D-SUITE 300 CONCORD, ONTARIO L4K 4L8
T.905.795.2601 F.905.795.2844 WWW.GC-ARCHITECTS.COM

PROPOSED MIXED USE DEVELOPMENT

603 - 643 & 645 - 699 Kingston Road

Director Industrial Holdings Limited

PICKERING ONTARIO

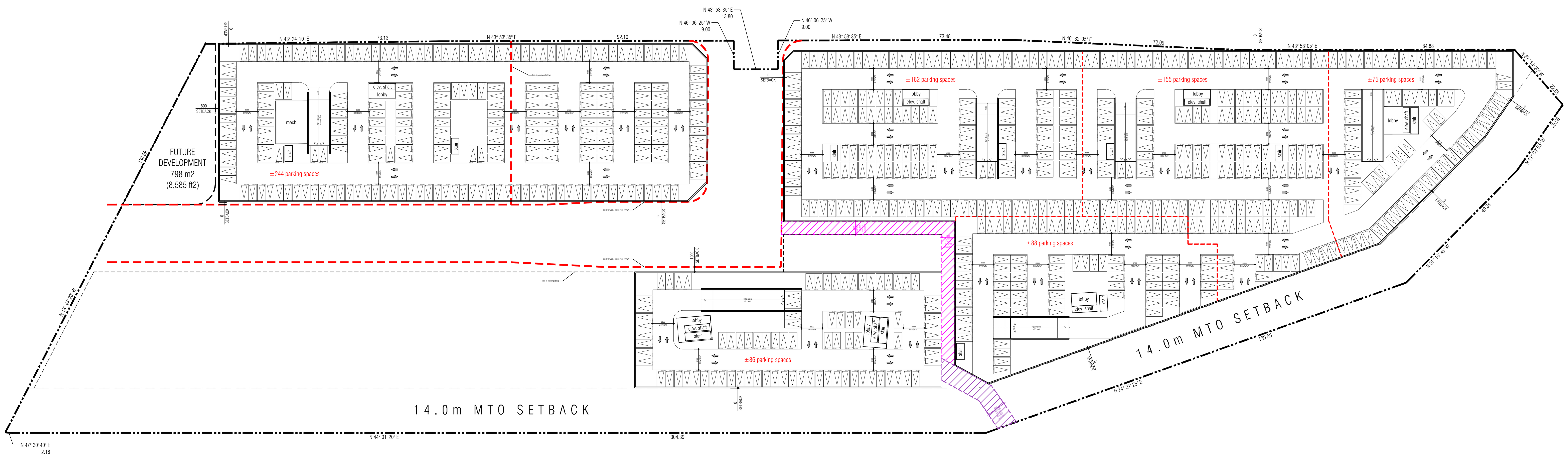
PROJECT ARCHITECT:	E.CORAZZA
ASSISTANT DESIGNER:	L.WONG
DRAWN BY:	L.WONG/O.HADI/W.CHIU
CHECKED BY:	D.BIASE
PLOT DATE:	OCT.25.2023
JOB #	1682.19

SITE PLAN

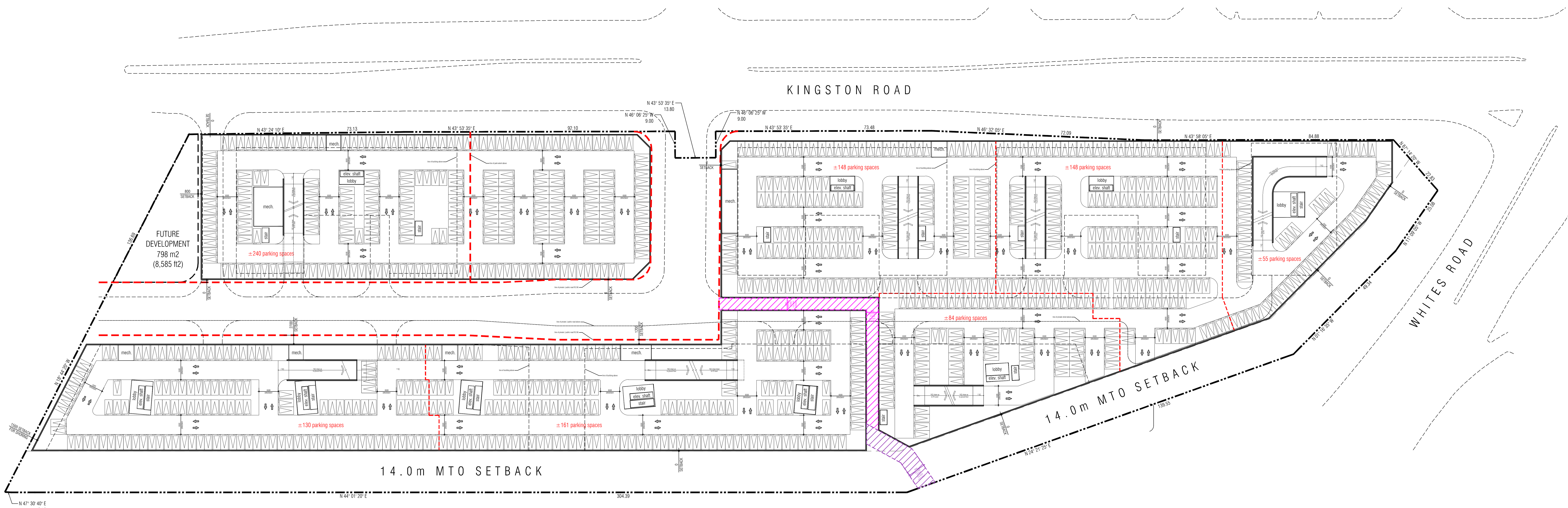
1:500

A.102

TITLEBLOCK SIZE: 610 x 950



P2 UNDERGROUND PLAN 1 A.201
1:750



P1 UNDERGROUND PLAN 2 A.201
1:750

01.	APR.2020	ISSUED FOR REZONING	E.C.
02.	OCT.19.2023	REISSUED FOR REZONING	E.C.

issued for revisions

GRAZIANI + CORAZZA ARCHITECTS
8400 JANE STREET, BUILDING D-SUITE 300 CONCORD, ONTARIO L4K 4L8
T.905.795.2601 F.905.795.2844 WWW.GC-ARCHITECTS.COM

PROPOSED MIXED USE DEVELOPMENT

603 - 643 & 645 - 699 Kingston Road

Director Industrial Holdings Limited

PICKERING ONTARIO

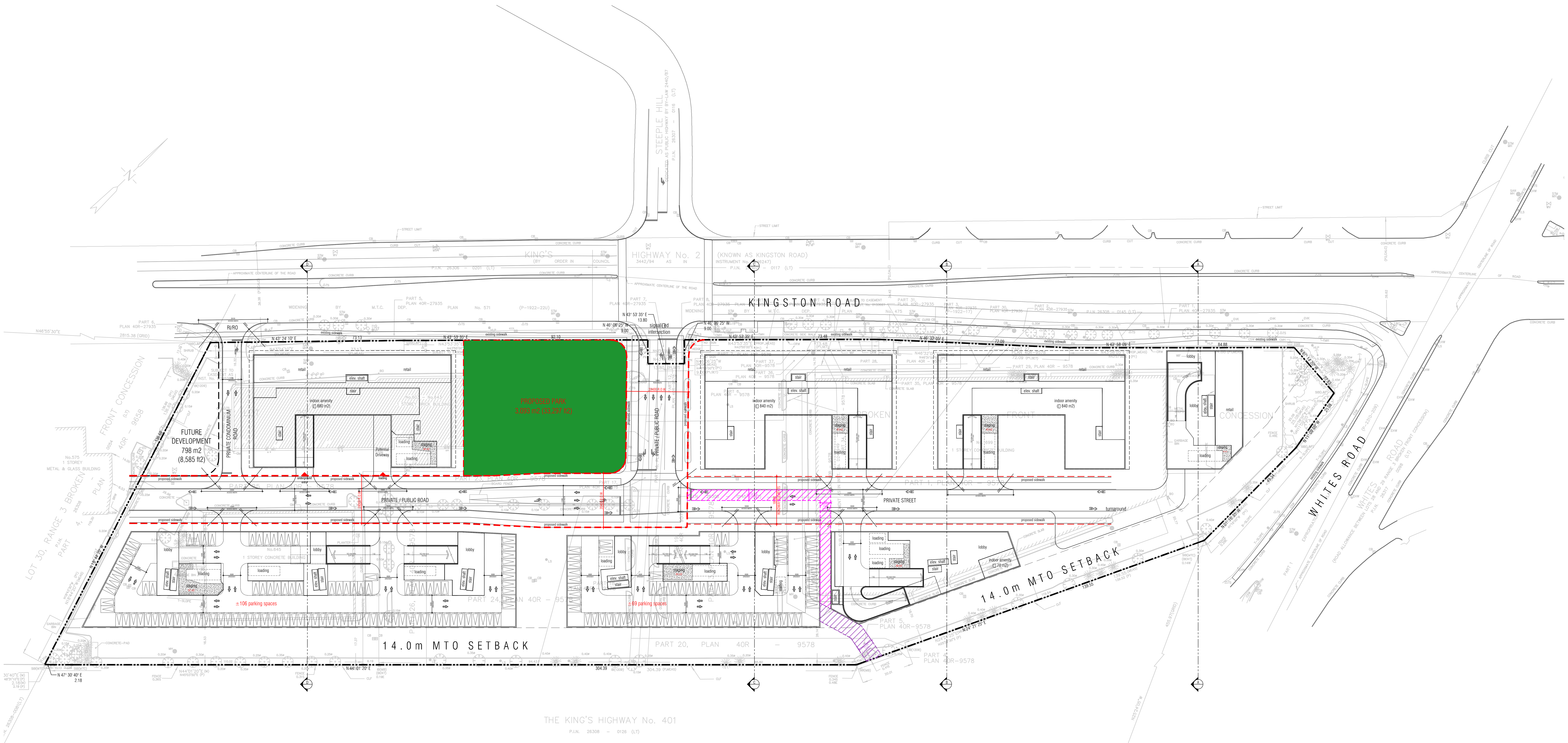
PROJECT ARCHITECT:	E.CORAZZA
ASSISTANT DESIGNER:	L.WONG
DRAWN BY:	L.WONG/O.HADI/W.CHIU
CHECKED BY:	D.BIASE
PLOT DATE:	OCT.25.2023
JOB #	1682.19

UNDERGROUND PLAN

1:750

A.201

TITLEBLOCK SIZE: 610 x 950



01.	APR.2020	ISSUED FOR REZONING	E.C.
02.	OCT.19.2023	REISSUED FOR REZONING	E.C.

issued for revisions

GRAZIANI + CORAZZA ARCHITECTS
8400 JANE STREET, BUILDING D-SUITE 300 CONCORD, ONTARIO L4K 4L8
T.905.795.2601 F.905.795.2844 WWW.GC-ARCHITECTS.COM

PROPOSED MIXED USE DEVELOPMENT

603 - 643 & 645 - 699 Kingston Road

Director Industrial Holdings Limited

PICKERING ONTARIO

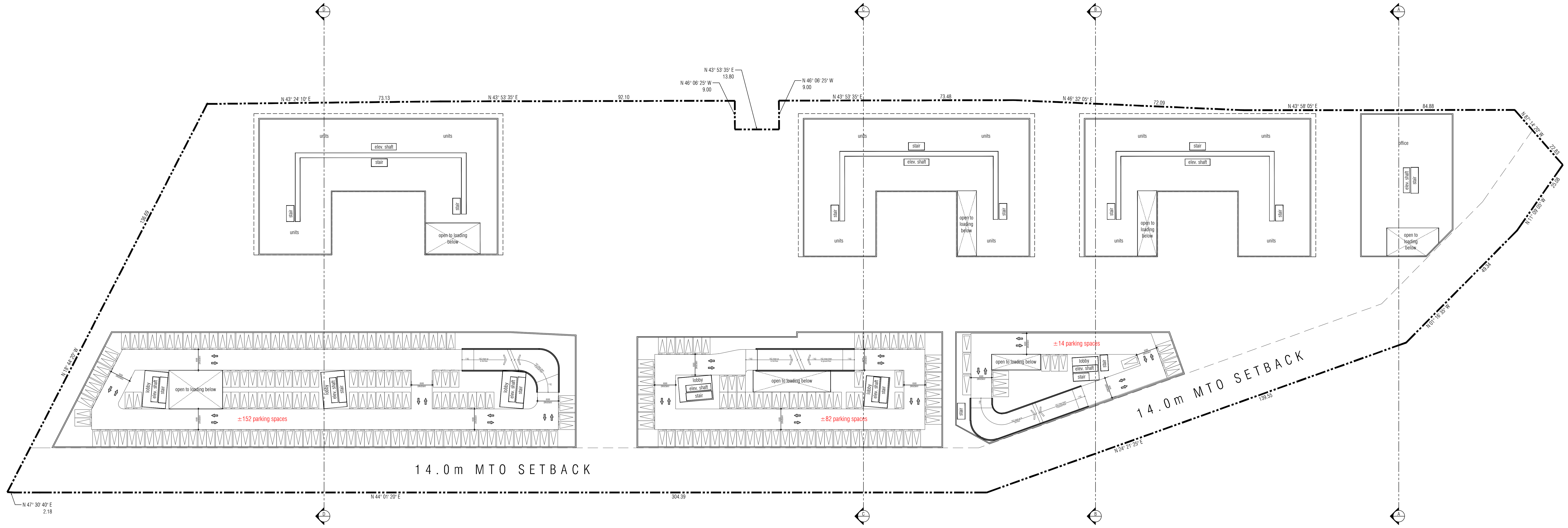
PROJECT ARCHITECT:	E.CORAZZA
ASSISTANT DESIGNER:	L.WONG
DRAWN BY:	L.WONG/O.HADI/W.CHIU
CHECKED BY:	D.BIASE
PLOT DATE:	OCT.25.2023
JOB #	1682.19

GROUND □LOOR PLAN

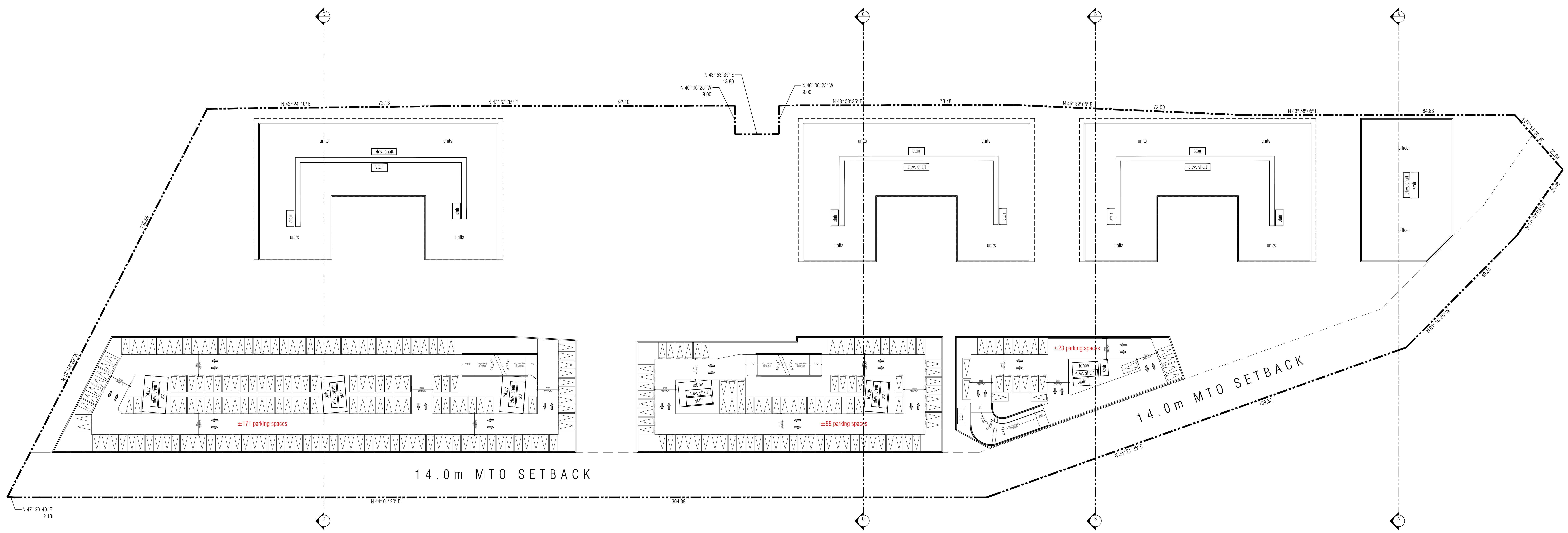
1:□50

A.301

TITLEBLOCK SIZE: 610 x 950



2ND FLOOR PLAN 1 A.302
1:750



3RD FLOOR PLAN 2 A.302
1:750

01.	APR.2020	ISSUED FOR REZONING	E.C.
02.	OCT.19.2023	REISSUED FOR REZONING	E.C.

issued for revisions

GRAZIANI + CORAZZA ARCHITECTS
8400 JANE STREET, BUILDING D-SUITE 300 CONCORD, ONTARIO L4K 4L8
T.905.795.2601 F.905.795.2844 WWW.GC-ARCHITECTS.COM

PROPOSED MIXED USE DEVELOPMENT

603 - 643 & 645 - 699 Kingston Road

Director Industrial Holdings Limited
PICKERING ONTARIO

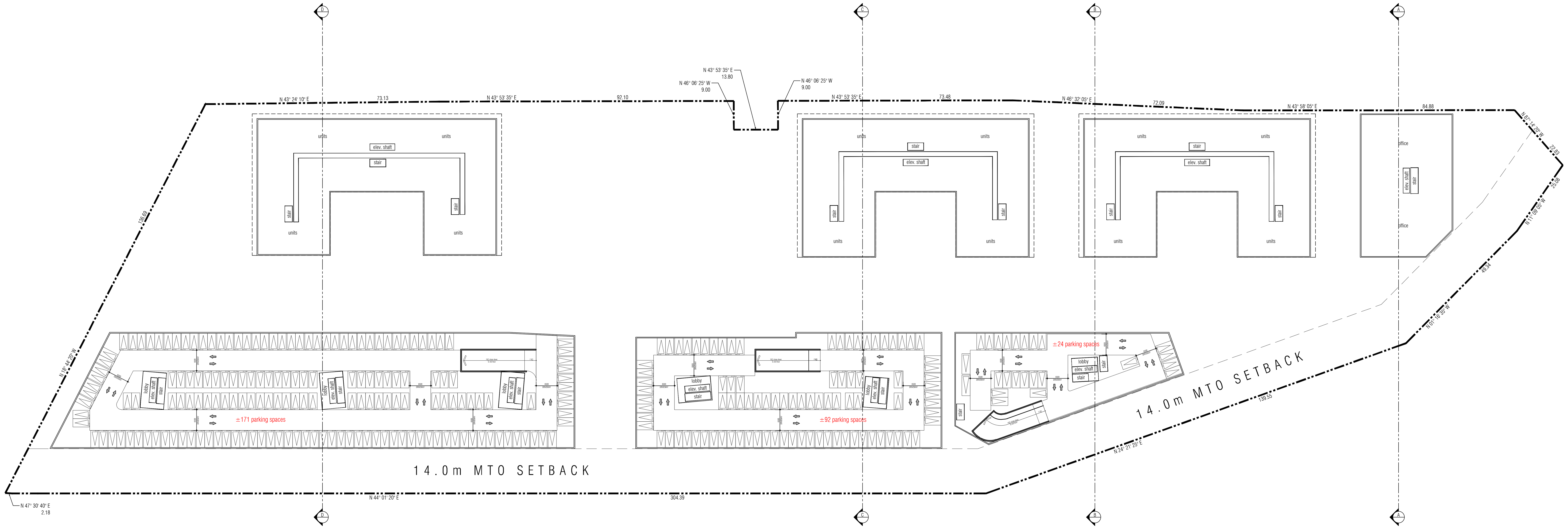
PROJECT ARCHITECT:	E.CORAZZA
ASSISTANT DESIGNER:	L.WONG
DRAWN BY:	L.WONG/O.HADI/W.CHIU
CHECKED BY:	D.BIASE
PLOT DATE:	OCT.25.2023
JOB #	1682.19

2ND - 3RD
FLOOR PLAN

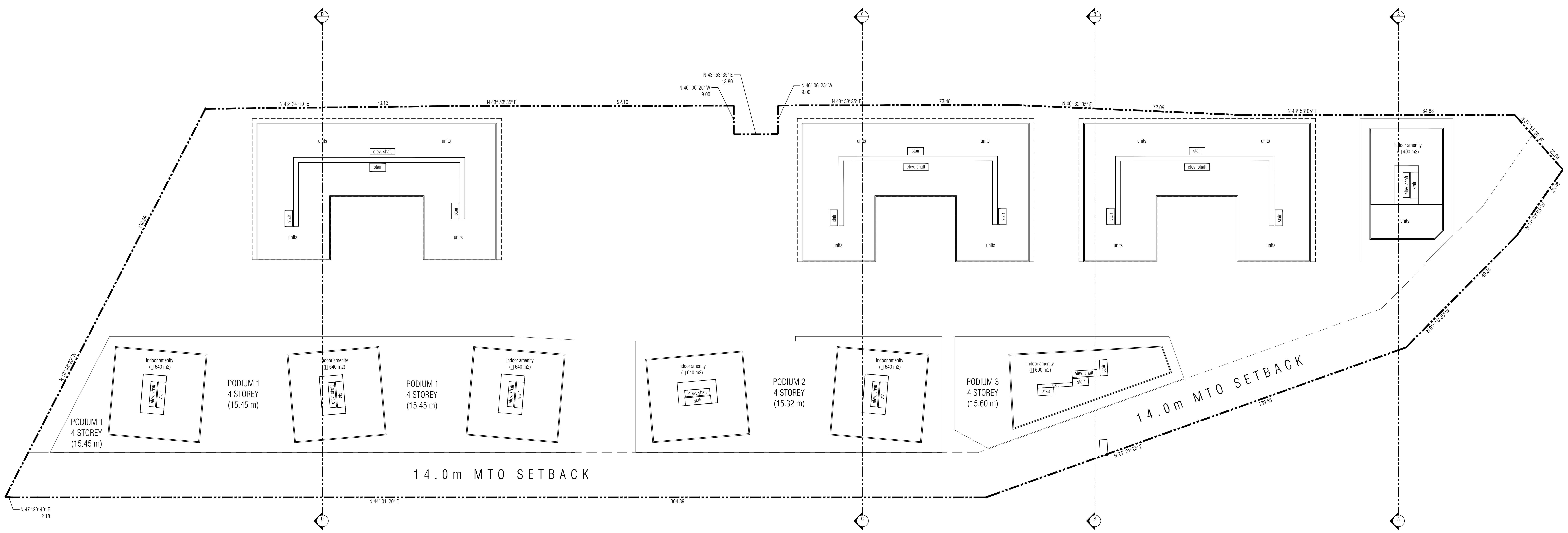
1:50

A.302

TITLEBLOCK SIZE: 610 x 950



4TH FLOOR PLAN 1
1:750 A.303



5TH FLOOR PLAN 2
1:750 A.303

01.	APR.2020	ISSUED FOR REZONING	E.C.
02.	OCT.19.2023	REISSUED FOR REZONING	E.C.

issued for revisions

GRAZIANI + CORAZZA ARCHITECTS
8400 JANE STREET, BUILDING D-SUITE 300 CONCORD, ONTARIO L4K 4L8
T.905.795.2601 F.905.795.2844 WWW.GC-ARCHITECTS.COM

PROPOSED MIXED USE DEVELOPMENT

603 - 643 & 645 - 699 Kingston Road

Director Industrial Holdings Limited
PICKERING ONTARIO

PROJECT ARCHITECT:	E.CORAZZA
ASSISTANT DESIGNER:	L.WONG
DRAWN BY:	L.WONG/O.HADI/W.CHIU
CHECKED BY:	D.BIASE
PLOT DATE:	OCT.25.2023
JOB #	1682.19

4TH - 5TH FLOOR PLAN

1:50

A.303

TITLEBLOCK SIZE: 610 x 950

Appendix B:
Transit Reach & Impact Analysis

2.0 METHODOLOGY

The ESRI ArcGIS suite of functions was used to generate and spatially analyse the various existing and future transit scenarios and their impact in relation to the Site. The Network Analyst toolbox in particular was used to model and run analyses for the different transit network scenarios.

The inputs for these different transit scenarios are further discussed in **Section 3.0**.

2.1 NETWORK ASSUMPTIONS

Table B1 summarizes all the assumptions that have been made when a transit network is built.

TABLE B1 NETWORK MODEL ASSUMPTIONS

		Assumption
1	Existing Schedules	All transit runs on time and according to schedule.
2	Pedestrian Travel Speed	Pedestrians travel at a speed of 4 km/s, or approximately 1.11 m/s.
		Pedestrians do not have to wait at intersections.
3	Transfers	There is no time penalty for transferring between transit services.
		No consideration is taken for an acceptable number of transfers in a trip
4	Fare	All transit modes can be taken without regard for fare differences

2.2 TRANSIT SERVICE AREA ANALYSIS

The transit service area analysis is a type of geospatial analysis which generates service area polygons around areas that are accessible by transit and walking in a given time interval for a specified site in a given transit network.

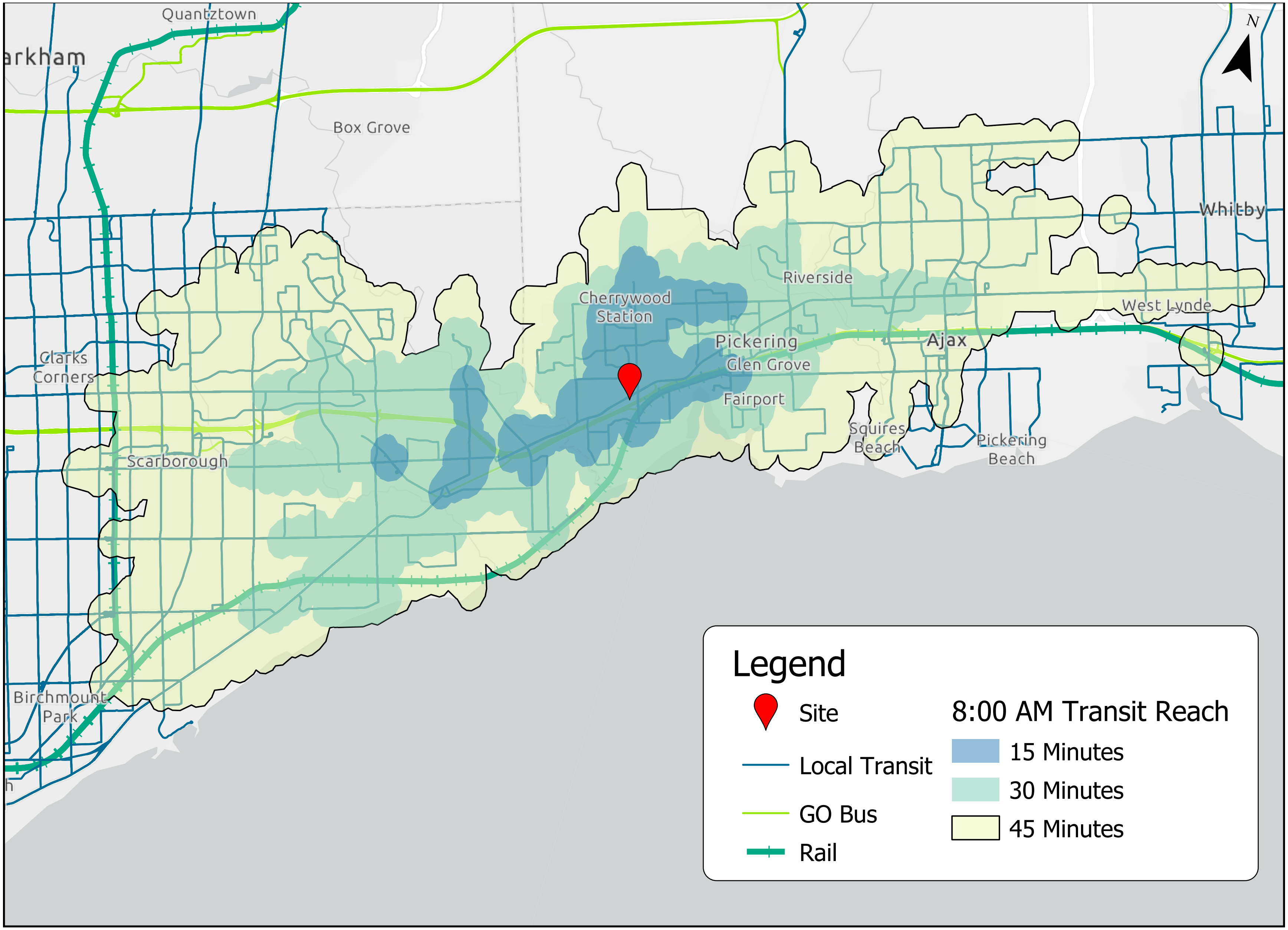
This type of analysis requires the following inputs:

- Transit Network Model
- Site Location
- Departure or Arrival Time (e.g. 8:00 AM on a typical Thursday)
- Time Interval (e.g. 5 minute service area)

The analysis results in a geocoded coverage area highlighting the largest area a transit user can expect to reach if they were to leave the site at the specified time.

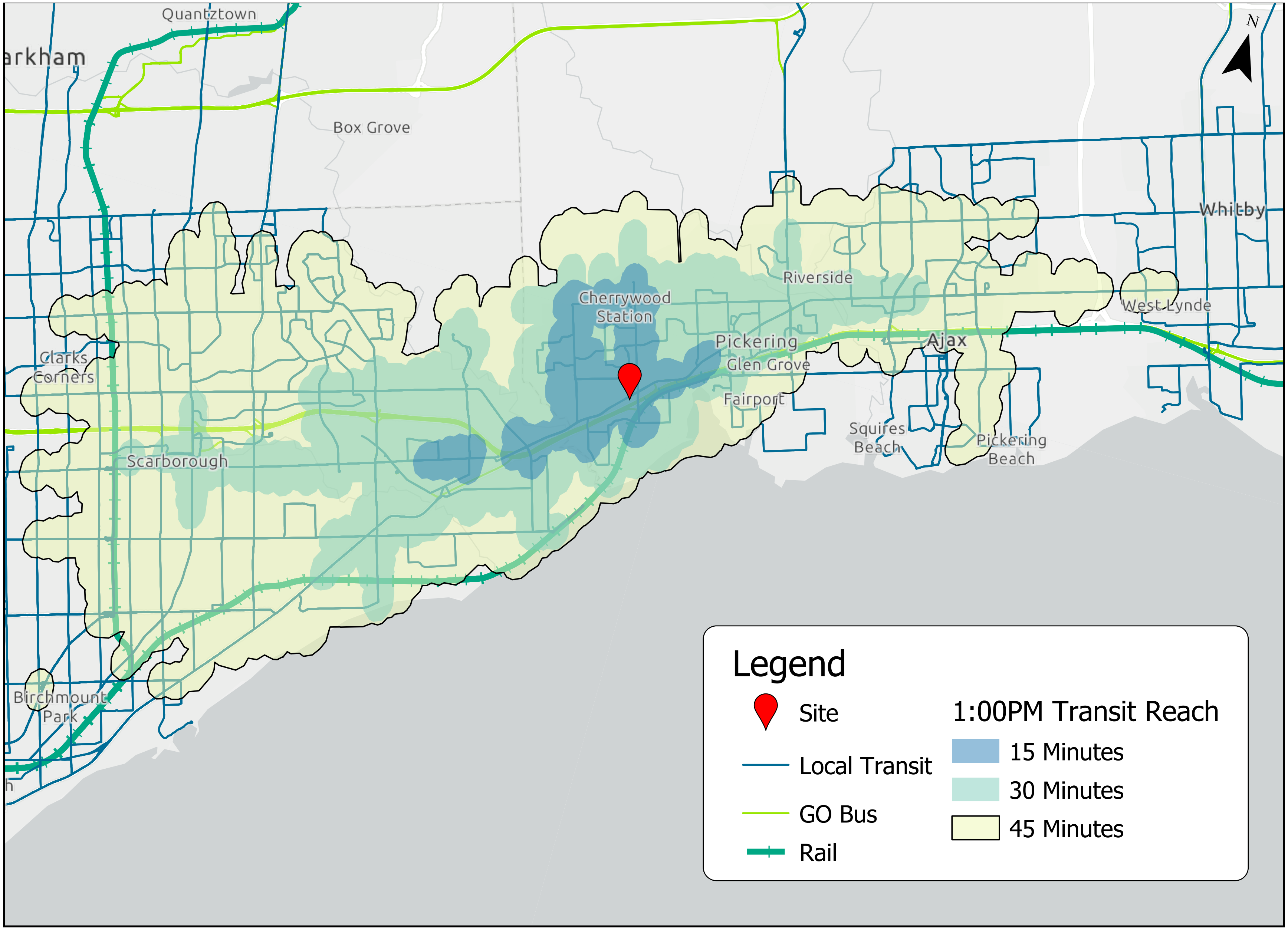
As the analysis requires temporal inputs, service area outputs vary based on the exact time chosen to run the analysis. The output provides a snapshot of what transit accessibility is like for the given departure time.

Figure B1 and **Figure B2** illustrate sample outputs from an existing transit network model with 8:00 AM and 1:00 PM departure times respectively.



\\bafp02.tor.bagroup.com\data\WP\5883\41\Graphics

FIGURE B1 EXISTING TRANSIT SERVICE AREA AT 8:00 AM



\\bafp02.tor.bagroup.com\data\WP\5883\41\Graphics

FIGURE B2 EXISTING TRANSIT SERVICE AREA AT 1:00 PM

2.3 DEPARTURE DEPENDENCE SERVICE AREA ANALYSIS

The Departure Dependence Service Area (DDSA) Analysis is a variation of the Transit Service Area Analysis as described in **Section 2.2**.

Due to the transit network model's dependence on temporal factors, resultant transit service areas change based on the departure or arrival time specified when running the transit service area analysis.

What this results in is that running a single transit service area can only approximate transit accessibility for the specific minute that is analysed. It provides a snapshot of what specific transit service area can be like for a specific departure or arrival time.

This means that a single transit service area may not be indicative of what the overall transit accessibility is for a peak hour, or any time period of interest. Running a service area analysis for a departure time 5 minutes later is equivalent to leaving the house 5 minutes later, potentially missing a bus and having to wait until the next bus arrives, which is accounted for in the model. This could potentially reduce the service area that is generated significantly.

The purpose of the DDSA analysis is to provide a representative version of the transit service area for a given peak hour. It quantifies how often a specific location can be reached within a specified time interval (e.g. 15 min, 30 min, 45 min) over the course of an hour to determine the dependence on departure time a given transit service area has.

The DDSA analysis requires the following inputs:

- Transit Network Model
- Site Location
- Time Interval (e.g. 5 minute service area)
- 1 Hour Analysis Time Period (e.g. 8:00am to 9:00am)

A TSA analysis is run 60 times for every minute of the specified analysis time period (i.e. 8:01 am, 8:02 am, 8:03am, 8:04 am, etc.). These 60 transit service areas are overlaid to determine how many times in the hour each location can be accessed within in the hour and where on the departure time dependence scale each location falls.

Table B2 below summarizes a generalized version of the Departure Dependence Scale. **Figure B3** illustrates a sample output of the departure dependence service area analysis.

TABLE B2 DEPARTURE TIME DEPENDENCE SCALE

Number of Overlays	Equivalent Frequency of Reach	
1 time per hour	60 min	Departure Time Dependent
5 times per hour	12 min	↕
10 times per hour	6 min	
12 times per hour	5 min	
30 times per hour	2 min	
60 times per hour	1 min	Departure Time Independent (Guaranteed Reach)

Similar to the TSA analysis, the DDSA analysis results in geocoded polygons which highlights the areas a transit user can expect to reach within given time interval over the course of the given analysis time period.

This type of analysis can help determine what the average transit service area is, and also help quantify changes in transit service that pertain more to frequency, rather than vehicle speed.

This type of analysis can also illustrate transit convenience and redundancy of service based on the frequency of the transit services. Reaching some destinations is departure time-dependent (i.e. the arrival at the destination within 30 minutes relies on a scheduled departure), while others are “guaranteed” or departure time-independent (i.e. the destinations can be reached frequently within 30 minutes and there is no need to schedule the departure).

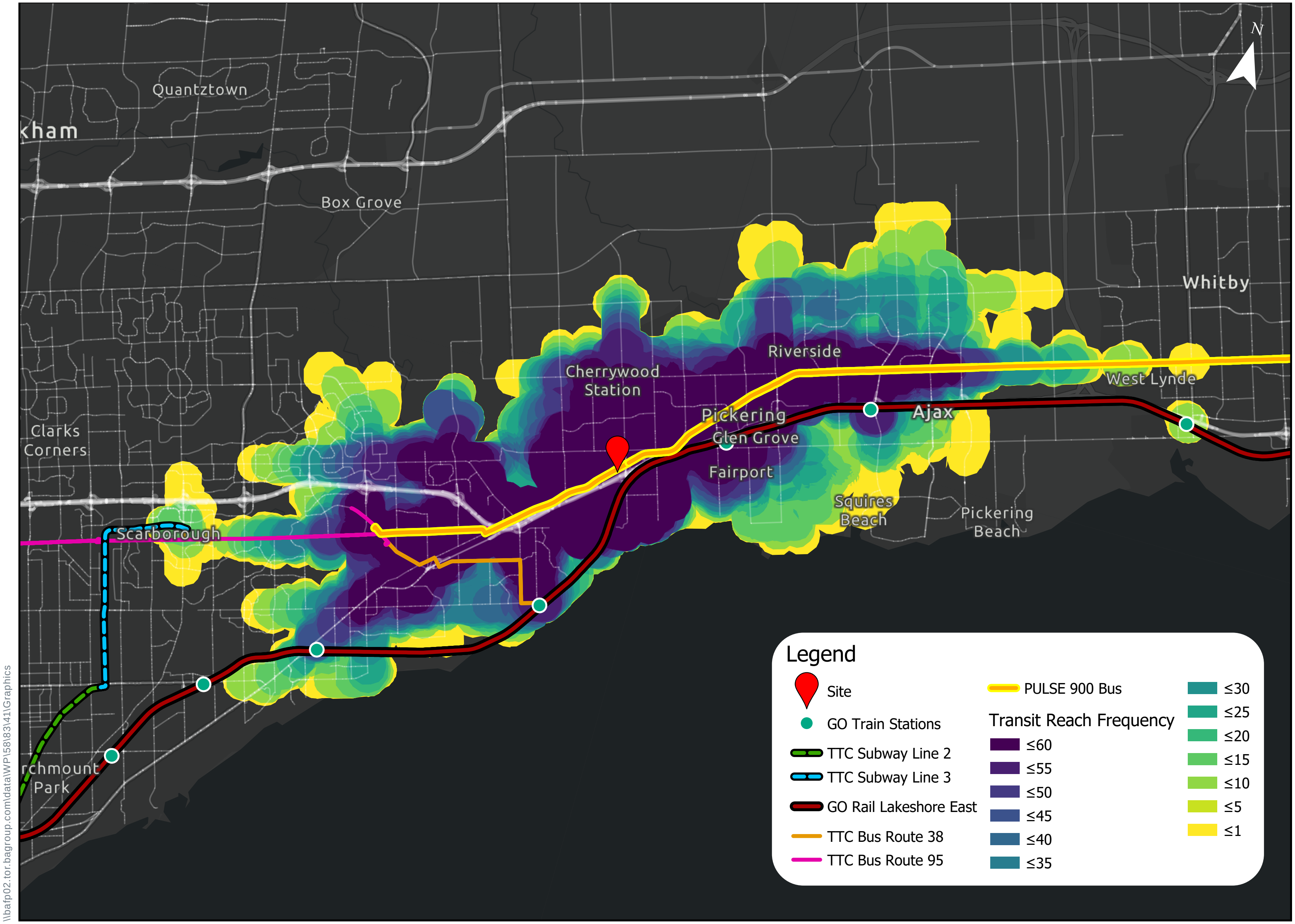


FIGURE B3 EXISTING TRANSIT SERVICE AREA BETWEEN 8:00 AM AND 9:00 AM

3.0 MODEL PARAMETERS

3.1 EXISTING GTA TRANSIT NETWORK

The GTA Transit Network Model is a network dataset built for the purpose of running transit service area analysis of existing conditions.

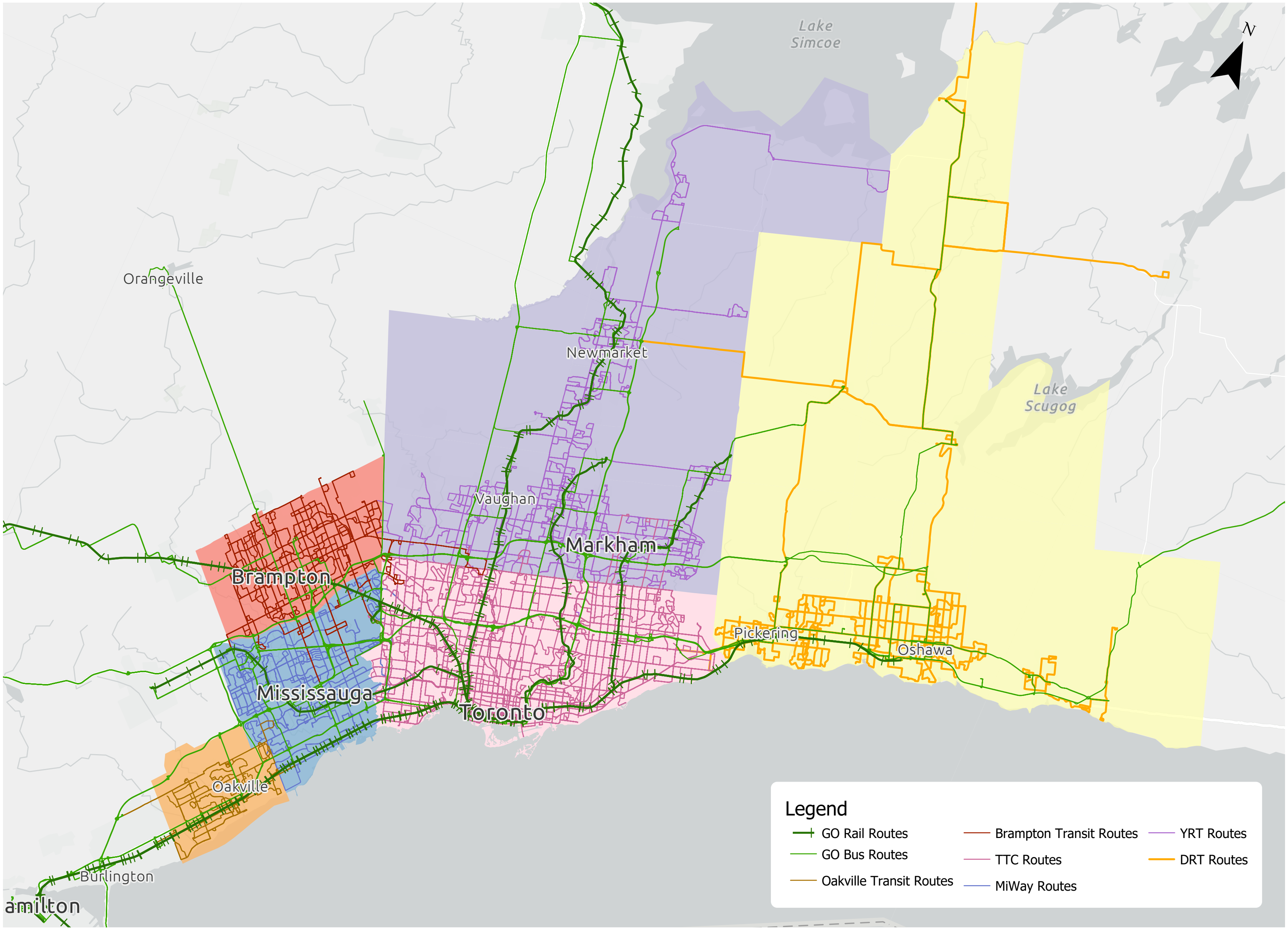
3.1.1 Inputs

It contains current transit network and schedule information provided by the following transit agencies and services within the GTA:

- GO Transit
- UP Express
- Toronto Transit Commission
- Mississauga Transit
- York Region Transit
- Oakville Transit
- Durham Region Transit

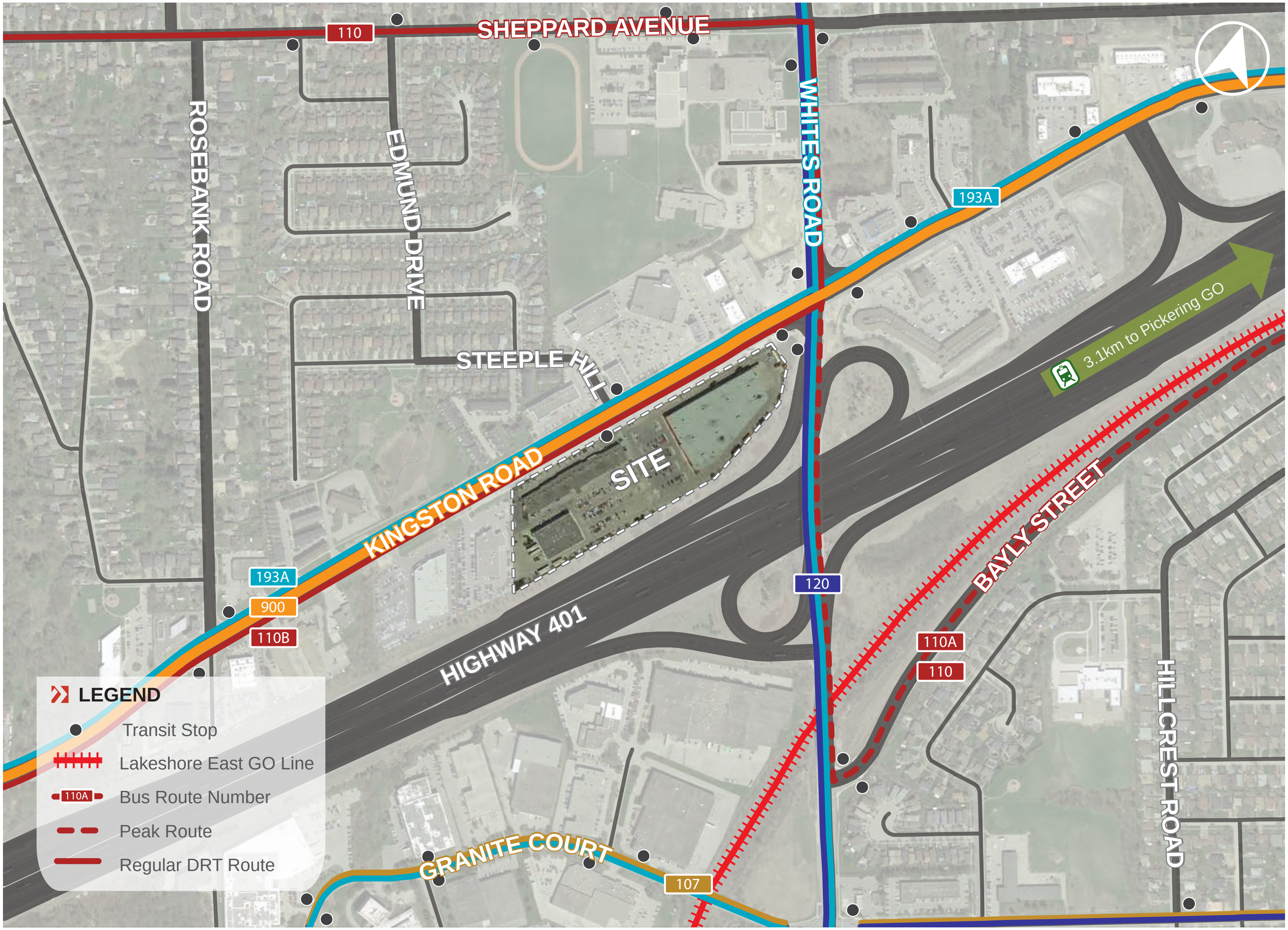
It also contains road network information provided by the Province of Ontario, which is licensed under the Open Government Licence – Ontario.

Figure B4 illustrates the extent of the transit network. **Figure B5** illustrates the transit context within the vicinity of the Site.



\\bafp02.tor.bagroup.com\data\WP\5883\41\Graphics

FIGURE B4 EXISTING GTA TRANSIT NETWORK MODEL



\\bafp02.tor.bagroup.com\data\WP\5818\3\41\Graphics

FIGURE B5 EXISTING TRANSIT NETWORK WITHIN SITE VICINITY

3.2 FUTURE NETWORK WITH DURHAM SCARBOROUGH BRT

Scenario 2 consists of the following inputs:

- Existing transit network with the PULSE 900 express bus removed
- Addition of the Durham-Scarborough BRT

The Durham-Scarborough BRT corridor, as proposed in the *Durham-Scarborough Bus Rapid Transit Study Initial Business Case Report*, dated spring 2019 (herein referred to as the Initial Business Case) consists of three BRT routes, running primarily along Kingston Road. It services Downtown Oshawa to the west, and Scarborough Centre and the Kingston / Lawrence / Morningside area to the east.

The BRT is proposed to operate in mixed traffic along some sections of the route, and fully separated in the median of the road in other sections.

Between the three routes, a combined frequency of 26 buses per hour, or about 13 buses per direction (approximately, one bus every 5 minutes) would be provided during the weekday morning peak period. Within the vicinity of the site, two stops are proposed along Kingston Road at Rosebank Road and at Whites Road.

Figure B6 provides the locations of the stops along the primary BRT route. **Figure B7** illustrates the currently proposed BRT route.

FIGURE B6: DURHAM-SCARBOROUGH BRT STOP LOCATIONS

\\bafp02.tor.bagroup.com\data\WP\5818\3\41\Graphics

FIGURE B7 DURHAM-SCARBOROUGH BRT PROPOSED DESIGN

3.3 FUTURE NETWORK WITH GO EXPANSION

GO Expansion, formerly known as the Regional Express Rail, is an initiative by the Province to improve GO rail service using new train technology on several key GO rail lines. Service frequency is anticipated to increase in for both on and off peak hours.

Figure B8 illustrates number of trains per hour on each line during the AM peak hour

The new train technology / electrification will boost travel speeds on the Lakeshore East GO Transit line will provide all-day, two-way services with 15 minutes or better transit service. RER and SmartTrack will add new stations (East Harbour and Gerrard-Carlaw) on the Lakeshore East line as well. The RER program is currently underway and is anticipated to be completed in 2024, according to Metrolinx's 2041 RTP.

Figure B9 illustrates the travel time differences on the Lakeshore East line between existing schedules and after GO Expansion.

For the purposes of this analysis, the new stations have not been added. This scenario only changes the travel speed and frequency of trains on the Lakeshore East and West Lines.

As the design and / or construction of the Durham Scarborough BRT (as described in the previous **Section 3.2)** and RER are both underway and funded, both services were assumed to be in place for this scenario.

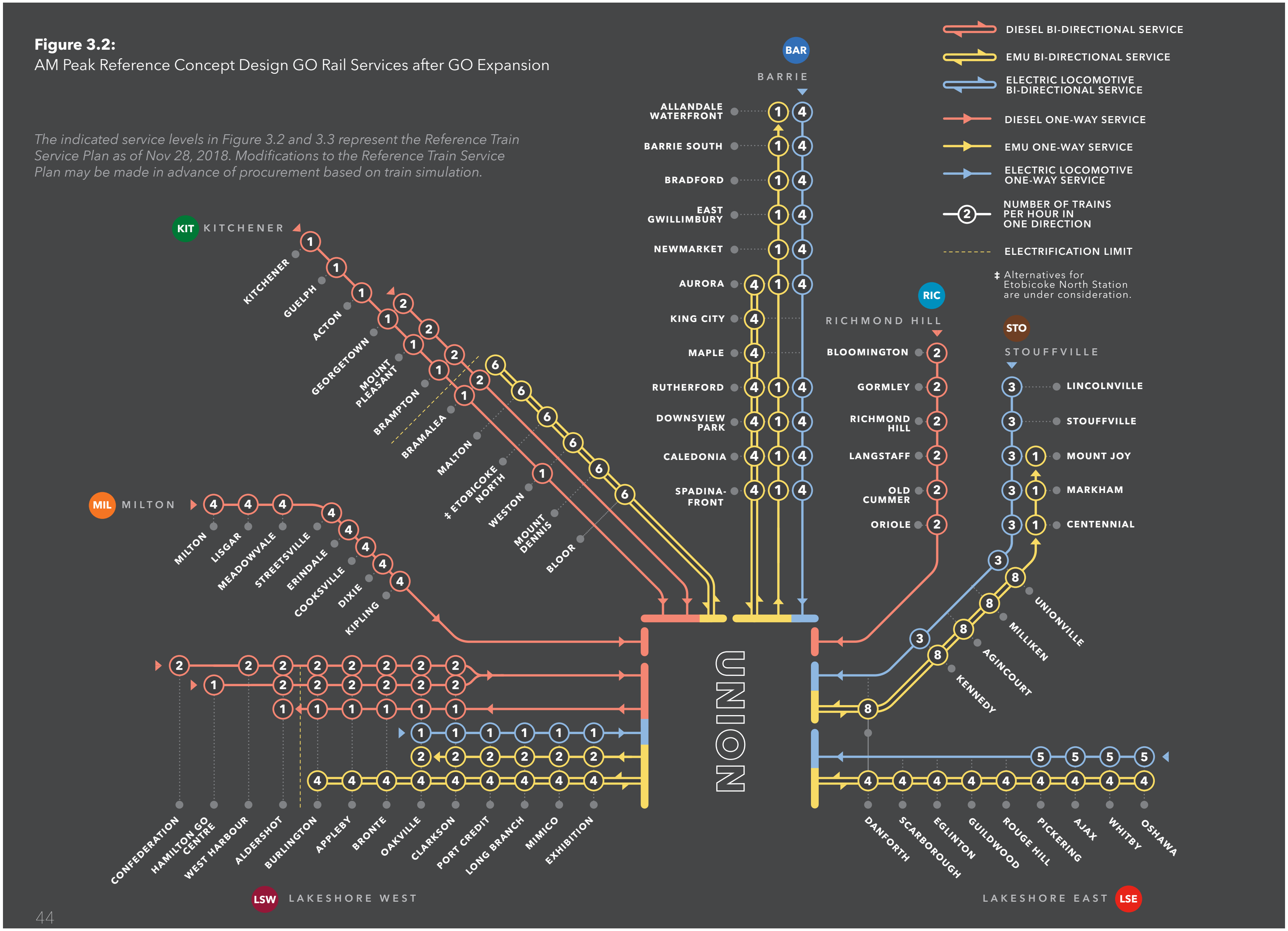
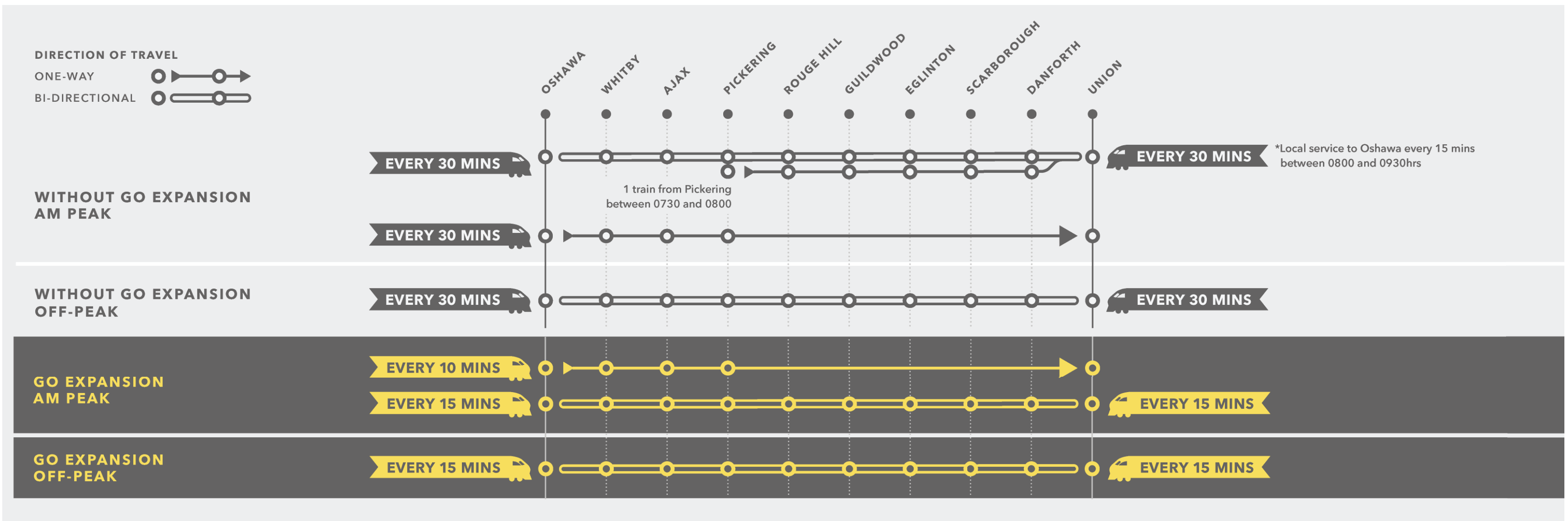


FIGURE B8 AM PEAK REFERENCE CONCEPT DESIGN GO RAIL SERVICES AFTER GO EXPANSION



BEST TIME TO UNION STATION (MINS)

		OSHAWA	WHITBY	AJAX	PICKERING	ROUGE HILL	GUILDWOOD	EGLINTON	SCARBOROUGH	DANFORTH	UNION
AM PEAK	WITHOUT GO EXPANSION	49	42	34	29	30	25	20	16	10	
	GO EXPANSION	40	35	29	25	20	17	14	11	7	
OFF-PEAK	WITHOUT GO EXPANSION	58	51	43	38	30	25	20	16	10	
	GO EXPANSION	40	35	29	26	20	17	14	11	7	

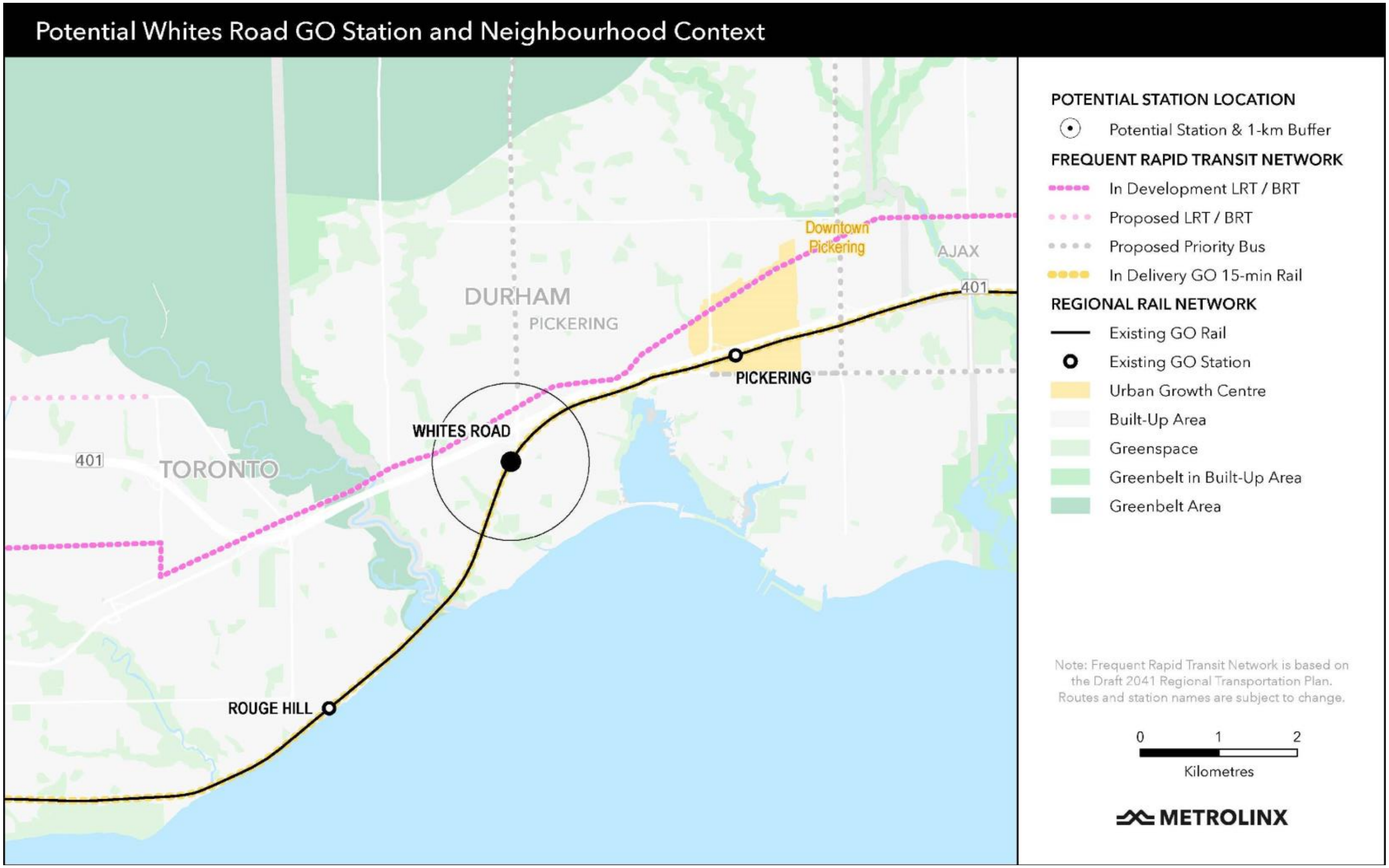
FIGURE B9 LAKESHORE EAST TRAVEL TIME CHANGE FROM GO EXPANSION

3.4 FUTURE NETWORK WITH WHITES GO

In a June 2016 report, Metrolinx examined a number of potential new stations locations across the seven existing GO Transit rail corridors in light of the planned RER and SmartTrack programs. The initial business case (IBC) approach analyzed each potential station based on a strategic and financial case. One of these stations is Whites GO, located near the intersection of Kingston Road and Whites Road.

The location of the potential Whites Road GO Station is illustrated in **Figure B10**.

Whites GO would only be serviced by local service trains along the Lakeshore East line. As such, this scenario would only be feasible with the implementation of GO Expansion. As such this scenario builds upon the previous *Future with GO Expansion* scenario as described in **Section 1.1**.



\\bafp02.tor.bagroup.com\data\WP\5818\3\41\Graphics

FIGURE B10 POTENTIAL WHITES ROAD GO STATION LOCATION

4.0 ANALYSIS OUTPUTS

As discussed in earlier sections, the analysis focuses the following four transit scenarios:

1. Existing Conditions
2. Future Conditions with the planned Durham-Scarborough BRT
3. Future Conditions with the planned Durham-Scarborough BRT , Regional Express Rail Improvements
4. Future Conditions with the planned Durham-Scarborough BRT , Regional Express Rail Improvements and proposed Whites GO Station

Within the four scenarios, transit was also analysed under a local and regional lens.

Local Transit

Local transit accessibility was analysed based on the area that could be serviced within 30 minutes of the Site. The local transit analysis assesses the impact of the planned Durham Scarborough BRT on local travel and day to day trips.

The BRT will provide increased service along the Kingston corridor, with increased headways and connections to Scarborough Town Centre. This will increase the will increase the number of destinations that are “guaranteed” or departure time-independent.

Figure B11 and **Figure B12** illustrate the outputs of scenarios 1 and 2 respectively.

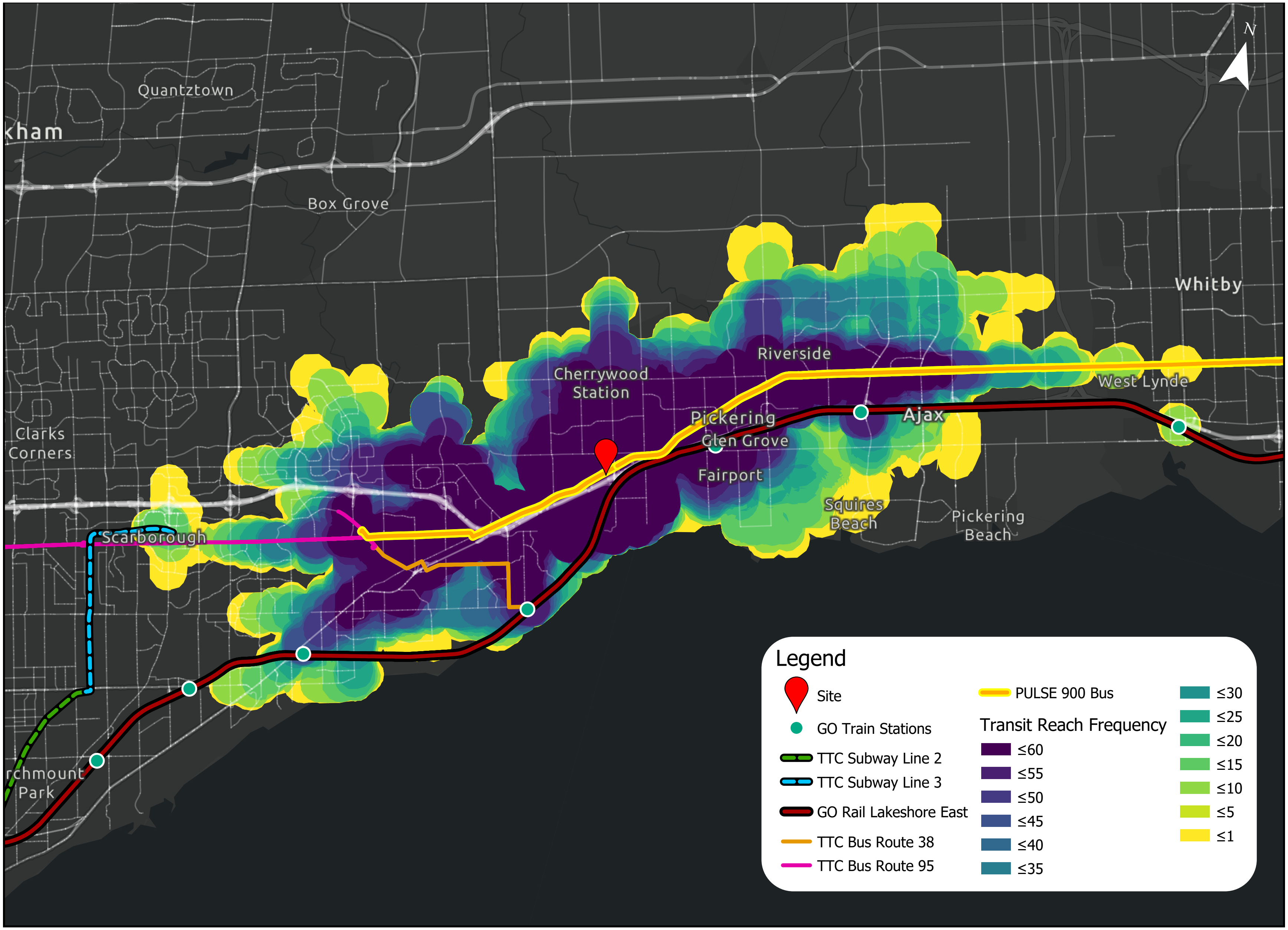
Figure B13 illustrates a comparison of the “guaranteed” transit service area, as discussed in **Section 2.3**, of the existing and future scenarios.

Regional Transit

Regional transit accessibility was analysed based on the area that could be serviced within 60 minutes of the Site. The regional transit analysis assesses the impact of the GO Expansion and the addition of a new GO Station on regional commuters.

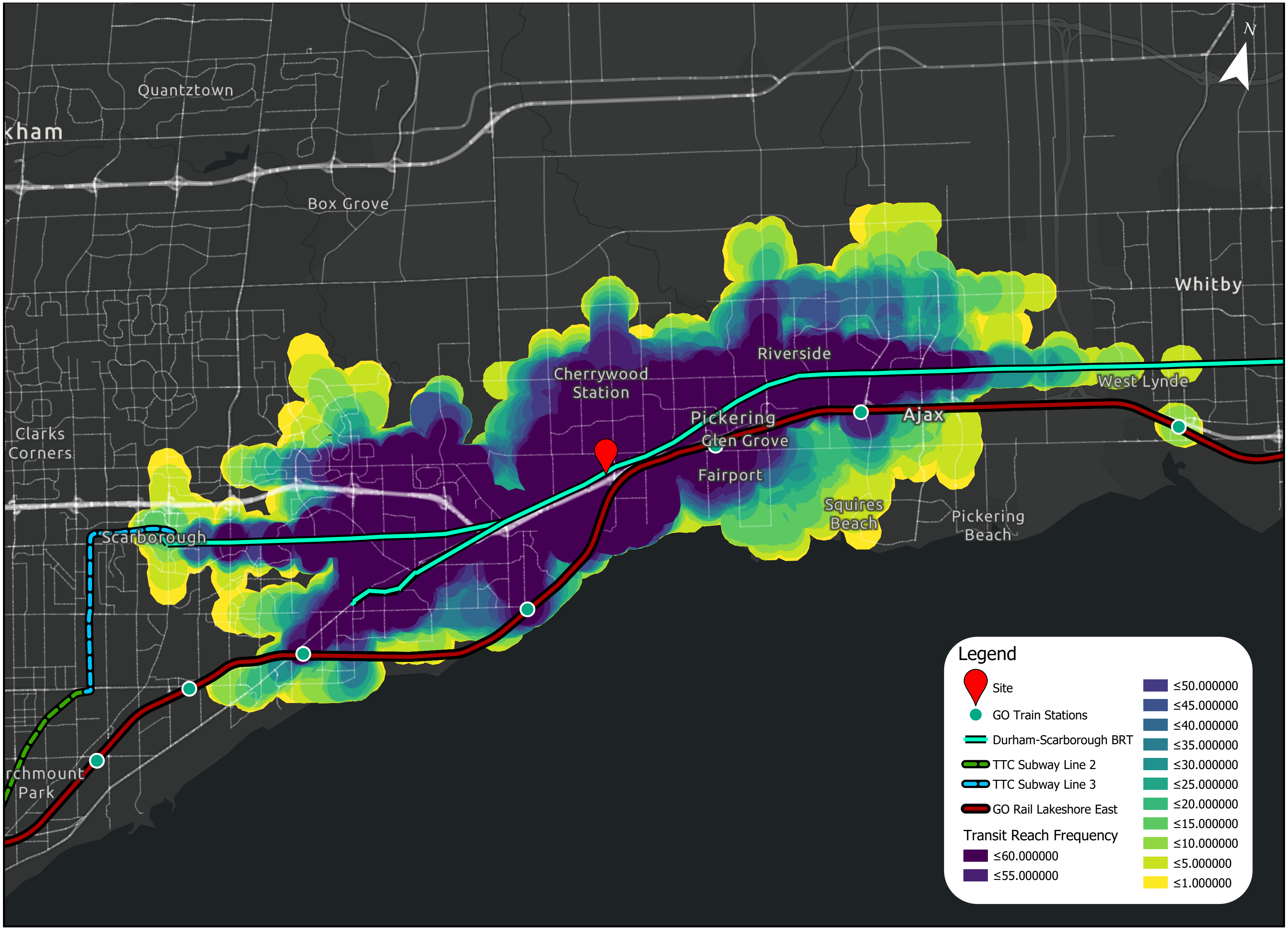
The increased service will provide the Site with an increased Transit Service Area. Additionally, the high frequency services will increase the number of destinations that are “guaranteed” or departure time-independent.

Figure B14 through **Figure B16** illustrate the outputs of scenarios 1, 3, and 4 respectively.



\\bafp02.tor.bagroup.com\data\WP\5883\41\Graphics

FIGURE B11 EXISTING 30 MIN TRANSIT SERVICE AREA BETWEEN 8:00 AM AND 9:00 AM



\\bafp02.tor.bagroup.com\data\WP\5883\41\Graphics

FIGURE B12 FUTURE 30 MIN TRANSIT SERVICE AREA BETWEEN 8:00 AM AND 9:00 AM

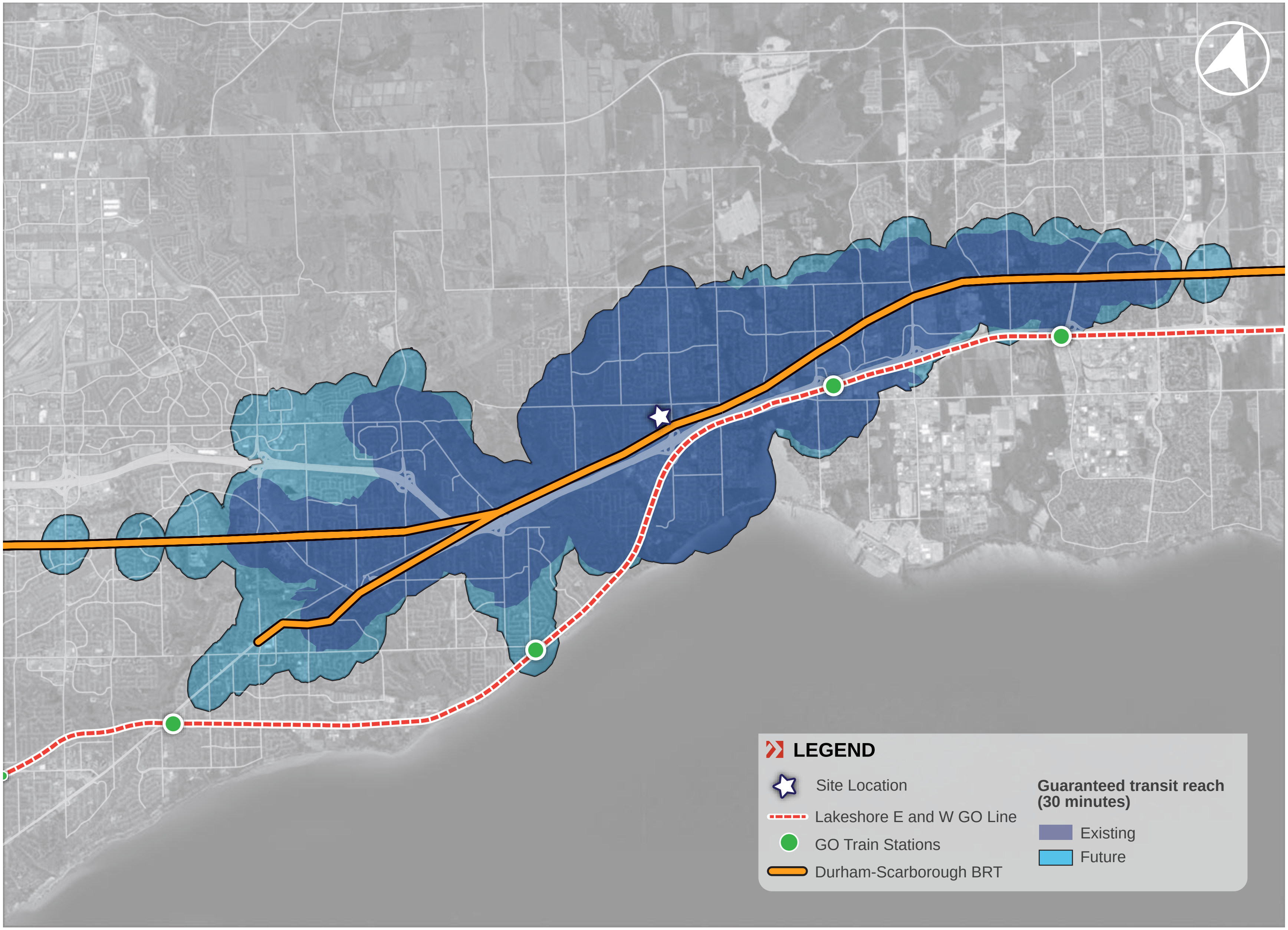
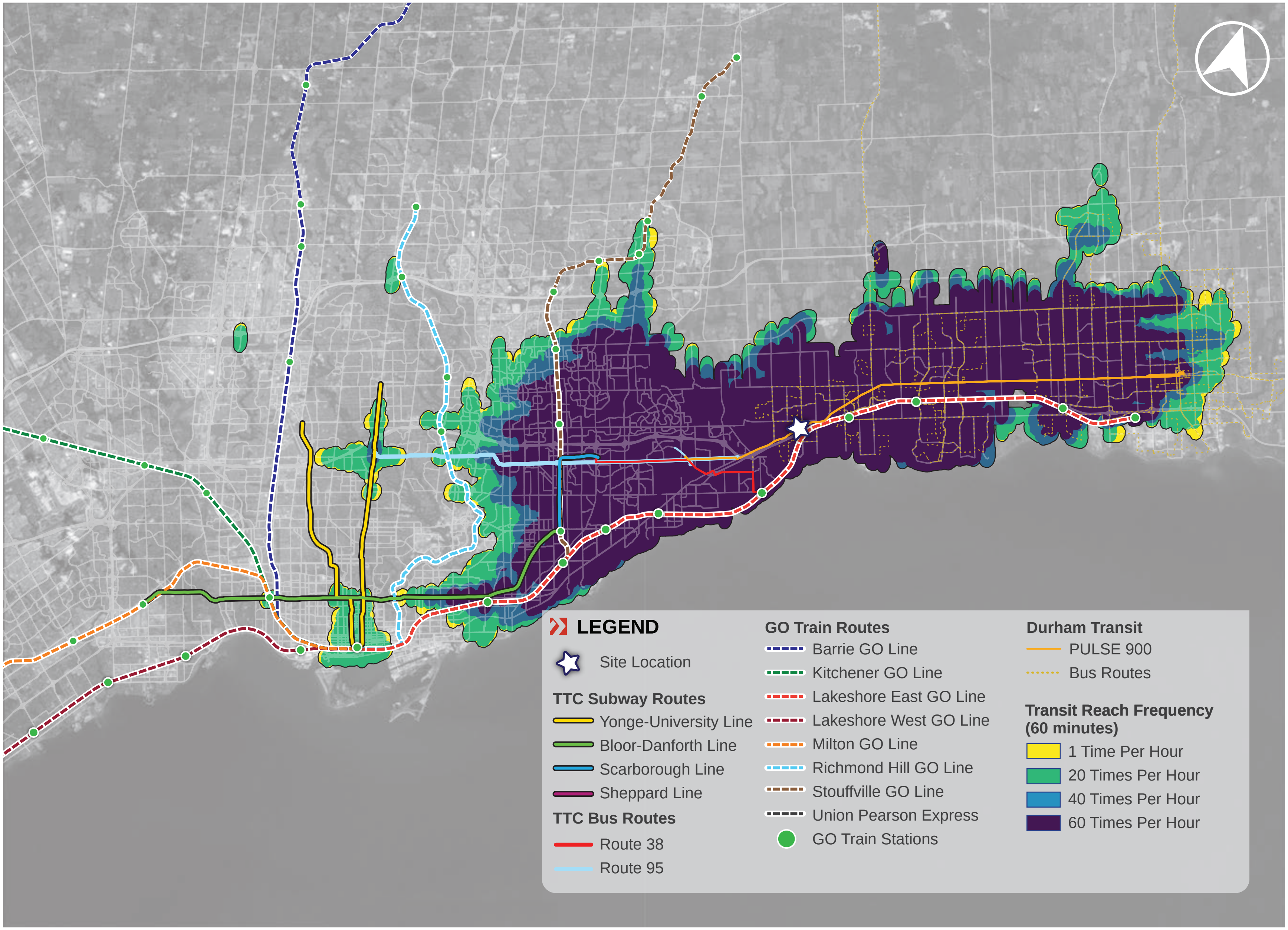
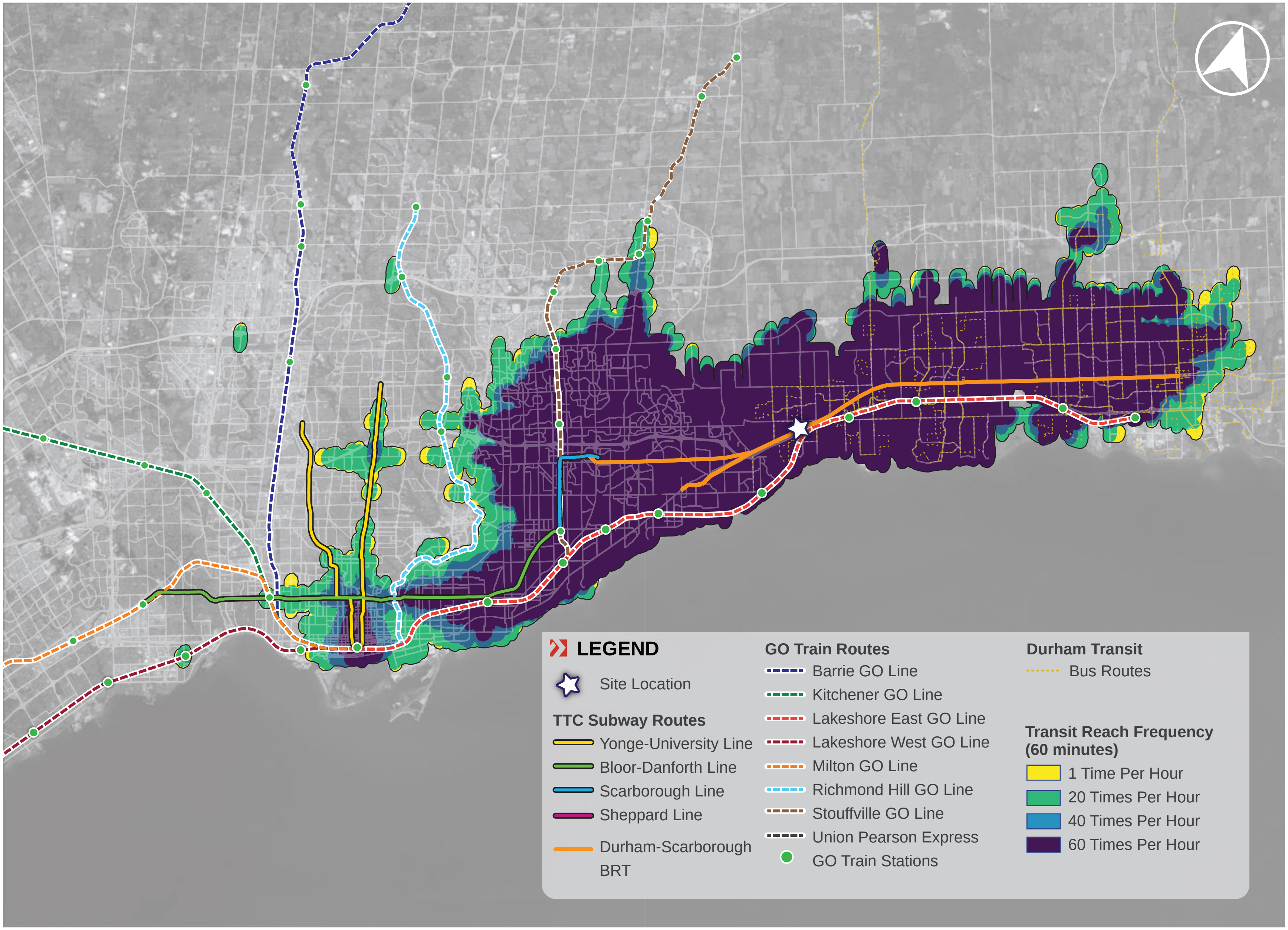


FIGURE B13 EXISTING VS FUTURE WITH BRT GUARANTEED 30 MIN TRANSIT SERVICE AREA



\\bafp02.tor.bagroup.com\data\WP\5818341\Graphics

FIGURE B14 EXISTING 60 MIN TRANSIT SERVICE AREA 8:00 AM AND 9:00 AM



\\bafp02.tor.bagroup.com\data\WP\58\83\41\Graphics

FIGURE B15 FUTURE WITH GO EXPANSION 60 MIN TRANSIT SERVICE AREA BETWEEN 8:00 AM AND 9:00 AM

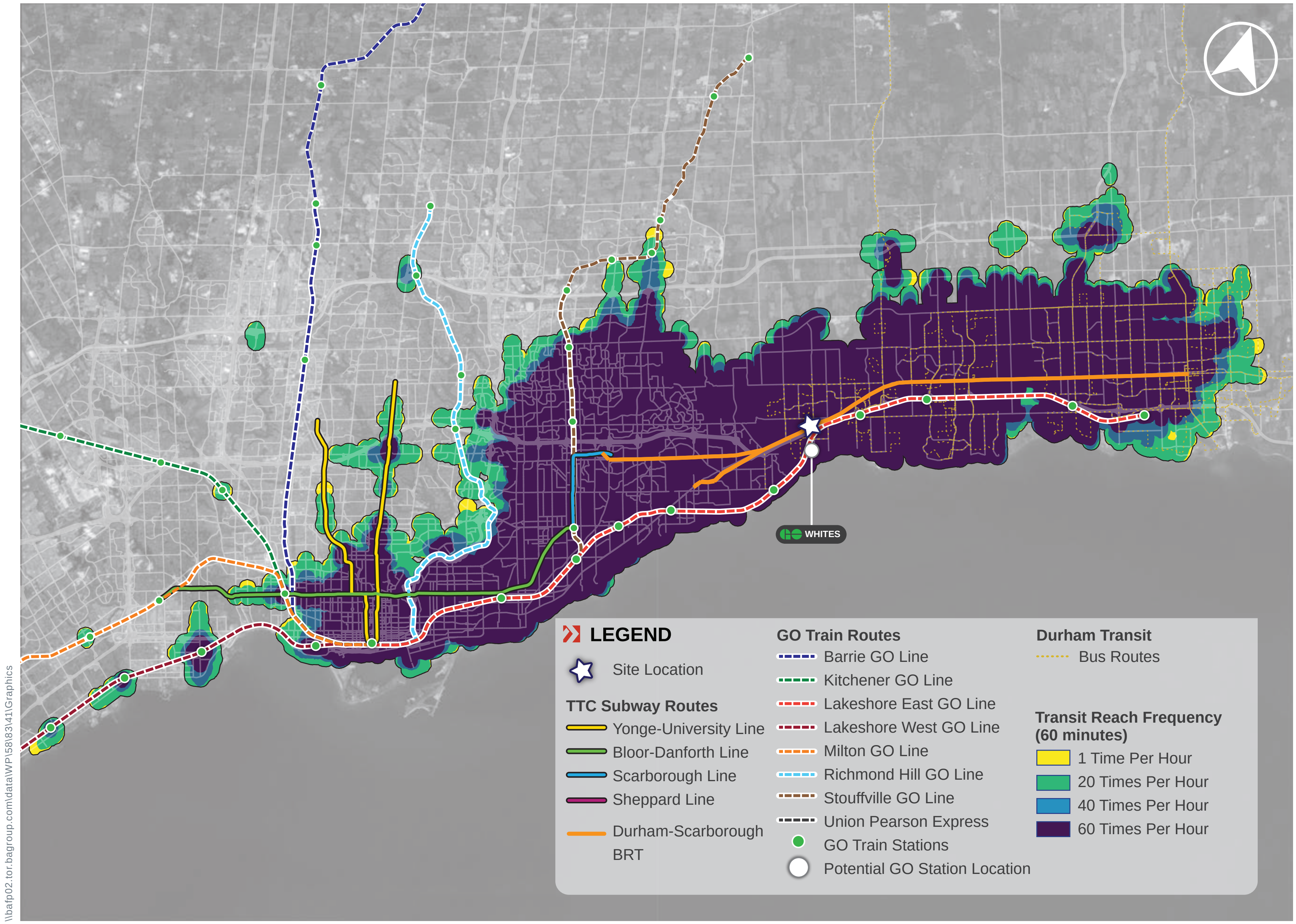


FIGURE B16 FUTURE WITH WHITES GO 60 MIN TRANSIT SERVICE AREA BETWEEN 8:00 AM AND 9:00 AM

Appendix C:
Turning Movements Counts

BA Group
300 45 ST. CLAIR AVE W
TORONTO ONTARIO, M4V 1K9
CANADA

Turning Movement Count (1 . KINGSTON RD & ROSEBANK RD)

Start Time	N Approach ROSEBANK RD						E Approach KINGSTON RD						S Approach ROSEBANK RD						W Approach KINGSTON RD						Int. Total (15 min)	Int. Total (1 hr)
	Right N:W	Thru N:S	Left N:E	UTurn N:N	Peds N:	Approach Total	Right E:N	Thru E:W	Left E:S	UTurn E:E	Peds E:	Approach Total	Right S:E	Thru S:N	Left S:W	UTurn S:S	Peds S:	Approach Total	Right W:S	Thru W:E	Left W:N	UTurn W:W	Peds W:	Approach Total		
07:00:00	11	0	13	0	3	24	6	95	0	0	1	101	0	0	0	0	1	0	0	53	6	0	0	59	184	
07:15:00	10	0	7	0	3	17	14	100	1	0	2	115	0	0	0	0	1	0	0	69	5	0	0	74	206	
07:30:00	23	0	13	0	1	36	7	118	1	0	0	126	0	0	0	0	2	0	1	64	1	0	3	66	228	
07:45:00	25	0	15	0	1	40	14	149	4	0	0	167	1	0	1	0	1	2	2	104	13	0	1	119	328	946
08:00:00	34	1	21	0	1	56	7	147	5	0	0	159	1	0	0	0	0	1	2	104	10	1	0	117	333	1095
08:15:00	29	0	20	0	2	49	19	151	0	0	0	170	1	1	1	0	1	3	2	107	5	0	1	114	336	1225
08:30:00	34	0	33	0	2	67	15	179	5	0	1	199	2	0	0	0	0	2	1	151	3	0	0	155	423	1420
08:45:00	24	3	19	0	1	46	22	180	6	0	0	208	1	1	1	0	0	3	3	156	14	0	1	173	430	1522
BREAK																										
16:00:00	21	1	14	0	5	36	13	206	2	0	2	221	4	0	3	0	1	7	0	281	26	0	2	307	571	
16:15:00	16	1	15	0	2	32	19	205	1	0	0	225	4	1	2	0	1	7	2	282	30	0	0	314	578	
16:30:00	20	0	17	0	4	37	17	171	0	0	1	188	2	1	0	0	1	3	1	367	33	0	4	401	629	
16:45:00	15	0	16	0	1	31	18	152	1	0	0	171	2	0	2	0	0	4	4	313	36	0	1	353	559	2337
17:00:00	19	1	11	0	2	31	17	203	1	0	0	221	9	1	3	0	0	13	0	315	31	0	0	346	611	2377
17:15:00	23	0	12	0	2	35	20	204	1	0	0	225	3	2	0	0	1	5	1	276	35	0	1	312	577	2376
17:30:00	21	1	16	0	7	38	16	162	0	0	6	178	1	1	2	0	5	4	1	292	37	0	1	330	550	2297
17:45:00	20	0	19	0	4	39	11	169	2	0	1	182	1	2	1	0	1	4	1	270	39	0	0	310	535	2273
Grand Total	345	8	261	0	41	614	235	2591	30	0	14	2856	32	10	16	0	16	58	21	3204	324	1	15	3550	**7078**	-
Approach%	56.2%	1.3%	42.5%	0%		-	8.2%	90.7%	1.1%	0%		-	55.2%	17.2%	27.6%	0%		-	0.6%	90.3%	9.1%	0%		-	-	-
Totals %	4.9%	0.1%	3.7%	0%		8.7%	3.3%	36.6%	0.4%	0%		40.4%	0.5%	0.1%	0.2%	0%		0.8%	0.3%	45.3%	4.6%	0%		50.2%	-	-
Heavy	6	0	4	0		-	2	68	0	0		-	0	0	0	0		-	0	71	1	0		-	-	-
Heavy %	1.7%	0%	1.5%	0%		-	0.9%	2.6%	0%	0%		-	0%	0%	0%	0%		-	0%	2.2%	0.3%	0%		-	-	-
Bicycles	0	0	0	0		-	0	1	0	0		-	0	0	0	0		-	0	2	0	0		-	-	-
Bicycle %	0%	0%	0%	0%		-	0%	0%	0%	0%		-	0%	0%	0%	0%		-	0%	0.1%	0%	0%		-	-	-

BA Group
300 45 ST. CLAIR AVE W
TORONTO ONTARIO, M4V 1K9
CANADA

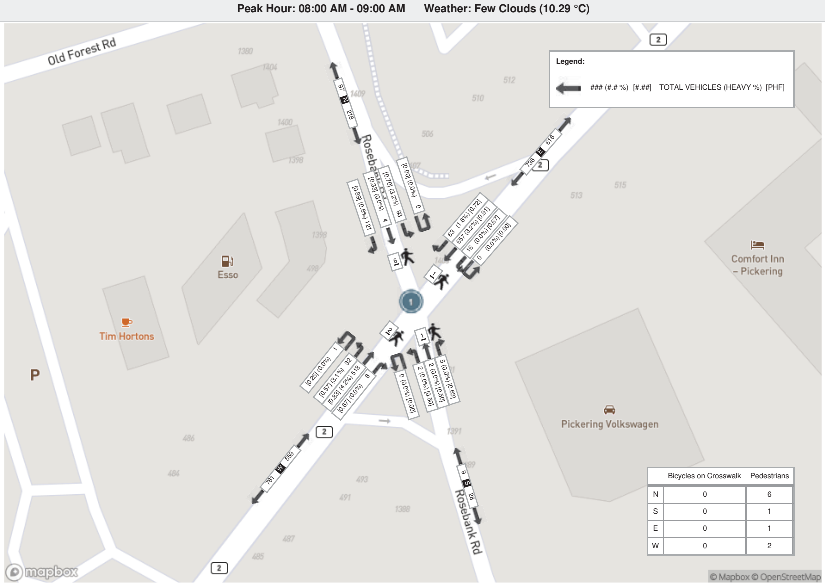
Peak Hour: 08:00 AM - 09:00 AM Weather: Few Clouds (10.29 °C)

Start Time	N Approach ROSEBANK RD						E Approach KINGSTON RD						S Approach ROSEBANK RD						W Approach KINGSTON RD						Int. Total (15 min)
	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	
08:00:00	34	1	21	0	1	56	7	147	5	0	0	159	1	0	0	0	0	1	2	104	10	1	0	117	333
08:15:00	29	0	20	0	2	49	19	151	0	0	0	170	1	1	1	0	1	3	2	107	5	0	1	114	336
08:30:00	34	0	33	0	2	67	15	179	5	0	1	199	2	0	0	0	0	2	1	151	3	0	0	155	423
08:45:00	24	3	19	0	1	46	22	180	6	0	0	208	1	1	1	0	0	3	3	156	14	0	1	173	430
Grand Total	121	4	93	0	6	218	63	657	16	0	1	736	5	2	2	0	1	9	8	518	32	1	2	559	**1522**
Approach%	55.5%	1.8%	42.7%	0%		-	8.6%	89.3%	2.2%	0%		-	55.6%	22.2%	22.2%	0%		-	1.4%	92.7%	5.7%	0.2%		-	-
Totals %	8%	0.3%	6.1%	0%		14.3%	4.1%	43.2%	1.1%	0%		48.4%	0.3%	0.1%	0.1%	0%		0.6%	0.5%	34%	2.1%	0.1%		36.7%	-
PHF	0.89	0.33	0.7	0		0.81	0.72	0.91	0.67	0		0.88	0.63	0.5	0.5	0		0.75	0.67	0.83	0.57	0.25		0.81	-
Heavy	1	0	3	0		4	1	21	0	0		22	0	0	0	0		0	0	22	1	0		23	-
Heavy %	0.8%	0%	3.2%	0%		1.8%	1.6%	3.2%	0%	0%		3%	0%	0%	0%	0%		0%	0%	4.2%	3.1%	0%		4.1%	-
Lights	120	4	90	0		214	62	636	16	0		714	5	2	2	0		9	8	496	31	1		536	-
Lights %	99.2%	100%	96.8%	0%		98.2%	98.4%	96.8%	100%	0%		97%	100%	100%	100%	0%		100%	100%	95.8%	96.9%	100%		95.9%	-
Single-Unit Trucks	1	0	2	0		3	0	6	0	0		6	0	0	0	0		0	0	9	1	0		10	-
Single-Unit Trucks %	0.8%	0%	2.2%	0%		1.4%	0%	0.9%	0%	0%		0.8%	0%	0%	0%	0%		0%	0%	1.7%	3.1%	0%		1.8%	-
Buses	0	0	1	0		1	1	12	0	0		13	0	0	0	0		0	0	12	0	0		12	-
Buses %	0%	0%	1.1%	0%		0.5%	1.6%	1.8%	0%	0%		1.8%	0%	0%	0%	0%		0%	0%	2.3%	0%	0%		2.1%	-
Articulated Trucks	0	0	0	0		0	0	3	0	0		3	0	0	0	0		0	0	1	0	0		1	-
Articulated Trucks %	0%	0%	0%	0%		0%	0%	0.5%	0%	0%		0.4%	0%	0%	0%	0%		0%	0%	0.2%	0%	0%		0.2%	-
Pedestrians	-	-	-	-	6	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	2	-	-
Pedestrians%	-	-	-	-	60%		-	-	-	-	10%		-	-	-	-	10%		-	-	-	-	20%		-
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
Bicycles on Crosswalk%	-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-
Bicycles on Road	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	-
Bicycles on Road%	-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-

Peak Hour: 04:15 PM - 05:15 PM Weather: Scattered Clouds (19.72 °C)

Start Time	N Approach ROSEBANK RD						E Approach KINGSTON RD						S Approach ROSEBANK RD						W Approach KINGSTON RD						Int. Total (15 min)
	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	
16:15:00	16	1	15	0	2	32	19	205	1	0	0	225	4	1	2	0	1	7	2	282	30	0	0	314	578
16:30:00	20	0	17	0	4	37	17	171	0	0	1	188	2	1	0	0	1	3	1	367	33	0	4	401	629
16:45:00	15	0	16	0	1	31	18	152	1	0	0	171	2	0	2	0	0	4	4	313	36	0	1	353	559
17:00:00	19	1	11	0	2	31	17	203	1	0	0	221	9	1	3	0	0	13	0	315	31	0	0	346	611
Grand Total	70	2	59	0	9	131	71	731	3	0	1	805	17	3	7	0	2	27	7	1277	130	0	5	1414	**2377**
Approach%	53.4%	1.5%	45%	0%		-	8.8%	90.8%	0.4%	0%		-	63%	11.1%	25.9%	0%		-	0.5%	90.3%	9.2%	0%		-	-
Totals %	2.9%	0.1%	2.5%	0%		5.5%	3%	30.8%	0.1%	0%		33.9%	0.7%	0.1%	0.3%	0%		1.1%	0.3%	53.7%	5.5%	0%		59.5%	-
PHF	0.88	0.5	0.87	0		0.89	0.93	0.89	0.75	0		0.89	0.47	0.75	0.58	0		0.52	0.44	0.87	0.9	0		0.88	-
Heavy	1	0	0	0		1	0	11	0	0		11	0	0	0	0		0	0	23	0	0		23	-
Heavy %	1.4%	0%	0%	0%		0.8%	0%	1.5%	0%	0%		1.4%	0%	0%	0%	0%		0%	0%	1.8%	0%	0%		1.6%	-
Lights	69	2	59	0		130	71	720	3	0		794	17	3	7	0		27	7	1254	130	0		1391	-
Lights %	98.6%	100%	100%	0%		99.2%	100%	98.5%	100%	0%		98.6%	100%	100%	100%	0%		100%	100%	98.2%	100%	0%		98.4%	-
Single-Unit Trucks	1	0	0	0		1	0	2	0	0		2	0	0	0	0		0	0	11	0	0		11	-
Single-Unit Trucks %	1.4%	0%	0%	0%		0.8%	0%	0.3%	0%	0%		0.2%	0%	0%	0%	0%		0%	0%	0.9%	0%	0%		0.8%	-
Buses	0	0	0	0		0	0	8	0	0		8	0	0	0	0		0	0	10	0	0		10	-
Buses %	0%	0%	0%	0%		0%	0%	1.1%	0%	0%		1%	0%	0%	0%	0%		0%	0%	0.8%	0%	0%		0.7%	-
Articulated Trucks	0	0	0	0		0	0	1	0	0		1	0	0	0	0		0	0	2	0	0		2	-
Articulated Trucks %	0%	0%	0%	0%		0%	0%	0.1%	0%	0%		0.1%	0%	0%	0%	0%		0%	0%	0.2%	0%	0%		0.1%	-
Pedestrians	-	-	-	-	9	-	-	-	-	-	1	-	-	-	-	-	2	-	-	-	-	-	5	-	-
Pedestrians%	-	-	-	-	52.9%		-	-	-	-	5.9%		-	-	-	-	11.8%		-	-	-	-	29.4%		-
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
Bicycles on Crosswalk%	-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-
Bicycles on Road	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	-
Bicycles on Road%	-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-

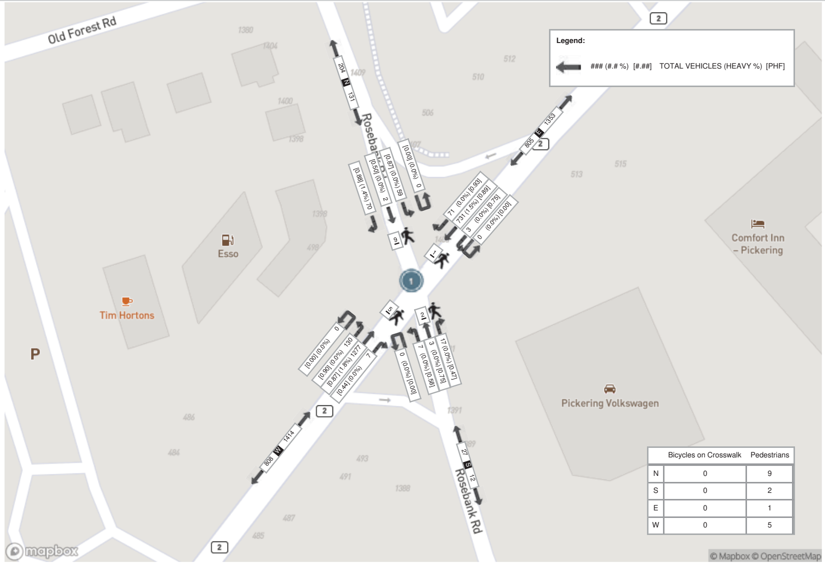
Peak Hour: 08:00 AM - 09:00 AM Weather: Few Clouds (10.29 °C)



	Bicycles on Crosswalk	Pedestrians
N	0	6
S	0	1
E	0	1
W	0	2

BA Group
300 45 ST. CLAIR AVE W
TORONTO ONTARIO, M4V 1K9
CANADA

Peak Hour: 04:15 PM - 05:15 PM Weather: Scattered Clouds (19.72 °C)



BA Group
300 45 ST. CLAIR AVE W
TORONTO ONTARIO, M4V 1K9
CANADA

Turning Movement Count (2 . KINGSTON RD & WEST SITE ACCESS)

Start Time	E Approach KINGSTON RD					S Approach 603-643 KINGSTON RD PLAZA WEST ACCESS					W Approach KINGSTON RD					Int. Total (15 min)	Int. Total (1 hr)
	Thru E:W	Left E:S	UTurn E:E	Peds E:	Approach Total	Right S:E	Left S:W	UTurn S:S	Peds S:	Approach Total	Right W:S	Thru W:E	UTurn W:W	Peds W:	Approach Total		
07:00:00	114	1	0	0	115	1	0	0	0	1	0	67	0	0	67	183	
07:15:00	119	0	0	0	119	0	2	0	0	2	1	77	0	0	78	199	
07:30:00	136	2	0	0	138	1	0	0	1	1	1	77	0	0	78	217	
07:45:00	166	0	0	0	166	3	0	0	0	3	1	118	0	0	119	288	887
08:00:00	172	0	1	1	173	0	2	0	1	2	3	124	0	0	127	302	1006
08:15:00	160	0	0	0	160	0	1	0	0	1	0	130	0	0	130	291	1098
08:30:00	192	0	0	0	192	0	3	0	0	3	2	181	0	0	183	378	1259
08:45:00	209	0	1	0	210	2	1	0	2	3	0	175	1	0	176	389	1360
BREAK																	
16:00:00	226	3	2	0	231	2	9	0	0	11	5	286	0	0	291	533	
16:15:00	220	3	1	0	224	7	4	0	0	11	10	303	0	0	313	548	
16:30:00	196	1	0	0	197	6	0	0	1	6	11	379	0	0	390	593	
16:45:00	202	1	0	0	203	0	2	0	0	2	8	340	0	0	348	553	2227
17:00:00	208	3	0	0	211	5	2	0	0	7	11	345	0	0	356	574	2268
17:15:00	221	1	0	0	222	7	5	0	1	12	5	301	0	0	306	540	2260
17:30:00	177	4	1	0	182	6	3	0	1	9	6	325	0	0	331	522	2189
17:45:00	195	1	1	0	197	7	6	0	1	13	9	295	0	0	304	514	2150
Grand Total	2913	20	7	1	2940	47	40	0	8	87	73	3523	1	0	3597	**6624**	-
Approach%	99.1%	0.7%	0.2%		-	54%	46%	0%		-	2%	97.9%	0%		-	-	-
Totals %	44%	0.3%	0.1%		44.4%	0.7%	0.6%	0%		1.3%	1.1%	53.2%	0%		54.3%	-	-
Heavy	73	0	0		-	2	1	0		-	0	81	0		-	-	-
Heavy %	2.5%	0%	0%		-	4.3%	2.5%	0%		-	0%	2.3%	0%		-	-	-
Bicycles	0	0	0		-	0	0	0		-	0	1	0		-	-	-
Bicycle %	0%	0%	0%		-	0%	0%	0%		-	0%	0%	0%		-	-	-

BA Group
300 45 ST. CLAIR AVE W
TORONTO ONTARIO, M4V 1K9
CANADA

Peak Hour: 08:00 AM - 09:00 AM Weather: Few Clouds (10.29 °C)

Start Time	E Approach KINGSTON RD					S Approach 603-643 KINGSTON RD PLAZA WEST ACCESS					W Approach KINGSTON RD					Int. Total (15 min)
	Thru	Left	UTurn	Peds	Approach Total	Right	Left	UTurn	Peds	Approach Total	Right	Thru	UTurn	Peds	Approach Total	
08:00:00	172	0	1	1	173	0	2	0	1	2	3	124	0	0	127	302
08:15:00	160	0	0	0	160	0	1	0	0	1	0	130	0	0	130	291
08:30:00	192	0	0	0	192	0	3	0	0	3	2	181	0	0	183	378
08:45:00	209	0	1	0	210	2	1	0	2	3	0	175	1	0	176	389
Grand Total	733	0	2	1	735	2	7	0	3	9	5	610	1	0	616	**1360**
Approach%	99.7%	0%	0.3%		-	22.2%	77.8%	0%		-	0.8%	99%	0.2%		-	-
Totals %	53.9%	0%	0.1%		54%	0.1%	0.5%	0%		0.7%	0.4%	44.9%	0.1%		45.3%	-
PHF	0.88	0	0.5		0.88	0.25	0.58	0		0.75	0.42	0.84	0.25		0.84	-
Heavy	22	0	0		22	0	1	0		1	0	28	0		28	-
Heavy %	3%	0%	0%		3%	0%	14.3%	0%		11.1%	0%	4.6%	0%		4.5%	-
Lights	711	0	2		713	2	6	0		8	5	582	1		588	-
Lights %	97%	0%	100%		97%	100%	85.7%	0%		88.9%	100%	95.4%	100%		95.5%	-
Single-Unit Trucks	7	0	0		7	0	1	0		1	0	14	0		14	-
Single-Unit Trucks %	1%	0%	0%		1%	0%	14.3%	0%		11.1%	0%	2.3%	0%		2.3%	-
Buses	12	0	0		12	0	0	0		0	0	13	0		13	-
Buses %	1.6%	0%	0%		1.6%	0%	0%	0%		0%	0%	2.1%	0%		2.1%	-
Articulated Trucks	3	0	0		3	0	0	0		0	0	1	0		1	-
Articulated Trucks %	0.4%	0%	0%		0.4%	0%	0%	0%		0%	0%	0.2%	0%		0.2%	-
Pedestrians	-	-	-	1	-	-	-	-	3	-	-	-	-	0	-	-
Pedestrians%	-	-	-	25%		-	-	-	75%		-	-	-	0%		-
Bicycles on Road	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	-
Bicycles on Road%	-	-	-	0%		-	-	-	0%		-	-	-	0%		-

BA Group
300 45 ST. CLAIR AVE W
TORONTO ONTARIO, M4V 1K9
CANADA

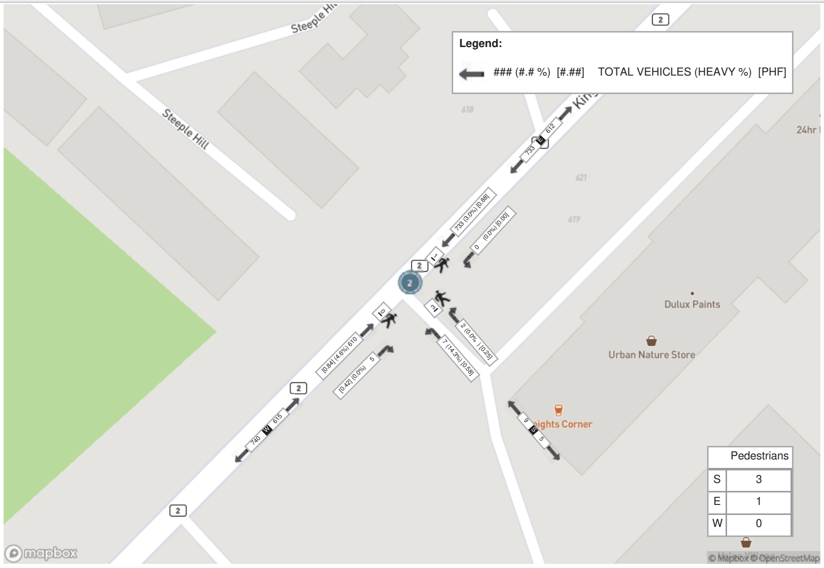
Peak Hour: 04:15 PM - 05:15 PM Weather: Scattered Clouds (19.72 °C)

Start Time	E Approach KINGSTON RD					S Approach 603-643 KINGSTON RD PLAZA WEST ACCESS					W Approach KINGSTON RD					Int. Total (15 min)
	Thru	Left	UTurn	Peds	Approach Total	Right	Left	UTurn	Peds	Approach Total	Right	Thru	UTurn	Peds	Approach Total	
16:15:00	220	3	1	0	224	7	4	0	0	11	10	303	0	0	313	548
16:30:00	196	1	0	0	197	6	0	0	1	6	11	379	0	0	390	593
16:45:00	202	1	0	0	203	0	2	0	0	2	8	340	0	0	348	553
17:00:00	208	3	0	0	211	5	2	0	0	7	11	345	0	0	356	574
Grand Total	826	8	1	0	835	18	8	0	1	26	40	1367	0	0	1407	**2268**
Approach%	98.9%	1%	0.1%		-	69.2%	30.8%	0%		-	2.8%	97.2%	0%		-	-
Totals %	36.4%	0.4%	0%		36.8%	0.8%	0.4%	0%		1.1%	1.8%	60.3%	0%		62%	-
PHF	0.94	0.67	0.25		0.93	0.64	0.5	0		0.59	0.91	0.9	0		0.9	-
Heavy	13	0	0		13	1	0	0		1	0	23	0		23	-
Heavy %	1.6%	0%	0%		1.6%	5.6%	0%	0%		3.8%	0%	1.7%	0%		1.6%	-
Lights	813	8	1		822	17	8	0		25	40	1344	0		1384	-
Lights %	98.4%	100%	100%		98.4%	94.4%	100%	0%		96.2%	100%	98.3%	0%		98.4%	-
Single-Unit Trucks	4	0	0		4	0	0	0		0	0	12	0		12	-
Single-Unit Trucks %	0.5%	0%	0%		0.5%	0%	0%	0%		0%	0%	0.9%	0%		0.9%	-
Buses	8	0	0		8	0	0	0		0	0	9	0		9	-
Buses %	1%	0%	0%		1%	0%	0%	0%		0%	0%	0.7%	0%		0.6%	-
Articulated Trucks	1	0	0		1	1	0	0		1	0	2	0		2	-
Articulated Trucks %	0.1%	0%	0%		0.1%	5.6%	0%	0%		3.8%	0%	0.1%	0%		0.1%	-
Pedestrians	-	-	-	0	-	-	-	-	1	-	-	-	-	0	-	-
Pedestrians%	-	-	-	0%		-	-	-	100%		-	-	-	0%		-
Bicycles on Road	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	-
Bicycles on Road%	-	-	-	0%		-	-	-	0%		-	-	-	0%		-

Turning Movement Count
Location Name: KINGSTON RD & WEST SITE ACCESS
Date: Tue, May 16, 2023   Deployment Lead: Walter Fugaj

BA Group
300 45 ST. CLAIR AVE W
TORONTO ONTARIO, M4V 1K9
CANADA

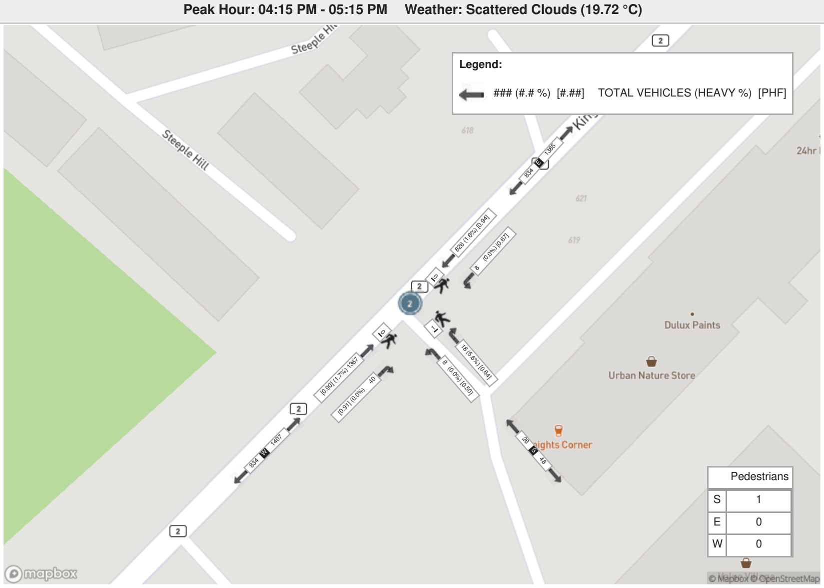
Peak Hour: 08:00 AM - 09:00 AM   Weather: Few Clouds (10.29 °C)



Turning Movement Count
Location Name: KINGSTON RD & WEST SITE ACCESS
Date: Tue, May 16, 2023   Deployment Lead: Walter Fugaj

BA Group
300 45 ST. CLAIR AVE W
TORONTO ONTARIO, M4V 1K9
CANADA

Peak Hour: 04:15 PM - 05:15 PM   Weather: Scattered Clouds (19.72 °C)



Turning Movement Count (3 . KINGSTON RD & STEEPLE HILL / EAST SITE ACCESS)

Start Time	N Approach STEEPLE HILL RD						E Approach KINGSTON RD					
	Right N:W	Thru N:S	Left N:E	UTurn N:N	Peds N:	Approach Total	Right E:N	Thru E:W	Left E:S	UTurn E:E	Peds E:	Approach Total
07:00:00	3	0	22	0	3	25	6	110	7	0	0	123
07:15:00	6	0	20	0	1	26	7	111	7	1	0	126
07:30:00	7	0	27	0	1	34	6	128	4	0	1	138
07:45:00	9	0	31	0	1	40	16	158	7	2	2	183
08:00:00	11	0	29	0	1	40	6	156	6	0	3	168
08:15:00	8	0	22	0	1	30	2	150	4	0	1	156
08:30:00	6	1	38	0	3	45	7	190	11	1	3	209
08:45:00	9	0	38	0	1	47	15	202	7	1	1	225
BREAK												
16:00:00	10	4	63	0	7	77	26	208	34	3	5	271
16:15:00	14	5	43	0	2	62	29	205	30	0	5	264
16:30:00	16	4	49	0	3	69	16	172	27	2	5	217
16:45:00	12	0	43	0	1	55	20	180	29	1	1	230
17:00:00	8	8	61	0	5	77	37	192	20	0	6	249
17:15:00	14	6	53	0	5	73	26	200	24	0	4	250
17:30:00	8	3	52	0	3	63	34	165	32	2	6	233
17:45:00	17	4	51	0	2	72	20	171	39	2	2	232
Grand Total	158	35	642	0	40	835	273	2698	288	15	45	3274
Approach%	18.9%	4.2%	76.9%	0%		-	8.3%	82.4%	8.8%	0.5%		-
Totals %	2%	0.4%	7.9%	0%		10.3%	3.4%	33.4%	3.6%	0.2%		40.5%
Heavy	3	0	7	0		-	3	70	4	0		-
Heavy %	1.9%	0%	1.1%	0%		-	1.1%	2.6%	1.4%	0%		-
Bicycles	0	0	0	0		-	0	0	0	0		-
Bicycle %	0%	0%	0%	0%		-	0%	0%	0%	0%		-

Start Time	S Approach 603-643 KINGSTON RD PLAZA EAST ACCESS						W Approach KINGSTON RD						Int. Total (15 min)	Int. Total (1 hr)
	Right S:E	Thru S:N	Left S:W	UTurn S:S	Peds S:	Approach Total	Right W:S	Thru W:E	Left W:N	UTurn W:W	Peds W:	Approach Total		
07:00:00	4	0	1	0	1	5	0	65	3	0	0	68	221	
07:15:00	3	0	1	0	0	4	0	73	3	0	0	76	232	
07:30:00	0	0	1	0	1	1	0	74	6	0	0	80	253	
07:45:00	6	1	0	0	1	7	1	116	4	0	0	121	351	1057
08:00:00	3	0	2	0	0	5	1	114	7	0	1	122	335	1171
08:15:00	4	0	1	0	1	5	2	126	7	0	0	135	326	1265
08:30:00	6	0	1	0	0	7	2	161	14	0	1	177	438	1450
08:45:00	5	1	1	0	0	7	1	165	14	0	0	180	459	1558
BREAK														
16:00:00	25	4	8	0	2	37	7	271	20	0	3	298	683	
16:15:00	27	7	5	0	1	39	6	281	26	1	0	314	679	
16:30:00	34	6	10	0	0	50	9	345	23	1	0	378	714	
16:45:00	31	3	11	0	0	45	8	313	22	0	0	343	673	2749
17:00:00	46	6	8	0	0	60	10	315	25	1	0	351	737	2803
17:15:00	27	4	10	0	3	41	8	285	18	0	1	311	675	2799
17:30:00	24	2	6	0	0	32	5	297	26	1	2	329	657	2742
17:45:00	34	4	8	0	1	46	2	282	21	0	1	305	655	2724
Grand Total	279	38	74	0	11	391	62	3283	239	4	9	3588	**8088**	-
Approach%	71.4%	9.7%	18.9%	0%		-	1.7%	91.5%	6.7%	0.1%		-	-	-
Totals %	3.4%	0.5%	0.9%	0%		4.8%	0.8%	40.6%	3%	0%		44.4%	-	-
Heavy	1	0	1	0		-	0	80	3	0		-	-	-
Heavy %	0.4%	0%	1.4%	0%		-	0%	2.4%	1.3%	0%		-	-	-
Bicycles	0	0	0	0		-	0	1	0	0		-	-	-
Bicycle %	0%	0%	0%	0%		-	0%	0%	0%	0%		-	-	-

Peak Hour: 08:00 AM - 09:00 AM Weather: Few Clouds (10.29 °C)

Start Time	N Approach STEEPLE HILL RD						E Approach KINGSTON RD					
	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total
08:00:00	11	0	29	0	1	40	6	156	6	0	3	168
08:15:00	8	0	22	0	1	30	2	150	4	0	1	156
08:30:00	6	1	38	0	3	45	7	190	11	1	3	209
08:45:00	9	0	38	0	1	47	15	202	7	1	1	225
Grand Total	34	1	127	0	6	162	30	698	28	2	8	758
Approach%	21%	0.6%	78.4%	0%		-	4%	92.1%	3.7%	0.3%		-
Totals %	2.2%	0.1%	8.2%	0%		10.4%	1.9%	44.8%	1.8%	0.1%		48.7%
PHF	0.77	0.25	0.84	0		0.86	0.5	0.86	0.64	0.5		0.84
Heavy	2	0	5	0		7	1	19	2	0		22
Heavy %	5.9%	0%	3.9%	0%		4.3%	3.3%	2.7%	7.1%	0%		2.9%
Lights	32	1	122	0		155	29	679	26	2		736
Lights %	94.1%	100%	96.1%	0%		95.7%	96.7%	97.3%	92.9%	100%		97.1%
Single-Unit Trucks	1	0	4	0		5	1	6	2	0		9
Single-Unit Trucks %	2.9%	0%	3.1%	0%		3.1%	3.3%	0.9%	7.1%	0%		1.2%
Buses	1	0	0	0		1	0	10	0	0		10
Buses %	2.9%	0%	0%	0%		0.6%	0%	1.4%	0%	0%		1.3%
Articulated Trucks	0	0	1	0		1	0	3	0	0		3
Articulated Trucks %	0%	0%	0.8%	0%		0.6%	0%	0.4%	0%	0%		0.4%
Pedestrians	-	-	-	-	6	-	-	-	-	-	8	-
Pedestrians%	-	-	-	-	35.3%		-	-	-	-	47.1%	
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-
Bicycles on Crosswalk%	-	-	-	-	0%		-	-	-	-	0%	
Bicycles on Road	0	0	0	0	0	-	0	0	0	0	0	-
Bicycles on Road%	-	-	-	-	0%		-	-	-	-	0%	

Start Time	S Approach 603-643 KINGSTON RD PLAZA EAST ACCESS						W Approach KINGSTON RD						Int. Total (15 min)
	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	
08:00:00	3	0	2	0	0	5	1	114	7	0	1	122	335
08:15:00	4	0	1	0	1	5	2	126	7	0	0	135	326
08:30:00	6	0	1	0	0	7	2	161	14	0	1	177	438
08:45:00	5	1	1	0	0	7	1	165	14	0	0	180	459
Grand Total	18	1	5	0	1	24	6	566	42	0	2	614	**1558**
Approach%	75%	4.2%	20.8%	0%		-	1%	92.2%	6.8%	0%		-	-
Totals %	1.2%	0.1%	0.3%	0%		1.5%	0.4%	36.3%	2.7%	0%		39.4%	-
PHF	0.75	0.25	0.63	0		0.86	0.75	0.86	0.75	0		0.85	-
Heavy	0	0	1	0		1	0	26	2	0		28	-
Heavy %	0%	0%	20%	0%		4.2%	0%	4.6%	4.8%	0%		4.6%	-
Lights	18	1	4	0		23	6	540	40	0		586	-
Lights %	100%	100%	80%	0%		95.8%	100%	95.4%	95.2%	0%		95.4%	-
Single-Unit Trucks	0	0	0	0		0	0	12	2	0		14	-
Single-Unit Trucks %	0%	0%	0%	0%		0%	0%	2.1%	4.8%	0%		2.3%	-
Buses	0	0	1	0		1	0	13	0	0		13	-
Buses %	0%	0%	20%	0%		4.2%	0%	2.3%	0%	0%		2.1%	-
Articulated Trucks	0	0	0	0		0	0	1	0	0		1	-
Articulated Trucks %	0%	0%	0%	0%		0%	0%	0.2%	0%	0%		0.2%	-
Pedestrians	-	-	-	-	1	-	-	-	-	-	2	-	-
Pedestrians%	-	-	-	-	5.9%		-	-	-	-	11.8%		-
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-
Bicycles on Crosswalk%	-	-	-	-	0%		-	-	-	-	0%		-
Bicycles on Road	0	0	0	0	0	-	0	0	0	0	0	-	-
Bicycles on Road%	-	-	-	-	0%		-	-	-	-	0%		-

Spectrum

Turning Movement Count
Location Name: KINGSTON RD & STEEPLE HILL / EAST SITE ACCESS
Date: Tue, May 16, 2023 Deployment Lead: Walter Fugaj

BA Group
300 45 ST. CLAIR AVE W
TORONTO ONTARIO, M4V 1K9
CANADA

Peak Hour: 04:15 PM - 05:15 PM Weather: Scattered Clouds (19.72 °C)

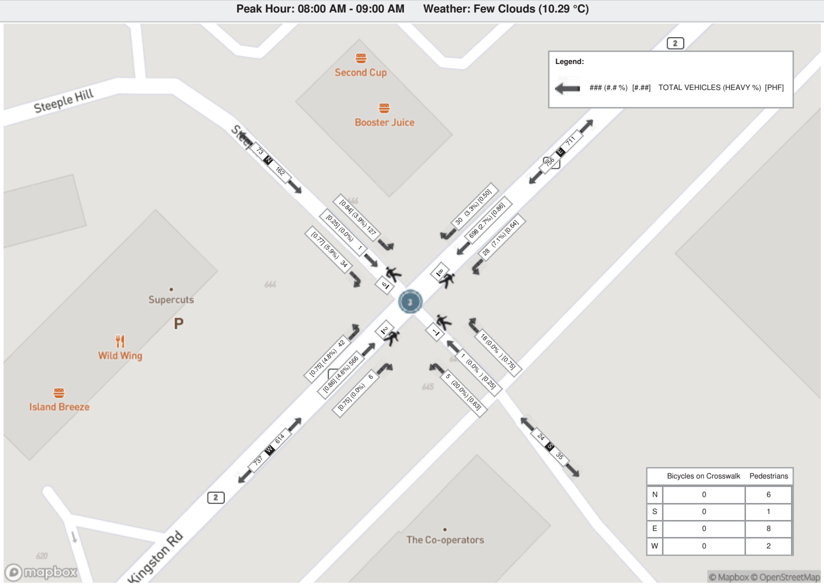
Start Time	N Approach STEEPLE HILL RD						E Approach KINGSTON RD						S Approach 603-643 KINGSTON RD PLAZA EAST ACCESS						W Approach KINGSTON RD						Int. Total (15 min)
	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	
16:15:00	14	5	43	0	2	62	29	205	30	0	5	264	27	7	5	0	1	39	6	281	26	1	0	314	679
16:30:00	16	4	49	0	3	69	16	172	27	2	5	217	34	6	10	0	0	50	9	345	23	1	0	378	714
16:45:00	12	0	43	0	1	55	20	180	29	1	1	230	31	3	11	0	0	45	8	313	22	0	0	343	673
17:00:00	8	8	61	0	5	77	37	192	20	0	6	249	46	6	8	0	0	60	10	315	25	1	0	351	737
Grand Total	50	17	196	0	11	263	102	749	106	3	17	960	138	22	34	0	1	194	33	1254	96	3	0	1386	**2803**
Approach%	19%	6.5%	74.5%	0%		-	10.6%	78%	11%	0.3%		-	71.1%	11.3%	17.5%	0%		-	2.4%	90.5%	6.9%	0.2%		-	-
Totals %	1.8%	0.6%	7%	0%		9.4%	3.6%	26.7%	3.8%	0.1%		34.2%	4.9%	0.8%	1.2%	0%		6.9%	1.2%	44.7%	3.4%	0.1%		49.4%	-
PHF	0.78	0.53	0.8	0		0.85	0.69	0.91	0.88	0.38		0.91	0.75	0.79	0.77	0		0.81	0.83	0.91	0.92	0.75		0.92	-
Heavy	0	0	1	0		1	0	13	0	0		13	0	0	0	0		0	0	24	0	0		24	-
Heavy %	0%	0%	0.5%	0%		0.4%	0%	1.7%	0%	0%		1.4%	0%	0%	0%	0%		0%	0%	1.9%	0%	0%		1.7%	-
Lights	50	17	195	0		262	102	736	106	3		947	138	22	34	0		194	33	1230	96	3		1362	-
Lights %	100%	100%	99.5%	0%		99.6%	100%	98.3%	100%	100%		98.6%	100%	100%	100%	0%		100%	100%	98.1%	100%	100%		98.3%	-
Single-Unit Trucks	0	0	1	0		1	0	4	0	0		4	0	0	0	0		0	0	12	0	0		12	-
Single-Unit Trucks %	0%	0%	0.5%	0%		0.4%	0%	0.5%	0%	0%		0.4%	0%	0%	0%	0%		0%	0%	1%	0%	0%		0.9%	-
Buses	0	0	0	0		0	0	8	0	0		8	0	0	0	0		0	0	9	0	0		9	-
Buses %	0%	0%	0%	0%		0%	0%	1.1%	0%	0%		0.8%	0%	0%	0%	0%		0%	0%	0.7%	0%	0%		0.6%	-
Articulated Trucks	0	0	0	0		0	0	1	0	0		1	0	0	0	0		0	0	3	0	0		3	-
Articulated Trucks %	0%	0%	0%	0%		0%	0%	0.1%	0%	0%		0.1%	0%	0%	0%	0%		0%	0%	0.2%	0%	0%		0.2%	-
Pedestrians	-	-	-	-	11	-	-	-	-	-	17	-	-	-	-	-	1	-	-	-	-	-	0	-	-
Pedestrians%	-	-	-	-	37.9%		-	-	-	-	58.6%		-	-	-	-	3.4%		-	-	-	-	0%		-
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
Bicycles on Crosswalk%	-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-
Bicycles on Road	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	-
Bicycles on Road%	-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-

Spectrum

Turning Movement Count
Location Name: KINGSTON RD & STEEPLE HILL / EAST SITE ACCESS
Date: Tue, May 16, 2023 Deployment Lead: Walter Fugaj

BA Group
300 45 ST. CLAIR AVE W
TORONTO ONTARIO, M4V 1K9
CANADA

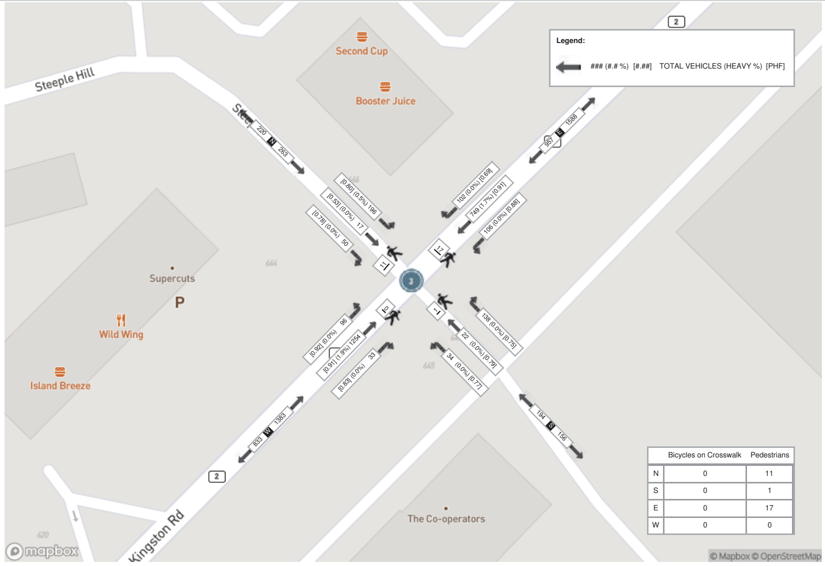
Peak Hour: 08:00 AM - 09:00 AM Weather: Few Clouds (10.29 °C)



Turning Movement Count
Location Name: KINGSTON RD & STEEPLE HILL / EAST SITE ACCESS
Date: Tue, May 16, 2023   Deployment Lead: Walter Fugaj

BA Group
300 45 ST. CLAIR AVE W
TORONTO ONTARIO, M4V 1K9
CANADA

Peak Hour: 04:15 PM - 05:15 PM   Weather: Scattered Clouds (19.72 °C)



Er WUgN omL& LUtVor Ut
uocatioUN a& L:NDS GAETI NK NNR OSEBANK
atL:NEr LNW aFN41N8032NNNN LploF& LUtNLaP:NR altLWNr ga(

- sNGWr p
200N68NAE%Wus SKNs, BNR
ETKTI ETNTI EsKSTNW 6, N4D5
VsIs s

Turning Movement Count (4 . KINGSTON RD & WHITES RD)

Start Time	N Approach R OSEBANK						E Approach DS GAETI NK						S Approach R OSEBANK						W Approach DS GAETI NK						Int. Total (15 min)	Int. Total (1 hr)
	Kight I :R	EhW I :A	uLd I :B	f ErW I :I	nLPd I :	sppWachNEotal	Kight B:I	EhW B:R	uLd B:A	f ErW B:B	nLPd B:	sppWachNEotal	Kight A:B	EhW A:I	uLd A:R	f ErW A:A	nLPd A:	sppWachNEotal	Kight R :A	EhW R :B	uLd R :I	f ErW R :R	nLPd R :	sppWachNEotal		
07:00:00	1	300	7	0	2	342	69	54	82	0	2	453	12	75	26	0	4	471	63	60	1	0	0	99	115	
07:48:00	45	347	47	0	0	382	12	51	13	0	0	334	10	97	37	0	0	476	10	34	7	0	0	99	721	
07:20:00	32	315	45	0	8	244	89	404	65	4	2	305	76	52	20	0	4	457	18	60	9	0	0	442	920	
07:68:00	24	267	27	3	4	647	93	445	52	0	8	356	59	432	25	0	3	310	71	67	44	0	3	426	4408	2260
09:00:00	38	392	64	0	1	265	72	444	52	0	1	377	51	447	62	0	2	381	93	89	34	0	2	414	4062	2746
09:48:00	37	316	20	0	4	234	54	445	18	0	4	378	57	440	29	0	4	368	74	89	40	0	4	425	590	2589
09:20:00	23	388	60	0	2	237	50	485	13	0	2	244	59	54	39	0	3	347	407	54	30	0	6	349	4072	6304
09:68:00	35	365	60	0	6	249	55	473	72	4	2	268	463	433	61	4	4	244	95	54	34	4	4	303	4471	6373
- KBs D																										
41:00:00	62	467	80	0	41	360	435	309	13	0	5	255	496	450	17	0	47	664	56	329	65	0	49	294	4614	
41:48:00	68	439	84	0	8	336	425	491	17	4	8	252	491	308	88	0	3	661	55	456	66	0	7	227	4600	
41:20:00	35	471	67	0	41	383	422	416	18	0	40	213	485	304	60	0	2	600	403	383	85	0	6	642	4637	
41:68:00	65	493	65	0	7	390	443	411	15	0	40	267	478	453	69	0	0	648	407	321	88	4	0	255	4664	8735
47:00:00	22	464	68	0	7	345	424	456	18	4	9	254	419	346	11	0	4	669	409	314	67	4	4	647	4678	8762
47:48:00	20	495	66	0	8	312	420	475	72	0	8	293	303	394	81	0	8	825	404	306	67	0	7	283	4821	8975
47:20:00	66	475	80	0	2	372	462	471	14	0	6	290	453	305	82	0	3	686	56	320	83	4	2	277	4696	8521
47:68:00	36	479	83	0	2	386	425	496	87	0	8	290	490	303	86	0	6	621	54	327	65	0	0	277	4667	8563
Grand Total	695	2606	145	3	98	6846	4110	3638	4015	6	90	8489	3476	3841	736	4	68	8648	4299	3359	801	6	84	6451	**19283**	.
Approach%	40%9C	78%6C	42%7C	0C		.	23%3C	67C	30%7C	0%4C		.	60%4C	61%8C	42%6C	0C		.	22%4C	86%9C	43%4C	0%4C		.	-	.
Totals %	3%8C	47%7C	2%3C	0C		32%6C	9%4C	43%1C	8%8C	0C		31%7C	44%2C	42C	2%9C	0C		39%4C	7%3C	44%5C	3%1C	0C		34%9C	-	.
Heavy	40	13	7	0		.	63	81	39	0		.	68	84	42	0		.	37	83	9	0		.	-	.
Heavy %	3C	4%9C	4%4C	0C		.	3%8C	3%2C	3%1C	0C		.	3%4C	3C	4%9C	0C		.	4%5C	3%2C	4%1C	0C		.	-	.
Bicycles	0	0	0	0		.	0	4	0	0		.	0	4	0	0		.	0	4	0	0		.	-	.
Bicycle %	0C	0C	0C	0C		.	0C	0C	0C	0C		.	0C	0C	0C	0C		.	0C	0C	0C	0C		.	-	.

Peak Hour: 08:00 AM - 09:00 AM NNNNWeather: Few Clouds (10.29 °C)

Start Time	N Approach R OSEBANK						E Approach DS GAETI NK					
	Kight	EhW	uLet	f Er W	nLPd	sppWachNEotal	Kight	EhW	uLet	f Er W	nLPd	sppWachNEotal
09:00:00	38	392	64	0	1	265	72	444	52	0	1	377
09:48:00	37	316	20	0	4	234	54	445	18	0	4	378
09:20:00	23	388	60	0	2	237	50	485	13	0	2	244
09:68:00	35	365	60	0	6	249	55	473	72	4	2	268
Grand Total	442	4084	484	0	46	4248	282	814	352	4	42	4309
Approach%	9%1C	75%5C	44%8C	0C		.	35%3C	61%6C	36%2C	0%4C		.
Totals %	3%1C	36%1C	2%8C	0C		20%9C	9%2C	42%4C	1%5C	0C		39%2C
PHF	0%99	0%52	0%53	0		0%56	0%35	0%93	0%75	0%38		0%99
Heavy	3	30	2	0		38	40	45	40	0		25
Heavy %	4%9C	4%5C	3C	0C		4%5C	3%9C	2%6C	2%6C	0C		2%3C
Lights	444	4024	469	0		4350	262	863	392	4		4415
Lights %	59%3C	59%4C	59C	0C		59%4C	57%3C	51%1C	51%1C	400C		51%9C
Single-Unit Trucks	3	5	4	0		43	6	9	5	0		34
Single-Unit Trucks %	4%9C	0%5C	0%7C	0C		0%5C	4%4C	4%6C	2%4C	0C		4%7C
Buses	0	40	3	0		43	6	40	0	0		46
Buses %	0C	4C	4%2C	0C		0%5C	4%4C	4%9C	0C	0C		4%3C
Articulated Trucks	0	4	0	0		4	3	4	4	0		6
Articulated Trucks %	0C	0%4C	0C	0C		0%4C	0%1C	0%3C	0%2C	0C		0%2C
Pedestrians	.	.	.	.	46	.	.	.	.	.	43	.
Pedestrians%	.	.	.	.	23%1C	N	.	.	.	.	37%5C	N
Bicycles on Crosswalk	.	.	.	.	0	.	.	.	.	.	4	.
Bicycles on Crosswalk%	.	.	.	.	0C	N	.	.	.	.	3%2C	N
Bicycles on Road	0	0	0	0	0	.	0	0	0	0	0	.
Bicycles on Road%	.	.	.	.	0C	N	.	.	.	.	0C	N

Start Time	S Approach R OSEBANK						W Approach DS GAETI NK						Int. Total (15 min)
	Kight	EhW	uLet	f Er W	nLPd	sppWachNEotal	Kight	EhW	uLet	f Er W	nLPd	sppWachNEotal	
09:00:00	51	447	62	0	2	381	93	89	34	0	2	414	4062
09:48:00	57	440	29	0	4	368	74	89	40	0	4	425	590
09:20:00	59	54	39	0	3	347	407	54	30	0	6	349	4072
09:68:00	463	433	61	4	4	244	95	54	34	4	4	303	4471
Grand Total	622	660	488	4	7	4035	265	359	73	4	5	730	**4272**
Approach%	63%4C	63%9C	48%4C	0%4C		.	69%8C	64%6C	40C	0%4C		.	-
Totals %	40%4C	40%2C	2%1C	0C		36%4C	9%3C	7C	4%7C	0C		41%5C	-
PHF	0%71	0%5	0%96	0%38		0%92	0%93	0%93	0%91	0%38		0%92	-
Heavy	49	5	2	0		20	40	41	2	0		35	-
Heavy %	6%3C	3C	4%5C	0C		3%5C	3%5C	8%6C	6%3C	0C		6C	-
Lights	648	624	483	4		555	225	393	15	4		154	-
Lights %	58%3C	59C	59%4C	400C		57%4C	57%4C	56%1C	58%9C	400C		51C	-
Single-Unit Trucks	44	0	4	0		43	7	7	4	0		48	-
Single-Unit Trucks %	3%8C	0C	0%1C	0C		4%3C	3C	3%2C	4%6C	0C		3%4C	-
Buses	6	9	0	0		43	3	9	3	0		43	-
Buses %	0%5C	4%9C	0C	0C		4%3C	0%1C	3%7C	3%9C	0C		4%7C	-
Articulated Trucks	2	4	3	0		1	4	4	0	0		3	-
Articulated Trucks %	0%7C	0%3C	4%2C	0C		0%1C	0%2C	0%2C	0C	0C		0%2C	-
Pedestrians	.	.	.	.	7	.	.	.	.	.	5	.	-
Pedestrians%	.	.	.	.	41%2C	N	.	.	.	.	30%5C	N	-
Bicycles on Crosswalk	.	.	.	.	0	.	.	.	.	.	0	.	-
Bicycles on Crosswalk%	.	.	.	.	0C	N	.	.	.	.	0C	N	-
Bicycles on Road	0	0	0	0	0	.	0	0	0	0	0	.	-
Bicycles on Road%	.	.	.	.	0C	N	.	.	.	.	0C	N	-

Spectrum

Er WdUgN onL& LUtNVor Ut
uocatioUN a&L:NDS GAETI NK NyNR OSEBANK
atL:NEr LNW aFN41N8032NNNNN LploF&LUtNLaP:NR altLWNr ga(

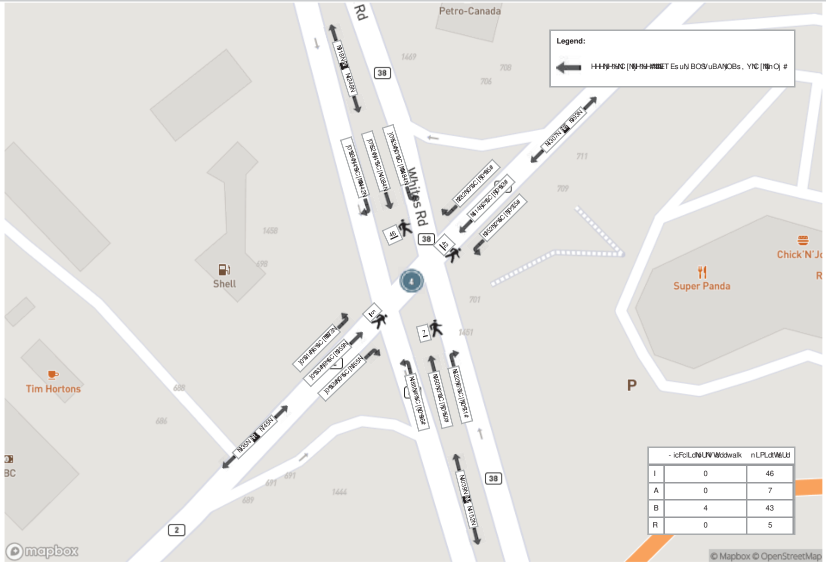
- s NGWr p
200N68NAE%Vus SKNs, BNR
ETKTI ETNTI EsKSTNW 6, N4D5
VsIs s

Peak Hour: 05:00 PM - 06:00 PM NNNNWeather: Scattered Clouds (19.72 °C)

Start Time	N Approach R OSEBANK						E Approach DS GAETI NK					
	Kight	EhW	uLet	f Er W	nLPd	sppWachNEotal	Kight	EhW	uLet	f Er W	nLPd	sppWachNEotal
47:00:00	22	464	68	0	7	345	424	456	18	4	9	254
47:48:00	20	495	66	0	8	312	420	475	72	0	8	293
47:20:00	66	475	80	0	2	372	462	471	14	0	6	290
47:68:00	36	479	83	0	2	386	425	496	87	0	8	290
Grand Total	424	197	454	0	49	4005	862	722	381	4	33	4822
Approach%	42C	19%4C	49%5C	0C		.	28%6C	67%9C	41%7C	0%4C		.
Totals %	3%3C	44%1C	2%3C	0C		47C	5%4C	43%2C	6%2C	0C		38%9C
PHF	0%76	0%54	0%53	0		0%53	0%58	0%56	0%99	0%38		0%59
Heavy	6	7	0	0		44	2	44	8	0		45
Heavy %	2%4C	4C	0C	0C		4%4C	0%1C	4%3C	3C	0C		4%3C
Lights	437	190	454	0		559	860	733	384	4		4846
Lights %	51%5C	55C	400C	0C		59%5C	55%6C	59%8C	59C	400C		59%9C
Single-Unit Trucks	4	2	0	0		6	3	8	8	0		43
Single-Unit Trucks %	0%9C	0%6C	0C	0C		0%6C	0%6C	0%7C	3C	0C		0%9C
Buses	2	4	0	0		6	4	1	0	0		7
Buses %	3%2C	0%4C	0C	0C		0%6C	0%3C	0%9C	0C	0C		0%8C
Articulated Trucks	0	2	0	0		2	0	0	0	0		0
Articulated Trucks %	0C	0%6C	0C	0C		0%2C	0C	0C	0C	0C		0C
Pedestrians	.	.	.	.	47	.	.	.	.	.	34	.
Pedestrians%	.	.	.	.	37C	N	.	.	.	.	22%2C	N
Bicycles on Crosswalk	.	.	.	.	4	.	.	.	.	.	4	.
Bicycles on Crosswalk%	.	.	.	.	4%1C	N	.	.	.	.	4%1C	N
Bicycles on Road	0	0	0	0	0	.	0	4	0	0	0	.
Bicycles on Road%	.	.	.	.	0C	N	.	.	.	.	0C	N

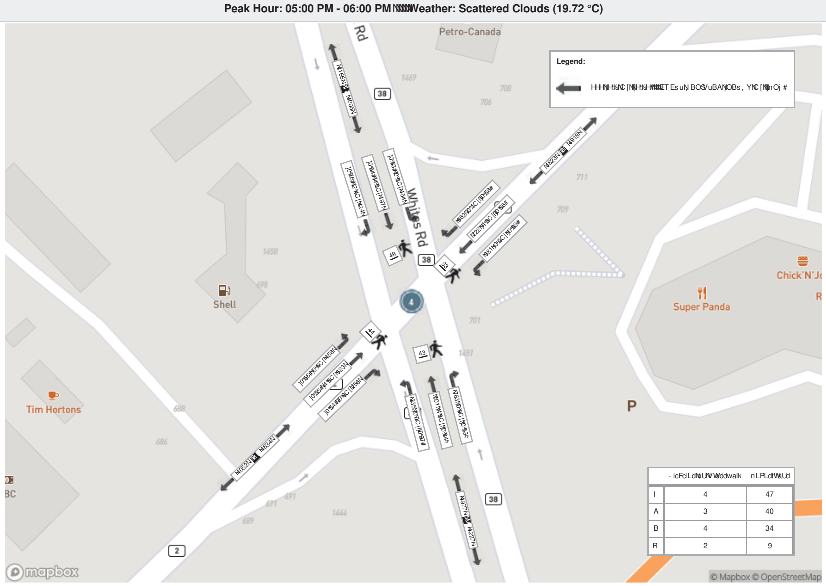
Start Time	S Approach R OSEBANK						W Approach DS GAETI NK						Int. Total (15 min)
	Kight	EhW	uLet	f Er W	nLPd	sppWachNEotal	Kight	EhW	uLet	f Er W	nLPd	sppWachNEotal	
47:00:00	419	346	11	0	4	669	409	314	67	4	4	647	4678
47:48:00	303	394	81	0	8	825	404	306	67	0	7	283	4821
47:20:00	453	305	82	0	3	686	56	320	83	4	2	277	4696
47:68:00	490	303	86	0	6	621	54	327	65	0	0	277	4667
Grand Total	763	501	335	0	43	4977	256	523	458	3	44	4832	**5942**
Approach%	25%8C	69%2C	43%3C	0C		.	38%5C	14%3C	43%9C	0%4C		.	-
Totals %	43%8C	48%3C	2%5C	0C		24%1C	1%1C	48%7C	2%2C	0C		38%1C	-
PHF	0%53	0%94	0%97	0		0%97	0%54	0%95	0%56	0%8		0%54	-
Heavy	1	44	0	0		47	2	46	4	0		49	-
Heavy %	0%9C	4%3C	0C	0C		0%5C	0%9C	4%8C	0%8C	0C		4%3C	-
Lights	721	958	335	0		4910	254	549	456	3		4808	-
Lights %	55%3C	59%9C	400C	0C		55%4C	55%3C	59%8C	55%8C	400C		59%9C	-
Single-Unit Trucks	3	6	0	0		1	2	8	4	0		5	-
Single-Unit Trucks %	0%2C	0%6C	0C	0C		0%2C	0%9C	0%8C	0%8C	0C		0%1C	-
Buses	6	2	0	0		7	0	5	0	0		5	-
Buses %	0%8C	0%2C	0C	0C		0%6C	0C	4C	0C	0C		0%1C	-
Articulated Trucks	0	6	0	0		6	0	0	0	0		0	-
Articulated Trucks %	0C	0%6C	0C	0C		0%3C	0C	0C	0C	0C		0C	-
Pedestrians	.	.	.	.	40	.	.	.	.	.	9	.	-
Pedestrians%	.	.	.	.	48%5C	N	.	.	.	.	43%7C	N	-
Bicycles on Crosswalk	.	.	.	.	3	.	.	.	.	.	2	.	-
Bicycles on Crosswalk%	.	.	.	.	2%3C	N	.	.	.	.	6%9C	N	-
Bicycles on Road	0	4	0	0	0	.	0	4	0	0	0	.	-
Bicycles on Road%	.	.	.	.	0C	N	.	.	.	.	0C	N	-

Peak Hour: 08:00 AM - 09:00 AM Weather: Few Clouds (10.29 °C)



I	0	46
A	0	7
B	4	43
R	0	5

Peak Hour: 05:00 PM - 06:00 PM Weather: Scattered Clouds (19.72 °C)



I	4	47
A	3	40
B	4	34
R	2	9

Turning Movement Count (9 . KINGSTON RD & DELTA BLVD)

Start Time	N Approach RGSEB ANK	ED ANG	TigB ANi	t ID ANA	Wru AN	LeeDUnEPfBud	E Approach RGSEB hNA	ED hNK	TigB hNG	t ID hNi	Wru hN	LeeDUnEPfBud	S Approach RGSEB GNi	ED GNA	TigB GNK	t ID GNG	Wru GN	LeeDUnEPfBud	W Approach RGSEB KNG	ED KNi	TigB KNA	t ID KNK	Wru KN	LeeDUnEPfBud	Int. Total (15 min)	Int. Total (1 hr)
spNsNs	oa	s	c	s	l	op	a0	lc7	s	l	s	l1l	s	s	s	s	s	s	c	pl	ao	s	s	33	ol p	
spNcNs	oo	s	ll	s	l	00	ap	l1o	0	s	s	al 0	s	s	0	s	s	0	a	p3	as	s	s	lsl	o7o	
spNsNs	o3	s	ls	s	s	03	ao	l7c	s	s	l	l11	o	s	a	s	s	c	7	lsc	ac	l	s	lop	op3	
spNcNs	o7	a	lp	s	s	cc	oo	a7a	c	s	l	oss	o	l	o	s	l	p	c	lo7	oo	s	l	lp0	co7	lc3c
s1NsNs	7l	a	1	s	l	pl	aa	ass	7	s	s	aa1	l	s	p	s	s	1	p	lcs	o7	l	s	l30	csl	lpp3
s1NcNs	o3	l	l7	s	s	c7	oc	ac7	o	s	s	a30	c	s	0	s	l	3	l	l03	a1	s	s	lp1	cop	l3co
s1NsNs	07	s	ll	s	l	cp	ao	a0o	c	s	a	apl	c	s	0	s	o	3	a	l1o	a1	l	l	al 0	ccl	al ac
s1NcNs	00	o	l0	s	a	7l	a3	oso	c	l	a	oo1	o	s	ls	s	s	lo	a	aos	op	s	s	a73	71l	aaps
2224RhL6222																										
l7NsNs	o1	l	l3	s	c	c1	ap	ol 7	lp	s	a	o7s	ac	l	07	s	l	pa	ls	o77	o1	l	s	0l c	3sc	
l7NcNs	07	a	as	s	a	71	ao	ol c	aa	s	l	o7s	a1	o	07	s	l	pp	p	o01	as	s	s	opc	11s	
l7NsNs	os	o	ll	s	l	00	l3	a1a	ac	s	s	oa7	ap	o	oa	s	s	7a	p	op3	a1	l	s	0l c	10p	
l7NcNs	o1	o	os	s	o	pl	l0	apa	as	s	s	os7	o3	c	0p	s	s	3l	al	opo	a3	s	o	0ao	13l	ocao
lpNsNs	0o	0	l7	s	l	7o	al	a1c	al	s	l	oap	op	c	0c	s	l	1p	0	o0a	oc	s	s	o1l	1c1	o0p7
lpNcNs	a0	o	a1	s	a	cc	os	ol p	l1	s	0	o7c	ap	7	o1	s	o	pl	l0	o7o	0s	l	o	0l 1	3s3	ocsc
lpNsNs	o3	a	a0	s	o	7c	a3	oss	lo	l	s	o0o	a7	o	oo	s	s	7a	7	o30	a3	s	0	0a3	133	occp
lpNcNs	0l	7	ao	l	l	pl	l1	osc	lo	s	s	oo7	os	0	op	s	a	pl	o	opo	oo	a	a	0l l	113	occc
Grand Total	7a3	oa	a7o	l	a0	3ac	o3p	0l 7s	lpp	o	l0	0pop	ac3	ol	oc1	s	lo	701	lsa	0s0l	01a	1	l0	07oo	**10943**	9
Approach%	715	o8.5	a18.05	s8.5		9	18.05	1p8.5	o8.5	s8.5		9	0s5	08.5	cc8.5	s5		9	a8.5	1p8.5	ls8.05	s8.5		9	-	9
Totals %	c8.5	s8.5	a8.05	s5		18.5	o8.75	o15	l8.75	s5		0o8.5	a8.05	s8.5	o8.5	s5		c8.5	s8.5	o78.5	08.05	s8.5		0a8.5	-	9
Heavy	lo	s	a	s		9	p	lla	o	s		9	o	s	l	s		9	l	37	p	s		9	-	9
Heavy %	a8.5	s5	s8.5	s5		9	l8.5	a8.5	l8.5	s5		9	l8.5	s5	s8.5	s5		9	l5	a8.05	l8.5	s5		9	-	9
Bicycles	s	s	s	s		9	s	l	s	s		9	s	s	s	s		9	s	s	s	s		9	-	9
Bicycle %	s5	s5	s5	s5		9	s5	s5	s5	s5		9	s5	s5	s5	s5		9	s5	s5	s5	s5		9	-	9

Spectrum

IDOSP, fvimi : BP fl : B
TfnUBD: PAUmi NB.A* G CAPRMR&PMhT LP4T%M
MUB NP Ii VP, UyP 7VPasaoPPPPMi ed ymi : BPTi Ur NPK UdB DPFI SUj

4LP Dle
ossP0cPG 8P TL.RPL%hPK
CRCA CPCA LR.CVP, 0%P63
- LALML

Peak Hour: 08:00 AM - 09:00 AM PPPPWeather: Few Clouds (10.29 °C)

Start Time	N Approach RGSEB	ED	TigB	t ID	Wru	LeeDUnEPfBud	E Approach RGSEB	ED	TigB	t ID	Wru	LeeDUnEPfBud	S Approach RGSEB	ED	TigB	t ID	Wru	LeeDUnEPfBud	W Approach RGSEB	ED	TigB	t ID	Wru	LeeDUnEPfBud	Int. Total (15 min)
s1NsNs	7l	a	1	s	l	pl	aa	ass	7	s	s	aa1	l	s	p	s	s	1	p	lcs	o7	l	s	l30	csl
s1NcNs	o3	l	l7	s	s	c7	oc	ac7	o	s	s	a30	c	s	0	s	l	3	l	l03	a1	s	s	lp1	cop
s1NsNs	07	s	ll	s	l	cp	ao	a0o	c	s	a	apl	c	s	0	s	o	3	a	l1o	a1	l	l	al 0	ccl
s1NcNs	00	o	l0	s	a	7l	a3	oso	c	l	a	oo1	o	s	ls	s	s	lo	a	aos	op	s	s	a73	71l
Grand Total	l3s	7	03	s	0	a0c	ls3	lssa	l3	l	0	llol	l0	s	ac	s	0	o3	la	pl a	la3	a	l	1cc	**2270**
Approach%	pp8.75	a8.05	as5	s5		9	38.75	118.75	l8.5	s8.5		9	oc8.5	s5	708.5	s5		9	l8.05	1o8.5	lc8.5	s8.5		9	-
Totals %	18.05	s8.5	a8.5	s5		ls8.5	08.5	008.5	s8.5	s5		038.5	s8.75	s5	l8.5	s5		l8.5	s8.5	ol 8.05	c8.5	s8.5		op8.5	-
PHF	s8.1	s8.c	s8.pp	s		s8.7	s8.1	s8.o	s8.3	s8.ac		s8.0	s8.	s	s8.7o	s		s8.c	s8.o	s8.pp	s8.p	s8.c		s8.3	-
Heavy	p	s	l	s		1	a	oc	a	s		o3	l	s	s	s		l	s	oa	c	s		op	-
Heavy %	o8.5	s5	a5	s5		o8.5	l8.5	o8.5	ls8.5	s5		o8.05	p8.5	s5	s5	s5		a8.75	s5	08.5	o8.5	s5		08.5	-
Lights	l1o	7	01	s		aop	lsp	37p	lp	l		ls3a	lo	s	ac	s		o1	la	71s	la0	a		1l 1	-
Lights %	378.5	lss5	315	s5		378.5	318.5	378.5	138.5	lss5		378.75	3a8.5	s5	lss5	s5		3p8.05	lss5	3c8.5	378.5	lss5		3c8.5	-
Single-Unit Trucks	7	s	l	s		p	a	l1	l	s		al	l	s	s	s		l	s	lc	0	s		l3	-
Single-Unit Trucks %	o8.5	s5	a5	s5		a8.5	l8.5	l8.5	c8.5	s5		l8.5	p8.5	s5	s5	s5		a8.75	s5	a8.5	o8.5	s5		a8.5	-
Buses	l	s	s	s		l	s	lo	s	s		lo	s	s	s	s		s	s	lo	l	s		l0	-
Buses %	s8.5	s5	s5	s5		s8.05	s5	l8.5	s5	s5		l8.5	s5	s5	s5	s5		s5	s5	l8.5	s8.5	s5		l8.75	-
Articulated Trucks	s	s	s	s		s	s	0	l	s		c	s	s	s	s		s	s	0	s	s		0	-
Articulated Trucks %	s5	s5	s5	s5		s5	s5	s8.05	c8.5	s5		s8.05	s5	s5	s5	s5		s5	s5	s8.75	s5	s5		s8.5	-
Pedestrians	9	9	9	9	0	9	9	9	9	9	0	9	9	9	9	9	0	9	9	9	9	9	l	9	-
Pedestrians%	9	9	9	9	os8.5	P	9	9	9	9	os8.5	P	9	9	9	9	os8.5	P	9	9	9	9	p8.5	P	-
Bicycles on Crosswalk	9	9	9	9	s	9	9	9	9	9	s	9	9	9	9	9	s	9	9	9	9	9	s	9	-
Bicycles on Crosswalk%	9	9	9	9	s5	P	9	9	9	9	s5	P	9	9	9	9	s5	P	9	9	9	9	s5	P	-
Bicycles on Road	s	s	s	s	s	9	s	s	s	s	s	9	s	s	s	s	s	9	s	s	s	s	s	9	-
Bicycles on Road%	9	9	9	9	s5	P	9	9	9	9	s5	P	9	9	9	9	s5	P	9	9	9	9	s5	P	-

Peak Hour: 04:45 PM - 05:45 PM Weather: Scattered Clouds (19.72 °C)

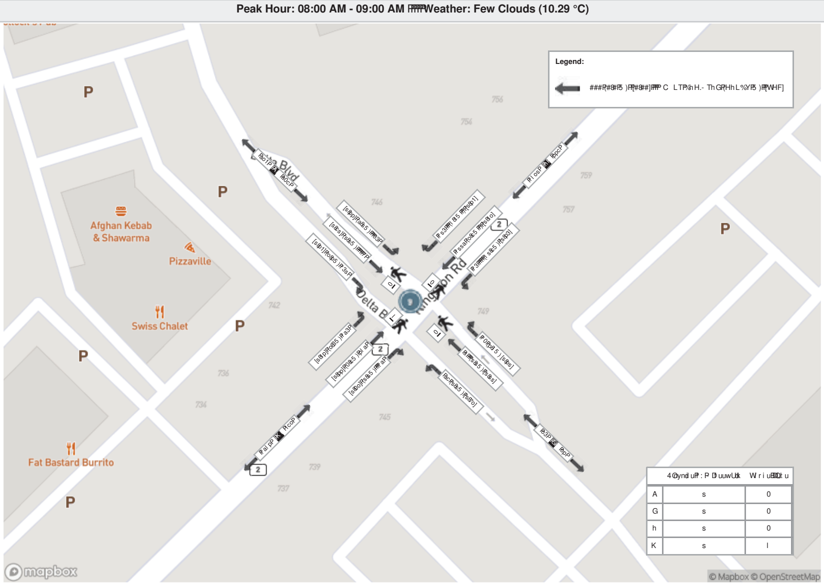
Start Time	N Approach						E Approach						S Approach						W Approach						Int. Total (15 min)
	RGEB	ED	TigB	t ID	Wru	LeeDUnEPfBud	RGEB	ED	TigB	t ID	Wru	LeeDUnEPfBud	RGEB	ED	TigB	t ID	Wru	LeeDUnEPfBud	RGEB	ED	TigB	t ID	Wru	LeeDUnEPfBud	
I7NcNs	o1	o	os	s	o	pl	I0	apa	as	s	s	os7	o3	c	0p	s	s	3I	al	opo	a3	s	o	0ao	13I
IpNsNs	0o	0	I7	s	I	7o	al	a1c	al	s	I	oap	op	c	0c	s	I	1p	0	o0a	oc	s	s	o1I	1c1
IpNcNs	a0	o	a1	s	a	cc	os	olp	I1	s	0	o7c	ap	7	o1	s	o	pl	I0	o7o	0s	I	o	0I1	3s3
IpNsNs	o3	a	a0	s	o	7c	a3	oss	Io	I	s	o0o	a7	o	oo	s	s	7a	7	o30	a3	s	0	0a3	133
Grand Total	I00	Ia	31	s	3	ac0	30	IIp0	pa	I	c	Io0I	Ia3	I3	I7o	s	0	olI	0c	I0pa	Ioo	I	Is	I7cl	**3557**
Approach%	c78p5	08p5	o1875	s5		9	p5	1p8c5	c805	s85		9	0I8c5	785	ca805	s5		9	a8p5	138a5	185	s85		9	-
Totals %	05	s8p5	a815	s5		p815	a875	oo5	a5	s5		op8p5	o875	s8c5	0875	s5		18p5	I8o5	0I805	o8p5	s5		07805	-
PHF	s810	s8pc	s8Ia	s		s8I3	s8p1	s88o	s8I7	s8ac		s88a	s8Io	s8p3	s8Ip	s		s8Ic	s8c0	s88o	s8Io	s8ac		s887	-
Heavy	s	s	s	s		s	s	I1	s	s		I1	s	s	I	s		I	s	I3	s	s		I3	-
Heavy %	s5	s5	s5	s5		s5	s5	I8c5	s5	s5		I8o5	s5	s5	s875	s5		s8o5	s5	I8o5	s5	s5		I8a5	-
Lights	I00	Ia	31	s		ac0	30	IIc7	pa	I		Ioao	Ia3	I3	I7a	s		ols	0c	I0co	Ioo	I		I7oa	-
Lights %	Iss5	Iss5	Iss5	s5		Iss5	Iss5	318c5	Iss5	Iss5		318p5	Iss5	Iss5	33805	s5		338p5	Iss5	318p5	Iss5	Iss5		318I5	-
Single-Unit Trucks	s	s	s	s		s	s	II	s	s		II	s	s	I	s		I	s	Is	s	s		Is	-
Single-Unit Trucks %	s5	s5	s5	s5		s5	s5	s885	s5	s5		s8I5	s5	s5	s875	s5		s8o5	s5	s8p5	s5	s5		s875	-
Buses	s	s	s	s		s	s	p	s	s		p	s	s	s	s		s	s	3	s	s		3	-
Buses %	s5	s5	s5	s5		s5	s5	s875	s5	s5		s8c5	s5	s5	s5	s5		s5	s5	s875	s5	s5		s8c5	-
Articulated Trucks	s	s	s	s		s	s	s	s	s		s	s	s	s	s		s	s	s	s	s		s	-
Articulated Trucks %	s5	s5	s5	s5		s5	s5	s5	s5	s5		s5	s5	s5	s5	s5		s5	s5	s5	s5	s5		s5	-
Pedestrians	9	9	9	9	3	9	9	9	9	9	c	9	9	9	9	9	0	9	9	9	9	9	Is	9	-
Pedestrians%	9	9	9	9	oa85	P	9	9	9	9	Ip885	P	9	9	9	9	I08o5	P	9	9	9	9	oc8p5	P	-
Bicycles on Crosswalk	9	9	9	9	s	9	9	9	9	9	s	9	9	9	9	9	s	9	9	9	9	9	s	9	-
Bicycles on Crosswalk%	9	9	9	9	s5	P	9	9	9	9	s5	P	9	9	9	9	s5	P	9	9	9	9	s5	P	-
Bicycles on Road	s	s	s	s	s	9	s	I	s	s	s	9	s	s	s	s	s	9	s	s	s	s	s	9	-
Bicycles on Road%	9	9	9	9	s5	P	9	9	9	9	s5	P	9	9	9	9	s5	P	9	9	9	9	s5	P	-

Spectrum

I D OSP, f vi mi : BP f I : B
Tf nUBD: FAUmi NB.A* G CAFRMR&RMhT LR4T%M
MUB NP I i VP, UyP 7VPasaoFFFFMi ed ymi : BPTi Ur NK UdB DFI SUj

4LP DI e
ossP0cPG 8P TL.RPL%hPK
CRCA CPCA LR.CVP, 0%P63
- LALML

Peak Hour: 08:00 AM - 09:00 AM Weather: Few Clouds (10.29 °C)

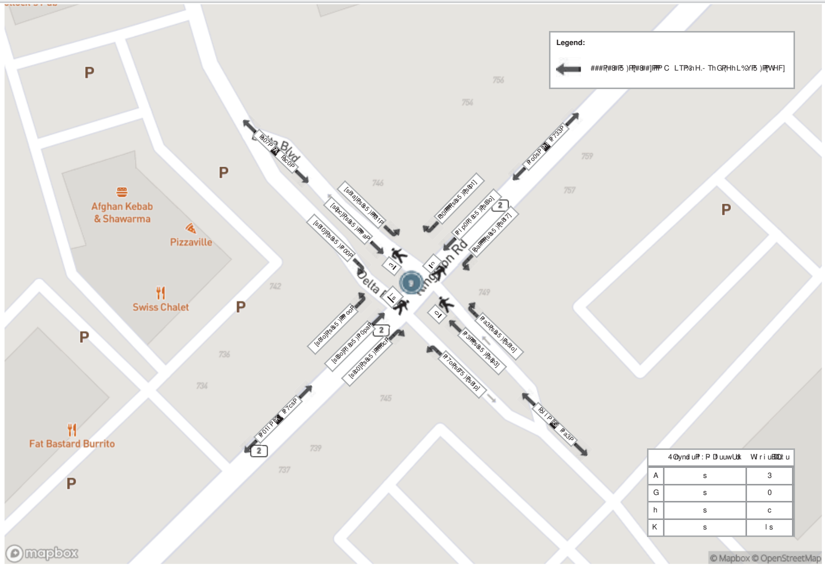


I D OSP, f vi mi : B
- f I : B

WUSi PoP gP.

4L- ao, 1%

Peak Hour: 04:45 PM - 05:45 PM Weather: Scattered Clouds (19.72 °C)



Spectrum

Turning Movement Count
Location Name: KINGSTON RD & HWY 401 WB ACCESS
Date: Tue, May 16, 2023 Deployment Lead: Walter Fugaj

BA Group
300 45 ST. CLAIR AVE W
TORONTO ONTARIO, M4V 1K9
CANADA

Turning Movement Count (5 . KINGSTON RD & HWY 401 WB ACCESS)

Start Time	E Approach KINGSTON RD					S Approach HWY 401 WB ACCESS					W Approach KINGSTON RD					Int. Total (15 min)	Int. Total (1 hr)
	Thru E:W	Left E:S	UTurn E:E	Peds E:	Approach Total	Right S:E	Left S:W	UTurn S:S	Peds S:	Approach Total	Right W:S	Thru W:E	UTurn W:W	Peds W:	Approach Total		
07:00:00	93	59	0	0	152	7	83	0	0	90	1	69	0	0	70	312	
07:15:00	121	85	0	0	206	13	96	0	0	109	3	87	0	0	90	405	
07:30:00	116	79	0	0	195	14	80	0	0	94	2	108	0	0	110	399	
07:45:00	146	104	0	0	250	31	167	0	0	198	1	134	0	0	135	583	1699
08:00:00	93	121	0	0	214	23	105	0	0	128	1	170	0	0	171	513	1900
08:15:00	155	78	0	0	233	15	148	0	0	163	1	159	0	0	160	556	2051
08:30:00	154	65	0	0	219	26	124	0	0	150	1	206	0	0	207	576	2228
08:45:00	175	72	0	0	247	23	163	0	1	186	1	229	0	0	230	663	2308
BREAK																	
16:00:00	198	58	0	1	256	32	160	0	0	192	3	396	0	0	399	847	
16:15:00	181	40	0	0	221	35	187	0	0	222	9	399	0	0	408	851	
16:30:00	179	36	0	0	215	29	141	0	0	170	10	415	0	0	425	810	
16:45:00	230	54	0	0	284	16	74	0	0	90	11	422	0	0	433	807	3315
17:00:00	235	69	0	0	304	10	83	0	0	93	5	425	0	0	430	827	3295
17:15:00	217	75	0	0	292	21	160	1	0	182	3	420	0	0	423	897	3341
17:30:00	193	63	0	1	256	19	128	0	0	147	9	429	0	0	438	841	3372
17:45:00	178	54	1	0	233	24	153	0	2	177	10	410	0	0	420	830	3395
Grand Total	2664	1112	1	2	3777	338	2052	1	3	2391	71	4478	0	0	4549	**10717**	-
Approach%	70.5%	29.4%	0%		-	14.1%	85.8%	0%		-	1.6%	98.4%	0%		-	-	-
Totals %	24.9%	10.4%	0%		35.2%	3.2%	19.1%	0%		22.3%	0.7%	41.8%	0%		42.4%	-	-
Heavy	65	34	0		-	12	54	0		-	1	99	0		-	-	-
Heavy %	2.4%	3.1%	0%		-	3.6%	2.6%	0%		-	1.4%	2.2%	0%		-	-	-
Bicycles	1	0	0		-	0	0	0		-	0	1	0		-	-	-
Bicycle %	0%	0%	0%		-	0%	0%	0%		-	0%	0%	0%		-	-	-

BA Group
300 45 ST. CLAIR AVE W
TORONTO ONTARIO, M4V 1K9
CANADA

Peak Hour: 08:00 AM - 09:00 AM Weather: Few Clouds (10.29 °C)

Start Time	E Approach KINGSTON RD					S Approach HWY 401 WB ACCESS					W Approach KINGSTON RD					Int. Total (15 min)
	Thru	Left	UTurn	Peds	Approach Total	Right	Left	UTurn	Peds	Approach Total	Right	Thru	UTurn	Peds	Approach Total	
08:00:00	93	121	0	0	214	23	105	0	0	128	1	170	0	0	171	513
08:15:00	155	78	0	0	233	15	148	0	0	163	1	159	0	0	160	556
08:30:00	154	65	0	0	219	26	124	0	0	150	1	206	0	0	207	576
08:45:00	175	72	0	0	247	23	163	0	1	186	1	229	0	0	230	663
Grand Total	577	336	0	0	913	87	540	0	1	627	4	764	0	0	768	**2308**
Approach%	63.2%	36.8%	0%		-	13.9%	86.1%	0%		-	0.5%	99.5%	0%		-	-
Totals %	25%	14.6%	0%		39.6%	3.8%	23.4%	0%		27.2%	0.2%	33.1%	0%		33.3%	-
PHF	0.82	0.69	0		0.92	0.84	0.83	0		0.84	1	0.83	0		0.83	-
Heavy	15	9	0		24	2	19	0		21	1	34	0		35	-
Heavy %	2.6%	2.7%	0%		2.6%	2.3%	3.5%	0%		3.3%	25%	4.5%	0%		4.6%	-
Lights	562	327	0		889	85	521	0		606	3	730	0		733	-
Lights %	97.4%	97.3%	0%		97.4%	97.7%	96.5%	0%		96.7%	75%	95.5%	0%		95.4%	-
Single-Unit Trucks	8	5	0		13	2	11	0		13	1	18	0		19	-
Single-Unit Trucks %	1.4%	1.5%	0%		1.4%	2.3%	2%	0%		2.1%	25%	2.4%	0%		2.5%	-
Buses	6	4	0		10	0	4	0		4	0	13	0		13	-
Buses %	1%	1.2%	0%		1.1%	0%	0.7%	0%		0.6%	0%	1.7%	0%		1.7%	-
Articulated Trucks	1	0	0		1	0	4	0		4	0	3	0		3	-
Articulated Trucks %	0.2%	0%	0%		0.1%	0%	0.7%	0%		0.6%	0%	0.4%	0%		0.4%	-
Pedestrians	-	-	-	0	-	-	-	-	1	-	-	-	-	0	-	-
Pedestrians%	-	-	-	0%		-	-	-	100%		-	-	-	0%		-
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
Bicycles on Crosswalk%	-	-	-	0%		-	-	-	0%		-	-	-	0%		-
Bicycles on Road	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	-
Bicycles on Road%	-	-	-	0%		-	-	-	0%		-	-	-	0%		-

BA Group
300 45 ST. CLAIR AVE W
TORONTO ONTARIO, M4V 1K9
CANADA

Peak Hour: 05:00 PM - 06:00 PM Weather: Scattered Clouds (19.72 °C)

Start Time	E Approach KINGSTON RD					S Approach HWY 401 WB ACCESS					W Approach KINGSTON RD					Int. Total (15 min)
	Thru	Left	UTurn	Peds	Approach Total	Right	Left	UTurn	Peds	Approach Total	Right	Thru	UTurn	Peds	Approach Total	
17:00:00	235	69	0	0	304	10	83	0	0	93	5	425	0	0	430	827
17:15:00	217	75	0	0	292	21	160	1	0	182	3	420	0	0	423	897
17:30:00	193	63	0	1	256	19	128	0	0	147	9	429	0	0	438	841
17:45:00	178	54	1	0	233	24	153	0	2	177	10	410	0	0	420	830
Grand Total	823	261	1	1	1085	74	524	1	2	599	27	1684	0	0	1711	**3395**
Approach%	75.9%	24.1%	0.1%		-	12.4%	87.5%	0.2%		-	1.6%	98.4%	0%		-	-
Totals %	24.2%	7.7%	0%		32%	2.2%	15.4%	0%		17.6%	0.8%	49.6%	0%		50.4%	-
PHF	0.88	0.87	0.25		0.89	0.77	0.82	0.25		0.82	0.68	0.98	0		0.98	-
Heavy	11	10	0		21	2	7	0		9	0	20	0		20	-
Heavy %	1.3%	3.8%	0%		1.9%	2.7%	1.3%	0%		1.5%	0%	1.2%	0%		1.2%	-
Lights	812	251	1		1064	72	517	1		590	27	1664	0		1691	-
Lights %	98.7%	96.2%	100%		98.1%	97.3%	98.7%	100%		98.5%	100%	98.8%	0%		98.8%	-
Single-Unit Trucks	4	6	0		10	1	6	0		7	0	7	0		7	-
Single-Unit Trucks %	0.5%	2.3%	0%		0.9%	1.4%	1.1%	0%		1.2%	0%	0.4%	0%		0.4%	-
Buses	7	3	0		10	0	1	0		1	0	13	0		13	-
Buses %	0.9%	1.1%	0%		0.9%	0%	0.2%	0%		0.2%	0%	0.8%	0%		0.8%	-
Articulated Trucks	0	1	0		1	1	0	0		1	0	0	0		0	-
Articulated Trucks %	0%	0.4%	0%		0.1%	1.4%	0%	0%		0.2%	0%	0%	0%		0%	-
Pedestrians	-	-	-	1	-	-	-	-	1	-	-	-	-	0	-	-
Pedestrians%	-	-	-	33.3%		-	-	-	33.3%		-	-	-	0%		-
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	1	-	-	-	-	0	-	-
Bicycles on Crosswalk%	-	-	-	0%		-	-	-	33.3%		-	-	-	0%		-
Bicycles on Road	1	0	0	0	-	0	0	0	0	-	0	1	0	0	-	-
Bicycles on Road%	-	-	-	0%		-	-	-	0%		-	-	-	0%		-

Spectrum

Turning Movement Count
Location Name: KINGSTON RD & HWY 401 WB ACCESS
Date: Tue, May 16, 2023   Deployment Lead: Walter Fugaj

BA Group
300 45 ST. CLAIR AVE W
TORONTO ONTARIO, M4V 1K9
CANADA

Peak Hour: 08:00 AM - 09:00 AM   Weather: Few Clouds (10.29 °C)

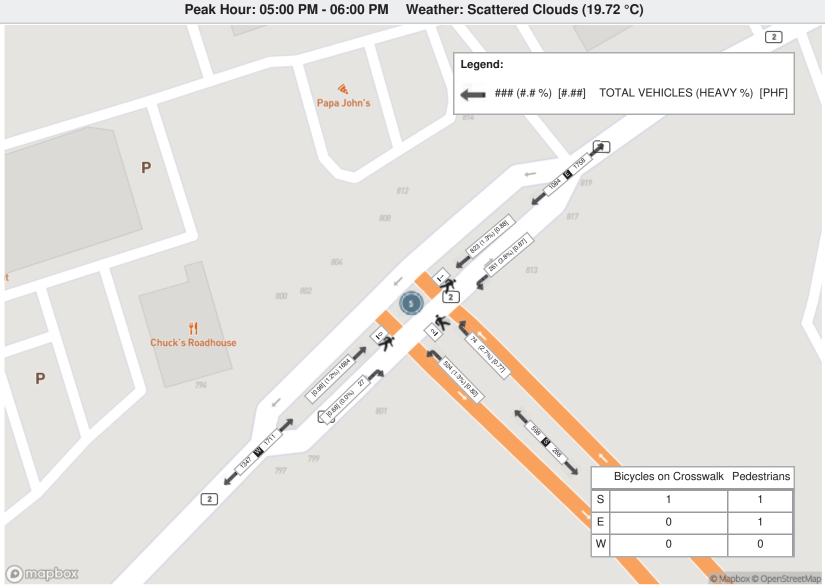
	Bicycles on Crosswalk	Pedestrians
S	0	1
E	0	0
W	0	0

Spectrum

Turning Movement Count
Location Name: KINGSTON RD & HWY 401 WB ACCESS
Date: Tue, May 16, 2023   Deployment Lead: Walter Fugaj

BA Group
300 45 ST. CLAIR AVE W
TORONTO ONTARIO, M4V 1K9
CANADA

Peak Hour: 05:00 PM - 06:00 PM   Weather: Scattered Clouds (19.72 °C)



	Bicycles on Crosswalk	Pedestrians
S	1	1
E	0	1
W	0	0

Turning Movement Count (6 . WHITES RD & HWY 401 WB RAMPS)

Start Time	N Approach R OSEBANK ND					E Approach OR I NGTi NR gNh DNKt : W			S Approach R OSEBANK ND					W Approach OR I NGTi NR gNh DNKt : W			Int. Total (15 min)	Int. Total (1 hr)
	KruLe DfR	ELUh DfA	PEnUd DfD	Wspo Df	t aaUd l 0LNEcd 7	PEnUd BfB	Wspo Bf	t aaUd l 0LNEcd 7	KruLe AfB	ELUh AfD	PEnUd AfA	Wspo Af	t aaUd l 0LNEcd 7	PEnUd R fR	Wspo R f	t aaUd l 0LNEcd 7		
T1fTTfTT	i G3	i G2	T	T	469	T	i	T	3i	i 69	T	T	45T	T	T	T	529	
T1fi 5fTT	i GG	4T4	T	T	2G3	T	1	T	16	i 36	T	T	4G3	T	T	T	594	
T1f2TfTT	i 14	4i 9	T	T	29i	T	2	T	3T	4i 4	T	T	414	T	4	T	332	
T1fG5fTT	i 3i	2G9	T	T	5i T	T	2	T	3G	429	T	T	2T2	T	T	T	6i 2	43T1
T6fTTfTT	i 3i	494	T	T	G52	T	2	T	i TT	413	T	T	213	T	T	T	649	4691
T6fi 5fTT	i 21	413	T	T	G 2	T	T	T	53	422	T	T	469	T	T	T	1T4	2TT1
T6f2TfTT	i 46	463	T	T	G G	T	4	T	35	42i	T	T	493	T	2	T	1i T	2T5G
T6fG5fTT	i 4i	2Ti	T	T	G44	T	4	T	5i	2T3	T	T	251	T	T	T	119	2T4T
888g KBt * 888																		
i 3fTTfTT	62	444	T	T	2T5	T	T	T	21	G5T	T	T	G61	T	T	T	194	
i 3fi 5fTT	6i	4i i	T	T	494	T	4	T	54	G4T	T	T	G 4	T	2	T	13G	
i 3f2TfTT	i TT	4G3	T	T	2G3	T	G	T	32	G i	T	T	G G	T	T	T	64T	
i 3fG5fTT	i i 5	429	T	T	25G	T	G	T	1i	G 2	T	T	G6G	T	T	T	626	24i G
i 1fTTfTT	61	424	T	T	2i 9	T	2	T	i i 9	G 2	T	T	594	T	i	T	9i i	2222
i 1fi 5fTT	i 49	42G	T	T	232	T	G	T	i T1	524	T	T	329	T	5	T	i TT4	251i
i 1f2TfTT	i i 5	42i	T	T	2G3	T	4	T	5G	G53	T	T	5i T	T	4	T	653	23T1
i 1fG5fTT	9T	425	T	T	245	T	4	T	G6	G49	T	T	G 1	T	2	T	6T4	251i
Grand Total	i 91T	29i 6	T	T	5666	T	G4	T	i T63	5G26	T	T	354G	T	i 9	T	**12412**	-
Approach%	22.5%	33.5%	T%		-	T%		-	i 3.3%	62.G%	T%		-	T%		-	-	-
Totals %	i 5.9%	2i .3%	T%		G1.G%	T%		T%	6.1%	G2.6%	T%		54.3%	T%		T%	-	-
Heavy	22	63	T		-	T		-	2T	i i 4	T		-	T		-	-	-
Heavy %	i .1%	4.4%	T%		-	T%		-	4.6%	4.i %	T%		-	T%		-	-	-
Bicycles	T	T	T		-	T		-	T	i	T		-	T		-	-	-
Bicycle %	T%	T%	T%		-	T%		-	T%	T%	T%		-	T%		-	-	-

Spectrum

EnUdrduN cms&sdeNVcnde
, c0l ecdNDl & sfNR OSEBANK NjNOR I NGTi NR gNh DNKt : WA
l esfNEnsvN I FN3vN4T42NNNNN sa7cF&sde,Nsl pfNR I 7esUjNnul (

gt NCUcna
2TTNG5NAE.NV, t SKN MBNR
Eh Kh DEh Nh DEt KSh vN GMN* 9
Vt Dt t

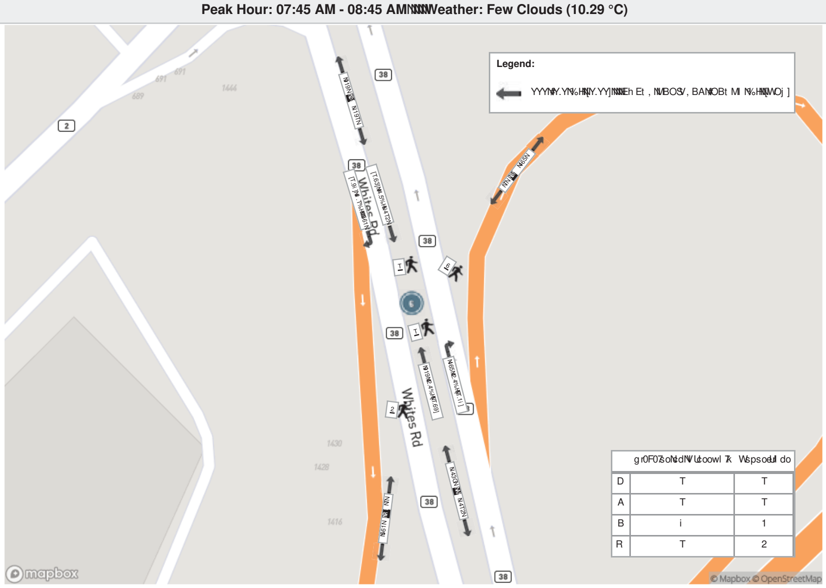
Peak Hour: 07:45 AM - 08:45 AMNNNNWeather: Few Clouds (10.29 °C)

Start Time	N Approach R OSEBANK ND					E Approach OR I NGTi NR gNh DNKt : W			S Approach R OSEBANK ND					W Approach OR I NGTi NR gNh DNKt : W			Int. Total (15 min)
	KruLe	ELUh	PEnUd	Wspo	t aaUd l 0LNEcd 7	PEnUd	Wspo	t aaUd l 0LNEcd 7	KruLe	ELUh	PEnUd	Wspo	t aaUd l 0LNEcd 7	PEnUd	Wspo	t aaUd l 0LNEcd 7	
T1fG5fTT	i 3i	2G9	T	T	5i T	T	2	T	3G	429	T	T	2T2	T	T	T	6i 2
T6fTTfTT	i 3i	494	T	T	G52	T	2	T	i TT	413	T	T	213	T	T	T	649
T6fi 5fTT	i 21	413	T	T	G 2	T	T	T	53	422	T	T	469	T	T	T	1T4
T6f2TfTT	i 46	463	T	T	G G	T	4	T	35	42i	T	T	493	T	2	T	1i T
Grand Total	561	i 4T2	T	T	i 19T	T	6	T	465	919	T	T	i 43G	T	2	T	**3054**
Approach%	24.6%	31.4%	T%		-	T%		-	44.5%	11.5%	T%		-	T%		-	-
Totals %	i 9.4%	29.G%	T%		56.3%	T%		T%	9.2%	24.i %	T%		G .G%	T%		T%	-
PHF	T.9i	T.63	T		T.66	T		T	T.1i	T.69	T		T.6G	T		T	-
Heavy	3	2T	T		23	T		T	9	2i	T		GT	T		T	-
Heavy %	i %	4.5%	T%		4%	T%		T%	2.4%	2.4%	T%		2.4%	T%		T%	-
Lights	56i	i i 12	T		i 15G	T		T	413	9G6	T		i 44G	T		T	-
Lights %	99%	91.5%	T%		96%	T%		T%	93.6%	93.6%	T%		93.6%	T%		T%	-
Single-Unit Trucks	5	i 6	T		42	T		T	9	i G	T		42	T		T	-
Single-Unit Trucks %	T.9%	i .5%	T%		i .2%	T%		T%	2.4%	i .G%	T%		i .6%	T%		T%	-
Buses	T	i T	T		i T	T		T	T	i i	T		i i	T		T	-
Buses %	T%	T.6%	T%		T.3%	T%		T%	T%	i .i %	T%		T.9%	T%		T%	-
Articulated Trucks	i	4	T		2	T		T	T	3	T		3	T		T	-
Articulated Trucks %	T.4%	T.4%	T%		T.4%	T%		T%	T%	T.3%	T%		T.5%	T%		T%	-
Pedestrians	-	-	-	T	-	-	1	-	-	-	-	T	-	-	2	-	-
Pedestrians%	-	-	-	T%	N	-	32.3%	N	-	-	-	T%	N	-	41.2%	N	-
Bicycles on Crosswalk	-	-	-	T	-	-	i	-	-	-	-	T	-	-	T	-	-
Bicycles on Crosswalk%	-	-	-	T%	N	-	9.i %	N	-	-	-	T%	N	-	T%	N	-
Bicycles on Road	T	T	T	T	-	T	T	-	T	T	T	T	-	T	T	-	-
Bicycles on Road%	-	-	-	T%	N	-	T%	N	-	-	-	T%	N	-	T%	N	-

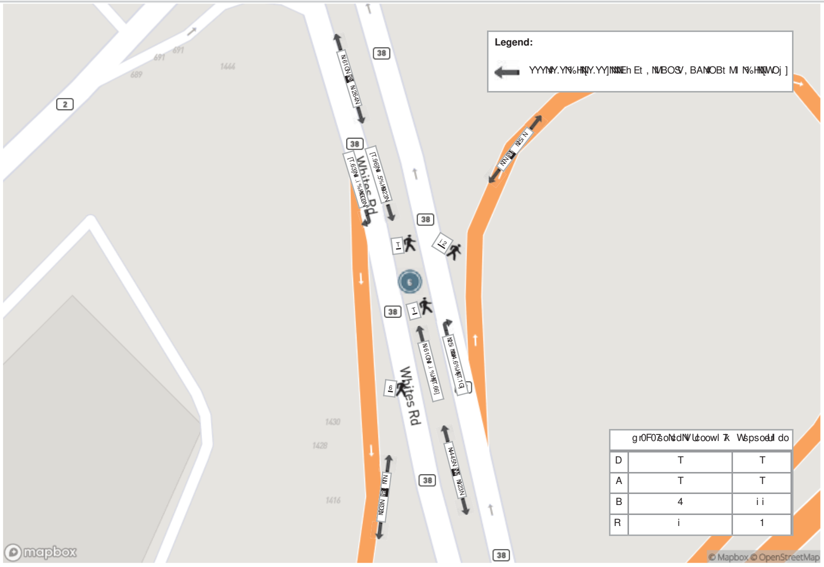
Peak Hour: 04:45 PM - 05:45 PMNNNNWeather: Scattered Clouds (19.72 °C)

Start Time	N Approach ROSEBANK ND					E Approach ORI NGTi NR gNh DNKt : W			S Approach ROSEBANK ND					W Approach ORI NGTi NR gNh DNKt : W			Int. Total (15 min)
	KruLe	ELUh	PEnUd	Wspo	taaUcl 0LNEcd 7	PEnUd	Wspo	taaUcl 0LNEcd 7	KruLe	ELUh	PEnUd	Wspo	taaUcl 0LNEcd 7	PEnUd	Wspo	taaUcl 0LNEcd 7	
i 3fG5fTT	i i 5	429	T	T	25G	T	G	T	1i	Gl 2	T	T	G6G	T	T	T	626
i 1fTTfTT	61	424	T	T	2i 9	T	2	T	i i 9	G12	T	T	594	T	i	T	9i i
i 1fi 5fTT	i 49	42G	T	T	232	T	G	T	i T1	524	T	T	329	T	5	T	i TT4
i 1f2TfTT	i i 5	42i	T	T	2G3	T	4	T	5G	G53	T	T	5i T	T	4	T	653
Grand Total	GG3	923	T	T	i 264	T	i 2	T	25i	i 61G	T	T	4445	T	6	T	**3607**
Approach%	24.2%	31.1%	T%		-	T%		-	i 5.6%	6G4%	T%		-	T%		-	-
Totals %	i 4.G%	45.9%	T%		26.2%	T%		T%	9.1%	54%	T%		3i .1%	T%		T%	-
PHF	T.63	T.96	T		T.95	T		T	T.1G	T.66	T		T.61	T		T	-
Heavy	5	i G	T		i 9	T		T	i T	4i	T		2i	T		T	-
Heavy %	i .i %	i .5%	T%		i .G%	T%		T%	4.6%	i .i %	T%		i .G%	T%		T%	-
Lights	GG	944	T		i 232	T		T	2G	i 652	T		4i 9G	T		T	-
Lights %	96.9%	96.5%	T%		96.3%	T%		T%	91.4%	96.9%	T%		96.3%	T%		T%	-
Single-Unit Trucks	2	i T	T		i 2	T		T	5	i 4	T		i 1	T		T	-
Single-Unit Trucks %	T.1%	i .i %	T%		T.9%	T%		T%	i .G%	T.3%	T%		T.6%	T%		T%	-
Buses	T	2	T		2	T		T	T	3	T		3	T		T	-
Buses %	T%	T.2%	T%		T.4%	T%		T%	T%	T.2%	T%		T.2%	T%		T%	-
Articulated Trucks	4	i	T		2	T		T	5	2	T		6	T		T	-
Articulated Trucks %	T.G%	T.i %	T%		T.4%	T%		T%	i .G%	T.4%	T%		T.G%	T%		T%	-
Pedestrians	-	-	-	T	-	-	i i	-	-	-	-	T	-	-	1	-	-
Pedestrians%	-	-	-	T%	N	-	54.G%	N	-	-	-	T%	N	-	22.2%	N	-
Bicycles on Crosswalk	-	-	-	T	-	-	4	-	-	-	-	T	-	-	i	-	-
Bicycles on Crosswalk%	-	-	-	T%	N	-	9.5%	N	-	-	-	T%	N	-	G6%	N	-
Bicycles on Road	T	T	T	T	-	T	T	-	T	i	T	T	-	T	T	-	-
Bicycles on Road%	-	-	-	T%	N	-	T%	N	-	-	-	T%	N	-	T%	N	-

Peak Hour: 07:45 AM - 08:45 AMNNNNWeather: Few Clouds (10.29 °C)



Peak Hour: 04:45 PM - 05:45 PMNNNNWeather: Scattered Clouds (19.72 °C)



Turning Movement Count (7 . WHITES RD & HWY 401 EB RAMPS)

Start Time	N Approach ROSEBANK ND						S Approach ROSEBANK ND					NW Approach ORI NGTi NBgNh DNKt : W			E Approach			W Approach ORI NGTi NBgNh r r NKt : W						Int. Total (15 min)	Int. Total (1 hr)
	KuLef DUDR	EerP DUA	dspl DUB	oEPra DUD	Wscl DU	t 00n713eNE7f12	KuLef AUB	EerP AUD	oEPra AUA	Wscl AU	t 00n713eNE7f12	oEPra DR UDR	Wscl DR U	t 00n713eNE7f12	oEPra BUB	Wscl BU	t 00n713eNE7f12	KuLef R UA	EerP R UB	dspl R UD	oEPra R UR	Wscl R U	t 00n713eNE7f12		
T4UTUT	64	9T	T	T	T	i G4	58	i 58	T	T	i 6G	T	T	T	T	i	T	G4	T	i i *	T	T	i 66	G44	
T4U-UT	*6	i T8	T	T	T	i *9	58	i 5*	T	-	i 4i	T	T	T	T	4	T	48	i	i Ti	T	T	i 4G	-G5	
T4U5TUT	i i 6	i T8	T	T	T	8i 9	G	i - i	T	T	i *8	T	8	T	T	G	T	*G	T	i 85	T	8	8i 4	684	
T4UG-UT	i G	i **	T	T	T	5GG	5i	i G6	T	T	i 44	T	T	T	T	i	T	i TG	T	i 65	T	T	864	499	8G5-
T9UTUT	i G'	i - 6	T	T	T	5T-	5G	886	T	T	86T	T	T	T	T	i	T	45	T	i G6	T	T	8i *	49G	84G8
T9U-UT	i 6G	i i T	T	T	T	84G	GG	i - *	T	T	8T5	T	5	T	T	8	T	i Ti	T	i 86	T	5	884	4TG	8*T5
T9U5TUT	i - 6	i 5-	T	T	T	8*i	G9	i G6	T	T	i *G	T	T	T	T	G	T	*5	T	i 54	T	T	85T	4i -	8**i
T9UG-UT	i 48	i 8G	T	T	T	8*6	- 9	i 66	T	T	88G	T	T	T	T	T	T	98	i	i 9-	T	T	869	499	8**i
...gKBt %..																									
i 6UTUT	4T	i - 9	i	T	T	88*	i 6	i 6T	T	T	i 46	T	-	T	T	i	T	i 4G	i	586	T	-	- Ti	*T6	
i 6U-UT	6T	i - 8	T	T	T	8i 8	i 9	i 6-	T	T	i 95	T	i	T	T	i	T	i G'	i	8*T	T	i	GGT	95-	
i 6U5TUT	6*	i 4T	T	T	T	85*	58	i *i	T	T	885	T	i	T	T	G	T	i 6i	T	8*5	T	i	G G	*i 6	
i 6UG-UT	46	i 64	T	T	T	8G5	8G	8i 6	T	T	8GT	T	T	T	T	-	T	i 6*	T	84-	T	T	GGG	*84	5-9G
i 4UTUT	46	i - G	T	T	T	85T	GG	8*G	T	T	559	T	6	T	T	G	T	i 5i	T	5TT	T	6	G5i	***	5644
i 4U-UT	9i	i - -	T	T	T	856	i 9	5T9	T	T	586	T	T	T	T	8	T	i *9	T	585	T	T	- 8i	i T95	5*8-
i 4U5TUT	66	i - 4	T	T	T	885	i *	i 4*	T	T	i *9	T	i	T	T	i	T	i 9-	i	5i *	T	i	- T-	*86	5*5-
i 4UG-UT	6*	i 46	T	T	T	8G	i *	i 64	T	T	i 96	T	G	T	T	8	T	i 9-	i	5i *	T	G	- T-	*56	5*GG
Grand Total	i 658	88*4	i	T	T	5*5T	- i T	8*G	T	-	5G -	T	85	T	T	GT	T	8Ti 9	6	5-G	T	85	- - 6*	**12954**	C
Approach%	GV,	-9VG,	T,	T,		C	i G9,	9-V8,	T,		C	T,		C	T,		C	56V8,	TV,	65V4,	T,		C	-	C
Totals %	i 8V6,	i 4V4,	T,	T,		5TV6,	5V,	88V4,	T,		86V4,	T,		T,	T,		T,	i -V6,	T,	84VG,	T,		G5,	-	C
Heavy	54	- T	T	T		C	*	44	T		C	T		C	T		C	- G	T	65	T		C	-	C
Heavy %	8V6,	8V8,	T,	T,		C	i V9,	8V6,	T,		C	T,		C	T,		C	8V4,	T,	i V9,	T,		C	-	C
Bicycles	T	i	T	T		C	T	i	T		C	T		C	T		C	T	T	T	T		C	-	C
Bicycle %	T,	T,	T,	T,		C	T,	T,	T,		C	T,		C	T,		C	T,	T,	T,	T,		C	-	C

Peak Hour: 08:00 AM - 09:00 AM NNNNWeather: Few Clouds (10.29 °C)

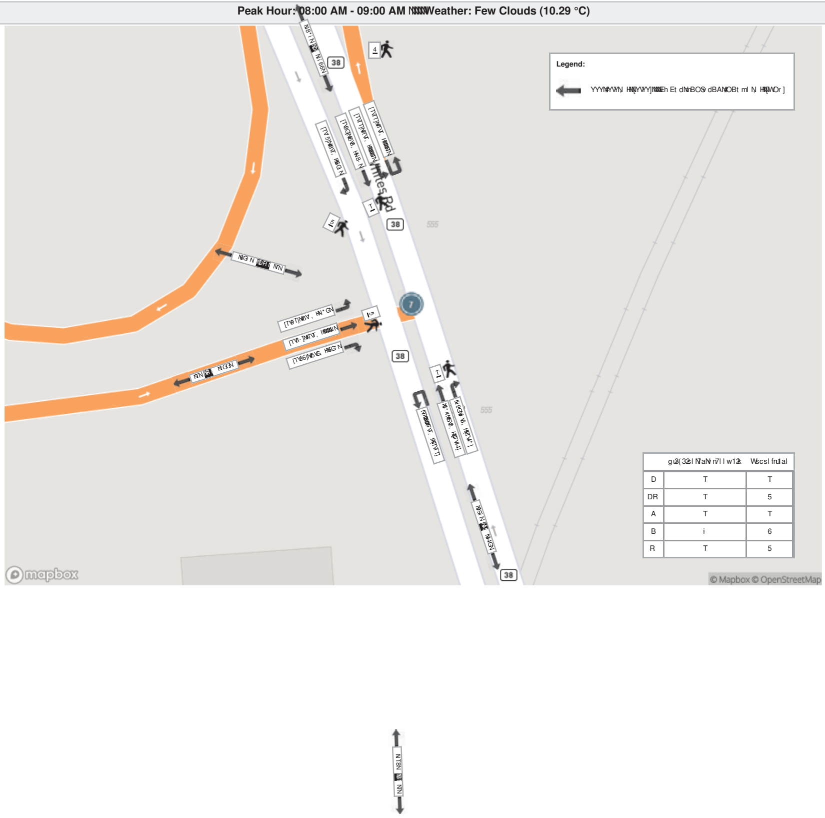
Start Time	N Approach ROSEBANK ND						S Approach ROSEBANK ND					NW Approach OR I NGTi NBg N DNKt : W			E Approach			W Approach OR I NGTi NBg N r r NKt : W						Int. Total (15 min)
	KuLef	EerP	dsp	oEPra	Wscl	t 00n713eNE7f12	KuLef	EerP	oEPra	Wscl	t 00n713eNE7f12	oEPra	Wscl	t 00n713eNE7f12	oEPra	Wscl	t 00n713eNE7f12	KuLef	EerP	dsp	oEPra	Wscl	t 00n713eNE7f12	
T9UTUT	iG'	i-6	T	T	T	5T-	5G	886	T	T	86T	T	T	T	T	i	T	45	T	iG6	T	T	8i*	49G
T9U-UT	i6G	iiT	T	T	T	84G	GG	i-*	T	T	8T5	T	5	T	T	8	T	iTi	T	i86	T	5	884	4TG
T9U5TUT	i-6	i5-	T	T	T	8*i	G9	iG6	T	T	i*G	T	T	T	T	G	T	*5	T	i54	T	T	85T	4i-
T9UG-UT	i48	i8G	T	T	T	8*6	-9	i66	T	T	88G	T	T	T	T	T	T	98	i	i9-	T	T	869	499
Grand Total	6G	-8-	T	T	T	ii66	i9G	6*4	T	T	99i	T	5	T	T	4	T	5G'	i	-*G	T	5	*GG	**2991**
Approach%	--,	G,	T,	T,		C	8TV,	4*V,	T,		C	T,		C	T,		C	54,	TV,	68V,	T,		C	-
Totals %	8iVG	i4V6,	T,	T,		5*,	6V8,	85V5,	T,		8*V,	T,		T,	T,		T,	iiV4,	T,	i*V,	T,		5iV6,	-
PHF	TV5	TV9G	T	T		TV6	TV4*	TV44	T		TV9-	T		T	T		T	TV96	TV8-	TV9	T		TV99	-
Heavy	i5	i4	T	T		5T	5	88	T		8-	T		T	T		T	i8	T	i4	T		8*	-
Heavy %	8,	5V8,	T,	T,		8V6,	iV6,	5V8,	T,		8V9,	T,		T,	T,		T,	5VG	T,	8V,	T,		5V,	-
Lights	689	-T9	T	T		ii56	i9i	64-	T		9-6	T		T	T		T	554	i	-44	T		*i-	-
Lights %	*9,	*6V9,	T,	T,		*4VG	*9VG	*6V9,	T,		*4V8,	T,		T,	T,		T,	*6V6,	iTT,	*4V,	T,		*6V,	-
Single-Unit Trucks	9	*	T	T		i4	8	*	T		ii	T		T	T		T	9	T	i8	T		8T	-
Single-Unit Trucks %	iV8,	iV4,	T,	T,		iV,	iV,	iV5,	T,		iV8,	T,		T,	T,		T,	8V5,	T,	8,	T,		8V,	-
Buses	-	4	T	T		i8	i	*	T		iT	T		T	T		T	5	T	8	T		-	-
Buses %	TV9,	iV5,	T,	T,		i,	TV,	iV5,	T,		iV,	T,		T,	T,		T,	TV,	T,	TV5,	T,		TV,	-
Articulated Trucks	T	i	T	T		i	T	G	T		G	T		T	T		T	i	T	5	T		G	-
Articulated Trucks %	T,	TV8,	T,	T,		TV,	T,	TV6,	T,		TV,	T,		T,	T,		T,	TV5,	T,	TV,	T,		TVG	-
Pedestrians	C	C	C	C	T	C	C	C	C	T	C	C	5	C	C	6	C	C	C	C	C	5	C	-
Pedestrians%	C	C	C	C	T,	N	C	C	C	T,	N	C	85V,	N	C	G6V8,	N	C	C	C	C	85V,	N	-
Bicycles on Crosswalk	C	C	C	C	T	C	C	C	C	T	C	C	T	C	C	i	C	C	C	C	C	T	C	-
Bicycles on Crosswalk%	C	C	C	C	T,	N	C	C	C	T,	N	C	T,	N	C	4V4,	N	C	C	C	C	T,	N	-
Bicycles on Road	T	T	T	T	T	C	T	T	T	T	C	T	T	C	T	T	C	T	T	T	T	T	C	-
Bicycles on Road%	C	C	C	C	T,	N	C	C	C	T,	N	C	T,	N	C	T,	N	C	C	C	C	T,	N	-

Peak Hour: 05:00 PM - 06:00 PM NNNNWeather: Scattered Clouds (19.72 °C)

Start Time	N Approach ROSEBANK ND						S Approach ROSEBANK ND					NW Approach OR I NGTi NBg N DNKt : W			E Approach			W Approach OR I NGTi NBg N r r NKt : W						Int. Total (15 min)
	KuLef	EerP	dsp	oEPra	Wscl	t 00n713eNE7f12	KuLef	EerP	oEPra	Wscl	t 00n713eNE7f12	oEPra	Wscl	t 00n713eNE7f12	oEPra	Wscl	t 00n713eNE7f12	KuLef	EerP	dsp	oEPra	Wscl	t 00n713eNE7f12	
i4UTUT	46	i-G	T	T	T	85T	GG	8*G	T	T	559	T	6	T	T	G	T	i5i	T	5TT	T	6	G5i	***
i4U-UT	9i	i--	T	T	T	856	i9	5T9	T	T	586	T	T	T	T	8	T	i*9	T	585	T	T	-8i	iT95
i4U5TUT	66	i-4	T	T	T	885	i*	i4*	T	T	i*9	T	i	T	T	i	T	i9-	i	5i*	T	i	-T-	*86
i4UG-UT	6*	i46	T	T	T	8G	i*	i64	T	T	i96	T	G	T	T	8	T	i9-	i	5i*	T	G	-T-	*56
Grand Total	8*8	6G8	T	T	T	*5G	iTT	*G9	T	T	iTG9	T	ii	T	T	*	T	6**	8	i86i	T	ii	i*68	**3944**
Approach%	5iV5,	69V4,	T,	T,		C	*V,	*TV,	T,		C	T,		C	T,		C	5-V6,	TV,	6GV5,	T,		C	-
Totals %	4VG	i6V5,	T,	T,		85V4,	8V,	8G	T,		86V6,	T,		T,	T,		T,	i4V4,	TV,	58,	T,		G'V4,	-
PHF	TV	TVi	T	T		TV-	TV4	TV44	T		TV49	T		T	T		T	TV99	TV	TV9	T		TVG	-
Heavy	G	-	T	T		*	i	i4	T		i9	T		T	T		T	iG	T	ii	T		8-	-
Heavy %	iVG	TV9,	T,	T,		i,	i,	iV9,	T,		iV4,	T,		T,	T,		T,	8,	T,	TV,	T,		iV5,	-
Lights	899	654	T	T		*8-	**	*5i	T		iT5T	T		T	T		T	69-	8	i8-T	T		i*54	-
Lights %	*9V6,	**V8,	T,	T,		**,	**,	*9V8,	T,		*9V5,	T,		T,	T,		T,	*9,	iTT,	**V,	T,		*9V4,	-
Single-Unit Trucks	G	5	T	T		4	i	4	T		9	T		T	T		T	4	T	G	T		ii	-
Single-Unit Trucks %	iVG	TV,	T,	T,		TV4,	i,	TV4,	T,		TV9,	T,		T,	T,		T,	i,	T,	TV5,	T,		TV6,	-
Buses	T	8	T	T		8	T	8	T		8	T		T	T		T	i	T	-	T		6	-
Buses %	T,	TV5,	T,	T,		TV8,	T,	TV8,	T,		TV8,	T,		T,	T,		T,	TV,	T,	TVG	T,		TV5,	-
Articulated Trucks	T	T	T	T		T	T	9	T		9	T		T	T		T	6	T	8	T		9	-
Articulated Trucks %	T,	T,	T,	T,		T,	T,	TV9,	T,		TV9,	T,		T,	T,		T,	TV,	T,	TV8,	T,		TVG	-
Pedestrians	C	C	C	C	T	C	C	C	C	T	C	C	ii	C	C	4	C	C	C	C	C	ii	C	-
Pedestrians%	C	C	C	C	T,	N	C	C	C	T,	N	C	5-V,	N	C	88V6,	N	C	C	C	C	5-V,	N	-
Bicycles on Crosswalk	C	C	C	C	T	C	C	C	C	T	C	C	T	C	C	8	C	C	C	C	C	T	C	-
Bicycles on Crosswalk%	C	C	C	C	T,	N	C	C	C	T,	N	C	T,	N	C	6V,	N	C	C	C	C	T,	N	-
Bicycles on Road	T	i	T	T	T	C	T	i	T	T	C	T	T	C	T	T	C	T	T	T	T	T	C	-
Bicycles on Road%	C	C	C	C	T,	N	C	C	C	T,	N	C	T,	N	C	T,	N	C	C	C	C	T,	N	-

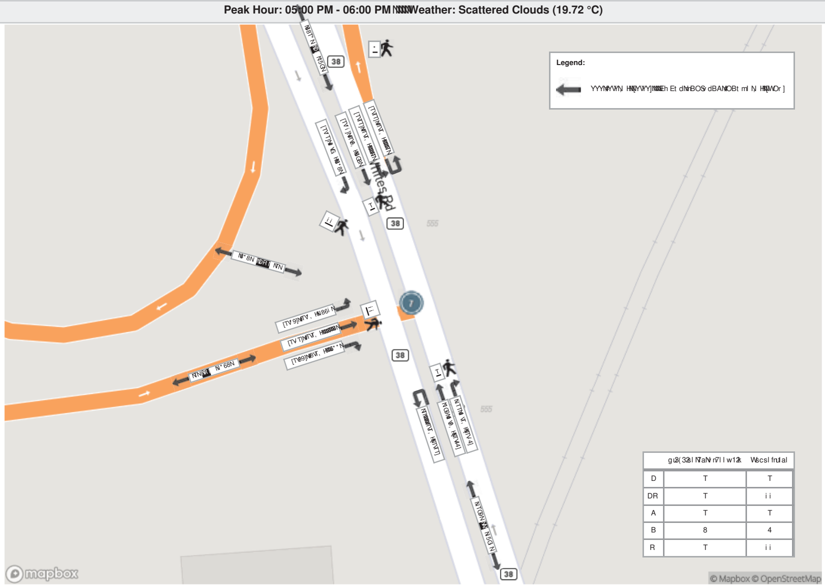
Spectrum

Peak Hour: 08:00 AM - 09:00 AM Weather: Few Clouds (10.29 °C)



Spectrum

Peak Hour: 05:00 PM - 06:00 PM Weather: Scattered Clouds (19.72 °C)



Turning Movement Count (8 . WHITES RD & BAYLY ST)

Start Time	N Approach KINGSTOR G401 BAT	YOEh BAS	r G10u BAB	: OLe BA	Hf f 0 Un4O3t hUP	E Approach DHWYWOTG ds4h SAB	YOEh SAT	r G10u SAS	: OLe SA	Hf f 0 Un4O3t hUP	S Approach KINGSTOR ds4h TAS	G401 TAB	r G10u TAT	: OLe TA	Hf f 0 Un4O3t hUP	Int. Total (15 min)	Int. Total (1 hr)
poApAop	op	ac	p	p	l i c	gl	l o	p	l	o7	l 9	co	p	p	l l p	9l o	
poA aAop	7l	cp	p	p	l ol	gc	i p	p	i	7c	i l	co	p	p	l l 7	9o7	
poA9pAop	7i	l p3	p	p	l 7g	oc	i 3	p	a	l p9	l 7	l l o	p	l	l 9a	3i 3	
poA8aAop	l ao	l 3o	p	p	9p3	o7	i 3	p	p	l pi	l c	l l c	p	p	l 97	a33	l gg9
p7ApAop	l 9p	ca	p	p	i i a	l pp	i i	p	l	l i i	l c	l a9	p	p	l oi	al c	l 7ga
p7A aAop	l l o	l pg	p	p	i i 9	oo	99	p	9	l l p	l 7	l l 3	p	p	l 9i	3ga	l cai
p7A9pAop	l po	l l 7	p	p	i i a	gi	l o	p	i	oc	i a	l 9p	p	p	l aa	3ac	l c7o
p7A8aAop	cp	l pc	p	p	l cc	o3	9a	p	l	l pc	9o	l a3	p	p	l cl	3cc	l c3i
555D SH2 555																	
l gApAop	l p3	i l 7	p	p	9i i	g3	3p	p	p	l p3	3g	l l a	p	a	l gl	a7o	
l gA aAop	l l 7	l 7i	p	p	9pp	7c	9o	p	p	l i g	9p	l pa	p	i	l 9a	agl	
l gA9pAop	l l g	i 9p	p	p	93g	79	i p	p	9	l p9	39	l i 9	p	p	l gg	gl a	
l gA8aAop	cc	i al	p	p	9ap	l i 7	39	p	l	l ol	3g	l i i	p	p	l g7	g7c	i 3ai
l oApAop	cc	l c9	p	p	i ci	l 73	al	p	c	i 9a	gc	l gl	p	p	i 9p	oao	i gi i
l oA aAop	c7	i al	p	p	93c	i l o	gc	p	i	i 7g	39	l l l	p	p	l a3	o7c	i 7ap
l oA9pAop	l pl	i 97	p	p	99c	l l i	99	p	p	l 3a	3c	79	p	p	l 9i	gl g	i 7al
l oA8aAop	l i o	i aa	p	p	97i	oo	9i	p	a	l pc	i g	l pa	p	p	l 9l	gi i	i o73
Grand Total	l gcg	i g3g	p	p	393i	l aa3	al o	p	9a	i pol	ai i	l cpg	p	7	i 3i 7	**8841**	8
Approach%	9c6 *	gp6c*	p*		8	oa*	i a*	p*		8	i l 6a*	o76a*	p*		8	-	8
Totals %	l c6 *	i c6c*	p*		3c6 *	l o6g*	a67*	p*		i 963*	a6c*	i l 6g*	p*		i o6a*	-	8
Heavy	3g	a9	p		8	93	l l	p		8	c	a9	p		8	-	8
Heavy %	i 6o*	i *	p*		8	i 6 *	i 6 *	p*		8	l 6o*	i 67*	p*		8	-	8
Bicycles	l	p	p		8	l	p	p		8	p	p	p		8	-	8
Bicycle %	p6 *	p*	p*		8	p6 *	p*	p*		8	p*	p*	p*		8	-	8

Spectrum

G10udusOMt vOmOuhO t 1uh
Yt nUhd uOBUmCAIX I NGSTO RGOOHWYWOTG
RUhCAOG1C,OMUyOg,Opi 9OOOORO f PymOuhOYOULAOX UPOOOF1sUj

DHO 0 1f
9ppO3aOTG6O YHN OH%SOX
GV VBGVOVBGH NV,OM3%O2c
. HBHRH

Peak Hour: 07:45 AM - 08:45 AMOOOOWeather: Few Clouds (10.29 °C)

Start Time	N Approach KINGSTOR G401	YOEh	r G10u	: OLe	Hf f 0 Un4O3t hUP	E Approach DHWYWOTG ds4h	YOEh	r G10u	: OLe	Hf f 0 Un4O3t hUP	S Approach KINGSTOR ds4h	G401	r G10u	: OLe	Hf f 0 Un4O3t hUP	Int. Total (15 min)
poA8aAop	l ao	l 3o	p	p	9p3	o7	i 3	p	p	l pi	l c	l l c	p	p	l 97	a33
p7ApAop	l 9p	ca	p	p	i i a	l pp	i i	p	l	l i i	l c	l a9	p	p	l oi	al c
p7A aAop	l l o	l pg	p	p	i i 9	oo	99	p	9	l l p	l 7	l l 3	p	p	l 9i	3ga
p7A9pAop	l po	l l 7	p	p	i i a	gi	l o	p	i	oc	i a	l 9p	p	p	l aa	3ac
Grand Total	al l	3gg	p	p	coo	9l o	cg	p	g	3l 9	7l	al g	p	p	aco	**1987**
Approach%	ai 69*	3o6o*	p*		8	og67*	i 96 *	p*		8	l 96g*	7g63*	p*		8	-
Totals %	i a6o*	i 96a*	p*		3c6 *	l g*	367*	p*		i p67*	36 *	i g*	p*		9p*	-
PHF	p67l	p6oc	p		p67	p6oc	p6o9	p		p67a	p67l	p673	p		p67o	-
Heavy	l 9	l g	p		i c	l p	a	p		l a	3	l a	p		l c	-
Heavy %	i 6a*	963*	p*		9*	96 *	a6 *	p*		96g*	36c*	i 6c*	p*		96 *	-
Lights	3c7	3ap	p		c37	9po	cl	p		9c7	oo	apl	p		ao7	-
Lights %	co6a*	cg6g*	p*		co*	cg67*	c367*	p*		cg63*	ca6 *	co6 *	p*		cg67*	-
Single-Unit Trucks	o	c	p		l g	g	l	p		o	l	7	p		c	-
Single-Unit Trucks %	l 63*	l 6c*	p*		l 6g*	l 6c*	l *	p*		l 6o*	l 6 *	l 6g*	p*		l 6a*	-
Buses	a	3	p		c	i	9	p		a	l	g	p		o	-
Buses %	l *	p6c*	p*		p6c*	p6g*	96 *	p*		l 6 *	l 6 *	l 6 *	p*		l 6 *	-
Articulated Trucks	l	9	p		3	i	l	p		9	i	l	p		9	-
Articulated Trucks %	p6 *	p6g*	p*		p63*	p6g*	l *	p*		p6o*	i 6a*	p6 *	p*		p6a*	-
Pedestrians	8	8	8	p	8	8	8	8	a	8	8	8	8	p	8	-
Pedestrians%	8	8	8	p*	O	8	8	8	7969*	O	8	8	8	p*	O	-
Bicycles on Crosswalk	8	8	8	p	8	8	8	8	l	8	8	8	8	p	8	-
Bicycles on Crosswalk%	8	8	8	p*	O	8	8	8	l g6o*	O	8	8	8	p*	O	-
Bicycles on Road	p	p	p	p	8	p	p	p	p	8	p	p	p	p	8	-
Bicycles on Road%	8	8	8	p*	O	8	8	8	p*	O	8	8	8	p*	O	-

G10udusOMt vOmOuh
. t 1uh

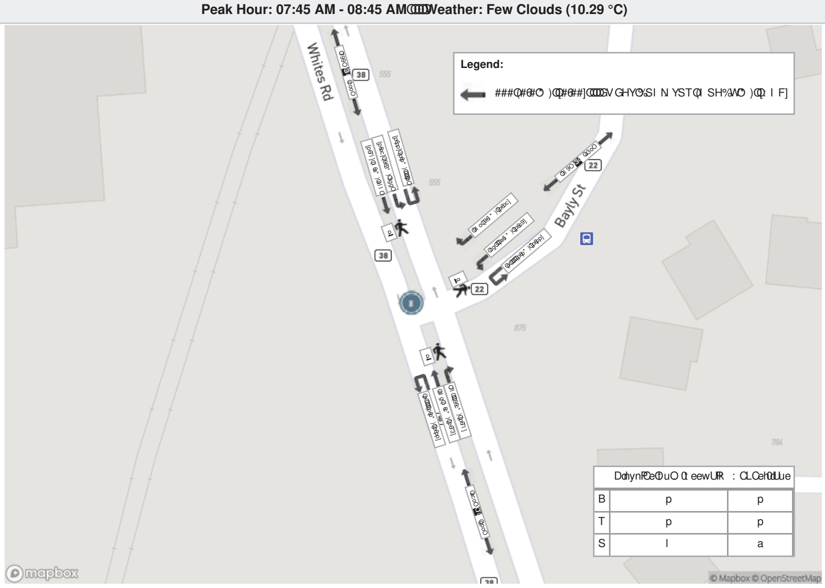
: UsOOOOEa

DH. i 9M7%

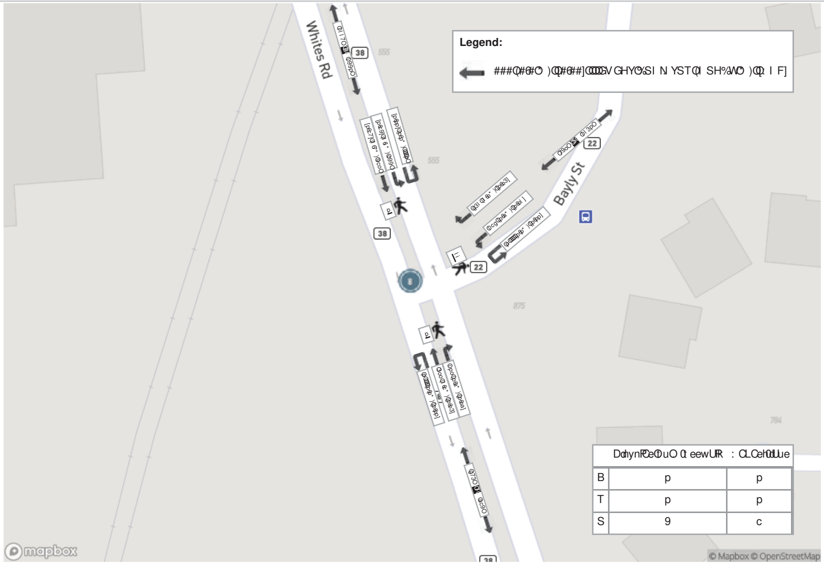
Peak Hour: 04:45 PM - 05:45 PM Weather: Scattered Clouds (19.72 °C)

Start Time	N Approach KI NGSTOR					E Approach DHWYWOTG					S Approach KI NGSTOR					Int. Total (15 min)
	G401	YOEh	r G10u	: OLe	Hf f 0 Un4OOt hUP	ot4h	YOEh	r G10u	: OLe	Hf f 0 Un4OOt hUP	ot4h	G401	r G10u	: OLe	Hf f 0 Un4OOt hUP	
l gA3aApp	cc	i al	p	p	9ap	l i 7	39	p	l	l ol	3g	l i i	p	p	l g7	g7c
l oAppApp	cc	l c9	p	p	i ci	l 73	al	p	c	i 9a	gc	l gl	p	p	i 9p	oao
l oAl aApp	c7	i al	p	p	93c	i l o	gc	p	i	i 7g	39	l l l	p	p	l a3	o7c
l oA9pApp	l pl	i 97	p	p	99c	l l i	99	p	p	l 3a	3c	79	p	p	l 9i	gl g
Grand Total	9co	c99	p	p	l 99p	g3l	l cg	p	l i	79o	i po	3oo	p	p	g73	**2851**
Approach%	i c67*	op6 *	p*		8	og6g*	i 963*	p*		8	9p69*	gc6o*	p*		8	-
Totals %	l 96c*	9i 6o*	p*		3g6o*	i i 6a*	g6c*	p*		i c63*	o69*	l g6o*	p*		i 3*	-
PHF	p6c7	p6c9	p		p6ca	p6o3	p6ol	p		p6o9	p6oa	p6o3	p		p6o3	-
Heavy	o	l l	p		l 7	l l	l	p		l i	l	c	p		l p	-
Heavy %	l 67*	l 6 *	p*		l 63*	l 6o*	p6a*	p*		l 63*	p6a*	l 6c*	p*		l 6a*	-
Lights	9cp	ci i	p		l 9l i	g9p	l ca	p		7i a	i pg	3g7	p		go3	-
Lights %	c76 *	c767*	p*		c76g*	c769*	cc6a*	p*		c76g*	cc6a*	c76 *	p*		c76a*	-
Single-Unit Trucks	a	3	p		c	a	l	p		g	l	a	p		g	-
Single-Unit Trucks %	l 69*	p63*	p*		p6o*	p67*	p6a*	p*		p6o*	p6a*	l *	p*		p6c*	-
Buses	i	l	p		9	p	p	p		p	p	i	p		i	-
Buses %	p6a*	p6 *	p*		p6 *	p*	p*	p*		p*	p*	p63*	p*		p69*	-
Articulated Trucks	p	g	p		g	g	p	p		g	p	i	p		i	-
Articulated Trucks %	p*	p6g*	p*		p6a*	p6c*	p*	p*		p6o*	p*	p63*	p*		p69*	-
Pedestrians	8	8	8	p	8	8	8	8	c	8	8	8	8	p	8	-
Pedestrians%	8	8	8	p*	O	8	8	8	oa*	O	8	8	8	p*	O	-
Bicycles on Crosswalk	8	8	8	p	8	8	8	8	9	8	8	8	8	p	8	-
Bicycles on Crosswalk%	8	8	8	p*	O	8	8	8	i a*	O	8	8	8	p*	O	-
Bicycles on Road	l	p	p	p	8	l	p	p	p	8	p	p	p	p	8	-
Bicycles on Road%	8	8	8	p*	O	8	8	8	p*	O	8	8	8	p*	O	-

Peak Hour: 07:45 AM - 08:45 AM Weather: Few Clouds (10.29 °C)



Peak Hour: 04:45 PM - 05:45 PM Weather: Scattered Clouds (19.72 °C)



Appendix D:
Signal Timing Plans

INTERSECTION SIGNAL TIMING REPORT

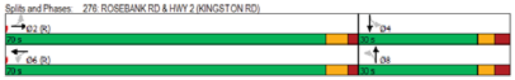
Location	Kingston Road (Hwy 2) and Rosebank Rd				
Date	2023-05-24	C&E No.	41860731	Prepared by	M.A
Prepared for	BA Consulting				

AM Peak 5:30 -9:00

Phase Number	2	4	6	8
Movement	EBTL	SBTL	WBTL	NBTL
Lead/Lag				
Lead-Lag Optimize				
Recall Mode	C-Max	None	C-Max	None
Maximum Split (s)	70	30	70	30
Maximum Split (%)	70.0%	30.0%	70.0%	30.0%
Minimum Split (s)	28	28	28	28
Yellow Time (s)	4.3	3.5	4.3	3.5
All-Red Time (s)	2.3	3.1	2.3	3.1
Minimum Initial (s)	20	8	20	8
Vehicle Extension (s)	3	3	3	3
Minimum Gap (s)	3	3	3	3
Time Before Reduce (s)	0	0	0	0
Time To Reduce (s)	0	0	0	0
Walk Time (s)	7	7	7	7
Flash Dont Walk (s)	10	14	10	14

Intersection Summary	
Cycle Length	100
Control Type	Actuated-Coordinated
Natural Cycle	60
Offset: 57 (57%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	

Splits and Phases: 276: ROSEBANK RD & HWY 2 (KINGSTON RD)

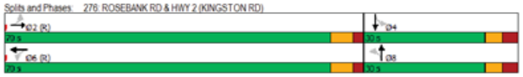


PM Peak 14:30-21:00

Phase Number	2	4	6	8
Movement	EBTL	SBTL	WBTL	NBTL
Lead/Lag				
Lead-Lag Optimize				
Recall Mode	C-Max	None	C-Max	None
Maximum Split (s)	70	30	70	30
Maximum Split (%)	70.0%	30.0%	70.0%	30.0%
Minimum Split (s)	28	28	28	28
Yellow Time (s)	4.3	3.5	4.3	3.5
All-Red Time (s)	2.3	3.1	2.3	3.1
Minimum Initial (s)	20	8	20	8
Vehicle Extension (s)	3	3	3	3
Minimum Gap (s)	3	3	3	3
Time Before Reduce (s)	0	0	0	0
Time To Reduce (s)	0	0	0	0
Walk Time (s)	7	7	7	7
Flash Dont Walk (s)	10	14	10	14

Intersection Summary	
Cycle Length	100
Control Type	Actuated-Coordinated
Natural Cycle	65
Offset: 83 (83%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	

Splits and Phases: 276: ROSEBANK RD & HWY 2 (KINGSTON RD)

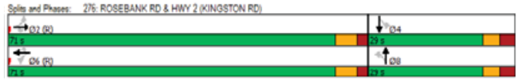


Weekend Peak 08:00-21:00

Phase Number	2	4	6	8
Movement	EBTL	SBTL	WBTL	NBTL
Lead/Lag				
Lead-Lag Optimize				
Recall Mode	C-Max	None	C-Max	None
Maximum Split (s)	71	29	71	29
Maximum Split (%)	71.0%	29.0%	71.0%	29.0%
Minimum Split (s)	28	28	28	28
Yellow Time (s)	4.3	3.5	4.3	3.5
All-Red Time (s)	2.3	3.1	2.3	3.1
Minimum Initial (s)	20	8	20	8
Vehicle Extension (s)	3	3	3	3
Minimum Gap (s)	3	3	3	3
Time Before Reduce (s)	0	0	0	0
Time To Reduce (s)	0	0	0	0
Walk Time (s)	7	7	7	7
Flash Dont Walk (s)	10	14	10	14

Intersection Summary	
Cycle Length	100
Control Type	Actuated-Coordinated
Natural Cycle	60
Offset: 92 (92%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	

Splits and Phases: 276: ROSEBANK RD & HWY 2 (KINGSTON RD)



Please note a concerted effort has been made to ensure the accuracy and completeness of the data provided, however, inadvertent errors or omissions can still occur. Please bring any errors or omissions to the Region's attention.

INTERSECTION SIGNAL TIMING REPORT

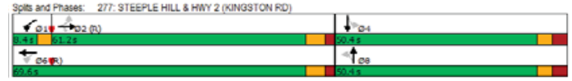
Location	Kingston Road (Hwy 2) and Steeple Hill				
Date	2023-05-24	C&E No.	41860731	Prepared by	M.A
Prepared for	BA Consulting				

AM Peak 05:30-09:00

Phase Number	1	2	4	6	8
Movement	WBL	EBTL	SBTL	WBTL	NBTL
Lead/Lag	Lead	Lag			
Lead-Lag Optimize	Yes	Yes			
Recall Mode	None	C-Max	None	C-Max	None
Maximum Split (s)	8.4	61.2	50.4	69.6	50.4
Maximum Split (%)	7.0%	51.0%	42.0%	58.0%	42.0%
Minimum Split (s)	8	27	38	27	38
Yellow Time (s)	3	4.2	3.3	4.2	3.3
All-Red Time (s)	0	2.1	3.4	2.1	3.4
Minimum Initial (s)	5	20	8	20	8
Vehicle Extension (s)	3	3	3	3	3
Minimum Gap (s)	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0
Walk Time (s)		7	7	7	7
Flash Dont Walk (s)		13	24	13	24

Intersection Summary	
Cycle Length	120
Control Type	Actuated-Coordinated
Natural Cycle	75
Offset: 1.2 (1%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	

Splits and Phases: 277: STEEPLE HILL & HWY 2 (KINGSTON RD)

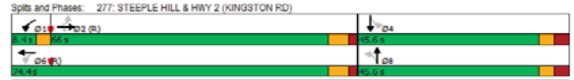


PM Peak 14:30-20:00

Phase Number	1	2	4	6	8
Movement	WBL	EBTL	SBTL	WBTL	NBTL
Lead/Lag	Lead	Lag			
Lead-Lag Optimize	Yes	Yes			
Recall Mode	None	C-Max	None	C-Max	None
Maximum Split (s)	8.4	66	45.6	74.4	45.6
Maximum Split (%)	7.0%	55.0%	38.0%	62.0%	38.0%
Minimum Split (s)	8	27	38	27	38
Yellow Time (s)	3	4.2	3.3	4.2	3.3
All-Red Time (s)	0	2.1	3.4	2.1	3.4
Minimum Initial (s)	5	20	8	20	8
Vehicle Extension (s)	3	3	3	3	3
Minimum Gap (s)	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0
Walk Time (s)		7	7	7	7
Flash Dont Walk (s)		13	24	13	24

Intersection Summary	
Cycle Length	120
Control Type	Actuated-Coordinated
Natural Cycle	75
Offset: 100.8 (84%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	

Splits and Phases: 277: STEEPLE HILL & HWY 2 (KINGSTON RD)

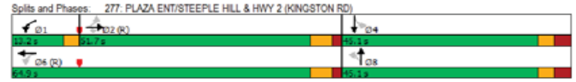


Weekend Peak (08:00 - 21:00)

Phase Number	1	2	4	6	8
Movement	WBL	EBTL	SBTL	WBTL	NBTL
Lead/Lag	Lead	Lag			
Lead-Lag Optimize	Yes	Yes			
Recall Mode	None	C-Max	None	C-Max	None
Maximum Split (s)	13.2	51.7	45.1	64.9	45.1
Maximum Split (%)	12.0%	47.0%	41.0%	59.0%	41.0%
Minimum Split (s)	8	27	38	27	38
Yellow Time (s)	3	4.2	3.3	4.2	3.3
All-Red Time (s)	0	2.1	3.4	2.1	3.4
Minimum Initial (s)	5	20	8	20	8
Vehicle Extension (s)	3	3	3	3	3
Minimum Gap (s)	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0
Walk Time (s)		7	7	7	7
Flash Dont Walk (s)		13	24	13	24

Intersection Summary	
Cycle Length	110
Control Type	Actuated-Coordinated
Natural Cycle	75
Offset: 107.8 (98%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	

Splits and Phases: 277: PLAZA ENT/STEEPLE HILL & HWY 2 (KINGSTON RD)



Please note a concerted effort has been made to ensure the accuracy and completeness of the data provided, however, inadvertent errors or omissions can still occur. Please bring any errors or omissions to the Region's attention.

INTERSECTION SIGNAL TIMING REPORT

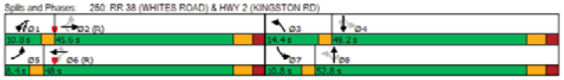
Location	Kingston Road (Hwy 2) and Whites Road (RR38)				
Date	2023-05-24	C&E No.	41860731	Prepared by	M.A
Prepared for	BA Consulting				

AM Peak 05:30-09:00

Phase Number	1	2	3	4	5	6	7	8
Movement	WBL	EBTL	NBL	SBTL	EBL	WBTL	SBL	NBTL
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	None	Max	None	C-Max	None	Max
Maximum Split (s)	10.8	45.6	14.4	49.2	8.4	48	10.8	52.8
Maximum Split (%)	9.0%	38.0%	12.0%	41.0%	7.0%	40.0%	9.0%	44.0%
Minimum Split (s)	8	43	8	45	8	43	8	45
Yellow Time (s)	3	4.2	3	4.3	3	4.2	3	4.3
All-Red Time (s)	0	2.8	0	2.8	0	2.8	0	2.8
Minimum Initial (s)	5	20	5	8	5	20	5	8
Vehicle Extension (s)	3	3	3	3	3	3	3	3
Minimum Gap (s)	3	3	3	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0	0	0	0
Walk Time (s)		7		7		7		7
Flash Dont Walk (s)		29		30		29		30

Intersection Summary	
Cycle Length	120
Control Type	Actuated-Coordinated
Natural Cycle	105
Offset: 1.2 (1%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	

Splits and Phases: 250: RR 38 (WHITES ROAD) & HWY 2 (KINGSTON RD)

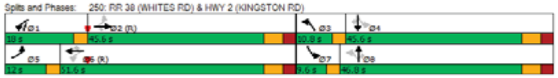


PM Peak 14:30-20:00

Phase Number	1	2	3	4	5	6	7	8
Movement	WBL	EBTL	NBL	SBTL	EBL	WBTL	SBL	NBTL
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	None	Max	None	C-Max	None	Max
Maximum Split (s)	18	45.6	10.8	45.6	12	51.6	9.6	46.8
Maximum Split (%)	15.0%	38.0%	9.0%	38.0%	10.0%	43.0%	8.0%	39.0%
Minimum Split (s)	8	43	8	45	8	43	8	45
Yellow Time (s)	3	4.2	3	4.3	3	4.2	3	4.3
All-Red Time (s)	0	2.8	0	2.8	0	2.8	0	2.8
Minimum Initial (s)	5	20	5	8	5	20	5	8
Vehicle Extension (s)	3	3	3	3	3	3	3	3
Minimum Gap (s)	3	3	3	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0	0	0	0
Walk Time (s)		7		7		7		7
Flash Dont Walk (s)		29		30		29		30

Intersection Summary	
Cycle Length	120
Control Type	Actuated-Coordinated
Natural Cycle	105
Offset: 1.2 (1%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	

Splits and Phases: 250: RR 38 (WHITES RD) & HWY 2 (KINGSTON RD)

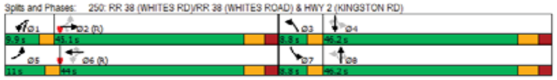


Weekend Peak 08:00 - 21:00

Phase Number	1	2	3	4	5	6	7	8
Movement	WBL	EBTL	NBL	SBTL	EBL	WBTL	SBL	NBTL
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	None	Max	None	C-Max	None	Max
Maximum Split (s)	9.9	45.1	8.8	46.2	11	44	8.8	46.2
Maximum Split (%)	9.0%	41.0%	8.0%	42.0%	10.0%	40.0%	8.0%	42.0%
Minimum Split (s)	8	43	8	45	8	43	8	45
Yellow Time (s)	3	4.2	3	4.3	3	4.2	3	4.3
All-Red Time (s)	0	2.8	0	2.8	0	2.8	0	2.8
Minimum Initial (s)	5	20	5	8	5	20	5	8
Vehicle Extension (s)	3	3	3	3	3	3	3	3
Minimum Gap (s)	3	3	3	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0	0	0	0
Walk Time (s)		7		7		7		7
Flash Dont Walk (s)		29		30		29		30

Intersection Summary	
Cycle Length	110
Control Type	Actuated-Coordinated
Natural Cycle	105
Offset: 1.1 (1%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	

Splits and Phases: 250: RR 38 (WHITES RD)/RR 38 (WHITES ROAD) & HWY 2 (KINGSTON RD)



**Please note a concerted effort has been made to ensure the accuracy and completeness of the data provided, however, inadvertent errors or omissions can still occur. Please bring any errors or omissions to the Region's attention.*

INTERSECTION SIGNAL TIMING REPORT

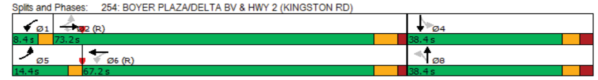
Location	Kingston Rd & Delta / Boyer				
Date	2023-05-24	C&E No.	41860731	Prepared by	M.A
Prepared for	BA Consulting				

AM Peak 05:30-09:00

Phase Number	1	2	4	5	6	8
Movement	WBL	EBTL	SBTL	EBL	WBTL	NBTL
Lead/Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize	Yes	Yes		Yes	Yes	
Recall Mode	None	C-Max	None	None	C-Max	None
Maximum Split (s)	8.4	73.2	38.4	14.4	67.2	38.4
Maximum Split (%)	7.0%	61.0%	32.0%	12.0%	56.0%	32.0%
Minimum Split (s)	8	32	38	8	32	38
Yellow Time (s)	3	4.7	3.8	3	4.7	3.8
All-Red Time (s)	0	2.2	2.8	0	2.2	2.8
Minimum Initial (s)	5	20	8	5	20	8
Vehicle Extension (s)	3	3	3	3	3	3
Minimum Gap (s)	3	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0	0
Walk Time (s)		7	7		7	7
Flash Dont Walk (s)		18	24		18	24

Intersection Summary	
Cycle Length	120
Control Type	Actuated-Coordinated
Natural Cycle	90
Offset: 105.6 (88%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	

Splits and Phases: 254: BOYER PLAZA/DELTA BV & HWY 2 (KINGSTON RD)

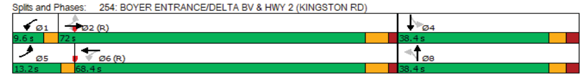


PM Peak 14:30-20:00

Phase Number	1	2	4	5	6	8
Movement	WBL	EBTL	SBTL	EBL	WBTL	NBTL
Lead/Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize	Yes	Yes		Yes	Yes	
Recall Mode	None	C-Max	None	None	C-Max	None
Maximum Split (s)	9.6	72	38.4	13.2	68.4	38.4
Maximum Split (%)	8.0%	60.0%	32.0%	11.0%	57.0%	32.0%
Minimum Split (s)	8	32	38	8	32	38
Yellow Time (s)	3	4.7	3.8	3	4.7	3.8
All-Red Time (s)	0	2.2	2.8	0	2.2	2.8
Minimum Initial (s)	5	20	8	5	20	8
Vehicle Extension (s)	3	3	3	3	3	3
Minimum Gap (s)	3	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0	0
Walk Time (s)		7	7		7	7
Flash Dont Walk (s)		18	24		18	24

Intersection Summary	
Cycle Length	120
Control Type	Actuated-Coordinated
Natural Cycle	90
Offset: 111.6 (93%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	

Splits and Phases: 254: BOYER ENTRANCE/DELTA BV & HWY 2 (KINGSTON RD)

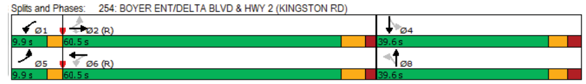


Weekend Peak 08:00 - 21:00

Phase Number	1	2	4	5	6	8
Movement	WBL	EBTL	SBTL	EBL	WBTL	NBTL
Lead/Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize	Yes	Yes		Yes	Yes	
Recall Mode	None	C-Max	None	None	C-Max	None
Maximum Split (s)	9.9	60.5	39.6	9.9	60.5	39.6
Maximum Split (%)	9.0%	55.0%	36.0%	9.0%	55.0%	36.0%
Minimum Split (s)	8	32	38	8	32	38
Yellow Time (s)	3	4.7	3.8	3	4.7	3.8
All-Red Time (s)	0	2.2	2.8	0	2.2	2.8
Minimum Initial (s)	5	20	8	5	20	8
Vehicle Extension (s)	3	3	3	3	3	3
Minimum Gap (s)	3	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0	0
Walk Time (s)		7	7		7	7
Flash Dont Walk (s)		18	24		18	24

Intersection Summary	
Cycle Length	110
Control Type	Actuated-Coordinated
Natural Cycle	80
Offset: 15.4 (14%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	

Splits and Phases: 254: BOYER ENT/DELTA BLVD & HWY 2 (KINGSTON RD)



**Please note a concerted effort has been made to ensure the accuracy and completeness of the data provided, however, inadvertent errors or omissions can still occur. Please bring any errors or omissions to the Region's attention.*

INTERSECTION SIGNAL TIMING REPORT

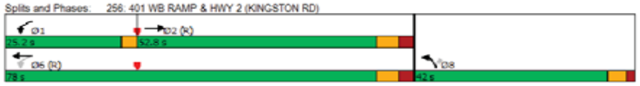
Location	Kingston Rd & Hwy 401 Ramp (E of Whites Rd.)				
Date	2023-05-24	C&E No.	41860731	Prepared by	M.A
Prepared for	BA Consulting				

AM Peak 05:30 - 09:00

Phase Number	1	2	6	8
Movement	WBL	EBT	WBTL	NBL
Lead/Lag	Lead	Lag		
Lead-Lag Optimize	Yes	Yes		
Recall Mode	None	C-Max	C-Max	None
Maximum Split (s)	25.2	52.8	78	42
Maximum Split (%)	21.0%	44.0%	65.0%	35.0%
Minimum Split (s)	8	50	50	32
Yellow Time (s)	3	4.2	4.2	3.7
All-Red Time (s)	0	3	3	1.7
Minimum Initial (s)	5	20	20	8
Vehicle Extension (s)	3	3	3	3
Minimum Gap (s)	3	3	3	3
Time Before Reduce (s)	0	0	0	0
Time To Reduce (s)	0	0	0	0
Walk Time (s)		7	7	7
Flash Dont Walk (s)		35	35	19

Intersection Summary	
Cycle Length	120
Control Type	Actuated-Coordinated
Natural Cycle	100
Offset: 115.2 (96%), Referenced to phase 2:EBT and 6:WBTL, Start of Green	

Splits and Phases: 256: 401 WB RAMP & HWY 2 (KINGSTON RD)

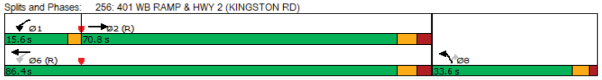


PM Peak 14:30-20:00

Phase Number	1	2	6	8
Movement	WBL	EBT	WBTL	NBL
Lead/Lag	Lead	Lag		
Lead-Lag Optimize	Yes	Yes		
Recall Mode	None	C-Max	C-Max	None
Maximum Split (s)	15.6	70.8	86.4	33.6
Maximum Split (%)	13.0%	59.0%	72.0%	28.0%
Minimum Split (s)	8	50	50	32
Yellow Time (s)	3	4.2	4.2	3.7
All-Red Time (s)	0	3	3	1.7
Minimum Initial (s)	5	20	20	8
Vehicle Extension (s)	3	3	3	3
Minimum Gap (s)	3	3	3	3
Time Before Reduce (s)	0	0	0	0
Time To Reduce (s)	0	0	0	0
Walk Time (s)		7	7	7
Flash Dont Walk (s)		35	35	19

Intersection Summary	
Cycle Length	120
Control Type	Actuated-Coordinated
Natural Cycle	100
Offset: 8.4 (7%), Referenced to phase 2:EBT and 6:WBTL, Start of Green	

Splits and Phases: 256: 401 WB RAMP & HWY 2 (KINGSTON RD)

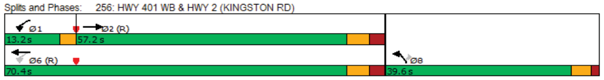


Weekend Peak 08:00 - 21:00

Phase Number	1	2	6	8
Movement	WBL	EBT	WBTL	NBL
Lead/Lag	Lead	Lag		
Lead-Laq Optimize	Yes	Yes		
Recall Mode	None	C-Max	C-Max	None
Maximum Split (s)	13.2	57.2	70.4	39.6
Maximum Split (%)	12.0%	52.0%	64.0%	36.0%
Minimum Split (s)	8	50	50	32
Yellow Time (s)	3	4.2	4.2	3.7
All-Red Time (s)	0	3	3	1.7
Minimum Initial (s)	5	20	20	8
Vehicle Extension (s)	3	3	3	3
Minimum Gap (s)	3	3	3	3
Time Before Reduce (s)	0	0	0	0
Time To Reduce (s)	0	0	0	0
Walk Time (s)		7	7	7
Flash Dont Walk (s)		35	35	19

Intersection Summary	
Cycle Length	110
Control Type	Actuated-Coordinated
Natural Cycle	90
Offset: 22 (20%), Referenced to phase 2:EBT and 6:WBTL, Start of Green	

Splits and Phases: 256: HWY 401 WB & HWY 2 (KINGSTON RD)



Please note a concerted effort has been made to ensure the accuracy and completeness of the data provided, however, inadvertent errors or omissions can still occur. Please bring any errors or omissions to the Region's attention.

INTERSECTION SIGNAL TIMING REPORT

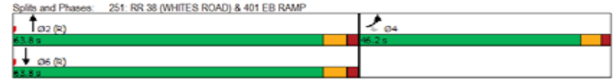
Location	Whites Rd. (RR 38) and Hwy. 401 EB Off-Ramp				
Date	2023-06-06	C&E No.	41860731	Prepared by	M.A
Prepared for	BA Consulting				

AM Peak 06:30 - 09:00

Phase Number	2	4	6
Movement	NBT	EBL	SBT
Lead/Lag			
Lead-Lag Optimize			
Recall Mode	C-Max	None	C-Max
Maximum Split (s)	63.8	46.2	63.8
Maximum Split (%)	58.0%	42.0%	58.0%
Minimum Split (s)	28	29	28
Yellow Time (s)	4.5	3.7	4.5
All-Red Time (s)	2.2	1.8	2.2
Minimum Initial (s)	20	8	20
Vehicle Extension (s)	3	3	3
Minimum Gap (s)	3	3	3
Time Before Reduce (s)	0	0	0
Time To Reduce (s)	0	0	0
Walk Time (s)	7	7	7
Flash Dont Walk (s)	14	16	14

Intersection Summary	
Cycle Length	110
Control Type	Actuated-Coordinated
Natural Cycle	60
Offset: 79.2 (72%), Referenced to phase 2:NBT and 6:SBT, Start of Green	

Splits and Phases: 251: RR 38 (WHITES ROAD) & 401 EB RAMP

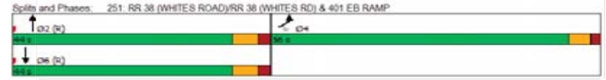


PM Peak 14:30 - 19:00

Phase Number	2	4	6
Movement	NBT	EBL	SBT
Lead/Lag			
Lead-Lag Optimize			
Recall Mode	C-Max	None	C-Max
Maximum Split (s)	44	56	44
Maximum Split (%)	44.0%	56.0%	44.0%
Minimum Split (s)	28	29	28
Yellow Time (s)	4.5	3.7	4.5
All-Red Time (s)	2.2	1.8	2.2
Minimum Initial (s)	20	8	20
Vehicle Extension (s)	3	3	3
Minimum Gap (s)	3	3	3
Time Before Reduce (s)	0	0	0
Time To Reduce (s)	0	0	0
Walk Time (s)	7	7	7
Flash Dont Walk (s)	14	16	14

Intersection Summary	
Cycle Length	100
Control Type	Actuated-Coordinated
Natural Cycle	110
Offset: 8 (8%), Referenced to phase 2:NBT and 6:SBT, Start of Green	

Splits and Phases: 251: RR 38 (WHITES ROAD)/RR 38 (WHITES RD) & 401 EB RAMP

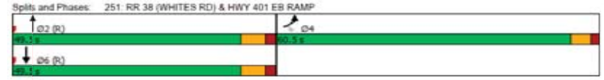


Weekend Peak (8:00-21:00)

Phase Number	2	4	6
Movement	NBT	EBL	SBT
Lead/Lag			
Lead-Lag Optimize			
Recall Mode	C-Max	None	C-Max
Maximum Split (s)	49.5	60.5	49.5
Maximum Split (%)	45.0%	55.0%	45.0%
Minimum Split (s)	28	29	28
Yellow Time (s)	4.5	3.7	4.5
All-Red Time (s)	2.2	1.8	2.2
Minimum Initial (s)	20	8	20
Vehicle Extension (s)	3	3	3
Minimum Gap (s)	3	3	3
Time Before Reduce (s)	0	0	0
Time To Reduce (s)	0	0	0
Walk Time (s)	7	7	7
Flash Dont Walk (s)	14	16	14

Intersection Summary	
Cycle Length	110
Control Type	Actuated-Coordinated
Natural Cycle	60
Offset: 24.2 (22%), Referenced to phase 2:NBT and 6:SBT, Start of Green	

Splits and Phases: 251: RR 38 (WHITES RD) & HWY 401 EB RAMP



Please note a concerted effort has been made to ensure the accuracy and completeness of the data provided, however, inadvertent errors or omissions can still occur. Please bring any errors or omissions to the Region's attention.

INTERSECTION SIGNAL TIMING REPORT

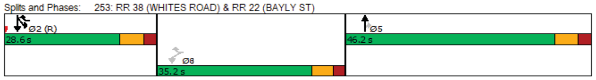
Location	Whites Rd. (RR38) & Bayly St. (RR22)				
Date	2023-05-24	**C&E No.**	41860731	**Prepared by**	M.A
Prepared for	BA Group				

AM Peak 06:15-09:15

Phase Number	2	5	8
Movement	SBTL	NBT	WBL
Lead/Lag			
Lead-Lag Optimize			
Recall Mode	C-Max	None	None
Maximum Split (s)	28.6	46.2	35.2
Maximum Split (%)	26.0%	42.0%	32.0%
Minimum Split (s)	27	39	32
Yellow Time (s)	4.4	4.4	4.2
All-Red Time (s)	2.6	2.6	2.2
Minimum Initial (s)	20	20	8
Vehicle Extension (s)	3	3	3
Minimum Gap (s)	3	3	3
Time Before Reduce (s)	0	0	0
Time To Reduce (s)	0	0	0
Walk Time (s)	5	7	7
Flash Dont Walk (s)	5	25	18

Intersection Summary	
Cycle Length	110
Control Type	Actuated-Coordinated
Natural Cycle	100
Offset: 24.2 (22%), Referenced to phase 2:SBTL, Start of Green	

Splits and Phases: 253: RR 38 (WHITES ROAD) & RR 22 (BAYLY ST)

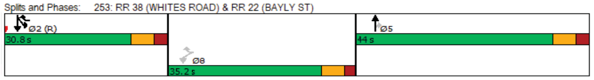


PM Peak 14:30-19:00

Phase Number	2	5	8
Movement	SBTL	NBT	WBL
Lead/Lag			
Lead-Lag Optimize			
Recall Mode	C-Max	None	None
Maximum Split (s)	30.8	44	35.2
Maximum Split (%)	28.0%	40.0%	32.0%
Minimum Split (s)	27	39	32
Yellow Time (s)	4.4	4.4	4.2
All-Red Time (s)	2.6	2.6	2.2
Minimum Initial (s)	20	20	8
Vehicle Extension (s)	3	3	3
Minimum Gap (s)	3	3	3
Time Before Reduce (s)	0	0	0
Time To Reduce (s)	0	0	0
Walk Time (s)	5	7	7
Flash Dont Walk (s)	5	25	18

Intersection Summary	
Cycle Length	110
Control Type	Actuated-Coordinated
Natural Cycle	110
Offset: 33 (30%), Referenced to phase 2:SBTL, Start of Green	

Splits and Phases: 253: RR 38 (WHITES ROAD) & RR 22 (BAYLY ST)

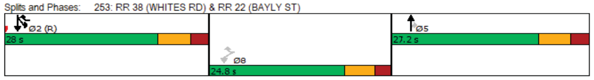


Weekend Peak 08:00-21:00

Phase Number	2	5	8
Movement	SBTL	NBT	WBL
Lead/Lag			
Lead-Lag Optimize			
Recall Mode	C-Max	None	None
Maximum Split (s)	28	27.2	24.8
Maximum Split (%)	35.0%	34.0%	31.0%
Minimum Split (s)	27	39	32
Yellow Time (s)	4.4	4.4	4.2
All-Red Time (s)	2.6	2.6	2.2
Minimum Initial (s)	20	20	8
Vehicle Extension (s)	3	3	3
Minimum Gap (s)	3	3	3
Time Before Reduce (s)	0	0	0
Time To Reduce (s)	0	0	0
Walk Time (s)	5	7	7
Flash Dont Walk (s)	5	25	18

Intersection Summary	
Cycle Length	80
Control Type	Actuated-Coordinated
Natural Cycle	110
Offset: 37.6 (47%), Referenced to phase 2:SBTL, Start of Green	

Splits and Phases: 253: RR 38 (WHITES RD) & RR 22 (BAYLY ST)



**Please note a concerted effort has been made to ensure the accuracy and completeness of the data provided, however, inadvertent errors or omissions can still occur. Please bring any errors or omissions to the Region's attention.*

Appendix E:
Synchro Analysis Worksheets

HCM Unsignalized Intersection Capacity Analysis
2: Site Access (West) & Kingston Road

Existing AM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	620	5	0	815	5	0
Future Volume (Veh/h)	620	5	0	815	5	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	713	6	0	937	6	0
Pedestrians					5	
Lane Width (m)					3.3	
Walking Speed (m/s)					1.2	
Percent Blockage					0	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				153		
pX, platoon unblocked					0.91	
vC, conflicting volume			724		1186	362
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			724		1000	362
tC, single (s)			4.1		7.1	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.6	3.3
p0 queue free %			100		97	100
cM capacity (veh/h)			884		199	639

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1
Volume Total	356	356	6	0	468	468	6
Volume Left	0	0	0	0	0	0	6
Volume Right	0	0	6	0	0	0	0
cSH	1700	1700	1700	1700	1700	1700	199
Volume to Capacity	0.21	0.21	0.00	0.00	0.28	0.28	0.03
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.7
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	23.7
Lane LOS							C
Approach Delay (s)	0.0			0.0			23.7
Approach LOS							C

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	32.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
1: Kingston Road & Rosebank Road

Existing AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	525	10	15	740	65	0	0	5	95	5	120
Future Volume (vph)	30	525	10	15	740	65	0	0	5	95	5	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5
Total Lost time (s)	5.6	5.6		5.6	5.6			5.6		5.6	5.6	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99			0.85		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00			1.00		0.95	1.00	
Satd. Flow (prot)	1688	3426		1745	3420			1597		1694	1609	
Flt Permitted	0.30	1.00		0.42	1.00			1.00		0.75	1.00	
Satd. Flow (perm)	526	3426		775	3420			1597		1344	1609	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	34	597	11	17	841	74	0	0	6	108	6	136
RTOR Reduction (vph)	0	1	0	0	5	0	0	5	0	0	116	0
Lane Group Flow (vph)	34	607	0	17	910	0	0	1	0	108	26	0
Confl. Peds. (#/hr)	5					5						
Heavy Vehicles (%)	3%	4%	0%	0%	3%	1%	0%	0%	0%	3%	0%	0%
Bus Blockages (#/hr)	0	0	11	0	0	11	0	0	0	0	0	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	73.4	73.4		73.4	73.4			13.4		13.4	13.4	
Effective Green, g (s)	74.4	74.4		74.4	74.4			14.4		14.4	14.4	
Actuated g/C Ratio	0.74	0.74		0.74	0.74			0.14		0.14	0.14	
Clearance Time (s)	6.6	6.6		6.6	6.6			6.6		6.6	6.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	391	2548		576	2544			229		193	231	
v/s Ratio Prot		0.18			c0.27			0.00			0.02	
v/s Ratio Perm	0.06			0.02						c0.08		
v/c Ratio	0.09	0.24		0.03	0.36			0.00		0.56	0.11	
Uniform Delay, d1	3.5	4.0		3.4	4.5			36.7		39.8	37.2	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.2		0.1	0.4			0.0		3.5	0.2	
Delay (s)	3.9	4.2		3.4	4.9			36.7		43.3	37.4	
Level of Service	A	A		A	A			D		D	D	
Approach Delay (s)		4.2			4.8			36.7			40.0	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	9.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	11.2
Intersection Capacity Utilization	46.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Whites Road & Kingston Road

Existing AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	70	300	350	295	565	355	155	440	435	150	1205	115
Future Volume (vph)	70	300	350	295	565	355	155	440	435	150	1205	115
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.3	3.3	3.5	3.3	3.3	3.5	3.3	3.3	3.5	3.3
Total Lost time (s)	2.0	6.0	6.0	2.0	6.0	6.0	2.0	6.1	2.0	2.0	6.1	6.1
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1675	3400	1505	1692	3466	1490	1818	5079	1456	1722	5079	1488
Flt Permitted	0.34	1.00	1.00	0.49	1.00	1.00	0.13	1.00	1.00	0.47	1.00	1.00
Satd. Flow (perm)	594	3400	1505	875	3466	1490	238	5079	1456	845	5079	1488
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	77	330	385	324	621	390	170	484	478	165	1324	126
RTOR Reduction (vph)	0	0	127	0	0	190	0	0	172	0	0	75
Lane Group Flow (vph)	77	330	258	324	621	200	170	484	306	165	1324	51
Confl. Peds. (#/hr)	15		5	5		15	10		15	15		10
Heavy Vehicles (%)	4%	5%	2%	3%	3%	2%	1%	1%	4%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	2	0	0	4
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	pm+ov	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases	2		2	6		6	8		8	4		4
Actuated Green, G (s)	42.9	38.6	38.6	49.4	42.1	42.1	56.2	45.7	53.5	50.8	43.0	43.0
Effective Green, g (s)	44.9	39.6	39.6	50.4	43.1	43.1	57.5	46.7	55.5	52.8	44.0	44.0
Actuated g/C Ratio	0.37	0.33	0.33	0.42	0.36	0.36	0.48	0.39	0.46	0.44	0.37	0.37
Clearance Time (s)	3.0	7.0	7.0	3.0	7.0	7.0	3.0	7.1	3.0	3.0	7.1	7.1
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	269	1122	496	427	1244	535	265	1976	673	436	1862	545
v/s Ratio Prot	0.01	0.10		c0.06	c0.18		c0.06	0.10	0.03	0.03	c0.26	
v/s Ratio Perm	0.09		0.17	0.26		0.13	0.25		0.18	0.14		0.03
v/c Ratio	0.29	0.29	0.52	0.76	0.50	0.37	0.64	0.24	0.45	0.38	0.71	0.09
Uniform Delay, d1	24.9	29.8	32.5	28.1	30.0	28.5	18.0	24.7	22.0	20.8	32.6	24.9
Progression Factor	0.81	0.82	0.65	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.6	0.6	3.8	7.6	1.4	2.0	5.2	0.3	0.5	0.6	2.3	0.3
Delay (s)	20.7	25.0	24.8	35.6	31.5	30.5	23.2	25.0	22.4	21.4	34.9	25.3
Level of Service	C	C	C	D	C	C	C	C	C	C	C	C
Approach Delay (s)		24.5			32.2			23.7			32.8	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	29.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.1
Intersection Capacity Utilization	102.5%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Site Access (East)/Steeple Hill & Kingston Road

Existing AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	575	5	30	775	30	5	0	20	125	0	35
Future Volume (vph)	40	575	5	30	775	30	5	0	20	125	0	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.3	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5
Total Lost time (s)	5.3	5.3		2.0	5.3		5.7	5.7		5.7	5.7	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.98		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		0.99	1.00	
Frt	1.00	1.00		1.00	0.99		1.00	0.85		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1671	3429		1631	3475		1454	1560		1675	1521	
Flt Permitted	0.30	1.00		0.36	1.00		0.73	1.00		0.74	1.00	
Satd. Flow (perm)	531	3429		622	3475		1118	1560		1308	1521	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	47	676	6	35	912	35	6	0	24	147	0	41
RTOR Reduction (vph)	0	0	0	0	1	0	0	20	0	0	34	0
Lane Group Flow (vph)	47	682	0	35	946	0	6	4	0	147	7	0
Confl. Peds. (#/hr)	5					5			10	10		
Heavy Vehicles (%)	4%	4%	0%	7%	2%	3%	20%	0%	0%	3%	0%	5%
Bus Blockages (#/hr)	0	0	0	0	0	13	0	0	0	0	0	0
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	80.2	80.2		87.2	87.2		19.8	19.8		19.8	19.8	
Effective Green, g (s)	81.2	81.2		88.2	88.2		20.8	20.8		20.8	20.8	
Actuated g/C Ratio	0.68	0.68		0.74	0.74		0.17	0.17		0.17	0.17	
Clearance Time (s)	6.3	6.3		3.0	6.3		6.7	6.7		6.7	6.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	359	2320		499	2554		193	270		226	263	
v/s Ratio Prot		0.20		0.00	c0.27			0.00			0.00	
v/s Ratio Perm	0.09			0.05			0.01			c0.11		
v/c Ratio	0.13	0.29		0.07	0.37		0.03	0.02		0.65	0.03	
Uniform Delay, d1	6.9	7.8		4.5	5.8		41.2	41.1		46.2	41.2	
Progression Factor	1.00	1.00		0.78	0.71		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.8	0.3		0.1	0.4		0.1	0.0		6.5	0.0	
Delay (s)	7.6	8.2		3.5	4.5		41.3	41.1		52.8	41.2	
Level of Service	A	A		A	A		D	D		D	D	
Approach Delay (s)		8.1			4.4			41.2			50.2	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	10.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	56.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Whites Road & Bayly Street

Existing AM Peak Hour

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	95	315	590	80	465	510
Future Volume (vph)	95	315	590	80	465	510
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.5	3.3	3.3	3.5
Total Lost time (s)	5.4	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	0.95	1.00	0.91	0.91
Frpb, ped/bikes	1.00	1.00	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	0.99
Satd. Flow (prot)	1662	1516	3500	1476	1542	3308
Flt Permitted	0.95	1.00	1.00	1.00	0.95	0.99
Satd. Flow (perm)	1662	1516	3500	1476	1542	3308
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	104	346	648	88	511	560
RTOR Reduction (vph)	0	41	0	54	0	0
Lane Group Flow (vph)	104	305	648	34	347	724
Confl. Peds. (#/hr)				5	5	
Heavy Vehicles (%)	5%	3%	2%	4%	3%	2%
Turn Type	Perm	pm+ov	NA	Perm	Split	NA
Protected Phases		2	5		2	2
Permitted Phases	8	8		5		
Actuated Green, G (s)	12.4	63.1	26.5	26.5	50.7	50.7
Effective Green, g (s)	13.4	65.1	27.5	27.5	51.7	51.7
Actuated g/C Ratio	0.12	0.59	0.25	0.25	0.47	0.47
Clearance Time (s)	6.4	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	202	979	875	369	724	1554
v/s Ratio Prot		0.15	c0.19		c0.23	0.22
v/s Ratio Perm	c0.06	0.05		0.02		
v/c Ratio	0.51	0.31	0.74	0.09	0.48	0.47
Uniform Delay, d1	45.3	11.2	38.0	31.7	19.9	19.8
Progression Factor	1.00	1.00	1.00	1.00	1.11	1.11
Incremental Delay, d2	2.2	0.2	3.4	0.1	2.2	1.0
Delay (s)	47.5	11.4	41.4	31.8	24.4	22.9
Level of Service	D	B	D	C	C	C
Approach Delay (s)	19.7		40.2			23.4
Approach LOS	B		D			C

Intersection Summary			
HCM 2000 Control Delay	28.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.4
Intersection Capacity Utilization	57.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: Highway 401 WB Off-Ramp & Kingston Road

Existing AM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	805	5	335	590	540	85
Future Volume (vph)	805	5	335	590	540	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.3	3.5	3.3	3.3
Total Lost time (s)	6.2		2.0	6.2	4.4	4.4
Lane Util. Factor	0.95		1.00	0.95	0.97	1.00
Frt	1.00		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3425		1711	3500	3286	1531
Flt Permitted	1.00		0.21	1.00	0.95	1.00
Satd. Flow (perm)	3425		369	3500	3286	1531
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	925	6	385	678	621	98
RTOR Reduction (vph)	1	0	0	0	0	29
Lane Group Flow (vph)	930	0	385	678	621	69
Heavy Vehicles (%)	4%	25%	2%	2%	3%	2%
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases			6			8
Actuated Green, G (s)	55.7		79.1	79.1	28.3	28.3
Effective Green, g (s)	56.7		80.1	80.1	29.3	29.3
Actuated g/C Ratio	0.47		0.67	0.67	0.24	0.24
Clearance Time (s)	7.2		3.0	7.2	5.4	5.4
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1618		485	2336	802	373
v/s Ratio Prot	c0.27		c0.14	0.19	c0.19	
v/s Ratio Perm			0.39			0.05
v/c Ratio	0.58		0.79	0.29	0.77	0.19
Uniform Delay, d1	22.9		14.8	8.2	42.3	35.9
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	1.5		8.7	0.3	4.7	0.2
Delay (s)	24.4		23.5	8.5	47.0	36.1
Level of Service	C		C	A	D	D
Approach Delay (s)	24.4			13.9	45.5	
Approach LOS	C			B	D	

Intersection Summary			
HCM 2000 Control Delay	25.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.6
Intersection Capacity Utilization	68.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
10: Whites Road & Highway 401 EB Off-Ramp

Existing AM Peak Hour

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	595	350	0	905	625	0
Future Volume (vph)	595	350	0	905	625	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.5	3.5	3.5	3.5
Total Lost time (s)	4.5	4.5		5.7	5.7	
Lane Util. Factor	0.97	0.91		0.95	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	0.99	0.85		1.00	1.00	
Flt Protected	0.96	1.00		1.00	1.00	
Satd. Flow (prot)	3295	1379		3570	3570	
Flt Permitted	0.96	1.00		1.00	1.00	
Satd. Flow (perm)	3295	1379		3570	3570	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	626	368	0	953	658	0
RTOR Reduction (vph)	8	151	0	0	0	0
Lane Group Flow (vph)	677	158	0	953	658	0
Confl. Peds. (#/hr)			5			5
Heavy Vehicles (%)	2%	3%	0%	0%	0%	0%
Turn Type	Prot	Perm		NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4				
Actuated Green, G (s)	29.1	29.1		68.7	68.7	
Effective Green, g (s)	30.1	30.1		69.7	69.7	
Actuated g/C Ratio	0.27	0.27		0.63	0.63	
Clearance Time (s)	5.5	5.5		6.7	6.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	901	377		2262	2262	
v/s Ratio Prot	c0.21			c0.27	0.18	
v/s Ratio Perm		0.11				
v/c Ratio	0.75	0.42		0.42	0.29	
Uniform Delay, d1	36.5	32.8		10.1	9.1	
Progression Factor	1.00	1.00		0.35	1.00	
Incremental Delay, d2	3.6	0.8		0.5	0.3	
Delay (s)	40.1	33.5		4.0	9.4	
Level of Service	D	C		A	A	
Approach Delay (s)	38.1			4.0	9.4	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	18.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	10.2
Intersection Capacity Utilization	54.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
9: Car Dealer Site Access/Delta Boulevard & Kingston Road

Existing AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	130	745	10	20	1000	110	25	0	15	50	5	190
Future Volume (vph)	130	745	10	20	1000	110	25	0	15	50	5	190
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	5.9	5.9	2.0	5.9	5.9	5.6	5.6		5.3	5.3	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.97	1.00	0.98		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.99	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85		1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1733	3433	1548	1621	3466	1533	1785	1467		1758	1559	
Flt Permitted	0.19	1.00	1.00	0.32	1.00	1.00	0.32	1.00		0.75	1.00	
Satd. Flow (perm)	340	3433	1548	541	3466	1533	606	1467		1380	1559	
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	157	898	12	24	1205	133	30	0	18	60	6	229
RTOR Reduction (vph)	0	0	3	0	0	34	0	16	0	0	164	0
Lane Group Flow (vph)	157	898	9	24	1205	99	30	2	0	60	71	0
Confl. Peds. (#/hr)	5		5	5		5			5	5		
Heavy Vehicles (%)	3%	4%	0%	10%	3%	1%	0%	0%	7%	1%	0%	3%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8			4		
Actuated Green, G (s)	85.1	78.5	78.5	77.1	73.5	73.5	11.4	11.4		11.7	11.7	
Effective Green, g (s)	86.1	79.5	79.5	79.1	74.5	74.5	12.4	12.4		12.7	12.7	
Actuated g/C Ratio	0.78	0.72	0.72	0.72	0.68	0.68	0.11	0.11		0.12	0.12	
Clearance Time (s)	3.0	6.9	6.9	3.0	6.9	6.9	6.6	6.6		6.3	6.3	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	387	2481	1118	434	2347	1038	68	165		159	179	
v/s Ratio Prot	c0.04	0.26		0.00	c0.35			0.00			0.05	
v/s Ratio Perm	0.28		0.01	0.04		0.06	c0.05			0.04		
v/c Ratio	0.41	0.36	0.01	0.06	0.51	0.10	0.44	0.01		0.38	0.40	
Uniform Delay, d1	4.6	5.7	4.3	4.4	8.8	6.1	45.6	43.4		45.0	45.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.7	0.4	0.0	0.1	0.8	0.2	4.5	0.0		1.5	1.5	
Delay (s)	5.3	6.1	4.3	4.5	9.6	6.3	50.1	43.4		46.5	46.6	
Level of Service	A	A	A	A	A	A	D	D		D	D	
Approach Delay (s)		6.0			9.2			47.6			46.6	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	12.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	69.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
2: Site Access (West) & Kingston Road

Existing PM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1365	40	10	965	10	20
Future Volume (Veh/h)	1365	40	10	965	10	20
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	1422	42	10	1005	10	21
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				153		
pX, platoon unblocked					0.87	
vC, conflicting volume			1464		1944	711
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1464		1786	711
tC, single (s)			4.1		6.8	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		84	94
cM capacity (veh/h)			467		63	369

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1
Volume Total	711	711	42	10	502	502	31
Volume Left	0	0	0	10	0	0	10
Volume Right	0	0	42	0	0	0	21
cSH	1700	1700	1700	467	1700	1700	144
Volume to Capacity	0.42	0.42	0.02	0.02	0.30	0.30	0.22
Queue Length 95th (m)	0.0	0.0	0.0	0.5	0.0	0.0	6.2
Control Delay (s)	0.0	0.0	0.0	12.9	0.0	0.0	36.7
Lane LOS				B			E
Approach Delay (s)	0.0			0.1			36.7
Approach LOS							E

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	47.7%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
1: Kingston Road & Rosebank Road

Existing PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	130	1330	5	5	900	70	5	5	15	60	0	70
Future Volume (vph)	130	1330	5	5	900	70	5	5	15	60	0	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5
Total Lost time (s)	5.4	5.4		5.4	5.4		5.2	5.2		5.2	5.2	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	0.98	
Flpb, ped/bikes	0.99	1.00		1.00	1.00		0.99	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99		1.00	0.89		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1733	3533		1745	3486		1732	1664		1745	1549	
Flt Permitted	0.27	1.00		0.17	1.00		0.71	1.00		0.74	1.00	
Satd. Flow (perm)	485	3533		306	3486		1292	1664		1366	1549	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	138	1415	5	5	957	74	5	5	16	64	0	74
RTOR Reduction (vph)	0	0	0	0	3	0	0	14	0	0	67	0
Lane Group Flow (vph)	138	1420	0	5	1028	0	5	7	0	64	7	0
Confl. Peds. (#/hr)	10					10	5					5
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	1%
Bus Blockages (#/hr)	0	0	11	0	0	11	0	0	0	0	0	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	78.5	78.5		78.5	78.5		8.9	8.9		8.9	8.9	
Effective Green, g (s)	79.5	79.5		79.5	79.5		9.9	9.9		9.9	9.9	
Actuated g/C Ratio	0.80	0.80		0.80	0.80		0.10	0.10		0.10	0.10	
Clearance Time (s)	6.4	6.4		6.4	6.4		6.2	6.2		6.2	6.2	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	385	2808		243	2771		127	164		135	153	
v/s Ratio Prot		c0.40			0.29			0.00			0.00	
v/s Ratio Perm	0.28			0.02			0.00			c0.05		
v/c Ratio	0.36	0.51		0.02	0.37		0.04	0.04		0.47	0.05	
Uniform Delay, d1	2.9	3.5		2.1	3.0		40.7	40.8		42.6	40.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.6	0.7		0.2	0.4		0.1	0.1		2.6	0.1	
Delay (s)	5.5	4.2		2.3	3.4		40.9	40.9		45.2	40.9	
Level of Service	A	A		A	A		D	D		D	D	
Approach Delay (s)		4.3			3.4			40.9			42.9	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	6.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.6
Intersection Capacity Utilization	77.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Whites Road & Kingston Road

Existing PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	195	1000	395	255	735	545	230	955	740	190	730	130
Future Volume (vph)	195	1000	395	255	735	545	230	955	740	190	730	130
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.3	3.3	3.5	3.3	3.3	3.5	3.3	3.3	3.5	3.3
Total Lost time (s)	2.0	6.0	6.0	2.0	6.0	6.0	2.0	6.1	2.0	2.0	6.1	6.1
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1742	3535	1527	1727	3535	1512	1744	5079	1514	1744	5129	1459
Flt Permitted	0.28	1.00	1.00	0.10	1.00	1.00	0.27	1.00	1.00	0.19	1.00	1.00
Satd. Flow (perm)	509	3535	1527	174	3535	1512	496	5079	1514	349	5129	1459
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	201	1031	407	263	758	562	237	985	763	196	753	134
RTOR Reduction (vph)	0	0	125	0	0	118	0	0	109	0	0	79
Lane Group Flow (vph)	201	1031	282	263	758	444	237	985	654	196	753	55
Confl. Peds. (#/hr)	20		10	10		20	10		20	20		10
Heavy Vehicles (%)	0%	1%	0%	1%	1%	0%	0%	1%	0%	0%	0%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	2	0	0	4
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	pm+ov	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases	2		2	6		6	8		8	4		4
Actuated Green, G (s)	47.9	38.9	38.9	56.6	44.6	44.6	47.5	39.7	54.4	45.1	38.5	38.5
Effective Green, g (s)	49.9	39.9	39.9	57.6	45.6	45.6	49.5	40.7	56.4	47.1	39.5	39.5
Actuated g/C Ratio	0.42	0.33	0.33	0.48	0.38	0.38	0.41	0.34	0.47	0.39	0.33	0.33
Clearance Time (s)	3.0	7.0	7.0	3.0	7.0	7.0	3.0	7.1	3.0	3.0	7.1	7.1
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	314	1175	507	286	1343	574	296	1722	711	225	1688	480
v/s Ratio Prot	0.05	c0.29		0.12	0.21		c0.06	0.19	c0.12	c0.06	0.15	
v/s Ratio Perm	0.21		0.18	0.32		0.29	0.27		0.31	0.29		0.04
v/c Ratio	0.64	0.88	0.56	0.92	0.56	0.77	0.80	0.57	0.92	0.87	0.45	0.11
Uniform Delay, d1	23.7	37.7	32.8	34.0	29.4	32.7	26.8	32.5	29.7	28.5	31.6	28.1
Progression Factor	0.79	0.76	0.54	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.5	7.6	3.4	32.5	1.7	9.7	14.3	1.4	17.2	28.7	0.9	0.5
Delay (s)	22.3	36.4	21.0	66.5	31.1	42.4	41.1	33.9	46.9	57.2	32.5	28.5
Level of Service	C	D	C	E	C	D	D	C	D	E	C	C
Approach Delay (s)		30.8			41.0			39.8			36.5	
Approach LOS		C			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	37.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.1
Intersection Capacity Utilization	104.5%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Site Access (East)/Steeple Hill & Kingston Road

Existing PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	95	1255	35	105	890	100	35	20	140	195	15	50
Future Volume (vph)	95	1255	35	105	890	100	35	20	140	195	15	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.3	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5
Total Lost time (s)	5.3	5.3		2.0	5.3		5.7	5.7		5.7	5.7	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.97		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		1.00	1.00		1.00	1.00		0.99	1.00	
Frt	1.00	1.00		1.00	0.98		1.00	0.87		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1733	3521		1745	3467		1745	1591		1722	1662	
Flt Permitted	0.27	1.00		0.12	1.00		0.71	1.00		0.57	1.00	
Satd. Flow (perm)	489	3521		217	3467		1308	1591		1027	1662	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	100	1321	37	111	937	105	37	21	147	205	16	53
RTOR Reduction (vph)	0	1	0	0	6	0	0	91	0	0	40	0
Lane Group Flow (vph)	100	1357	0	111	1036	0	37	77	0	205	29	0
Confl. Peds. (#/hr)	10					10			15	15		
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	13	0	0	0	0	0	0
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	69.1	69.1		79.4	79.4		27.6	27.6		27.6	27.6	
Effective Green, g (s)	70.1	70.1		80.4	80.4		28.6	28.6		28.6	28.6	
Actuated g/C Ratio	0.58	0.58		0.67	0.67		0.24	0.24		0.24	0.24	
Clearance Time (s)	6.3	6.3		3.0	6.3		6.7	6.7		6.7	6.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	285	2056		251	2322		311	379		244	396	
v/s Ratio Prot		c0.39		0.03	c0.30			0.05			0.02	
v/s Ratio Perm	0.20			0.27			0.03			c0.20		
v/c Ratio	0.35	0.66		0.44	0.45		0.12	0.20		0.84	0.07	
Uniform Delay, d1	13.0	16.9		12.2	9.3		35.8	36.6		43.5	35.4	
Progression Factor	1.00	1.00		2.47	0.77		1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.4	1.7		1.0	0.5		0.2	0.3		22.1	0.1	
Delay (s)	16.4	18.6		31.1	7.7		36.0	36.8		65.6	35.5	
Level of Service	B	B		C	A		D	D		E	D	
Approach Delay (s)		18.4			9.9			36.7			58.0	
Approach LOS		B			A			D			E	

Intersection Summary			
HCM 2000 Control Delay	20.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	90.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Whites Road & Bayly Street

Existing PM Peak Hour

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	195	640	475	205	935	410
Future Volume (vph)	195	640	475	205	935	410
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.5	3.3	3.3	3.5
Total Lost time (s)	5.4	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	0.95	1.00	0.91	0.91
Frpb, ped/bikes	1.00	1.00	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	0.97
Satd. Flow (prot)	1745	1546	3535	1527	1572	3298
Flt Permitted	0.95	1.00	1.00	1.00	0.95	0.97
Satd. Flow (perm)	1745	1546	3535	1527	1572	3298
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	217	711	528	228	1039	456
RTOR Reduction (vph)	0	52	0	170	0	0
Lane Group Flow (vph)	217	659	528	58	519	976
Confl. Peds. (#/hr)				10	10	
Heavy Vehicles (%)	0%	1%	1%	0%	1%	1%
Turn Type	Perm	pm+ov	NA	Perm	Split	NA
Protected Phases		2	5		2	2
Permitted Phases	8	8		5		
Actuated Green, G (s)	18.9	65.7	23.9	23.9	46.8	46.8
Effective Green, g (s)	19.9	67.7	24.9	24.9	47.8	47.8
Actuated g/C Ratio	0.18	0.62	0.23	0.23	0.43	0.43
Clearance Time (s)	6.4	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	315	1035	800	345	683	1433
v/s Ratio Prot		c0.28	c0.15		c0.33	0.30
v/s Ratio Perm	0.12	0.15		0.04		
v/c Ratio	0.69	0.64	0.66	0.17	0.76	0.68
Uniform Delay, d1	42.2	13.4	38.7	34.2	26.3	25.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	6.2	1.3	2.1	0.2	7.8	2.6
Delay (s)	48.3	14.7	40.8	34.4	34.0	27.6
Level of Service	D	B	D	C	C	C
Approach Delay (s)	22.5		38.9			29.8
Approach LOS	C		D			C

Intersection Summary			
HCM 2000 Control Delay	29.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.4
Intersection Capacity Utilization	70.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
5: Highway 401 WB Off-Ramp & Kingston Road

Existing PM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1685	25	260	865	525	75
Future Volume (vph)	1685	25	260	865	525	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.3	3.5	3.3	3.3
Total Lost time (s)	6.2		2.0	6.2	4.4	4.4
Lane Util. Factor	0.95		1.00	0.95	0.97	1.00
Frt	1.00		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3527		1694	3535	3351	1531
Flt Permitted	1.00		0.06	1.00	0.95	1.00
Satd. Flow (perm)	3527		107	3535	3351	1531
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1774	26	274	911	553	79
RTOR Reduction (vph)	1	0	0	0	0	25
Lane Group Flow (vph)	1799	0	274	911	553	54
Heavy Vehicles (%)	1%	0%	3%	1%	1%	2%
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases			6			8
Actuated Green, G (s)	63.6		83.0	83.0	24.4	24.4
Effective Green, g (s)	64.6		84.0	84.0	25.4	25.4
Actuated g/C Ratio	0.54		0.70	0.70	0.21	0.21
Clearance Time (s)	7.2		3.0	7.2	5.4	5.4
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1898		305	2474	709	324
v/s Ratio Prot	c0.51		c0.13	0.26	c0.17	
v/s Ratio Perm			0.50			0.04
v/c Ratio	0.95		0.90	0.37	0.78	0.17
Uniform Delay, d1	26.1		39.8	7.3	44.7	38.6
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	11.6		27.0	0.4	5.4	0.2
Delay (s)	37.7		66.8	7.7	50.1	38.9
Level of Service	D		E	A	D	D
Approach Delay (s)	37.7			21.4	48.7	
Approach LOS	D			C	D	

Intersection Summary			
HCM 2000 Control Delay	34.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.6
Intersection Capacity Utilization	88.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
10: Whites Road & Highway 401 EB Off-Ramp

Existing PM Peak Hour

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	1260	700	0	1115	645	0
Future Volume (vph)	1260	700	0	1115	645	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.5	3.5	3.5	3.5
Total Lost time (s)	4.5	4.5		5.7	5.7	
Lane Util. Factor	0.97	0.91		0.95	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	0.99	0.85		1.00	1.00	
Flt Protected	0.96	1.00		1.00	1.00	
Satd. Flow (prot)	3368	1407		3570	3570	
Flt Permitted	0.96	1.00		1.00	1.00	
Satd. Flow (perm)	3368	1407		3570	3570	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	1385	769	0	1225	709	0
RTOR Reduction (vph)	5	43	0	0	0	0
Lane Group Flow (vph)	1480	626	0	1225	709	0
Confl. Peds. (#/hr)			10			10
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%
Turn Type	Prot	Perm		NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4				
Actuated Green, G (s)	49.1	49.1		38.7	38.7	
Effective Green, g (s)	50.1	50.1		39.7	39.7	
Actuated g/C Ratio	0.50	0.50		0.40	0.40	
Clearance Time (s)	5.5	5.5		6.7	6.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	1687	704		1417	1417	
v/s Ratio Prot	0.44			c0.34	0.20	
v/s Ratio Perm		c0.44				
v/c Ratio	0.88	0.89		0.86	0.50	
Uniform Delay, d1	22.2	22.4		27.7	22.7	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	5.5	13.1		7.2	1.3	
Delay (s)	27.7	35.5		34.9	24.0	
Level of Service	C	D		C	C	
Approach Delay (s)	30.1			34.9	24.0	
Approach LOS	C			C	C	

Intersection Summary			
HCM 2000 Control Delay	30.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.2
Intersection Capacity Utilization	89.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
9: Car Dealer Site Access/Delta Boulevard & Kingston Road

Existing PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	135	1470	45	70	1225	95	165	20	130	100	10	145
Future Volume (vph)	135	1470	45	70	1225	95	165	20	130	100	10	145
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	5.9	5.9	2.0	5.7	5.7	5.6	5.6		5.6	5.6	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.95	1.00	0.98		1.00	0.97	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00		0.99	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.87		1.00	0.86	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1785	3535	1541	1785	3535	1517	1761	1604		1773	1570	
Flt Permitted	0.15	1.00	1.00	0.11	1.00	1.00	0.57	1.00		0.58	1.00	
Satd. Flow (perm)	278	3535	1541	203	3535	1517	1061	1604		1089	1570	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	138	1500	46	71	1250	97	168	20	133	102	10	148
RTOR Reduction (vph)	0	0	18	0	0	30	0	106	0	0	118	0
Lane Group Flow (vph)	138	1500	28	71	1250	67	168	47	0	102	40	0
Confl. Peds. (#/hr)	10		5	5		10	10		5	5		10
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8			4		
Actuated Green, G (s)	75.3	66.5	66.5	69.5	63.7	63.7	21.2	21.2		21.2	21.2	
Effective Green, g (s)	76.3	67.5	67.5	71.5	64.7	64.7	22.2	22.2		22.2	22.2	
Actuated g/C Ratio	0.69	0.61	0.61	0.65	0.59	0.59	0.20	0.20		0.20	0.20	
Clearance Time (s)	3.0	6.9	6.9	3.0	6.7	6.7	6.6	6.6		6.6	6.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	327	2169	945	229	2079	892	214	323		219	316	
v/s Ratio Prot	c0.04	c0.42		0.02	0.35			0.03			0.03	
v/s Ratio Perm	0.25		0.02	0.18		0.04	c0.16			0.09		
v/c Ratio	0.42	0.69	0.03	0.31	0.60	0.07	0.79	0.15		0.47	0.13	
Uniform Delay, d1	9.0	14.3	8.4	10.4	14.4	9.8	41.6	36.1		38.7	36.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.9	1.8	0.1	0.8	1.3	0.2	17.0	0.2		1.6	0.2	
Delay (s)	9.9	16.1	8.4	11.2	15.7	9.9	58.7	36.3		40.2	36.1	
Level of Service	A	B	A	B	B	A	E	D		D	D	
Approach Delay (s)		15.4			15.1			48.0			37.7	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	19.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	83.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
2: Site Access (West) & Kingston Road

Future Background AM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	710	5	0	910	5	0
Future Volume (Veh/h)	710	5	0	910	5	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	816	6	0	1046	6	0
Pedestrians					5	
Lane Width (m)					3.3	
Walking Speed (m/s)					1.2	
Percent Blockage					0	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				153		
pX, platoon unblocked					0.90	
vC, conflicting volume			827		1344	413
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			827		1156	413
tC, single (s)			4.1		7.1	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.6	3.3
p0 queue free %			100		96	100
cM capacity (veh/h)			810		154	592

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1
Volume Total	408	408	6	0	523	523	6
Volume Left	0	0	0	0	0	0	6
Volume Right	0	0	6	0	0	0	0
cSH	1700	1700	1700	1700	1700	1700	154
Volume to Capacity	0.24	0.24	0.00	0.00	0.31	0.31	0.04
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0	1.0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	29.2
Lane LOS							D
Approach Delay (s)	0.0			0.0			29.2
Approach LOS							D

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	35.2%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
1: Kingston Road & Rosebank Road

Future Background AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	615	10	15	835	65	0	0	5	95	5	120
Future Volume (vph)	30	615	10	15	835	65	0	0	5	95	5	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5
Total Lost time (s)	5.6	5.6		5.6	5.6			5.6		5.6	5.6	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99			0.85		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00			1.00		0.95	1.00	
Satd. Flow (prot)	1689	3427		1745	3425			1597		1694	1609	
Flt Permitted	0.26	1.00		0.38	1.00			1.00		0.75	1.00	
Satd. Flow (perm)	462	3427		691	3425			1597		1344	1609	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	34	699	11	17	949	74	0	0	6	108	6	136
RTOR Reduction (vph)	0	1	0	0	4	0	0	5	0	0	116	0
Lane Group Flow (vph)	34	709	0	17	1019	0	0	1	0	108	26	0
Confl. Peds. (#/hr)	5					5						
Heavy Vehicles (%)	3%	4%	0%	0%	3%	1%	0%	0%	0%	3%	0%	0%
Bus Blockages (#/hr)	0	0	11	0	0	11	0	0	0	0	0	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	73.4	73.4		73.4	73.4			13.4		13.4	13.4	
Effective Green, g (s)	74.4	74.4		74.4	74.4			14.4		14.4	14.4	
Actuated g/C Ratio	0.74	0.74		0.74	0.74			0.14		0.14	0.14	
Clearance Time (s)	6.6	6.6		6.6	6.6			6.6		6.6	6.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	343	2549		514	2548			229		193	231	
v/s Ratio Prot		0.21			c0.30			0.00			0.02	
v/s Ratio Perm	0.07			0.02						c0.08		
v/c Ratio	0.10	0.28		0.03	0.40			0.00		0.56	0.11	
Uniform Delay, d1	3.5	4.1		3.4	4.7			36.7		39.8	37.2	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.6	0.3		0.1	0.5			0.0		3.5	0.2	
Delay (s)	4.1	4.4		3.5	5.1			36.7		43.3	37.4	
Level of Service	A	A		A	A			D		D	D	
Approach Delay (s)		4.4			5.1			36.7			40.0	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	9.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	11.2
Intersection Capacity Utilization	46.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

4: Whites Road & Kingston Road

Future Background AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	75	375	360	295	645	360	165	465	440	150	1300	120
Future Volume (vph)	75	375	360	295	645	360	165	465	440	150	1300	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.3	3.3	3.5	3.3	3.3	3.5	3.3	3.3	3.5	3.3
Total Lost time (s)	2.0	6.0	6.0	2.0	6.0	6.0	2.0	6.1	2.0	2.0	6.1	6.1
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1675	3400	1503	1692	3466	1486	1818	5079	1455	1722	5079	1486
Flt Permitted	0.32	1.00	1.00	0.46	1.00	1.00	0.13	1.00	1.00	0.42	1.00	1.00
Satd. Flow (perm)	572	3400	1503	814	3466	1486	238	5079	1455	768	5079	1486
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	82	412	396	324	709	396	181	511	484	165	1429	132
RTOR Reduction (vph)	0	0	121	0	0	147	0	0	205	0	0	73
Lane Group Flow (vph)	82	412	275	324	709	249	181	511	279	165	1429	59
Confl. Peds. (#/hr)	15		5	5		15	10		15	15		10
Heavy Vehicles (%)	4%	5%	2%	3%	3%	2%	1%	1%	4%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	2	0	0	4
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	pm+ov	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases	2		2	6		6	8		8	4		4
Actuated Green, G (s)	66.0	61.0	61.0	73.0	65.0	65.0	52.6	40.9	49.9	47.2	38.2	38.2
Effective Green, g (s)	68.0	62.0	62.0	74.0	66.0	66.0	53.9	41.9	51.9	49.2	39.2	39.2
Actuated g/C Ratio	0.49	0.44	0.44	0.53	0.47	0.47	0.38	0.30	0.37	0.35	0.28	0.28
Clearance Time (s)	3.0	7.0	7.0	3.0	7.0	7.0	3.0	7.1	3.0	3.0	7.1	7.1
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	325	1505	665	492	1633	700	234	1520	539	338	1422	416
v/s Ratio Prot	0.01	0.12		c0.05	c0.20		c0.07	0.10	0.04	0.03	c0.28	
v/s Ratio Perm	0.11		0.18	0.30		0.17	0.23		0.15	0.14		0.04
v/c Ratio	0.25	0.27	0.41	0.66	0.43	0.36	0.77	0.34	0.52	0.49	1.00	0.14
Uniform Delay, d1	19.8	24.7	26.6	21.9	24.6	23.5	29.4	38.2	34.3	32.6	50.4	37.8
Progression Factor	0.79	0.91	0.85	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.4	1.8	3.2	0.8	1.4	14.7	0.6	0.8	1.1	25.1	0.7
Delay (s)	16.1	23.0	24.5	25.1	25.4	24.9	44.1	38.8	35.1	33.7	75.5	38.5
Level of Service	B	C	C	C	C	C	D	D	D	C	E	D
Approach Delay (s)		23.0			25.2			38.1			68.6	
Approach LOS		C			C			D			E	

Intersection Summary			
HCM 2000 Control Delay	42.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.1
Intersection Capacity Utilization	103.1%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

3: Site Access (East)/Steeple Hill & Kingston Road

Future Background AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	665	5	30	870	30	5	0	20	125	0	35
Future Volume (vph)	40	665	5	30	870	30	5	0	20	125	0	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.3	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5
Total Lost time (s)	5.3	5.3		2.0	5.3		5.7	5.7		5.7	5.7	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.97		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		0.99	1.00	
Frt	1.00	1.00		1.00	1.00		1.00	0.85		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1671	3430		1631	3477		1454	1557		1672	1521	
Flt Permitted	0.27	1.00		0.32	1.00		0.73	1.00		0.74	1.00	
Satd. Flow (perm)	467	3430		551	3477		1118	1557		1305	1521	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	47	782	6	35	1024	35	6	0	24	147	0	41
RTOR Reduction (vph)	0	0	0	0	1	0	0	20	0	0	34	0
Lane Group Flow (vph)	47	788	0	35	1058	0	6	4	0	147	7	0
Confl. Peds. (#/hr)	5					5			10	10		
Heavy Vehicles (%)	4%	4%	0%	7%	2%	3%	20%	0%	0%	3%	0%	5%
Bus Blockages (#/hr)	0	0	0	0	0	13	0	0	0	0	0	0
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	97.3	97.3		105.4	105.4		21.6	21.6		21.6	21.6	
Effective Green, g (s)	98.3	98.3		106.4	106.4		22.6	22.6		22.6	22.6	
Actuated g/C Ratio	0.70	0.70		0.76	0.76		0.16	0.16		0.16	0.16	
Clearance Time (s)	6.3	6.3		3.0	6.3		6.7	6.7		6.7	6.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	327	2408		465	2642		180	251		210	245	
v/s Ratio Prot		0.23		0.00	c0.30			0.00			0.00	
v/s Ratio Perm	0.10			0.05			0.01			c0.11		
v/c Ratio	0.14	0.33		0.08	0.40		0.03	0.02		0.70	0.03	
Uniform Delay, d1	6.9	8.1		4.4	5.8		49.5	49.3		55.5	49.4	
Progression Factor	1.00	1.00		0.77	0.73		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.9	0.4		0.1	0.4		0.1	0.0		9.8	0.0	
Delay (s)	7.8	8.4		3.5	4.7		49.6	49.4		65.3	49.5	
Level of Service	A	A		A	A		D	D		E	D	
Approach Delay (s)		8.4			4.6			49.4			61.8	
Approach LOS		A			A			D			E	

Intersection Summary			
HCM 2000 Control Delay	11.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	56.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Whites Road & Bayly Street

Future Background AM Peak Hour

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	95	315	620	80	465	535
Future Volume (vph)	95	315	620	80	465	535
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.5	3.3	3.3	3.5
Total Lost time (s)	5.4	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	0.95	1.00	0.91	0.91
Frpb, ped/bikes	1.00	1.00	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	0.99
Satd. Flow (prot)	1662	1516	3500	1476	1542	3312
Flt Permitted	0.95	1.00	1.00	1.00	0.95	0.99
Satd. Flow (perm)	1662	1516	3500	1476	1542	3312
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	104	346	681	88	511	588
RTOR Reduction (vph)	0	37	0	50	0	0
Lane Group Flow (vph)	104	309	681	38	358	741
Confl. Peds. (#/hr)				5	5	
Heavy Vehicles (%)	5%	3%	2%	4%	3%	2%
Turn Type	Perm	pm+ov	NA	Perm	Split	NA
Protected Phases		2	5		2	2
Permitted Phases	8	8		5		
Actuated Green, G (s)	12.4	62.1	27.5	27.5	49.7	49.7
Effective Green, g (s)	13.4	64.1	28.5	28.5	50.7	50.7
Actuated g/C Ratio	0.12	0.58	0.26	0.26	0.46	0.46
Clearance Time (s)	6.4	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	202	966	906	382	710	1526
v/s Ratio Prot		0.15	c0.19		c0.23	0.22
v/s Ratio Perm	c0.06	0.06		0.03		
v/c Ratio	0.51	0.32	0.75	0.10	0.50	0.49
Uniform Delay, d1	45.3	11.8	37.5	31.0	20.8	20.6
Progression Factor	1.00	1.00	1.00	1.00	0.95	0.94
Incremental Delay, d2	2.2	0.2	3.6	0.1	2.5	1.1
Delay (s)	47.5	12.0	41.0	31.1	22.2	20.4
Level of Service	D	B	D	C	C	C
Approach Delay (s)	20.2		39.9			21.0
Approach LOS	C		D			C

Intersection Summary			
HCM 2000 Control Delay	27.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.4
Intersection Capacity Utilization	58.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: Highway 401 WB Off-Ramp & Kingston Road

Future Background AM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	885	10	350	630	575	90
Future Volume (vph)	885	10	350	630	575	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.3	3.5	3.3	3.3
Total Lost time (s)	6.2		2.0	6.2	4.4	4.4
Lane Util. Factor	0.95		1.00	0.95	0.97	1.00
Frt	1.00		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3420		1711	3500	3286	1531
Flt Permitted	1.00		0.15	1.00	0.95	1.00
Satd. Flow (perm)	3420		265	3500	3286	1531
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	1017	11	402	724	661	103
RTOR Reduction (vph)	1	0	0	0	0	28
Lane Group Flow (vph)	1027	0	402	724	661	75
Heavy Vehicles (%)	4%	25%	2%	2%	3%	2%
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases			6			8
Actuated Green, G (s)	50.5		77.7	77.7	29.7	29.7
Effective Green, g (s)	51.5		78.7	78.7	30.7	30.7
Actuated g/C Ratio	0.43		0.66	0.66	0.26	0.26
Clearance Time (s)	7.2		3.0	7.2	5.4	5.4
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1467		477	2295	840	391
v/s Ratio Prot	c0.30		c0.18	0.21	c0.20	
v/s Ratio Perm			0.38			0.05
v/c Ratio	0.70		0.84	0.32	0.79	0.19
Uniform Delay, d1	28.0		25.7	9.0	41.6	34.9
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	2.8		12.8	0.4	4.9	0.2
Delay (s)	30.8		38.4	9.3	46.5	35.2
Level of Service	C		D	A	D	D
Approach Delay (s)	30.8			19.7	45.0	
Approach LOS	C			B	D	

Intersection Summary			
HCM 2000 Control Delay	30.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.6
Intersection Capacity Utilization	72.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
10: Whites Road & Highway 401 EB Off-Ramp

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	630	370	0	935	630	0
Future Volume (vph)	630	370	0	935	630	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.5	3.5	3.5	3.5
Total Lost time (s)	4.5	4.5		5.7	5.7	
Lane Util. Factor	0.97	0.88		0.95	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	3319	2668		3570	3570	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	3319	2668		3570	3570	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	663	389	0	984	663	0
RTOR Reduction (vph)	0	265	0	0	0	0
Lane Group Flow (vph)	663	124	0	984	663	0
Confl. Peds. (#/hr)			5			5
Heavy Vehicles (%)	2%	3%	0%	0%	0%	0%
Turn Type	Prot	Perm		NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4				
Actuated Green, G (s)	28.5	28.5		69.3	69.3	
Effective Green, g (s)	29.5	29.5		70.3	70.3	
Actuated g/C Ratio	0.27	0.27		0.64	0.64	
Clearance Time (s)	5.5	5.5		6.7	6.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	890	715		2281	2281	
v/s Ratio Prot	c0.20			c0.28	0.19	
v/s Ratio Perm		0.05				
v/c Ratio	0.74	0.17		0.43	0.29	
Uniform Delay, d1	36.8	30.9		9.9	8.8	
Progression Factor	1.00	1.00		0.34	1.00	
Incremental Delay, d2	3.4	0.1		0.5	0.3	
Delay (s)	40.2	31.0		3.9	9.1	
Level of Service	D	C		A	A	
Approach Delay (s)	36.8			3.9	9.1	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay	18.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	10.2
Intersection Capacity Utilization	52.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
9: Car Dealer Site Access/Delta Boulevard & Kingston Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	130	825	10	20	1075	110	25	0	15	55	5	200
Future Volume (vph)	130	825	10	20	1075	110	25	0	15	55	5	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	5.9	5.9	2.0	5.9	5.9	5.6	5.6		5.3	5.3	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.97	1.00	0.98		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.99	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85		1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1733	3433	1548	1622	3466	1533	1785	1467		1758	1558	
Flt Permitted	0.16	1.00	1.00	0.28	1.00	1.00	0.30	1.00		0.75	1.00	
Satd. Flow (perm)	292	3433	1548	484	3466	1533	569	1467		1380	1558	
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	157	994	12	24	1295	133	30	0	18	66	6	241
RTOR Reduction (vph)	0	0	3	0	0	32	0	16	0	0	157	0
Lane Group Flow (vph)	157	994	9	24	1295	101	30	2	0	66	90	0
Confl. Peds. (#/hr)	5		5	5		5			5	5		
Heavy Vehicles (%)	3%	4%	0%	10%	3%	1%	0%	0%	7%	1%	0%	3%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8			4		
Actuated Green, G (s)	84.3	77.7	77.7	75.6	72.0	72.0	12.2	12.2		12.5	12.5	
Effective Green, g (s)	85.3	78.7	78.7	77.6	73.0	73.0	13.2	13.2		13.5	13.5	
Actuated g/C Ratio	0.78	0.72	0.72	0.71	0.66	0.66	0.12	0.12		0.12	0.12	
Clearance Time (s)	3.0	6.9	6.9	3.0	6.9	6.9	6.6	6.6		6.3	6.3	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	361	2456	1107	389	2300	1017	68	176		169	191	
v/s Ratio Prot	c0.04	0.29		0.00	c0.37			0.00			c0.06	
v/s Ratio Perm	0.30		0.01	0.04		0.07	0.05			0.05		
v/c Ratio	0.43	0.40	0.01	0.06	0.56	0.10	0.44	0.01		0.39	0.47	
Uniform Delay, d1	5.7	6.3	4.5	4.9	9.9	6.7	45.0	42.7		44.5	44.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.8	0.5	0.0	0.1	1.0	0.2	4.5	0.0		1.5	1.8	
Delay (s)	6.5	6.8	4.5	4.9	10.9	6.9	49.5	42.7		46.0	46.8	
Level of Service	A	A	A	A	B	A	D	D		D	D	
Approach Delay (s)		6.7			10.5			46.9			46.6	
Approach LOS		A			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	13.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	71.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
2: Site Access (West) & Kingston Road

Future Background PM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1530	40	10	1075	10	20
Future Volume (Veh/h)	1530	40	10	1075	10	20
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	1594	42	10	1120	10	21
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				153		
pX, platoon unblocked					0.86	
vC, conflicting volume			1636		2174	797
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1636		2042	797
tC, single (s)			4.1		6.8	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		76	94
cM capacity (veh/h)			402		42	323

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1
Volume Total	797	797	42	10	560	560	31
Volume Left	0	0	0	10	0	0	10
Volume Right	0	0	42	0	0	0	21
cSH	1700	1700	1700	402	1700	1700	102
Volume to Capacity	0.47	0.47	0.02	0.02	0.33	0.33	0.30
Queue Length 95th (m)	0.0	0.0	0.0	0.6	0.0	0.0	9.2
Control Delay (s)	0.0	0.0	0.0	14.2	0.0	0.0	54.8
Lane LOS				B			F
Approach Delay (s)	0.0			0.1			54.8
Approach LOS							F

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	52.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
1: Kingston Road & Rosebank Road

Future Background PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	130	1495	5	5	1010	70	5	5	15	60	0	70
Future Volume (vph)	130	1495	5	5	1010	70	5	5	15	60	0	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5
Total Lost time (s)	5.4	5.4		5.4	5.4		5.2	5.2		5.2	5.2	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	0.98	
Flpb, ped/bikes	0.99	1.00		1.00	1.00		0.99	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99		1.00	0.89		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1735	3533		1745	3491		1732	1664		1745	1549	
Flt Permitted	0.23	1.00		0.13	1.00		0.71	1.00		0.74	1.00	
Satd. Flow (perm)	424	3533		244	3491		1292	1664		1366	1549	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	138	1590	5	5	1074	74	5	5	16	64	0	74
RTOR Reduction (vph)	0	0	0	0	3	0	0	14	0	0	67	0
Lane Group Flow (vph)	138	1595	0	5	1145	0	5	7	0	64	7	0
Confl. Peds. (#/hr)	10					10	5					5
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	1%
Bus Blockages (#/hr)	0	0	11	0	0	11	0	0	0	0	0	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	78.5	78.5		78.5	78.5		8.9	8.9		8.9	8.9	
Effective Green, g (s)	79.5	79.5		79.5	79.5		9.9	9.9		9.9	9.9	
Actuated g/C Ratio	0.80	0.80		0.80	0.80		0.10	0.10		0.10	0.10	
Clearance Time (s)	6.4	6.4		6.4	6.4		6.2	6.2		6.2	6.2	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	337	2808		193	2775		127	164		135	153	
v/s Ratio Prot		c0.45			0.33			0.00			0.00	
v/s Ratio Perm	0.33			0.02			0.00			c0.05		
v/c Ratio	0.41	0.57		0.03	0.41		0.04	0.04		0.47	0.05	
Uniform Delay, d1	3.1	3.8		2.1	3.1		40.7	40.8		42.6	40.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.7	0.8		0.2	0.5		0.1	0.1		2.6	0.1	
Delay (s)	6.8	4.7		2.4	3.6		40.9	40.9		45.2	40.9	
Level of Service	A	A		A	A		D	D		D	D	
Approach Delay (s)		4.8			3.6			40.9			42.9	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	6.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.6
Intersection Capacity Utilization	82.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Whites Road & Kingston Road

Future Background PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	205	1125	425	255	830	565	240	1015	750	190	780	135
Future Volume (vph)	205	1125	425	255	830	565	240	1015	750	190	780	135
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.3	3.3	3.5	3.3	3.3	3.5	3.3	3.3	3.5	3.3
Total Lost time (s)	2.0	6.0	6.0	2.0	6.0	6.0	2.0	6.1	2.0	2.0	6.1	6.1
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1743	3535	1525	1728	3535	1507	1744	5079	1512	1744	5129	1457
Flt Permitted	0.21	1.00	1.00	0.09	1.00	1.00	0.22	1.00	1.00	0.16	1.00	1.00
Satd. Flow (perm)	383	3535	1525	161	3535	1507	412	5079	1512	291	5129	1457
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	211	1160	438	263	856	582	247	1046	773	196	804	139
RTOR Reduction (vph)	0	0	201	0	0	179	0	0	110	0	0	70
Lane Group Flow (vph)	211	1160	237	263	856	403	247	1046	663	196	804	69
Confl. Peds. (#/hr)	20		10	10		20	10		20	20		10
Heavy Vehicles (%)	0%	1%	0%	1%	1%	0%	0%	1%	0%	0%	0%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	2	0	0	4
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	pm+ov	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases	2		2	6		6	8		8	4		4
Actuated Green, G (s)	53.2	42.2	42.2	64.0	50.0	50.0	61.5	44.4	63.2	56.3	41.8	41.8
Effective Green, g (s)	55.2	43.2	43.2	65.0	51.0	51.0	62.9	45.4	65.2	58.3	42.8	42.8
Actuated g/C Ratio	0.39	0.31	0.31	0.46	0.36	0.36	0.45	0.32	0.47	0.42	0.31	0.31
Clearance Time (s)	3.0	7.0	7.0	3.0	7.0	7.0	3.0	7.1	3.0	3.0	7.1	7.1
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	267	1090	470	296	1287	548	357	1647	704	282	1568	445
v/s Ratio Prot	0.07	c0.33		0.13	0.24		c0.09	0.21	c0.13	c0.08	0.16	
v/s Ratio Perm	0.24		0.16	0.29		0.27	0.22		0.31	0.21		0.05
v/c Ratio	0.79	1.06	0.51	0.89	0.67	0.74	0.69	0.64	0.94	0.70	0.51	0.15
Uniform Delay, d1	30.6	48.4	39.6	41.9	37.3	38.7	26.1	40.3	35.6	28.6	40.0	35.4
Progression Factor	1.24	0.89	0.87	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	10.7	42.1	2.7	25.8	2.7	8.5	5.7	1.9	20.9	7.2	1.2	0.7
Delay (s)	48.6	85.2	37.1	67.7	40.1	47.2	31.8	42.1	56.5	35.8	41.2	36.2
Level of Service	D	F	D	E	D	D	C	D	E	D	D	D
Approach Delay (s)		69.3			46.8			46.3			39.7	
Approach LOS		E			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	51.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.1
Intersection Capacity Utilization	106.1%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Site Access (East)/Steeple Hill & Kingston Road

Future Background PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	95	1420	35	105	1000	100	35	20	140	195	15	50
Future Volume (vph)	95	1420	35	105	1000	100	35	20	140	195	15	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.3	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5
Total Lost time (s)	5.3	5.3		2.0	5.3		5.7	5.7		3.5	5.7	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.97		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99		1.00	0.87		1.00	0.88	
Flt Protected	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Satd. Flow (prot)	1825	3523		1837	3472		1837	1587		1831	1662	
Flt Permitted	0.24	1.00		0.09	1.00		0.71	1.00		0.26	1.00	
Satd. Flow (perm)	430	3523		172	3472		1308	1587		482	1662	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	100	1495	37	111	1053	105	37	21	147	205	16	53
RTOR Reduction (vph)	0	1	0	0	4	0	0	132	0	0	42	0
Lane Group Flow (vph)	100	1531	0	111	1154	0	37	36	0	205	27	0
Confl. Peds. (#/hr)	10					10			15	15		
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	13	0	0	0	0	0	0
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		pm+pt	NA	
Protected Phases		2		1	6			8		7	4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	86.3	86.3		98.5	98.5		13.5	13.5		28.5	28.5	
Effective Green, g (s)	87.3	87.3		99.5	99.5		14.5	14.5		29.5	29.5	
Actuated g/C Ratio	0.62	0.62		0.71	0.71		0.10	0.10		0.21	0.21	
Clearance Time (s)	6.3	6.3		3.0	6.3		6.7	6.7		4.5	6.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	268	2196		243	2467		135	164		212	350	
v/s Ratio Prot		c0.43		0.03	c0.33			0.02		c0.08	0.02	
v/s Ratio Perm	0.23			0.29			0.03			c0.12		
v/c Ratio	0.37	0.70		0.46	0.47		0.27	0.22		0.97	0.08	
Uniform Delay, d1	12.9	17.5		14.9	8.8		57.9	57.6		51.5	44.3	
Progression Factor	1.00	1.00		3.38	0.60		1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.9	1.9		1.1	0.5		1.1	0.7		51.8	0.1	
Delay (s)	16.9	19.4		51.6	5.8		59.0	58.3		103.3	44.4	
Level of Service	B	B		D	A		E	E		F	D	
Approach Delay (s)		19.3			9.8			58.4			88.5	
Approach LOS		B			A			E			F	

Intersection Summary			
HCM 2000 Control Delay	23.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.5
Intersection Capacity Utilization	92.1%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Whites Road & Bayly Street

Future Background PM Peak Hour

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	195	640	505	205	935	435
Future Volume (vph)	195	640	505	205	935	435
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.5	3.3	3.3	3.5
Total Lost time (s)	5.4	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	0.95	1.00	0.91	0.91
Frpb, ped/bikes	1.00	1.00	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	0.97
Satd. Flow (prot)	1745	1546	3535	1527	1572	3300
Flt Permitted	0.95	1.00	1.00	1.00	0.95	0.97
Satd. Flow (perm)	1745	1546	3535	1527	1572	3300
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	217	711	561	228	1039	483
RTOR Reduction (vph)	0	46	0	160	0	0
Lane Group Flow (vph)	217	665	561	68	519	1003
Confl. Peds. (#/hr)				10	10	
Heavy Vehicles (%)	0%	1%	1%	0%	1%	1%
Turn Type	Perm	pm+ov	NA	Perm	Split	NA
Protected Phases		2	5		2	2
Permitted Phases	8	8		5		
Actuated Green, G (s)	18.9	65.0	24.6	24.6	46.1	46.1
Effective Green, g (s)	19.9	67.0	25.6	25.6	47.1	47.1
Actuated g/C Ratio	0.18	0.61	0.23	0.23	0.43	0.43
Clearance Time (s)	6.4	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	315	1025	822	355	673	1413
v/s Ratio Prot		c0.28	c0.16		c0.33	0.30
v/s Ratio Perm	0.12	0.15		0.04		
v/c Ratio	0.69	0.65	0.68	0.19	0.77	0.71
Uniform Delay, d1	42.2	13.9	38.5	33.9	26.8	25.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	6.2	1.4	2.4	0.3	8.3	3.0
Delay (s)	48.3	15.3	40.8	34.2	35.2	28.9
Level of Service	D	B	D	C	D	C
Approach Delay (s)	23.0		38.9			31.0
Approach LOS	C		D			C

Intersection Summary			
HCM 2000 Control Delay	30.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.4
Intersection Capacity Utilization	70.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: Highway 401 WB Off-Ramp & Kingston Road

Future Background PM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1810	25	275	925	575	80
Future Volume (vph)	1810	25	275	925	575	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.3	3.5	3.3	3.3
Total Lost time (s)	6.2		2.0	6.2	4.4	4.4
Lane Util. Factor	0.95		1.00	0.95	0.97	1.00
Frt	1.00		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3528		1694	3535	3351	1531
Flt Permitted	1.00		0.05	1.00	0.95	1.00
Satd. Flow (perm)	3528		90	3535	3351	1531
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1905	26	289	974	605	84
RTOR Reduction (vph)	0	0	0	0	0	20
Lane Group Flow (vph)	1931	0	289	974	605	64
Heavy Vehicles (%)	1%	0%	3%	1%	1%	2%
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases			6			8
Actuated Green, G (s)	76.3		101.1	101.1	26.3	26.3
Effective Green, g (s)	77.3		102.1	102.1	27.3	27.3
Actuated g/C Ratio	0.55		0.73	0.73	0.20	0.20
Clearance Time (s)	7.2		3.0	7.2	5.4	5.4
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1947		326	2578	653	298
v/s Ratio Prot	c0.55		c0.14	0.28	c0.18	
v/s Ratio Perm			0.50			0.04
v/c Ratio	0.99		0.89	0.38	0.93	0.21
Uniform Delay, d1	31.0		48.3	7.1	55.4	47.3
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	18.5		23.8	0.4	19.2	0.4
Delay (s)	49.5		72.1	7.5	74.5	47.7
Level of Service	D		E	A	E	D
Approach Delay (s)	49.5			22.3	71.3	
Approach LOS	D			C	E	

Intersection Summary			
HCM 2000 Control Delay	44.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.6
Intersection Capacity Utilization	94.6%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	1335	700	0	1145	670	0
Future Volume (vph)	1335	700	0	1145	670	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.5	3.5	3.5	3.5
Total Lost time (s)	4.5	4.5		5.7	5.7	
Lane Util. Factor	0.97	0.88		0.95	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	3385	2720		3570	3570	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	3385	2720		3570	3570	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	1467	769	0	1258	736	0
RTOR Reduction (vph)	0	69	0	0	0	0
Lane Group Flow (vph)	1467	700	0	1258	736	0
Confl. Peds. (#/hr)			10			10
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%
Turn Type	Prot	Perm		NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4				
Actuated Green, G (s)	48.9	48.9		38.9	38.9	
Effective Green, g (s)	49.9	49.9		39.9	39.9	
Actuated g/C Ratio	0.50	0.50		0.40	0.40	
Clearance Time (s)	5.5	5.5		6.7	6.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	1689	1357		1424	1424	
v/s Ratio Prot	c0.43			c0.35	0.21	
v/s Ratio Perm		0.26				
v/c Ratio	0.87	0.52		0.88	0.52	
Uniform Delay, d1	22.2	16.9		27.9	22.8	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	5.0	0.3		8.3	1.3	
Delay (s)	27.2	17.2		36.2	24.1	
Level of Service	C	B		D	C	
Approach Delay (s)	23.8			36.2	24.1	
Approach LOS	C			D	C	

Intersection Summary			
HCM 2000 Control Delay	27.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.2
Intersection Capacity Utilization	84.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	145	1595	45	70	1335	95	165	20	130	100	10	150
Future Volume (vph)	145	1595	45	70	1335	95	165	20	130	100	10	150
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	5.9	5.9	2.0	5.7	5.7	5.6	5.6		5.6	5.6	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.95	1.00	0.98		1.00	0.97	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00		0.99	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.87		1.00	0.86	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1785	3535	1541	1785	3535	1517	1761	1604		1773	1569	
Flt Permitted	0.12	1.00	1.00	0.08	1.00	1.00	0.56	1.00		0.59	1.00	
Satd. Flow (perm)	221	3535	1541	155	3535	1517	1043	1604		1092	1569	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	148	1628	46	71	1362	97	168	20	133	102	10	153
RTOR Reduction (vph)	0	0	18	0	0	29	0	106	0	0	122	0
Lane Group Flow (vph)	148	1628	28	71	1362	68	168	47	0	102	41	0
Confl. Peds. (#/hr)	10		5	5		10	10		5	5		10
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8			4		
Actuated Green, G (s)	75.1	66.3	66.3	68.6	62.8	62.8	21.4	21.4		21.4	21.4	
Effective Green, g (s)	76.1	67.3	67.3	70.6	63.8	63.8	22.4	22.4		22.4	22.4	
Actuated g/C Ratio	0.69	0.61	0.61	0.64	0.58	0.58	0.20	0.20		0.20	0.20	
Clearance Time (s)	3.0	6.9	6.9	3.0	6.7	6.7	6.6	6.6		6.6	6.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	302	2162	942	200	2050	879	212	326		222	319	
v/s Ratio Prot	c0.05	c0.46		0.02	0.39			0.03			0.03	
v/s Ratio Perm	0.29		0.02	0.21		0.05	c0.16			0.09		
v/c Ratio	0.49	0.75	0.03	0.35	0.66	0.08	0.79	0.14		0.46	0.13	
Uniform Delay, d1	11.1	15.4	8.4	12.5	15.8	10.2	41.6	35.9		38.5	35.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.3	2.5	0.1	1.1	1.7	0.2	18.1	0.2		1.5	0.2	
Delay (s)	12.4	17.9	8.5	13.6	17.5	10.3	59.7	36.1		40.0	36.0	
Level of Service	B	B	A	B	B	B	E	D		D	D	
Approach Delay (s)		17.2			16.9			48.5			37.5	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	21.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	86.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
2: Site Access (West) & Kingston Road

Future Total (5 Year) AM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	755	0	0	1030	0	0
Future Volume (Veh/h)	755	0	0	1030	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	868	0	0	1184	0	0
Pedestrians					5	
Lane Width (m)					3.3	
Walking Speed (m/s)					1.2	
Percent Blockage					0	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				153		
pX, platoon unblocked					0.78	
vC, conflicting volume			873		1465	439
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			873		1023	439
tC, single (s)			4.1		7.1	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.6	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			778		164	569

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1
Volume Total	434	434	0	0	592	592	0
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	0	0
cSH	1700	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.26	0.26	0.00	0.00	0.35	0.35	0.00
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS							A
Approach Delay (s)	0.0			0.0			0.0
Approach LOS							A

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	31.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
1: Kingston Road & Rosebank Road

Future Total (5 Year) AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	655	10	15	950	65	0	0	5	95	5	120
Future Volume (vph)	30	655	10	15	950	65	0	0	5	95	5	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5
Total Lost time (s)	5.6	5.6		5.6	5.6			5.6		5.6	5.6	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99			0.85		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00			1.00		0.95	1.00	
Satd. Flow (prot)	1690	3427		1745	3429			1597		1694	1609	
Flt Permitted	0.22	1.00		0.36	1.00			1.00		0.75	1.00	
Satd. Flow (perm)	394	3427		656	3429			1597		1344	1609	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	34	744	11	17	1080	74	0	0	6	108	6	136
RTOR Reduction (vph)	0	1	0	0	4	0	0	5	0	0	99	0
Lane Group Flow (vph)	34	754	0	17	1150	0	0	1	0	108	43	0
Confl. Peds. (#/hr)	5					5						
Heavy Vehicles (%)	3%	4%	0%	0%	3%	1%	0%	0%	0%	3%	0%	0%
Bus Blockages (#/hr)	0	0	11	0	0	11	0	0	0	0	0	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	73.4	73.4		73.4	73.4			13.4		13.4	13.4	
Effective Green, g (s)	74.4	74.4		74.4	74.4			14.4		14.4	14.4	
Actuated g/C Ratio	0.74	0.74		0.74	0.74			0.14		0.14	0.14	
Clearance Time (s)	6.6	6.6		6.6	6.6			6.6		6.6	6.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	293	2549		488	2551			229		193	231	
v/s Ratio Prot		0.22			c0.34			0.00			0.03	
v/s Ratio Perm	0.09			0.03						c0.08		
v/c Ratio	0.12	0.30		0.03	0.45			0.00		0.56	0.18	
Uniform Delay, d1	3.6	4.2		3.4	4.9			36.7		39.8	37.6	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.8	0.3		0.1	0.6			0.0		3.5	0.4	
Delay (s)	4.4	4.5		3.5	5.5			36.7		43.3	38.0	
Level of Service	A	A		A	A			D		D	D	
Approach Delay (s)		4.5			5.5			36.7			40.3	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	9.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	11.2
Intersection Capacity Utilization	49.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Whites Road & Kingston Road

Future Total (5 Year) AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	105	405	800	295	685	360	230	465	440	150	1300	125
Future Volume (vph)	105	405	800	295	685	360	230	465	440	150	1300	125
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.3	3.3	3.5	3.3	3.3	3.5	3.3	3.3	3.5	3.3
Total Lost time (s)	2.0	6.0	2.0	2.0	6.0	6.0	2.0	6.1	2.0	2.0	6.1	6.1
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.97	1.00	1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1676	3400	1510	1692	3466	1486	1818	5079	1454	1721	5079	1486
Flt Permitted	0.28	1.00	1.00	0.42	1.00	1.00	0.13	1.00	1.00	0.45	1.00	1.00
Satd. Flow (perm)	494	3400	1510	746	3466	1486	238	5079	1454	821	5079	1486
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	115	445	879	324	753	396	253	511	484	165	1429	137
RTOR Reduction (vph)	0	0	37	0	0	138	0	0	182	0	0	72
Lane Group Flow (vph)	115	445	842	324	753	258	253	511	302	165	1429	65
Confl. Peds. (#/hr)	15		5	5		15	10		15	15		10
Heavy Vehicles (%)	4%	5%	2%	3%	3%	2%	1%	1%	4%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	2	0	0	4
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	Perm	pm+pt	NA	pm+ov	pm+pt	NA	Perm
Protected Phases	5	2	3	1	6		3	8	1	7	4	
Permitted Phases	2		2	6		6	8		8	4		4
Actuated Green, G (s)	59.0	54.0	72.0	66.0	58.0	58.0	59.9	43.8	52.8	52.0	38.9	38.9
Effective Green, g (s)	61.0	55.0	74.0	67.0	59.0	59.0	60.9	44.8	54.8	54.0	39.9	39.9
Actuated g/C Ratio	0.44	0.39	0.53	0.48	0.42	0.42	0.43	0.32	0.39	0.39	0.28	0.28
Clearance Time (s)	3.0	7.0	3.0	3.0	7.0	7.0	3.0	7.1	3.0	3.0	7.1	7.1
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	265	1335	798	424	1460	626	317	1625	569	407	1447	423
v/s Ratio Prot	0.02	0.13	c0.14	c0.05	0.22		0.11	0.10	0.04	0.04	c0.28	
v/s Ratio Perm	0.17		0.41	0.31		0.17	0.24		0.17	0.12		0.04
v/c Ratio	0.43	0.33	1.05	0.76	0.52	0.41	0.80	0.31	0.53	0.41	0.99	0.15
Uniform Delay, d1	24.7	29.7	33.0	28.2	29.9	28.4	27.9	36.0	32.7	29.2	49.8	37.4
Progression Factor	0.85	0.86	0.83	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.8	0.4	41.7	8.0	1.3	2.0	13.1	0.5	1.0	0.7	20.9	0.8
Delay (s)	21.7	25.8	69.0	36.1	31.2	30.3	41.0	36.5	33.7	29.9	70.7	38.2
Level of Service	C	C	E	D	C	C	D	D	C	C	E	D
Approach Delay (s)		51.8			32.1			36.3			64.2	
Approach LOS		D			C			D			E	

Intersection Summary			
HCM 2000 Control Delay	47.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.1
Intersection Capacity Utilization	109.0%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Site Access (East)/Steeple Hill & Kingston Road

Future Total (5 Year) AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	650	65	155	855	30	140	0	535	125	0	35
Future Volume (vph)	40	650	65	155	855	30	140	0	535	125	0	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.3	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5
Total Lost time (s)	5.3	5.3		2.0	5.3		5.7	5.7		5.7	5.7	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.97		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	0.85		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1673	3398		1631	3477		1454	1557		1694	1521	
Flt Permitted	0.21	1.00		0.16	1.00		0.73	1.00		0.19	1.00	
Satd. Flow (perm)	378	3398		283	3477		1118	1557		332	1521	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	47	765	76	182	1006	35	165	0	629	147	0	41
RTOR Reduction (vph)	0	5	0	0	2	0	0	168	0	0	22	0
Lane Group Flow (vph)	47	836	0	182	1039	0	165	461	0	147	19	0
Confl. Peds. (#/hr)	5					5			10	10		
Heavy Vehicles (%)	4%	4%	0%	7%	2%	3%	20%	0%	0%	3%	0%	5%
Bus Blockages (#/hr)	0	0	0	0	0	13	0	0	0	0	0	0
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	48.5	48.5		64.8	64.8		62.2	62.2		62.2	62.2	
Effective Green, g (s)	49.5	49.5		65.8	65.8		63.2	63.2		63.2	63.2	
Actuated g/C Ratio	0.35	0.35		0.47	0.47		0.45	0.45		0.45	0.45	
Clearance Time (s)	6.3	6.3		3.0	6.3		6.7	6.7		6.7	6.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	133	1201		270	1634		504	702		149	686	
v/s Ratio Prot		c0.25		c0.07	0.30			0.30			0.01	
v/s Ratio Perm	0.12			0.25			0.15			c0.44		
v/c Ratio	0.35	0.70		0.67	0.64		0.33	0.66		0.99	0.03	
Uniform Delay, d1	33.4	38.8		25.7	28.0		24.7	29.9		38.0	21.3	
Progression Factor	1.00	1.00		1.74	0.70		1.00	1.00		1.00	1.00	
Incremental Delay, d2	7.2	3.3		5.7	1.7		0.4	2.2		69.1	0.0	
Delay (s)	40.6	42.1		50.4	21.4		25.1	32.2		107.1	21.3	
Level of Service	D	D		D	C		C	C		F	C	
Approach Delay (s)		42.1			25.7			30.7			88.4	
Approach LOS		D			C			C			F	

Intersection Summary			
HCM 2000 Control Delay	35.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	100.7%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	95	315	615	80	495	520
Future Volume (vph)	95	315	615	80	495	520
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.5	3.3	3.3	3.5
Total Lost time (s)	5.4	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	0.95	1.00	0.91	0.91
Frpb, ped/bikes	1.00	1.00	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	0.99
Satd. Flow (prot)	1662	1516	3500	1476	1542	3305
Flt Permitted	0.95	1.00	1.00	1.00	0.95	0.99
Satd. Flow (perm)	1662	1516	3500	1476	1542	3305
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	104	346	676	88	544	571
RTOR Reduction (vph)	0	37	0	51	0	0
Lane Group Flow (vph)	104	309	676	37	364	751
Confl. Peds. (#/hr)				5	5	
Heavy Vehicles (%)	5%	3%	2%	4%	3%	2%
Turn Type	Perm	pm+ov	NA	Perm	Split	NA
Protected Phases		2	5		2	2
Permitted Phases	8	8		5		
Actuated Green, G (s)	12.4	62.3	27.3	27.3	49.9	49.9
Effective Green, g (s)	13.4	64.3	28.3	28.3	50.9	50.9
Actuated g/C Ratio	0.12	0.58	0.26	0.26	0.46	0.46
Clearance Time (s)	6.4	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	202	968	900	379	713	1529
v/s Ratio Prot		0.15	c0.19		c0.24	0.23
v/s Ratio Perm	c0.06	0.06		0.02		
v/c Ratio	0.51	0.32	0.75	0.10	0.51	0.49
Uniform Delay, d1	45.3	11.7	37.6	31.1	20.8	20.5
Progression Factor	1.00	1.00	1.00	1.00	0.92	0.91
Incremental Delay, d2	2.2	0.2	3.6	0.1	2.5	1.1
Delay (s)	47.5	11.9	41.2	31.2	21.6	19.8
Level of Service	D	B	D	C	C	B
Approach Delay (s)	20.1		40.0			20.4
Approach LOS	C		D			C

Intersection Summary			
HCM 2000 Control Delay	26.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.4
Intersection Capacity Utilization	58.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	915	10	350	645	600	90
Future Volume (vph)	915	10	350	645	600	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.3	3.5	3.3	3.3
Total Lost time (s)	6.2		2.0	6.2	4.4	4.4
Lane Util. Factor	0.95		1.00	0.95	0.97	1.00
Frt	1.00		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3420		1711	3500	3286	1531
Flt Permitted	1.00		0.13	1.00	0.95	1.00
Satd. Flow (perm)	3420		230	3500	3286	1531
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	1052	11	402	741	690	103
RTOR Reduction (vph)	1	0	0	0	0	27
Lane Group Flow (vph)	1062	0	402	741	690	76
Heavy Vehicles (%)	4%	25%	2%	2%	3%	2%
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases			6			8
Actuated Green, G (s)	49.1		76.9	76.9	30.5	30.5
Effective Green, g (s)	50.1		77.9	77.9	31.5	31.5
Actuated g/C Ratio	0.42		0.65	0.65	0.26	0.26
Clearance Time (s)	7.2		3.0	7.2	5.4	5.4
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1427		467	2272	862	401
v/s Ratio Prot	c0.31		c0.18	0.21	c0.21	
v/s Ratio Perm			0.37			0.05
v/c Ratio	0.74		0.86	0.33	0.80	0.19
Uniform Delay, d1	29.5		28.7	9.4	41.3	34.4
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	3.6		14.9	0.4	5.4	0.2
Delay (s)	33.1		43.6	9.8	46.7	34.6
Level of Service	C		D	A	D	C
Approach Delay (s)	33.1			21.7	45.1	
Approach LOS	C			C	D	

Intersection Summary			
HCM 2000 Control Delay	31.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.6
Intersection Capacity Utilization	74.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	700	370	0	930	645	0
Future Volume (vph)	700	370	0	930	645	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.5	3.5	3.5	3.5
Total Lost time (s)	4.5	4.5		5.7	5.7	
Lane Util. Factor	0.97	0.88		0.95	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	3319	2668		3570	3570	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	3319	2668		3570	3570	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	737	389	0	979	679	0
RTOR Reduction (vph)	0	246	0	0	0	0
Lane Group Flow (vph)	737	143	0	979	679	0
Confl. Peds. (#/hr)			5			5
Heavy Vehicles (%)	2%	3%	0%	0%	0%	0%
Turn Type	Prot	Perm		NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4				
Actuated Green, G (s)	31.1	31.1		66.7	66.7	
Effective Green, g (s)	32.1	32.1		67.7	67.7	
Actuated g/C Ratio	0.29	0.29		0.62	0.62	
Clearance Time (s)	5.5	5.5		6.7	6.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	968	778		2197	2197	
v/s Ratio Prot	c0.22			c0.27	0.19	
v/s Ratio Perm		0.05				
v/c Ratio	0.76	0.18		0.45	0.31	
Uniform Delay, d1	35.5	29.2		11.2	10.0	
Progression Factor	1.00	1.00		0.34	1.00	
Incremental Delay, d2	3.6	0.1		0.6	0.4	
Delay (s)	39.0	29.3		4.4	10.4	
Level of Service	D	C		A	B	
Approach Delay (s)	35.7			4.4	10.4	
Approach LOS	D			A	B	

Intersection Summary			
HCM 2000 Control Delay	18.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	10.2
Intersection Capacity Utilization	60.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	130	855	10	20	1115	110	25	0	15	55	5	200
Future Volume (vph)	130	855	10	20	1115	110	25	0	15	55	5	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	5.9	5.9	2.0	5.9	5.9	5.6	5.6		5.3	5.3	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.97	1.00	0.98		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.99	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85		1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1733	3433	1548	1622	3466	1533	1785	1467		1758	1558	
Flt Permitted	0.15	1.00	1.00	0.27	1.00	1.00	0.30	1.00		0.75	1.00	
Satd. Flow (perm)	272	3433	1548	463	3466	1533	569	1467		1380	1558	
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	157	1030	12	24	1343	133	30	0	18	66	6	241
RTOR Reduction (vph)	0	0	3	0	0	32	0	16	0	0	155	0
Lane Group Flow (vph)	157	1030	9	24	1343	101	30	2	0	66	92	0
Confl. Peds. (#/hr)	5		5	5		5			5	5		
Heavy Vehicles (%)	3%	4%	0%	10%	3%	1%	0%	0%	7%	1%	0%	3%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8			4		
Actuated Green, G (s)	84.3	77.7	77.7	75.6	72.0	72.0	12.2	12.2		12.5	12.5	
Effective Green, g (s)	85.3	78.7	78.7	77.6	73.0	73.0	13.2	13.2		13.5	13.5	
Actuated g/C Ratio	0.78	0.72	0.72	0.71	0.66	0.66	0.12	0.12		0.12	0.12	
Clearance Time (s)	3.0	6.9	6.9	3.0	6.9	6.9	6.6	6.6		6.3	6.3	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	347	2456	1107	375	2300	1017	68	176		169	191	
v/s Ratio Prot	c0.04	0.30		0.00	c0.39			0.00			c0.06	
v/s Ratio Perm	0.31		0.01	0.04		0.07	0.05			0.05		
v/c Ratio	0.45	0.42	0.01	0.06	0.58	0.10	0.44	0.01		0.39	0.48	
Uniform Delay, d1	6.2	6.4	4.5	4.9	10.2	6.7	45.0	42.7		44.5	45.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.9	0.5	0.0	0.1	1.1	0.2	4.5	0.0		1.5	1.9	
Delay (s)	7.2	6.9	4.5	4.9	11.3	6.9	49.5	42.7		46.0	46.9	
Level of Service	A	A	A	A	B	A	D	D		D	D	
Approach Delay (s)		6.9			10.8			46.9			46.7	
Approach LOS		A			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	13.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	72.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
2: Site Access (West) & Kingston Road

Future Total (10 Year) AM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	770	0	0	1050	0	0
Future Volume (Veh/h)	770	0	0	1050	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	885	0	0	1207	0	0
Pedestrians					5	
Lane Width (m)					3.3	
Walking Speed (m/s)					1.2	
Percent Blockage					0	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				153		
pX, platoon unblocked					0.77	
vC, conflicting volume			890		1494	448
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			890		1041	448
tC, single (s)			4.1		7.1	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.6	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			767		158	562

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1
Volume Total	442	442	0	0	604	604	0
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	0	0
cSH	1700	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.26	0.26	0.00	0.00	0.35	0.35	0.00
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS							A
Approach Delay (s)	0.0			0.0			0.0
Approach LOS							A

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	32.4%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
1: Kingston Road & Rosebank Road

Future Total (10 Year) AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	670	10	15	970	65	0	0	5	95	5	120
Future Volume (vph)	30	670	10	15	970	65	0	0	5	95	5	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5
Total Lost time (s)	5.6	5.6		5.6	5.6			5.6		5.6	5.6	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99			0.85		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00			1.00		0.95	1.00	
Satd. Flow (prot)	1690	3427		1745	3430			1597		1694	1609	
Flt Permitted	0.22	1.00		0.35	1.00			1.00		0.75	1.00	
Satd. Flow (perm)	383	3427		643	3430			1597		1344	1609	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	34	761	11	17	1102	74	0	0	6	108	6	136
RTOR Reduction (vph)	0	1	0	0	4	0	0	5	0	0	95	0
Lane Group Flow (vph)	34	771	0	17	1172	0	0	1	0	108	47	0
Confl. Peds. (#/hr)	5					5						
Heavy Vehicles (%)	3%	4%	0%	0%	3%	1%	0%	0%	0%	3%	0%	0%
Bus Blockages (#/hr)	0	0	11	0	0	11	0	0	0	0	0	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	73.4	73.4		73.4	73.4			13.4		13.4	13.4	
Effective Green, g (s)	74.4	74.4		74.4	74.4			14.4		14.4	14.4	
Actuated g/C Ratio	0.74	0.74		0.74	0.74			0.14		0.14	0.14	
Clearance Time (s)	6.6	6.6		6.6	6.6			6.6		6.6	6.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	284	2549		478	2551			229		193	231	
v/s Ratio Prot		0.23			c0.34			0.00			0.03	
v/s Ratio Perm	0.09			0.03						c0.08		
v/c Ratio	0.12	0.30		0.04	0.46			0.00		0.56	0.20	
Uniform Delay, d1	3.6	4.2		3.4	5.0			36.7		39.8	37.7	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.9	0.3		0.1	0.6			0.0		3.5	0.4	
Delay (s)	4.5	4.5		3.5	5.6			36.7		43.3	38.2	
Level of Service	A	A		A	A			D		D	D	
Approach Delay (s)		4.5			5.5			36.7			40.4	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	9.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	11.2
Intersection Capacity Utilization	50.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Whites Road & Kingston Road

Future Total (10 Year) AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑	↱	↰	↑↑↑	↱	↰	↑↑↑	↱
Traffic Volume (vph)	105	415	805	295	700	360	235	475	445	150	1330	125
Future Volume (vph)	105	415	805	295	700	360	235	475	445	150	1330	125
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.3	3.3	3.5	3.3	3.3	3.5	3.3	3.3	3.5	3.3
Total Lost time (s)	2.0	6.0	6.0	2.0	6.0	6.0	2.0	6.1	2.0	2.0	6.1	6.1
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1676	3400	1503	1692	3466	1486	1818	5079	1454	1722	5079	1486
Flt Permitted	0.27	1.00	1.00	0.41	1.00	1.00	0.13	1.00	1.00	0.43	1.00	1.00
Satd. Flow (perm)	479	3400	1503	733	3466	1486	238	5079	1454	781	5079	1486
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	115	456	885	324	769	396	258	522	489	165	1462	137
RTOR Reduction (vph)	0	0	187	0	0	135	0	0	176	0	0	71
Lane Group Flow (vph)	115	456	698	324	769	261	258	522	313	165	1462	66
Confl. Peds. (#/hr)	15		5	5		15	10		15	15		10
Heavy Vehicles (%)	4%	5%	2%	3%	3%	2%	1%	1%	4%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	2	0	0	4
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	pm+ov	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases	2		2	6		6	8		8	4		4
Actuated Green, G (s)	59.0	54.0	54.0	66.0	58.0	58.0	59.9	43.8	52.8	53.3	40.2	40.2
Effective Green, g (s)	61.0	55.0	55.0	67.0	59.0	59.0	60.9	44.8	54.8	55.3	41.2	41.2
Actuated g/C Ratio	0.44	0.39	0.39	0.48	0.42	0.42	0.43	0.32	0.39	0.39	0.29	0.29
Clearance Time (s)	3.0	7.0	7.0	3.0	7.0	7.0	3.0	7.1	3.0	3.0	7.1	7.1
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	260	1335	590	419	1460	626	303	1625	569	403	1494	437
v/s Ratio Prot	0.02	0.13		c0.06	0.22		c0.11	0.10	0.04	0.04	c0.29	
v/s Ratio Perm	0.17		c0.46	0.31		0.18	0.26		0.18	0.12		0.04
v/c Ratio	0.44	0.34	1.18	0.77	0.53	0.42	0.85	0.32	0.55	0.41	0.98	0.15
Uniform Delay, d1	24.7	29.8	42.5	28.4	30.1	28.4	28.7	36.1	33.0	28.3	49.0	36.5
Progression Factor	0.85	0.84	0.66	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.8	0.5	93.7	8.6	1.4	2.0	19.9	0.5	1.1	0.7	18.7	0.7
Delay (s)	21.7	25.6	121.9	37.0	31.5	30.5	48.7	36.6	34.1	29.0	67.7	37.2
Level of Service	C	C	F	D	C	C	D	D	C	C	E	D
Approach Delay (s)		83.8			32.4			38.1			61.7	
Approach LOS		F			C			D			E	

Intersection Summary			
HCM 2000 Control Delay	54.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.1
Intersection Capacity Utilization	111.0%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Site Access (East)/Steeple Hill & Kingston Road

Future Total (10 Year) AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↱		↰	↱	
Traffic Volume (vph)	40	665	65	155	875	30	140	0	535	125	0	35
Future Volume (vph)	40	665	65	155	875	30	140	0	535	125	0	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.3	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5
Total Lost time (s)	5.3	5.3		2.0	5.3		5.7	5.7		5.7	5.7	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.97		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00		1.00	0.85		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1673	3399		1631	3477		1454	1557		1694	1521	
Flt Permitted	0.20	1.00		0.16	1.00		0.73	1.00		0.19	1.00	
Satd. Flow (perm)	360	3399		269	3477		1118	1557		332	1521	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	47	782	76	182	1029	35	165	0	629	147	0	41
RTOR Reduction (vph)	0	5	0	0	2	0	0	166	0	0	22	0
Lane Group Flow (vph)	47	853	0	182	1062	0	165	463	0	147	19	0
Confl. Peds. (#/hr)	5					5			10	10		
Heavy Vehicles (%)	4%	4%	0%	7%	2%	3%	20%	0%	0%	3%	0%	5%
Bus Blockages (#/hr)	0	0	0	0	0	13	0	0	0	0	0	0
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	48.5	48.5		64.8	64.8		62.2	62.2		62.2	62.2	
Effective Green, g (s)	49.5	49.5		65.8	65.8		63.2	63.2		63.2	63.2	
Actuated g/C Ratio	0.35	0.35		0.47	0.47		0.45	0.45		0.45	0.45	
Clearance Time (s)	6.3	6.3		3.0	6.3		6.7	6.7		6.7	6.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	127	1201		265	1634		504	702		149	686	
v/s Ratio Prot		c0.25		c0.07	0.31			0.30			0.01	
v/s Ratio Perm	0.13			0.25			0.15			c0.44		
v/c Ratio	0.37	0.71		0.69	0.65		0.33	0.66		0.99	0.03	
Uniform Delay, d1	33.7	39.1		26.0	28.3		24.7	30.0		38.0	21.3	
Progression Factor	1.00	1.00		1.81	0.72		1.00	1.00		1.00	1.00	
Incremental Delay, d2	8.1	3.6		6.3	1.8		0.4	2.2		69.1	0.0	
Delay (s)	41.8	42.6		53.4	22.2		25.1	32.2		107.1	21.3	
Level of Service	D	D		D	C		C	C		F	C	
Approach Delay (s)		42.6			26.8			30.8			88.4	
Approach LOS		D			C			C			F	

Intersection Summary			
HCM 2000 Control Delay	36.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	101.2%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Whites Road & Bayly Street

Future Total (10 Year) AM Peak Hour

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	95	315	630	80	495	535
Future Volume (vph)	95	315	630	80	495	535
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.5	3.3	3.3	3.5
Total Lost time (s)	5.4	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	0.95	1.00	0.91	0.91
Frpb, ped/bikes	1.00	1.00	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	0.99
Satd. Flow (prot)	1662	1516	3500	1476	1542	3307
Flt Permitted	0.95	1.00	1.00	1.00	0.95	0.99
Satd. Flow (perm)	1662	1516	3500	1476	1542	3307
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	104	346	692	88	544	588
RTOR Reduction (vph)	0	36	0	49	0	0
Lane Group Flow (vph)	104	310	692	39	370	762
Confl. Peds. (#/hr)				5	5	
Heavy Vehicles (%)	5%	3%	2%	4%	3%	2%
Turn Type	Perm	pm+ov	NA	Perm	Split	NA
Protected Phases		2	5		2	2
Permitted Phases	8	8		5		
Actuated Green, G (s)	12.4	61.7	27.9	27.9	49.3	49.3
Effective Green, g (s)	13.4	63.7	28.9	28.9	50.3	50.3
Actuated g/C Ratio	0.12	0.58	0.26	0.26	0.46	0.46
Clearance Time (s)	6.4	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	202	960	919	387	705	1512
v/s Ratio Prot		0.15	c0.20		c0.24	0.23
v/s Ratio Perm	c0.06	0.06		0.03		
v/c Ratio	0.51	0.32	0.75	0.10	0.52	0.50
Uniform Delay, d1	45.3	12.0	37.3	30.7	21.3	21.1
Progression Factor	1.00	1.00	1.00	1.00	0.93	0.92
Incremental Delay, d2	2.2	0.2	3.5	0.1	2.7	1.2
Delay (s)	47.5	12.2	40.8	30.8	22.5	20.6
Level of Service	D	B	D	C	C	C
Approach Delay (s)	20.3		39.7			21.2
Approach LOS	C		D			C

Intersection Summary			
HCM 2000 Control Delay	27.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.4
Intersection Capacity Utilization	59.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: Highway 401 WB Off-Ramp & Kingston Road

Future Total (10 Year) AM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	930	10	360	645	615	90
Future Volume (vph)	930	10	360	645	615	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.3	3.5	3.3	3.3
Total Lost time (s)	6.2		2.0	6.2	4.4	4.4
Lane Util. Factor	0.95		1.00	0.95	0.97	1.00
Frt	1.00		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3420		1711	3500	3286	1531
Flt Permitted	1.00		0.11	1.00	0.95	1.00
Satd. Flow (perm)	3420		199	3500	3286	1531
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	1069	11	414	741	707	103
RTOR Reduction (vph)	1	0	0	0	0	26
Lane Group Flow (vph)	1079	0	414	741	707	77
Heavy Vehicles (%)	4%	25%	2%	2%	3%	2%
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases			6			8
Actuated Green, G (s)	46.9		76.3	76.3	31.1	31.1
Effective Green, g (s)	47.9		77.3	77.3	32.1	32.1
Actuated g/C Ratio	0.40		0.64	0.64	0.27	0.27
Clearance Time (s)	7.2		3.0	7.2	5.4	5.4
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1365		473	2254	879	409
v/s Ratio Prot	c0.32		c0.20	0.21	c0.22	
v/s Ratio Perm			0.36			0.05
v/c Ratio	0.79		0.88	0.33	0.80	0.19
Uniform Delay, d1	31.7		31.4	9.6	41.0	33.9
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	4.7		16.4	0.4	5.4	0.2
Delay (s)	36.4		47.8	10.0	46.4	34.1
Level of Service	D		D	B	D	C
Approach Delay (s)	36.4			23.6	44.8	
Approach LOS	D			C	D	

Intersection Summary			
HCM 2000 Control Delay	33.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.6
Intersection Capacity Utilization	75.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	715	380	0	945	650	0
Future Volume (vph)	715	380	0	945	650	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.5	3.5	3.5	3.5
Total Lost time (s)	4.5	4.5		5.7	5.7	
Lane Util. Factor	0.97	0.88		0.95	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	3319	2668		3570	3570	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	3319	2668		3570	3570	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	753	400	0	995	684	0
RTOR Reduction (vph)	0	241	0	0	0	0
Lane Group Flow (vph)	753	159	0	995	684	0
Confl. Peds. (#/hr)			5			5
Heavy Vehicles (%)	2%	3%	0%	0%	0%	0%
Turn Type	Prot	Perm		NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4				
Actuated Green, G (s)	31.8	31.8		66.0	66.0	
Effective Green, g (s)	32.8	32.8		67.0	67.0	
Actuated g/C Ratio	0.30	0.30		0.61	0.61	
Clearance Time (s)	5.5	5.5		6.7	6.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	989	795		2174	2174	
v/s Ratio Prot	c0.23			c0.28	0.19	
v/s Ratio Perm		0.06				
v/c Ratio	0.76	0.20		0.46	0.31	
Uniform Delay, d1	35.0	28.8		11.7	10.4	
Progression Factor	1.00	1.00		0.34	1.00	
Incremental Delay, d2	3.5	0.1		0.6	0.4	
Delay (s)	38.6	28.9		4.6	10.8	
Level of Service	D	C		A	B	
Approach Delay (s)	35.2			4.6	10.8	
Approach LOS	D			A	B	

Intersection Summary			
HCM 2000 Control Delay	18.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	10.2
Intersection Capacity Utilization	61.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	130	870	10	20	1130	110	25	0	15	55	5	200
Future Volume (vph)	130	870	10	20	1130	110	25	0	15	55	5	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	5.9	5.9	2.0	5.9	5.9	5.6	5.6		5.3	5.3	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.97	1.00	0.98		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.99	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85		1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1733	3433	1548	1622	3466	1533	1785	1467		1758	1558	
Flt Permitted	0.14	1.00	1.00	0.26	1.00	1.00	0.30	1.00		0.75	1.00	
Satd. Flow (perm)	264	3433	1548	452	3466	1533	565	1467		1380	1558	
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	157	1048	12	24	1361	133	30	0	18	66	6	241
RTOR Reduction (vph)	0	0	3	0	0	32	0	16	0	0	154	0
Lane Group Flow (vph)	157	1048	9	24	1361	101	30	2	0	66	93	0
Confl. Peds. (#/hr)	5		5	5		5			5	5		
Heavy Vehicles (%)	3%	4%	0%	10%	3%	1%	0%	0%	7%	1%	0%	3%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8			4		
Actuated Green, G (s)	84.2	77.6	77.6	75.5	71.9	71.9	12.3	12.3		12.6	12.6	
Effective Green, g (s)	85.2	78.6	78.6	77.5	72.9	72.9	13.3	13.3		13.6	13.6	
Actuated g/C Ratio	0.77	0.71	0.71	0.70	0.66	0.66	0.12	0.12		0.12	0.12	
Clearance Time (s)	3.0	6.9	6.9	3.0	6.9	6.9	6.6	6.6		6.3	6.3	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	342	2453	1106	367	2297	1015	68	177		170	192	
v/s Ratio Prot	c0.04	0.31		0.00	c0.39			0.00			c0.06	
v/s Ratio Perm	0.31		0.01	0.04		0.07	0.05			0.05		
v/c Ratio	0.46	0.43	0.01	0.07	0.59	0.10	0.44	0.01		0.39	0.48	
Uniform Delay, d1	6.5	6.5	4.5	4.9	10.3	6.7	44.9	42.6		44.4	44.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.0	0.5	0.0	0.1	1.1	0.2	4.5	0.0		1.5	1.9	
Delay (s)	7.5	7.0	4.5	5.0	11.4	6.9	49.4	42.6		45.8	46.8	
Level of Service	A	A	A	A	B	A	D	D		D	D	
Approach Delay (s)		7.0			10.9			46.9			46.6	
Approach LOS		A			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	13.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	72.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
2: Site Access (West) & Kingston Road

Future Total (15 Year) AM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	795	0	0	1090	0	0
Future Volume (Veh/h)	795	0	0	1090	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	914	0	0	1253	0	0
Pedestrians					5	
Lane Width (m)					3.3	
Walking Speed (m/s)					1.2	
Percent Blockage					0	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				153		
pX, platoon unblocked					0.75	
vC, conflicting volume			919		1546	462
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			919		1068	462
tC, single (s)			4.1		7.1	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.6	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			748		148	550

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1
Volume Total	457	457	0	0	626	626	0
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	0	0
cSH	1700	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.27	0.27	0.00	0.00	0.37	0.37	0.00
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS							A
Approach Delay (s)	0.0			0.0			0.0
Approach LOS							A

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	33.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
1: Kingston Road & Rosebank Road

Future Total (15 Year) AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	695	10	15	1010	65	0	0	5	95	5	120
Future Volume (vph)	30	695	10	15	1010	65	0	0	5	95	5	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5
Total Lost time (s)	5.6	5.6		5.6	5.6			5.6		5.6	5.6	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99			0.85		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00			1.00		0.95	1.00	
Satd. Flow (prot)	1691	3427		1745	3431			1597		1694	1609	
Flt Permitted	0.20	1.00		0.34	1.00			1.00		0.75	1.00	
Satd. Flow (perm)	361	3427		622	3431			1597		1344	1609	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	34	790	11	17	1148	74	0	0	6	108	6	136
RTOR Reduction (vph)	0	1	0	0	3	0	0	5	0	0	86	0
Lane Group Flow (vph)	34	800	0	17	1219	0	0	1	0	108	56	0
Confl. Peds. (#/hr)	5					5						
Heavy Vehicles (%)	3%	4%	0%	0%	3%	1%	0%	0%	0%	3%	0%	0%
Bus Blockages (#/hr)	0	0	11	0	0	11	0	0	0	0	0	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	73.4	73.4		73.4	73.4			13.4		13.4	13.4	
Effective Green, g (s)	74.4	74.4		74.4	74.4			14.4		14.4	14.4	
Actuated g/C Ratio	0.74	0.74		0.74	0.74			0.14		0.14	0.14	
Clearance Time (s)	6.6	6.6		6.6	6.6			6.6		6.6	6.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	268	2549		462	2552			229		193	231	
v/s Ratio Prot		0.23			c0.36			0.00			0.03	
v/s Ratio Perm	0.09			0.03						c0.08		
v/c Ratio	0.13	0.31		0.04	0.48			0.00		0.56	0.24	
Uniform Delay, d1	3.6	4.3		3.4	5.1			36.7		39.8	38.0	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	1.0	0.3		0.1	0.6			0.0		3.5	0.5	
Delay (s)	4.6	4.6		3.5	5.7			36.7		43.3	38.5	
Level of Service	A	A		A	A			D		D	D	
Approach Delay (s)		4.6			5.7			36.7			40.6	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	9.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	11.2
Intersection Capacity Utilization	51.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Whites Road & Kingston Road

Future Total (15 Year) AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	105	430	815	295	730	360	245	495	450	150	1390	125
Future Volume (vph)	105	430	815	295	730	360	245	495	450	150	1390	125
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.3	3.3	3.5	3.3	3.3	3.5	3.3	3.3	3.5	3.3
Total Lost time (s)	2.0	6.0	6.0	2.0	6.0	6.0	2.0	6.1	2.0	2.0	6.1	6.1
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1676	3400	1503	1692	3466	1486	1818	5079	1454	1722	5079	1486
Flt Permitted	0.25	1.00	1.00	0.40	1.00	1.00	0.13	1.00	1.00	0.42	1.00	1.00
Satd. Flow (perm)	449	3400	1503	712	3466	1486	238	5079	1454	759	5079	1486
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	115	473	896	324	802	396	269	544	495	165	1527	137
RTOR Reduction (vph)	0	0	186	0	0	130	0	0	169	0	0	71
Lane Group Flow (vph)	115	473	710	324	802	266	269	544	326	165	1527	66
Confl. Peds. (#/hr)	15		5	5		15	10		15	15		10
Heavy Vehicles (%)	4%	5%	2%	3%	3%	2%	1%	1%	4%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	2	0	0	4
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	pm+ov	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases	2		2	6		6	8		8	4		4
Actuated Green, G (s)	59.0	54.0	54.0	66.0	58.0	58.0	59.9	43.8	52.8	53.0	39.9	39.9
Effective Green, g (s)	61.0	55.0	55.0	67.0	59.0	59.0	60.9	44.8	54.8	55.0	40.9	40.9
Actuated g/C Ratio	0.44	0.39	0.39	0.48	0.42	0.42	0.43	0.32	0.39	0.39	0.29	0.29
Clearance Time (s)	3.0	7.0	7.0	3.0	7.0	7.0	3.0	7.1	3.0	3.0	7.1	7.1
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	248	1335	590	410	1460	626	306	1625	569	395	1483	434
v/s Ratio Prot	0.02	0.14		c0.06	0.23		c0.11	0.11	0.04	0.04	c0.30	
v/s Ratio Perm	0.18		c0.47	0.32		0.18	0.27		0.18	0.12		0.04
v/c Ratio	0.46	0.35	1.20	0.79	0.55	0.43	0.88	0.33	0.57	0.42	1.03	0.15
Uniform Delay, d1	24.9	30.0	42.5	28.7	30.5	28.6	30.3	36.3	33.4	28.6	49.5	36.7
Progression Factor	0.88	0.88	0.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.9	0.5	101.6	10.0	1.5	2.1	23.6	0.6	1.4	0.7	31.3	0.7
Delay (s)	22.8	27.0	133.3	38.7	32.0	30.7	53.9	36.8	34.8	29.3	80.9	37.4
Level of Service	C	C	F	D	C	C	D	D	C	C	F	D
Approach Delay (s)		90.8			33.1			39.6			73.0	
Approach LOS		F			C			D			E	

Intersection Summary			
HCM 2000 Control Delay	60.3	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.06		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.1
Intersection Capacity Utilization	111.6%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Site Access (East)/Steeple Hill & Kingston Road

Future Total (15 Year) AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	690	65	155	915	30	140	0	535	125	0	35
Future Volume (vph)	40	690	65	155	915	30	140	0	535	125	0	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.3	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5
Total Lost time (s)	5.3	5.3		2.0	5.3		5.7	5.7		5.7	5.7	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.97		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00		1.00	0.85		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1674	3400		1631	3478		1454	1557		1694	1521	
Flt Permitted	0.18	1.00		0.14	1.00		0.73	1.00		0.19	1.00	
Satd. Flow (perm)	323	3400		246	3478		1118	1557		332	1521	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	47	812	76	182	1076	35	165	0	629	147	0	41
RTOR Reduction (vph)	0	5	0	0	2	0	0	164	0	0	22	0
Lane Group Flow (vph)	47	883	0	182	1109	0	165	465	0	147	19	0
Confl. Peds. (#/hr)	5					5			10	10		
Heavy Vehicles (%)	4%	4%	0%	7%	2%	3%	20%	0%	0%	3%	0%	5%
Bus Blockages (#/hr)	0	0	0	0	0	13	0	0	0	0	0	0
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		2		1	6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	48.5	48.5		64.8	64.8		62.2	62.2		62.2	62.2	
Effective Green, g (s)	49.5	49.5		65.8	65.8		63.2	63.2		63.2	63.2	
Actuated g/C Ratio	0.35	0.35		0.47	0.47		0.45	0.45		0.45	0.45	
Clearance Time (s)	6.3	6.3		3.0	6.3		6.7	6.7		6.7	6.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	114	1202		257	1634		504	702		149	686	
v/s Ratio Prot		c0.26		c0.07	0.32			0.30			0.01	
v/s Ratio Perm	0.15			0.26			0.15			c0.44		
v/c Ratio	0.41	0.73		0.71	0.68		0.33	0.66		0.99	0.03	
Uniform Delay, d1	34.2	39.5		26.5	28.9		24.7	30.1		38.0	21.3	
Progression Factor	1.00	1.00		1.83	0.70		1.00	1.00		1.00	1.00	
Incremental Delay, d2	10.6	4.0		7.4	2.0		0.4	2.4		69.1	0.0	
Delay (s)	44.9	43.5		55.7	22.2		25.1	32.4		107.1	21.3	
Level of Service	D	D		E	C		C	C		F	C	
Approach Delay (s)		43.6			26.9			30.9			88.4	
Approach LOS		D			C			C			F	

Intersection Summary			
HCM 2000 Control Delay	36.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	102.4%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Whites Road & Bayly Street

Future Total (15 Year) AM Peak Hour

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	95	315	660	80	495	560
Future Volume (vph)	95	315	660	80	495	560
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.5	3.3	3.3	3.5
Total Lost time (s)	5.4	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	0.95	1.00	0.91	0.91
Frpb, ped/bikes	1.00	1.00	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	0.99
Satd. Flow (prot)	1662	1516	3500	1476	1542	3310
Flt Permitted	0.95	1.00	1.00	1.00	0.95	0.99
Satd. Flow (perm)	1662	1516	3500	1476	1542	3310
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	104	346	725	88	544	615
RTOR Reduction (vph)	0	32	0	47	0	0
Lane Group Flow (vph)	104	314	725	41	375	784
Confl. Peds. (#/hr)				5	5	
Heavy Vehicles (%)	5%	3%	2%	4%	3%	2%
Turn Type	Perm	pm+ov	NA	Perm	Split	NA
Protected Phases		2	5		2	2
Permitted Phases	8	8		5		
Actuated Green, G (s)	12.4	60.6	29.0	29.0	48.2	48.2
Effective Green, g (s)	13.4	62.6	30.0	30.0	49.2	49.2
Actuated g/C Ratio	0.12	0.57	0.27	0.27	0.45	0.45
Clearance Time (s)	6.4	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	202	945	954	402	689	1480
v/s Ratio Prot		0.15	c0.21		c0.24	0.24
v/s Ratio Perm	c0.06	0.06		0.03		
v/c Ratio	0.51	0.33	0.76	0.10	0.54	0.53
Uniform Delay, d1	45.3	12.6	36.7	29.9	22.2	22.0
Progression Factor	1.00	1.00	1.00	1.00	0.95	0.94
Incremental Delay, d2	2.2	0.2	3.5	0.1	3.0	1.3
Delay (s)	47.5	12.8	40.2	30.0	24.0	22.0
Level of Service	D	B	D	C	C	C
Approach Delay (s)	20.8		39.1			22.7
Approach LOS	C		D			C

Intersection Summary			
HCM 2000 Control Delay	27.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.4
Intersection Capacity Utilization	60.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: Highway 401 WB Off-Ramp & Kingston Road

Future Total (15 Year) AM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	950	10	375	645	645	95
Future Volume (vph)	950	10	375	645	645	95
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.3	3.5	3.3	3.3
Total Lost time (s)	6.2		2.0	6.2	4.4	4.4
Lane Util. Factor	0.95		1.00	0.95	0.97	1.00
Frt	1.00		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3421		1711	3500	3286	1531
Flt Permitted	1.00		0.10	1.00	0.95	1.00
Satd. Flow (perm)	3421		171	3500	3286	1531
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	1092	11	431	741	741	109
RTOR Reduction (vph)	1	0	0	0	0	26
Lane Group Flow (vph)	1102	0	431	741	741	83
Heavy Vehicles (%)	4%	25%	2%	2%	3%	2%
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases			6			8
Actuated Green, G (s)	45.6		75.4	75.4	32.0	32.0
Effective Green, g (s)	46.6		76.4	76.4	33.0	33.0
Actuated g/C Ratio	0.39		0.64	0.64	0.28	0.28
Clearance Time (s)	7.2		3.0	7.2	5.4	5.4
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1328		465	2228	903	421
v/s Ratio Prot	c0.32		c0.21	0.21	c0.23	
v/s Ratio Perm			0.37			0.05
v/c Ratio	0.83		0.93	0.33	0.82	0.20
Uniform Delay, d1	33.1		34.4	10.0	40.7	33.3
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	6.1		24.5	0.4	6.0	0.2
Delay (s)	39.3		59.0	10.5	46.8	33.6
Level of Service	D		E	B	D	C
Approach Delay (s)	39.3			28.3	45.1	
Approach LOS	D			C	D	

Intersection Summary			
HCM 2000 Control Delay	36.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.6
Intersection Capacity Utilization	77.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
10: Whites Road & Highway 401 EB Off-Ramp

Future Total (15 Year) AM Peak Hour

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	745	400	0	975	655	0
Future Volume (vph)	745	400	0	975	655	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.5	3.5	3.5	3.5
Total Lost time (s)	4.5	4.5		5.7	5.7	
Lane Util. Factor	0.97	0.88		0.95	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	3319	2668		3570	3570	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	3319	2668		3570	3570	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	784	421	0	1026	689	0
RTOR Reduction (vph)	0	235	0	0	0	0
Lane Group Flow (vph)	784	186	0	1026	689	0
Confl. Peds. (#/hr)			5			5
Heavy Vehicles (%)	2%	3%	0%	0%	0%	0%
Turn Type	Prot	Perm		NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4				
Actuated Green, G (s)	32.8	32.8		65.0	65.0	
Effective Green, g (s)	33.8	33.8		66.0	66.0	
Actuated g/C Ratio	0.31	0.31		0.60	0.60	
Clearance Time (s)	5.5	5.5		6.7	6.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	1019	819		2142	2142	
v/s Ratio Prot	c0.24			c0.29	0.19	
v/s Ratio Perm		0.07				
v/c Ratio	0.77	0.23		0.48	0.32	
Uniform Delay, d1	34.6	28.4		12.3	10.9	
Progression Factor	1.00	1.00		0.33	1.00	
Incremental Delay, d2	3.6	0.1		0.7	0.4	
Delay (s)	38.1	28.5		4.8	11.3	
Level of Service	D	C		A	B	
Approach Delay (s)	34.8			4.8	11.3	
Approach LOS	C			A	B	

Intersection Summary			
HCM 2000 Control Delay	18.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	10.2
Intersection Capacity Utilization	63.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
9: Car Dealer Site Access/Delta Boulevard & Kingston Road

Future Total (15 Year) AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	130	890	10	20	1160	110	25	0	15	55	5	200
Future Volume (vph)	130	890	10	20	1160	110	25	0	15	55	5	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	5.9	5.9	2.0	5.9	5.9	5.6	5.6		5.3	5.3	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.97	1.00	0.98		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.99	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85		1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1733	3433	1548	1622	3466	1533	1785	1467		1758	1558	
Flt Permitted	0.14	1.00	1.00	0.26	1.00	1.00	0.30	1.00		0.75	1.00	
Satd. Flow (perm)	249	3433	1548	438	3466	1533	565	1467		1380	1558	
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	157	1072	12	24	1398	133	30	0	18	66	6	241
RTOR Reduction (vph)	0	0	3	0	0	32	0	16	0	0	153	0
Lane Group Flow (vph)	157	1072	9	24	1398	101	30	2	0	66	94	0
Confl. Peds. (#/hr)	5		5	5		5			5	5		
Heavy Vehicles (%)	3%	4%	0%	10%	3%	1%	0%	0%	7%	1%	0%	3%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8			4		
Actuated Green, G (s)	84.2	77.6	77.6	75.5	71.9	71.9	12.3	12.3		12.6	12.6	
Effective Green, g (s)	85.2	78.6	78.6	77.5	72.9	72.9	13.3	13.3		13.6	13.6	
Actuated g/C Ratio	0.77	0.71	0.71	0.70	0.66	0.66	0.12	0.12		0.12	0.12	
Clearance Time (s)	3.0	6.9	6.9	3.0	6.9	6.9	6.6	6.6		6.3	6.3	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	331	2453	1106	358	2297	1015	68	177		170	192	
v/s Ratio Prot	c0.04	0.31		0.00	c0.40			0.00			c0.06	
v/s Ratio Perm	0.32		0.01	0.04		0.07	0.05			0.05		
v/c Ratio	0.47	0.44	0.01	0.07	0.61	0.10	0.44	0.01		0.39	0.49	
Uniform Delay, d1	7.0	6.5	4.5	4.9	10.5	6.7	44.9	42.6		44.4	45.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.1	0.6	0.0	0.1	1.2	0.2	4.5	0.0		1.5	1.9	
Delay (s)	8.0	7.1	4.5	5.0	11.7	6.9	49.4	42.6		45.8	46.9	
Level of Service	A	A	A	A	B	A	D	D		D	D	
Approach Delay (s)		7.2			11.2			46.9			46.7	
Approach LOS		A			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	13.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	73.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
2: Site Access (West) & Kingston Road

Future Total (5 Year) PM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1570	200	0	1105	0	0
Future Volume (Veh/h)	1570	200	0	1105	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	1635	208	0	1151	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				153		
pX, platoon unblocked					0.85	
vC, conflicting volume			1843		2210	818
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1843		2076	818
tC, single (s)			4.1		6.8	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			334		41	313

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1
Volume Total	818	818	208	0	576	576	0
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	208	0	0	0	0
cSH	1700	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.48	0.48	0.12	0.00	0.34	0.34	0.00
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS							A
Approach Delay (s)	0.0			0.0			0.0
Approach LOS							A

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	46.7%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
1: Kingston Road & Rosebank Road

Future Total (5 Year) PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	130	1695	5	5	1030	70	5	5	15	60	0	70
Future Volume (vph)	130	1695	5	5	1030	70	5	5	15	60	0	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5
Total Lost time (s)	5.4	5.4		5.4	5.4		5.2	5.2		5.2	5.2	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	0.98	
Flpb, ped/bikes	0.99	1.00		1.00	1.00		0.99	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99		1.00	0.89		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1736	3533		1745	3492		1732	1664		1745	1549	
Flt Permitted	0.23	1.00		0.10	1.00		0.71	1.00		0.74	1.00	
Satd. Flow (perm)	413	3533		181	3492		1292	1664		1366	1549	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	138	1803	5	5	1096	74	5	5	16	64	0	74
RTOR Reduction (vph)	0	0	0	0	3	0	0	14	0	0	67	0
Lane Group Flow (vph)	138	1808	0	5	1167	0	5	7	0	64	7	0
Confl. Peds. (#/hr)	10					10	5					5
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	1%
Bus Blockages (#/hr)	0	0	11	0	0	11	0	0	0	0	0	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	78.5	78.5		78.5	78.5		8.9	8.9		8.9	8.9	
Effective Green, g (s)	79.5	79.5		79.5	79.5		9.9	9.9		9.9	9.9	
Actuated g/C Ratio	0.80	0.80		0.80	0.80		0.10	0.10		0.10	0.10	
Clearance Time (s)	6.4	6.4		6.4	6.4		6.2	6.2		6.2	6.2	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	328	2808		143	2776		127	164		135	153	
v/s Ratio Prot		c0.51			0.33			0.00			0.00	
v/s Ratio Perm	0.33			0.03			0.00			c0.05		
v/c Ratio	0.42	0.64		0.03	0.42		0.04	0.04		0.47	0.05	
Uniform Delay, d1	3.2	4.3		2.2	3.2		40.7	40.8		42.6	40.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.9	1.2		0.5	0.5		0.1	0.1		2.6	0.1	
Delay (s)	7.1	5.5		2.6	3.6		40.9	40.9		45.2	40.9	
Level of Service	A	A		A	A		D	D		D	D	
Approach Delay (s)		5.6			3.6			40.9			42.9	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	6.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.6
Intersection Capacity Utilization	87.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Whites Road & Kingston Road

Future Total (5 Year) PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	210	1050	615	255	895	565	360	1015	750	190	780	155
Future Volume (vph)	210	1050	615	255	895	565	360	1015	750	190	780	155
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.3	3.3	3.5	3.3	3.3	3.5	3.3	3.3	3.5	3.3
Total Lost time (s)	2.0	6.0	6.0	2.0	6.0	6.0	2.0	6.1	2.0	2.0	6.1	6.1
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1744	3535	1525	1728	3535	1507	1744	5079	1512	1744	5129	1457
Flt Permitted	0.17	1.00	1.00	0.09	1.00	1.00	0.21	1.00	1.00	0.17	1.00	1.00
Satd. Flow (perm)	317	3535	1525	161	3535	1507	380	5079	1512	318	5129	1457
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	216	1082	634	263	923	582	371	1046	773	196	804	160
RTOR Reduction (vph)	0	0	219	0	0	165	0	0	110	0	0	73
Lane Group Flow (vph)	216	1082	415	263	923	417	371	1046	663	196	804	87
Confl. Peds. (#/hr)	20		10	10		20	10		20	20		10
Heavy Vehicles (%)	0%	1%	0%	1%	1%	0%	0%	1%	0%	0%	0%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	2	0	0	4
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	pm+ov	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases	2		2	6		6	8		8	4		4
Actuated Green, G (s)	53.2	42.2	42.2	64.0	50.0	50.0	61.9	44.3	63.1	52.5	37.9	37.9
Effective Green, g (s)	55.2	43.2	43.2	65.0	51.0	51.0	62.9	45.3	65.1	54.5	38.9	38.9
Actuated g/C Ratio	0.39	0.31	0.31	0.46	0.36	0.36	0.45	0.32	0.46	0.39	0.28	0.28
Clearance Time (s)	3.0	7.0	7.0	3.0	7.0	7.0	3.0	7.1	3.0	3.0	7.1	7.1
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	247	1090	470	296	1287	548	385	1643	703	282	1425	404
v/s Ratio Prot	0.07	c0.31		0.13	0.26		c0.15	0.21	c0.13	0.08	0.16	
v/s Ratio Perm	0.27		0.27	0.29		0.28	0.28		0.31	0.19		0.06
v/c Ratio	0.87	0.99	0.88	0.89	0.72	0.76	0.96	0.64	0.94	0.70	0.56	0.22
Uniform Delay, d1	31.4	48.2	46.0	41.8	38.3	39.1	29.2	40.3	35.7	30.5	43.3	38.8
Progression Factor	1.70	1.22	1.51	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	13.1	15.6	9.7	25.8	3.5	9.6	36.1	1.9	21.1	7.2	1.6	1.2
Delay (s)	66.4	74.5	79.0	67.7	41.7	48.7	65.3	42.2	56.8	37.7	44.9	40.0
Level of Service	E	E	E	E	D	D	E	D	E	D	D	D
Approach Delay (s)		75.1			47.9			51.3			43.0	
Approach LOS		E			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	55.6	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.1
Intersection Capacity Utilization	111.7%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Site Access (East)/Steeple Hill & Kingston Road

Future Total (5 Year) PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	90	1400	80	340	975	95	80	10	280	195	0	50
Future Volume (vph)	90	1400	80	340	975	95	80	10	280	195	0	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.3	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5
Total Lost time (s)	5.3	5.3		2.0	5.3		5.7	5.7		3.5	5.7	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.97		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	0.86		1.00	0.85	
Flt Protected	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Satd. Flow (prot)	1823	3508		1837	3474		1837	1558		1834	1597	
Flt Permitted	0.25	1.00		0.06	1.00		0.72	1.00		0.18	1.00	
Satd. Flow (perm)	461	3508		110	3474		1327	1558		335	1597	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	95	1474	84	358	1026	100	84	11	295	205	0	53
RTOR Reduction (vph)	0	3	0	0	4	0	0	174	0	0	40	0
Lane Group Flow (vph)	95	1555	0	358	1122	0	84	132	0	205	13	0
Confl. Peds. (#/hr)	10					10			15	15		
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	13	0	0	0	0	0	0
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		pm+pt	NA	
Protected Phases		2		1	6			8		7	4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	63.7	63.7		94.6	94.6		17.4	17.4		32.4	32.4	
Effective Green, g (s)	64.7	64.7		95.6	95.6		18.4	18.4		33.4	33.4	
Actuated g/C Ratio	0.46	0.46		0.68	0.68		0.13	0.13		0.24	0.24	
Clearance Time (s)	6.3	6.3		3.0	6.3		6.7	6.7		4.5	6.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	213	1621		431	2372		174	204		203	380	
v/s Ratio Prot		c0.44		c0.17	0.32			0.08		c0.08	0.01	
v/s Ratio Perm	0.21			0.39			0.06			c0.16		
v/c Ratio	0.45	0.96		0.83	0.47		0.48	0.65		1.01	0.03	
Uniform Delay, d1	25.5	36.4		44.2	10.4		56.4	57.7		49.0	40.9	
Progression Factor	1.00	1.00		1.47	0.72		1.00	1.00		1.00	1.00	
Incremental Delay, d2	6.6	14.6		9.1	0.5		2.1	6.9		65.7	0.0	
Delay (s)	32.1	51.0		73.9	8.0		58.5	64.7		114.7	40.9	
Level of Service	C	D		E	A		E	E		F	D	
Approach Delay (s)		49.9			23.9			63.3			99.5	
Approach LOS		D			C			E			F	

Intersection Summary			
HCM 2000 Control Delay	44.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.5
Intersection Capacity Utilization	108.6%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Whites Road & Bayly Street

Future Total (5 Year) PM Peak Hour

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	195	640	480	205	950	400
Future Volume (vph)	195	640	480	205	950	400
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.5	3.3	3.3	3.5
Total Lost time (s)	5.4	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	0.95	1.00	0.91	0.91
Frpb, ped/bikes	1.00	1.00	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	0.97
Satd. Flow (prot)	1745	1546	3535	1527	1572	3296
Flt Permitted	0.95	1.00	1.00	1.00	0.95	0.97
Satd. Flow (perm)	1745	1546	3535	1527	1572	3296
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	217	711	533	228	1056	444
RTOR Reduction (vph)	0	51	0	168	0	0
Lane Group Flow (vph)	217	660	533	60	528	972
Confl. Peds. (#/hr)				10	10	
Heavy Vehicles (%)	0%	1%	1%	0%	1%	1%
Turn Type	Perm	pm+ov	NA	Perm	Split	NA
Protected Phases		2	5		2	2
Permitted Phases	8	8		5		
Actuated Green, G (s)	18.9	65.6	24.0	24.0	46.7	46.7
Effective Green, g (s)	19.9	67.6	25.0	25.0	47.7	47.7
Actuated g/C Ratio	0.18	0.61	0.23	0.23	0.43	0.43
Clearance Time (s)	6.4	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	315	1034	803	347	681	1429
v/s Ratio Prot		c0.28	c0.15		c0.34	0.29
v/s Ratio Perm	0.12	0.15		0.04		
v/c Ratio	0.69	0.64	0.66	0.17	0.78	0.68
Uniform Delay, d1	42.2	13.4	38.7	34.2	26.6	25.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	6.2	1.3	2.1	0.2	8.4	2.6
Delay (s)	48.3	14.8	40.8	34.4	35.0	27.7
Level of Service	D	B	D	C	C	C
Approach Delay (s)	22.6		38.9			30.2
Approach LOS	C		D			C

Intersection Summary			
HCM 2000 Control Delay	30.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.4
Intersection Capacity Utilization	71.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
5: Highway 401 WB Off-Ramp & Kingston Road

Future Total (5 Year) PM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1735	25	275	985	580	80
Future Volume (vph)	1735	25	275	985	580	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.3	3.5	3.3	3.3
Total Lost time (s)	6.2		2.0	6.2	4.4	4.4
Lane Util. Factor	0.95		1.00	0.95	0.97	1.00
Frt	1.00		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3528		1694	3535	3351	1531
Flt Permitted	1.00		0.05	1.00	0.95	1.00
Satd. Flow (perm)	3528		90	3535	3351	1531
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1826	26	289	1037	611	84
RTOR Reduction (vph)	1	0	0	0	0	20
Lane Group Flow (vph)	1851	0	289	1037	611	64
Heavy Vehicles (%)	1%	0%	3%	1%	1%	2%
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases			6			8
Actuated Green, G (s)	76.2		101.0	101.0	26.4	26.4
Effective Green, g (s)	77.2		102.0	102.0	27.4	27.4
Actuated g/C Ratio	0.55		0.73	0.73	0.20	0.20
Clearance Time (s)	7.2		3.0	7.2	5.4	5.4
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1945		326	2575	655	299
v/s Ratio Prot	c0.52		c0.14	0.29	c0.18	
v/s Ratio Perm			0.50			0.04
v/c Ratio	0.95		0.89	0.40	0.93	0.21
Uniform Delay, d1	29.6		47.8	7.3	55.4	47.3
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	11.8		23.8	0.5	20.3	0.4
Delay (s)	41.5		71.6	7.8	75.7	47.6
Level of Service	D		E	A	E	D
Approach Delay (s)	41.5			21.7	72.3	
Approach LOS	D			C	E	

Intersection Summary			
HCM 2000 Control Delay	40.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.6
Intersection Capacity Utilization	92.7%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
10: Whites Road & Highway 401 EB Off-Ramp

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	1480	700	0	1120	650	0
Future Volume (vph)	1480	700	0	1120	650	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.5	3.5	3.5	3.5
Total Lost time (s)	4.5	4.5		5.7	5.7	
Lane Util. Factor	0.97	0.88		0.95	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	3385	2720		3570	3570	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	3385	2720		3570	3570	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	1626	769	0	1231	714	0
RTOR Reduction (vph)	0	73	0	0	0	0
Lane Group Flow (vph)	1626	696	0	1231	714	0
Confl. Peds. (#/hr)			10			10
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%
Turn Type	Prot	Perm		NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4				
Actuated Green, G (s)	50.2	50.2		37.6	37.6	
Effective Green, g (s)	51.2	51.2		38.6	38.6	
Actuated g/C Ratio	0.51	0.51		0.39	0.39	
Clearance Time (s)	5.5	5.5		6.7	6.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	1733	1392		1378	1378	
v/s Ratio Prot	c0.48			c0.34	0.20	
v/s Ratio Perm		0.26				
v/c Ratio	0.94	0.50		0.89	0.52	
Uniform Delay, d1	22.9	16.0		28.8	23.6	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	10.2	0.3		9.2	1.4	
Delay (s)	33.2	16.3		38.0	25.0	
Level of Service	C	B		D	C	
Approach Delay (s)	27.7			38.0	25.0	
Approach LOS	C			D	C	

Intersection Summary			
HCM 2000 Control Delay	30.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.2
Intersection Capacity Utilization	88.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
9: Car Dealer Site Access/Delta Boulevard & Kingston Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	145	1520	45	70	1400	95	165	20	130	100	10	150
Future Volume (vph)	145	1520	45	70	1400	95	165	20	130	100	10	150
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	5.9	5.9	2.0	5.7	5.7	5.6	5.6		5.6	5.6	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.95	1.00	0.98		1.00	0.97	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00		0.99	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.87		1.00	0.86	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1785	3535	1541	1785	3535	1517	1761	1604		1773	1569	
Flt Permitted	0.10	1.00	1.00	0.10	1.00	1.00	0.56	1.00		0.59	1.00	
Satd. Flow (perm)	193	3535	1541	184	3535	1517	1043	1604		1092	1569	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	148	1551	46	71	1429	97	168	20	133	102	10	153
RTOR Reduction (vph)	0	0	18	0	0	27	0	106	0	0	122	0
Lane Group Flow (vph)	148	1551	28	71	1429	70	168	47	0	102	41	0
Confl. Peds. (#/hr)	10		5	5		10	10		5	5		10
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8			4		
Actuated Green, G (s)	75.1	66.3	66.3	68.6	62.8	62.8	21.4	21.4		21.4	21.4	
Effective Green, g (s)	76.1	67.3	67.3	70.6	63.8	63.8	22.4	22.4		22.4	22.4	
Actuated g/C Ratio	0.69	0.61	0.61	0.64	0.58	0.58	0.20	0.20		0.20	0.20	
Clearance Time (s)	3.0	6.9	6.9	3.0	6.7	6.7	6.6	6.6		6.6	6.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	285	2162	942	217	2050	879	212	326		222	319	
v/s Ratio Prot	c0.05	c0.44		0.02	0.40			0.03			0.03	
v/s Ratio Perm	0.31		0.02	0.19		0.05	c0.16			0.09		
v/c Ratio	0.52	0.72	0.03	0.33	0.70	0.08	0.79	0.14		0.46	0.13	
Uniform Delay, d1	12.5	14.8	8.4	11.3	16.3	10.2	41.6	35.9		38.5	35.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.6	2.1	0.1	0.9	2.0	0.2	18.1	0.2		1.5	0.2	
Delay (s)	14.1	16.9	8.5	12.2	18.3	10.3	59.7	36.1		40.0	36.0	
Level of Service	B	B	A	B	B	B	E	D		D	D	
Approach Delay (s)		16.4			17.5			48.5			37.5	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	20.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	85.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
2: Site Access (West) & Kingston Road

Future Total (10 Year) PM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1715	0	0	1130	0	0
Future Volume (Veh/h)	1715	0	0	1130	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	1786	0	0	1177	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				153		
pX, platoon unblocked					0.84	
vC, conflicting volume			1786		2374	893
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1786		2255	893
tC, single (s)			4.1		6.8	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			352		30	279

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1
Volume Total	893	893	0	0	588	588	0
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	0	0
cSH	1700	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.53	0.53	0.12	0.00	0.35	0.35	0.00
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS							A
Approach Delay (s)	0.0			0.0			0.0
Approach LOS							A

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	50.7%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
1: Kingston Road & Rosebank Road

Future Total (10 Year) PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	130	1640	5	5	1055	70	5	5	15	60	0	70
Future Volume (vph)	130	1640	5	5	1055	70	5	5	15	60	0	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5
Total Lost time (s)	5.4	5.4		5.4	5.4		5.2	5.2		5.2	5.2	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		0.99	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99		1.00	0.89		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1736	3533		1745	3493		1732	1664		1745	1549	
Flt Permitted	0.22	1.00		0.11	1.00		0.71	1.00		0.74	1.00	
Satd. Flow (perm)	400	3533		197	3493		1292	1664		1366	1549	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	138	1745	5	5	1122	74	5	5	16	64	0	74
RTOR Reduction (vph)	0	0	0	0	3	0	0	14	0	0	67	0
Lane Group Flow (vph)	138	1750	0	5	1193	0	5	7	0	64	7	0
Confl. Peds. (#/hr)	10					10	5					5
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	1%
Bus Blockages (#/hr)	0	0	11	0	0	11	0	0	0	0	0	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	78.5	78.5		78.5	78.5		8.9	8.9		8.9	8.9	
Effective Green, g (s)	79.5	79.5		79.5	79.5		9.9	9.9		9.9	9.9	
Actuated g/C Ratio	0.80	0.80		0.80	0.80		0.10	0.10		0.10	0.10	
Clearance Time (s)	6.4	6.4		6.4	6.4		6.2	6.2		6.2	6.2	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	318	2808		156	2776		127	164		135	153	
v/s Ratio Prot		c0.50			0.34			0.00			0.00	
v/s Ratio Perm	0.34			0.03			0.00			c0.05		
v/c Ratio	0.43	0.62		0.03	0.43		0.04	0.04		0.47	0.05	
Uniform Delay, d1	3.2	4.2		2.2	3.2		40.7	40.8		42.6	40.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	4.3	1.1		0.1	0.1		0.1	0.1		2.6	0.1	
Delay (s)	7.5	5.2		2.2	3.3		40.9	40.9		45.2	40.9	
Level of Service	A	A		A	A		D	D		D	D	
Approach Delay (s)		5.4			3.3			40.9			42.9	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	6.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.6
Intersection Capacity Utilization	86.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Whites Road & Kingston Road

Future Total (10 Year) PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	210	1075	620	255	915	565	450	1040	745	190	800	155
Future Volume (vph)	210	1075	620	255	915	565	450	1040	745	190	800	155
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.3	3.3	3.5	3.3	3.3	3.5	3.3	3.3	3.5	3.3
Total Lost time (s)	2.0	6.0	6.0	2.0	6.0	6.0	2.0	6.1	2.0	2.0	6.1	6.1
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1744	3535	1525	1728	3535	1507	1744	5079	1512	1744	5129	1457
Flt Permitted	0.16	1.00	1.00	0.09	1.00	1.00	0.20	1.00	1.00	0.16	1.00	1.00
Satd. Flow (perm)	298	3535	1525	161	3535	1507	363	5079	1512	294	5129	1457
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	216	1108	639	263	943	582	464	1072	768	196	825	160
RTOR Reduction (vph)	0	0	226	0	0	162	0	0	110	0	0	73
Lane Group Flow (vph)	216	1108	413	263	943	420	464	1072	658	196	825	87
Confl. Peds. (#/hr)	20		10	10		20	10		20	20		10
Heavy Vehicles (%)	0%	1%	0%	1%	1%	0%	0%	1%	0%	0%	0%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	2	0	0	4
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	pm+ov	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases	2		2	6		6	8		8	4		4
Actuated Green, G (s)	53.2	42.2	42.2	64.0	50.0	50.0	61.9	43.9	62.7	52.9	37.9	37.9
Effective Green, g (s)	55.2	43.2	43.2	65.0	51.0	51.0	62.9	44.9	64.7	54.9	38.9	38.9
Actuated g/C Ratio	0.39	0.31	0.31	0.46	0.36	0.36	0.45	0.32	0.46	0.39	0.28	0.28
Clearance Time (s)	3.0	7.0	7.0	3.0	7.0	7.0	3.0	7.1	3.0	3.0	7.1	7.1
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	241	1090	470	296	1287	548	380	1628	698	281	1425	404
v/s Ratio Prot	0.08	c0.31		0.13	0.27		c0.19	0.21	c0.13	0.08	0.16	
v/s Ratio Perm	0.28		0.27	0.29		0.28	0.36		0.30	0.19		0.06
v/c Ratio	0.90	1.02	0.88	0.89	0.73	0.77	1.22	0.66	0.94	0.70	0.58	0.22
Uniform Delay, d1	31.7	48.4	45.9	41.9	38.6	39.2	31.0	40.9	35.9	30.4	43.5	38.8
Progression Factor	1.55	1.12	1.30	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	11.7	18.6	6.8	25.8	3.7	9.8	121.0	2.1	21.0	7.3	1.7	1.2
Delay (s)	60.8	72.8	66.6	67.7	42.3	49.1	152.0	43.1	56.9	37.8	45.2	40.0
Level of Service	E	E	E	E	D	D	F	D	E	D	D	D
Approach Delay (s)		69.5			48.3			69.6			43.3	
Approach LOS		E			D			E			D	

Intersection Summary			
HCM 2000 Control Delay	60.0	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.1
Intersection Capacity Utilization	116.6%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Site Access (East)/Steeple Hill & Kingston Road

Future Total (10 Year) PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	90	1430	195	425	1000	95	80	10	280	195	0	50
Future Volume (vph)	90	1430	195	425	1000	95	80	10	280	195	0	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.3	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5
Total Lost time (s)	5.3	5.3		5.0	5.3		5.7	5.7		3.0	5.7	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.97		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	0.99		1.00	0.86		1.00	0.85	
Flt Protected	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Satd. Flow (prot)	1824	3475		1837	3475		1837	1558		1835	1597	
Flt Permitted	0.25	1.00		0.06	1.00		0.72	1.00		0.17	1.00	
Satd. Flow (perm)	449	3475		104	3475		1327	1558		310	1597	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	95	1505	205	447	1053	100	84	11	295	205	0	53
RTOR Reduction (vph)	0	7	0	0	4	0	0	132	0	0	39	0
Lane Group Flow (vph)	95	1703	0	447	1149	0	84	174	0	205	14	0
Confl. Peds. (#/hr)	10					10			15	15		
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	13	0	0	0	0	0	0
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		pm+pt	NA	
Protected Phases		2		1	6			8		7	4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	64.7	64.7		92.3	92.3		19.7	19.7		34.7	34.7	
Effective Green, g (s)	65.7	65.7		93.3	93.3		20.7	20.7		35.7	35.7	
Actuated g/C Ratio	0.47	0.47		0.67	0.67		0.15	0.15		0.26	0.26	
Clearance Time (s)	6.3	6.3		6.0	6.3		6.7	6.7		4.0	6.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	210	1630		349	2315		196	230		209	407	
v/s Ratio Prot		0.49		c0.21	0.33			0.11		c0.08	0.01	
v/s Ratio Perm	0.21			c0.65			0.06			c0.17		
v/c Ratio	0.45	1.04		1.28	0.50		0.43	0.76		0.98	0.03	
Uniform Delay, d1	25.0	37.1		49.7	11.6		54.3	57.2		46.7	39.2	
Progression Factor	1.00	1.00		1.22	0.79		1.00	1.00		1.00	1.00	
Incremental Delay, d2	6.9	34.9		138.4	0.4		1.5	13.2		56.5	0.0	
Delay (s)	31.9	72.1		198.9	9.6		55.8	70.4		103.2	39.2	
Level of Service	C	E		F	A		E	E		F	D	
Approach Delay (s)		69.9			62.5			67.3			90.1	
Approach LOS		E			E			E			F	

Intersection Summary			
HCM 2000 Control Delay	68.0	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.25		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	118.6%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Whites Road & Bayly Street

Future Total (10 Year) PM Peak Hour

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	195	640	490	205	950	410
Future Volume (vph)	195	640	490	205	950	410
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.5	3.3	3.3	3.5
Total Lost time (s)	5.4	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	0.95	1.00	0.91	0.91
Frpb, ped/bikes	1.00	1.00	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	0.97
Satd. Flow (prot)	1745	1546	3535	1527	1572	3297
Flt Permitted	0.95	1.00	1.00	1.00	0.95	0.97
Satd. Flow (perm)	1745	1546	3535	1527	1572	3297
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	217	711	544	228	1056	456
RTOR Reduction (vph)	0	49	0	165	0	0
Lane Group Flow (vph)	217	662	544	63	528	984
Confl. Peds. (#/hr)				10	10	
Heavy Vehicles (%)	0%	1%	1%	0%	1%	1%
Turn Type	Perm	pm+ov	NA	Perm	Split	NA
Protected Phases		2	5		2	2
Permitted Phases	8	8		5		
Actuated Green, G (s)	18.9	65.5	24.1	24.1	46.6	46.6
Effective Green, g (s)	19.9	67.5	25.1	25.1	47.6	47.6
Actuated g/C Ratio	0.18	0.61	0.23	0.23	0.43	0.43
Clearance Time (s)	6.4	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	315	1033	806	348	680	1426
v/s Ratio Prot		c0.28	c0.15		c0.34	0.30
v/s Ratio Perm	0.12	0.15		0.04		
v/c Ratio	0.69	0.64	0.67	0.18	0.78	0.69
Uniform Delay, d1	42.2	13.5	38.7	34.2	26.7	25.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	6.2	1.4	2.2	0.3	8.5	2.8
Delay (s)	48.3	14.9	41.0	34.4	35.1	28.0
Level of Service	D	B	D	C	D	C
Approach Delay (s)	22.7		39.0			30.5
Approach LOS	C		D			C

Intersection Summary			
HCM 2000 Control Delay	30.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.4
Intersection Capacity Utilization	71.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: Highway 401 WB Off-Ramp & Kingston Road

Future Total (10 Year) PM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1755	25	280	990	595	80
Future Volume (vph)	1755	25	280	990	595	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.3	3.5	3.3	3.3
Total Lost time (s)	6.2		2.0	6.2	4.4	4.4
Lane Util. Factor	0.95		1.00	0.95	0.97	1.00
Frt	1.00		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3528		1694	3535	3351	1531
Flt Permitted	1.00		0.05	1.00	0.95	1.00
Satd. Flow (perm)	3528		91	3535	3351	1531
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1847	26	295	1042	626	84
RTOR Reduction (vph)	0	0	0	0	0	19
Lane Group Flow (vph)	1873	0	295	1042	626	65
Heavy Vehicles (%)	1%	0%	3%	1%	1%	2%
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases			6			8
Actuated Green, G (s)	75.8		100.8	100.8	26.6	26.6
Effective Green, g (s)	76.8		101.8	101.8	27.6	27.6
Actuated g/C Ratio	0.55		0.73	0.73	0.20	0.20
Clearance Time (s)	7.2		3.0	7.2	5.4	5.4
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1935		329	2570	660	301
v/s Ratio Prot	c0.53		c0.15	0.29	c0.19	
v/s Ratio Perm			0.51			0.04
v/c Ratio	0.97		0.90	0.41	0.95	0.22
Uniform Delay, d1	30.4		48.2	7.4	55.5	47.1
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	14.1		25.3	0.5	22.9	0.4
Delay (s)	44.5		73.5	7.9	78.4	47.5
Level of Service	D		E	A	E	D
Approach Delay (s)	44.5			22.4	74.7	
Approach LOS	D			C	E	

Intersection Summary			
HCM 2000 Control Delay	42.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.6
Intersection Capacity Utilization	94.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
10: Whites Road & Highway 401 EB Off-Ramp

Future Total (10 Year) PM Peak Hour

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	1595	700	0	1130	660	0
Future Volume (vph)	1595	700	0	1130	660	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.5	3.5	3.5	3.5
Total Lost time (s)	4.5	4.5		5.7	5.7	
Lane Util. Factor	0.97	0.88		0.95	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	3385	2720		3570	3570	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	3385	2720		3570	3570	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	1753	769	0	1242	725	0
RTOR Reduction (vph)	0	70	0	0	0	0
Lane Group Flow (vph)	1753	699	0	1242	725	0
Confl. Peds. (#/hr)			10			10
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%
Turn Type	Prot	Perm		NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4				
Actuated Green, G (s)	50.5	50.5		37.3	37.3	
Effective Green, g (s)	51.5	51.5		38.3	38.3	
Actuated g/C Ratio	0.52	0.52		0.38	0.38	
Clearance Time (s)	5.5	5.5		6.7	6.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	1743	1400		1367	1367	
v/s Ratio Prot	c0.52			c0.35	0.20	
v/s Ratio Perm		0.26				
v/c Ratio	1.01	0.50		0.91	0.53	
Uniform Delay, d1	24.2	15.8		29.2	23.9	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	22.9	0.3		10.4	1.5	
Delay (s)	47.2	16.1		39.6	25.4	
Level of Service	D	B		D	C	
Approach Delay (s)	37.7			39.6	25.4	
Approach LOS	D			D	C	

Intersection Summary			
HCM 2000 Control Delay	36.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.2
Intersection Capacity Utilization	91.9%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
9: Car Dealer Site Access/Delta Boulevard & Kingston Road

Future Total (10 Year) PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	145	1540	45	70	1420	95	165	20	130	100	10	150
Future Volume (vph)	145	1540	45	70	1420	95	165	20	130	100	10	150
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	5.9	5.9	2.0	5.7	5.7	5.6	5.6		5.6	5.6	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.95	1.00	0.98		1.00	0.97	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00		0.99	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.87		1.00	0.86	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1785	3535	1541	1785	3535	1517	1761	1604		1773	1569	
Flt Permitted	0.10	1.00	1.00	0.09	1.00	1.00	0.56	1.00		0.59	1.00	
Satd. Flow (perm)	185	3535	1541	176	3535	1517	1043	1604		1092	1569	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	148	1571	46	71	1449	97	168	20	133	102	10	153
RTOR Reduction (vph)	0	0	18	0	0	27	0	106	0	0	122	0
Lane Group Flow (vph)	148	1571	28	71	1449	70	168	47	0	102	41	0
Confl. Peds. (#/hr)	10		5	5		10	10		5	5		10
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8			4		
Actuated Green, G (s)	75.1	66.3	66.3	68.6	62.8	62.8	21.4	21.4		21.4	21.4	
Effective Green, g (s)	76.1	67.3	67.3	70.6	63.8	63.8	22.4	22.4		22.4	22.4	
Actuated g/C Ratio	0.69	0.61	0.61	0.64	0.58	0.58	0.20	0.20		0.20	0.20	
Clearance Time (s)	3.0	6.9	6.9	3.0	6.7	6.7	6.6	6.6		6.6	6.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	280	2162	942	212	2050	879	212	326		222	319	
v/s Ratio Prot	c0.05	c0.44		0.02	0.41			0.03			0.03	
v/s Ratio Perm	0.31		0.02	0.19		0.05	c0.16			0.09		
v/c Ratio	0.53	0.73	0.03	0.33	0.71	0.08	0.79	0.14		0.46	0.13	
Uniform Delay, d1	13.0	14.9	8.4	11.6	16.4	10.2	41.6	35.9		38.5	35.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.8	2.2	0.1	0.9	2.1	0.2	18.1	0.2		1.5	0.2	
Delay (s)	14.8	17.1	8.5	12.5	18.5	10.3	59.7	36.1		40.0	36.0	
Level of Service	B	B	A	B	B	B	E	D		D	D	
Approach Delay (s)		16.7			17.8			48.5			37.5	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	21.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	85.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

2: Site Access (West) & Kingston Road

Future Total (15 Year) PM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1795	0	0	1175	0	0
Future Volume (Veh/h)	1795	0	0	1175	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	1870	0	0	1224	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				153		
pX, platoon unblocked					0.83	
vC, conflicting volume			1870		2482	935
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1870		2374	935
tC, single (s)			4.1		6.8	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			326		25	261

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1
Volume Total	935	935	0	0	612	612	0
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	0	0
cSH	1700	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.55	0.55	0.12	0.00	0.36	0.36	0.00
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS							A
Approach Delay (s)	0.0			0.0			0.0
Approach LOS							A

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	53.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis

1: Kingston Road & Rosebank Road

Future Total (15 Year) PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	130	1720	5	5	1100	70	5	5	15	60	0	70
Future Volume (vph)	130	1720	5	5	1100	70	5	5	15	60	0	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5
Total Lost time (s)	5.4	5.4		5.4	5.4		5.2	5.2		5.2	5.2	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		0.99	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99		1.00	0.89		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1737	3533		1745	3495		1732	1664		1745	1549	
Flt Permitted	0.21	1.00		0.09	1.00		0.71	1.00		0.74	1.00	
Satd. Flow (perm)	378	3533		174	3495		1292	1664		1366	1549	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	138	1830	5	5	1170	74	5	5	16	64	0	74
RTOR Reduction (vph)	0	0	0	0	3	0	0	14	0	0	67	0
Lane Group Flow (vph)	138	1835	0	5	1241	0	5	7	0	64	7	0
Confl. Peds. (#/hr)	10					10	5					5
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	1%
Bus Blockages (#/hr)	0	0	11	0	0	11	0	0	0	0	0	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	78.5	78.5		78.5	78.5		8.9	8.9		8.9	8.9	
Effective Green, g (s)	79.5	79.5		79.5	79.5		9.9	9.9		9.9	9.9	
Actuated g/C Ratio	0.80	0.80		0.80	0.80		0.10	0.10		0.10	0.10	
Clearance Time (s)	6.4	6.4		6.4	6.4		6.2	6.2		6.2	6.2	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	300	2808		138	2778		127	164		135	153	
v/s Ratio Prot		c0.52			0.36			0.00			0.00	
v/s Ratio Perm	0.37			0.03			0.00			c0.05		
v/c Ratio	0.46	0.65		0.04	0.45		0.04	0.04		0.47	0.05	
Uniform Delay, d1	3.3	4.4		2.2	3.3		40.7	40.8		42.6	40.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	5.0	1.2		0.5	0.5		0.1	0.1		2.6	0.1	
Delay (s)	8.3	5.6		2.7	3.8		40.9	40.9		45.2	40.9	
Level of Service	A	A		A	A		D	D		D	D	
Approach Delay (s)		5.8			3.8			40.9			42.9	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	6.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.6
Intersection Capacity Utilization	88.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Whites Road & Kingston Road

Future Total (15 Year) PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	210	1125	650	255	950	565	460	1090	755	190	835	155
Future Volume (vph)	210	1125	650	255	950	565	460	1090	755	190	835	155
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.3	3.3	3.5	3.3	3.3	3.5	3.3	3.3	3.5	3.3
Total Lost time (s)	2.0	6.0	6.0	2.0	6.0	6.0	2.0	6.1	2.0	2.0	6.1	6.1
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1744	3535	1525	1728	3535	1507	1744	5079	1512	1744	5129	1457
Flt Permitted	0.15	1.00	1.00	0.09	1.00	1.00	0.18	1.00	1.00	0.14	1.00	1.00
Satd. Flow (perm)	267	3535	1525	162	3535	1507	335	5079	1512	253	5129	1457
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	216	1160	670	263	979	582	474	1124	778	196	861	160
RTOR Reduction (vph)	0	0	225	0	0	156	0	0	110	0	0	73
Lane Group Flow (vph)	216	1160	445	263	979	426	474	1124	668	196	861	87
Confl. Peds. (#/hr)	20		10	10		20	10		20	20		10
Heavy Vehicles (%)	0%	1%	0%	1%	1%	0%	0%	1%	0%	0%	0%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	2	0	0	4
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	pm+ov	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases	2		2	6		6	8		8	4		4
Actuated Green, G (s)	52.9	41.9	41.9	64.0	50.0	50.0	61.9	43.5	62.6	53.3	37.9	37.9
Effective Green, g (s)	54.9	42.9	42.9	65.0	51.0	51.0	62.9	44.5	64.6	55.3	38.9	38.9
Actuated g/C Ratio	0.39	0.31	0.31	0.46	0.36	0.36	0.45	0.32	0.46	0.39	0.28	0.28
Clearance Time (s)	3.0	7.0	7.0	3.0	7.0	7.0	3.0	7.1	3.0	3.0	7.1	7.1
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	231	1083	467	300	1287	548	371	1614	697	274	1425	404
v/s Ratio Prot	0.08	c0.33		0.13	0.28		c0.20	0.22	c0.14	0.08	0.17	
v/s Ratio Perm	0.29		0.29	0.28		0.28	0.37		0.30	0.20		0.06
v/c Ratio	0.94	1.07	0.95	0.88	0.76	0.78	1.28	0.70	0.96	0.72	0.60	0.22
Uniform Delay, d1	32.4	48.5	47.5	41.6	39.1	39.5	32.7	41.8	36.4	30.6	43.9	38.8
Progression Factor	1.64	0.66	0.36	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	7.2	34.1	5.5	23.7	4.3	10.4	144.3	2.5	23.9	8.6	1.9	1.2
Delay (s)	60.3	66.0	22.4	65.3	43.4	49.8	176.9	44.3	60.3	39.2	45.8	40.0
Level of Service	E	E	C	E	D	D	F	D	E	D	D	D
Approach Delay (s)		51.1			48.6			76.0			44.0	
Approach LOS		D			D			E			D	

Intersection Summary			
HCM 2000 Control Delay	57.3	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.06		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.1
Intersection Capacity Utilization	118.3%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Site Access (East)/Steeple Hill & Kingston Road

Future Total (15 Year) PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	90	1510	195	425	1045	95	80	10	280	195	0	50
Future Volume (vph)	90	1510	195	425	1045	95	80	10	280	195	0	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.3	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5
Total Lost time (s)	5.3	5.3		5.0	5.3		5.7	5.7		3.5	5.7	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.97		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	0.99		1.00	0.86		1.00	0.85	
Flt Protected	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Satd. Flow (prot)	1825	3478		1837	3477		1837	1558		1835	1597	
Flt Permitted	0.23	1.00		0.06	1.00		0.72	1.00		0.16	1.00	
Satd. Flow (perm)	428	3478		104	3477		1327	1558		301	1597	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	95	1589	205	447	1100	100	84	11	295	205	0	53
RTOR Reduction (vph)	0	7	0	0	4	0	0	129	0	0	39	0
Lane Group Flow (vph)	95	1787	0	447	1196	0	84	177	0	205	14	0
Confl. Peds. (#/hr)	10					10			15	15		
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	13	0	0	0	0	0	0
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		pm+pt	NA	
Protected Phases		2		1	6			8		7	4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	64.7	64.7		92.1	92.1		19.9	19.9		34.9	34.9	
Effective Green, g (s)	65.7	65.7		93.1	93.1		20.9	20.9		35.9	35.9	
Actuated g/C Ratio	0.47	0.47		0.66	0.66		0.15	0.15		0.26	0.26	
Clearance Time (s)	6.3	6.3		6.0	6.3		6.7	6.7		4.5	6.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	200	1632		346	2312		198	232		203	409	
v/s Ratio Prot		0.51		c0.21	0.34			0.11		c0.08	0.01	
v/s Ratio Perm	0.22			c0.65			0.06			c0.18		
v/c Ratio	0.47	1.10		1.29	0.52		0.42	0.76		1.01	0.03	
Uniform Delay, d1	25.4	37.1		49.7	12.0		54.1	57.2		47.1	39.0	
Progression Factor	1.00	1.00		0.75	1.85		1.00	1.00		1.00	1.00	
Incremental Delay, d2	7.9	53.0		142.2	0.4		1.5	13.7		65.7	0.0	
Delay (s)	33.3	90.2		179.4	22.6		55.6	70.9		112.8	39.1	
Level of Service	C	F		F	C		E	E		F	D	
Approach Delay (s)		87.3			65.1			67.6			97.7	
Approach LOS		F			E			E			F	

Intersection Summary			
HCM 2000 Control Delay	77.4	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.27		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	19.5
Intersection Capacity Utilization	120.8%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Whites Road & Bayly Street

Future Total (15 Year) PM Peak Hour

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	195	640	520	205	950	435
Future Volume (vph)	195	640	520	205	950	435
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.5	3.3	3.3	3.5
Total Lost time (s)	5.4	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	0.95	1.00	0.91	0.91
Frpb, ped/bikes	1.00	1.00	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	0.97
Satd. Flow (prot)	1745	1546	3535	1527	1572	3300
Flt Permitted	0.95	1.00	1.00	1.00	0.95	0.97
Satd. Flow (perm)	1745	1546	3535	1527	1572	3300
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	217	711	578	228	1056	483
RTOR Reduction (vph)	0	43	0	154	0	0
Lane Group Flow (vph)	217	668	578	74	528	1011
Confl. Peds. (#/hr)				10	10	
Heavy Vehicles (%)	0%	1%	1%	0%	1%	1%
Turn Type	Perm	pm+ov	NA	Perm	Split	NA
Protected Phases		2	5		2	2
Permitted Phases	8	8		5		
Actuated Green, G (s)	18.9	64.7	24.9	24.9	45.8	45.8
Effective Green, g (s)	19.9	66.7	25.9	25.9	46.8	46.8
Actuated g/C Ratio	0.18	0.61	0.24	0.24	0.43	0.43
Clearance Time (s)	6.4	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	315	1021	832	359	668	1404
v/s Ratio Prot		c0.28	c0.16		c0.34	0.31
v/s Ratio Perm	0.12	0.15		0.05		
v/c Ratio	0.69	0.65	0.69	0.20	0.79	0.72
Uniform Delay, d1	42.2	14.1	38.4	33.8	27.4	26.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	6.2	1.5	2.5	0.3	9.3	3.2
Delay (s)	48.3	15.6	41.0	34.1	36.6	29.4
Level of Service	D	B	D	C	D	C
Approach Delay (s)	23.3		39.0			31.9
Approach LOS	C		D			C

Intersection Summary			
HCM 2000 Control Delay	31.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.4
Intersection Capacity Utilization	71.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: Highway 401 WB Off-Ramp & Kingston Road

Future Total (15 Year) PM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1815	25	295	1000	620	85
Future Volume (vph)	1815	25	295	1000	620	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.3	3.5	3.3	3.3
Total Lost time (s)	6.2		2.0	6.2	4.4	4.4
Lane Util. Factor	0.95		1.00	0.95	0.97	1.00
Frt	1.00		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3528		1694	3535	3351	1531
Flt Permitted	1.00		0.05	1.00	0.95	1.00
Satd. Flow (perm)	3528		92	3535	3351	1531
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1911	26	311	1053	653	89
RTOR Reduction (vph)	0	0	0	0	0	19
Lane Group Flow (vph)	1937	0	311	1053	653	70
Heavy Vehicles (%)	1%	0%	3%	1%	1%	2%
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases			6			8
Actuated Green, G (s)	74.9		100.8	100.8	26.6	26.6
Effective Green, g (s)	75.9		101.8	101.8	27.6	27.6
Actuated g/C Ratio	0.54		0.73	0.73	0.20	0.20
Clearance Time (s)	7.2		3.0	7.2	5.4	5.4
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1912		340	2570	660	301
v/s Ratio Prot	c0.55		c0.16	0.30	c0.19	
v/s Ratio Perm			0.51			0.05
v/c Ratio	1.01		0.91	0.41	0.99	0.23
Uniform Delay, d1	32.0		48.5	7.4	56.1	47.3
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	23.8		28.1	0.5	32.0	0.4
Delay (s)	55.9		76.6	7.9	88.0	47.7
Level of Service	E		E	A	F	D
Approach Delay (s)	55.9			23.6	83.2	
Approach LOS	E			C	F	

Intersection Summary			
HCM 2000 Control Delay	50.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.6
Intersection Capacity Utilization	97.2%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
10: Whites Road & Highway 401 EB Off-Ramp

Future Total (15 Year) PM Peak Hour

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	1660	700	0	1160	685	0
Future Volume (vph)	1660	700	0	1160	685	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.5	3.5	3.5	3.5
Total Lost time (s)	4.5	4.5		5.7	5.7	
Lane Util. Factor	0.97	0.88		0.95	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	3385	2720		3570	3570	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	3385	2720		3570	3570	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	1824	769	0	1275	753	0
RTOR Reduction (vph)	0	63	0	0	0	0
Lane Group Flow (vph)	1824	706	0	1275	753	0
Confl. Peds. (#/hr)			10			10
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%
Turn Type	Prot	Perm		NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4				
Actuated Green, G (s)	50.5	50.5		37.3	37.3	
Effective Green, g (s)	51.5	51.5		38.3	38.3	
Actuated g/C Ratio	0.52	0.52		0.38	0.38	
Clearance Time (s)	5.5	5.5		6.7	6.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	1743	1400		1367	1367	
v/s Ratio Prot	c0.54			c0.36	0.21	
v/s Ratio Perm		0.26				
v/c Ratio	1.05	0.50		0.93	0.55	
Uniform Delay, d1	24.2	15.9		29.6	24.1	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	34.9	0.3		12.8	1.6	
Delay (s)	59.1	16.2		42.4	25.7	
Level of Service	E	B		D	C	
Approach Delay (s)	46.4			42.4	25.7	
Approach LOS	D			D	C	

Intersection Summary			
HCM 2000 Control Delay	41.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.2
Intersection Capacity Utilization	94.6%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
9: Car Dealer Site Access/Delta Boulevard & Kingston Road

Future Total (15 Year) PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	145	1600	45	70	1455	95	165	20	130	100	10	150
Future Volume (vph)	145	1600	45	70	1455	95	165	20	130	100	10	150
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	5.9	5.9	2.0	5.7	5.7	5.6	5.6		5.6	5.6	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.95	1.00	0.98		1.00	0.97	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00		0.99	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.87		1.00	0.86	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1785	3535	1541	1785	3535	1517	1761	1604		1773	1569	
Flt Permitted	0.09	1.00	1.00	0.08	1.00	1.00	0.56	1.00		0.59	1.00	
Satd. Flow (perm)	171	3535	1541	153	3535	1517	1043	1604		1092	1569	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	148	1633	46	71	1485	97	168	20	133	102	10	153
RTOR Reduction (vph)	0	0	18	0	0	27	0	106	0	0	122	0
Lane Group Flow (vph)	148	1633	28	71	1485	70	168	47	0	102	41	0
Confl. Peds. (#/hr)	10		5	5		10	10		5	5		10
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8			4		
Actuated Green, G (s)	75.1	66.3	66.3	68.6	62.8	62.8	21.4	21.4		21.4	21.4	
Effective Green, g (s)	76.1	67.3	67.3	70.6	63.8	63.8	22.4	22.4		22.4	22.4	
Actuated g/C Ratio	0.69	0.61	0.61	0.64	0.58	0.58	0.20	0.20		0.20	0.20	
Clearance Time (s)	3.0	6.9	6.9	3.0	6.7	6.7	6.6	6.6		6.6	6.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	272	2162	942	199	2050	879	212	326		222	319	
v/s Ratio Prot	c0.05	c0.46		0.02	0.42			0.03			0.03	
v/s Ratio Perm	0.32		0.02	0.21		0.05	c0.16			0.09		
v/c Ratio	0.54	0.76	0.03	0.36	0.72	0.08	0.79	0.14		0.46	0.13	
Uniform Delay, d1	14.0	15.4	8.4	12.6	16.7	10.2	41.6	35.9		38.5	35.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.2	2.5	0.1	1.1	2.3	0.2	18.1	0.2		1.5	0.2	
Delay (s)	16.2	17.9	8.5	13.7	19.0	10.3	59.7	36.1		40.0	36.0	
Level of Service	B	B	A	B	B	B	E	D		D	D	
Approach Delay (s)		17.5			18.3			48.5			37.5	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	21.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	87.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
2: Site Access (West) & Kingston Road

Future Total (5 Year) AM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	755	0	0	990	0	0
Future Volume (Veh/h)	755	0	0	990	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	868	0	0	1138	0	0
Pedestrians					5	
Lane Width (m)					3.3	
Walking Speed (m/s)					1.2	
Percent Blockage					0	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				153		
pX, platoon unblocked					0.79	
vC, conflicting volume			873		1442	439
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			873		1033	439
tC, single (s)			4.1		7.1	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.6	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			778		165	569

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1
Volume Total	434	434	0	0	569	569	0
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	0	0
cSH	1700	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.26	0.26	0.00	0.00	0.33	0.33	0.00
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS							A
Approach Delay (s)	0.0			0.0			0.0
Approach LOS							A

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	30.7%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
1: Kingston Road & Rosebank Road

Future Total (5 Year) AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	655	10	15	910	65	0	0	5	95	5	120
Future Volume (vph)	30	655	10	15	910	65	0	0	5	95	5	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5
Total Lost time (s)	5.0	5.6		5.0	5.6			5.6		5.6	5.6	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99			0.85		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00			1.00		0.95	1.00	
Satd. Flow (prot)	1694	3427		1745	3428			1597		1694	1609	
Flt Permitted	0.95	1.00		0.95	1.00			1.00		0.75	1.00	
Satd. Flow (perm)	1694	3427		1745	3428			1597		1344	1609	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	34	744	11	17	1034	74	0	0	6	108	6	136
RTOR Reduction (vph)	0	1	0	0	4	0	0	5	0	0	116	0
Lane Group Flow (vph)	34	754	0	17	1104	0	0	1	0	108	26	0
Confl. Peds. (#/hr)	5					5						
Heavy Vehicles (%)	3%	4%	0%	0%	3%	1%	0%	0%	0%	3%	0%	0%
Bus Blockages (#/hr)	0	0	11	0	0	11	0	0	0	0	0	0
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	5.2	64.5		2.9	62.2			13.4		13.4	13.4	
Effective Green, g (s)	6.2	65.5		3.9	63.2			14.4		14.4	14.4	
Actuated g/C Ratio	0.06	0.66		0.04	0.63			0.14		0.14	0.14	
Clearance Time (s)	6.0	6.6		6.0	6.6			6.6		6.6	6.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	105	2244		68	2166			229		193	231	
v/s Ratio Prot	c0.02	0.22		0.01	c0.32			0.00			0.02	
v/s Ratio Perm										c0.08		
v/c Ratio	0.32	0.34		0.25	0.51			0.00		0.56	0.11	
Uniform Delay, d1	44.9	7.6		46.6	10.0			36.7		39.8	37.2	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	1.8	0.4		1.9	0.9			0.0		3.5	0.2	
Delay (s)	46.7	8.0		48.6	10.9			36.7		43.3	37.4	
Level of Service	D	A		D	B			D		D	D	
Approach Delay (s)		9.7			11.4			36.7			40.0	
Approach LOS		A			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	14.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	16.2
Intersection Capacity Utilization	48.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Whites Road & Kingston Road

Future Total (5 Year) AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	95	395	660	295	685	360	230	465	440	150	1300	125
Future Volume (vph)	95	395	660	295	685	360	230	465	440	150	1300	125
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.3	3.3	3.5	3.3	3.3	3.5	3.3	3.3	3.5	3.3
Total Lost time (s)	2.0	6.0	3.0	2.0	6.0	3.0	2.0	6.1	2.0	2.0	6.1	6.1
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1678	3400	1510	1694	3466	1505	1818	5079	1463	1721	5079	1486
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.13	1.00	1.00	0.45	1.00	1.00
Satd. Flow (perm)	1678	3400	1510	1694	3466	1505	238	5079	1463	822	5079	1486
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	104	434	725	324	753	396	253	511	484	165	1429	137
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	88	0	0	88
Lane Group Flow (vph)	104	434	725	324	753	396	253	511	396	165	1429	49
Confl. Peds. (#/hr)	15		5	5		15	10		15	15		10
Heavy Vehicles (%)	4%	5%	2%	3%	3%	2%	1%	1%	4%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	2	0	0	4
Turn Type	Prot	NA	Free	Prot	NA	Free	pm+pt	NA	pm+ov	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases			Free			Free	8		8	4		4
Actuated Green, G (s)	13.3	38.4	140.0	27.6	52.7	140.0	56.9	44.9	72.5	48.9	39.9	39.9
Effective Green, g (s)	14.3	39.4	140.0	28.6	53.7	140.0	57.9	45.9	74.5	50.9	40.9	40.9
Actuated g/C Ratio	0.10	0.28	1.00	0.20	0.38	1.00	0.41	0.33	0.53	0.36	0.29	0.29
Clearance Time (s)	3.0	7.0		3.0	7.0		3.0	7.1	3.0	3.0	7.1	7.1
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	171	956	1510	346	1329	1505	267	1665	778	363	1483	434
v/s Ratio Prot	0.06	0.13		c0.19	c0.22		c0.10	0.10	0.10	0.03	c0.28	
v/s Ratio Perm			0.48			0.26	0.29		0.17	0.13		0.03
v/c Ratio	0.61	0.45	0.48	0.94	0.57	0.26	0.95	0.31	0.51	0.45	0.96	0.11
Uniform Delay, d1	60.2	41.4	0.0	54.8	34.0	0.0	30.1	35.2	21.0	31.4	48.8	36.3
Progression Factor	1.13	0.85	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.6	1.2	0.8	32.1	1.8	0.4	40.5	0.5	0.5	0.9	16.2	0.5
Delay (s)	72.4	36.6	0.8	86.9	35.7	0.4	70.6	35.6	21.5	32.3	65.0	36.8
Level of Service	E	D	A	F	D	A	E	D	C	C	E	D
Approach Delay (s)		19.0			37.5			37.3			59.6	
Approach LOS		B			D			D			E	

Intersection Summary			
HCM 2000 Control Delay	40.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.1
Intersection Capacity Utilization	106.7%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Site Access (East)/Steeple Hill & Kingston Road

Future Total (5 Year) AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	650	65	155	855	30	100	0	375	125	0	35
Future Volume (vph)	40	650	65	155	855	30	100	0	375	125	0	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.3	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5
Total Lost time (s)	5.0	5.3		5.0	5.3		5.7	5.7		5.7	5.7	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.97		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	0.85		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1678	3398		1631	3477		1454	1557		1686	1521	
Flt Permitted	0.95	1.00		0.95	1.00		0.73	1.00		0.25	1.00	
Satd. Flow (perm)	1678	3398		1631	3477		1118	1557		436	1521	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	47	765	76	182	1006	35	118	0	441	147	0	41
RTOR Reduction (vph)	0	5	0	0	1	0	0	292	0	0	27	0
Lane Group Flow (vph)	47	836	0	182	1040	0	118	149	0	147	14	0
Confl. Peds. (#/hr)	5					5			10	10		
Heavy Vehicles (%)	4%	4%	0%	7%	2%	3%	20%	0%	0%	3%	0%	5%
Bus Blockages (#/hr)	0	0	0	0	0	13	0	0	0	0	0	0
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	4.8	53.8		20.9	69.9		46.3	46.3		46.3	46.3	
Effective Green, g (s)	5.8	54.8		21.9	70.9		47.3	47.3		47.3	47.3	
Actuated g/C Ratio	0.04	0.39		0.16	0.51		0.34	0.34		0.34	0.34	
Clearance Time (s)	6.0	6.3		6.0	6.3		6.7	6.7		6.7	6.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	69	1330		255	1760		377	526		147	513	
v/s Ratio Prot	0.03	c0.25		c0.11	0.30			0.10			0.01	
v/s Ratio Perm							0.11			c0.34		
v/c Ratio	0.68	0.63		0.71	0.59		0.31	0.28		1.00	0.03	
Uniform Delay, d1	66.2	34.4		56.1	24.3		34.3	33.9		46.4	31.0	
Progression Factor	1.00	1.00		1.20	0.70		1.00	1.00		1.00	1.00	
Incremental Delay, d2	24.2	2.3		7.6	1.2		0.5	0.3		74.2	0.0	
Delay (s)	90.4	36.6		75.1	18.3		34.8	34.2		120.6	31.0	
Level of Service	F	D		E	B		C	C		F	C	
Approach Delay (s)		39.5			26.8			34.4			101.0	
Approach LOS		D			C			C			F	

Intersection Summary			
HCM 2000 Control Delay	37.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	78.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Whites Road & Bayly Street

Future Total (5 Year) AM Peak Hour

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	95	315	615	80	485	520
Future Volume (vph)	95	315	615	80	485	520
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.5	3.3	3.3	3.5
Total Lost time (s)	5.4	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	0.95	1.00	0.91	0.91
Frpb, ped/bikes	1.00	1.00	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	0.99
Satd. Flow (prot)	1662	1516	3500	1476	1542	3306
Flt Permitted	0.95	1.00	1.00	1.00	0.95	0.99
Satd. Flow (perm)	1662	1516	3500	1476	1542	3306
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	104	346	676	88	533	571
RTOR Reduction (vph)	0	37	0	51	0	0
Lane Group Flow (vph)	104	309	676	37	357	747
Confl. Peds. (#/hr)				5	5	
Heavy Vehicles (%)	5%	3%	2%	4%	3%	2%
Turn Type	Perm	pm+ov	NA	Perm	Split	NA
Protected Phases		2	5		2	2
Permitted Phases	8	8		5		
Actuated Green, G (s)	12.4	62.3	27.3	27.3	49.9	49.9
Effective Green, g (s)	13.4	64.3	28.3	28.3	50.9	50.9
Actuated g/C Ratio	0.12	0.58	0.26	0.26	0.46	0.46
Clearance Time (s)	6.4	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	202	968	900	379	713	1529
v/s Ratio Prot		0.15	c0.19		c0.23	0.23
v/s Ratio Perm	c0.06	0.06		0.02		
v/c Ratio	0.51	0.32	0.75	0.10	0.50	0.49
Uniform Delay, d1	45.3	11.7	37.6	31.1	20.7	20.5
Progression Factor	1.00	1.00	1.00	1.00	0.91	0.91
Incremental Delay, d2	2.2	0.2	3.6	0.1	2.4	1.1
Delay (s)	47.5	11.9	41.2	31.2	21.3	19.7
Level of Service	D	B	D	C	C	B
Approach Delay (s)	20.1		40.0			20.2
Approach LOS	C		D			C

Intersection Summary			
HCM 2000 Control Delay	26.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.4
Intersection Capacity Utilization	58.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: Highway 401 WB Off-Ramp & Kingston Road

Future Total (5 Year) AM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	905	10	350	645	600	90
Future Volume (vph)	905	10	350	645	600	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.3	3.5	3.3	3.3
Total Lost time (s)	6.2		2.0	6.2	4.4	4.4
Lane Util. Factor	0.95		1.00	0.95	0.97	1.00
Frt	1.00		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3420		1711	3500	3286	1531
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3420		1711	3500	3286	1531
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	1040	11	402	741	690	103
RTOR Reduction (vph)	1	0	0	0	0	27
Lane Group Flow (vph)	1050	0	402	741	690	76
Heavy Vehicles (%)	4%	25%	2%	2%	3%	2%
Turn Type	NA		Prot	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases						8
Actuated Green, G (s)	45.6		28.3	76.9	30.5	30.5
Effective Green, g (s)	46.6		29.3	77.9	31.5	31.5
Actuated g/C Ratio	0.39		0.24	0.65	0.26	0.26
Clearance Time (s)	7.2		3.0	7.2	5.4	5.4
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1328		417	2272	862	401
v/s Ratio Prot	c0.31		c0.24	0.21	c0.21	
v/s Ratio Perm						0.05
v/c Ratio	0.79		0.96	0.33	0.80	0.19
Uniform Delay, d1	32.4		44.8	9.4	41.3	34.4
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	4.9		34.5	0.4	5.4	0.2
Delay (s)	37.3		79.4	9.8	46.7	34.6
Level of Service	D		E	A	D	C
Approach Delay (s)	37.3			34.2	45.1	
Approach LOS	D			C	D	

Intersection Summary			
HCM 2000 Control Delay	38.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.6
Intersection Capacity Utilization	74.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	700	370	0	930	635	0
Future Volume (vph)	700	370	0	930	635	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.5	3.5	3.5	3.5
Total Lost time (s)	4.5	4.5		5.7	5.7	
Lane Util. Factor	0.97	0.88		0.95	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	3319	2668		3570	3570	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	3319	2668		3570	3570	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	737	389	0	979	668	0
RTOR Reduction (vph)	0	253	0	0	0	0
Lane Group Flow (vph)	737	136	0	979	668	0
Confl. Peds. (#/hr)			5			5
Heavy Vehicles (%)	2%	3%	0%	0%	0%	0%
Turn Type	Prot	Perm		NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4				
Actuated Green, G (s)	31.1	31.1		66.7	66.7	
Effective Green, g (s)	32.1	32.1		67.7	67.7	
Actuated g/C Ratio	0.29	0.29		0.62	0.62	
Clearance Time (s)	5.5	5.5		6.7	6.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	968	778		2197	2197	
v/s Ratio Prot	c0.22			c0.27	0.19	
v/s Ratio Perm		0.05				
v/c Ratio	0.76	0.18		0.45	0.30	
Uniform Delay, d1	35.5	29.1		11.2	10.0	
Progression Factor	1.00	1.00		0.34	1.00	
Incremental Delay, d2	3.6	0.1		0.6	0.4	
Delay (s)	39.0	29.2		4.4	10.4	
Level of Service	D	C		A	B	
Approach Delay (s)	35.6			4.4	10.4	
Approach LOS	D			A	B	

Intersection Summary			
HCM 2000 Control Delay	18.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	10.2
Intersection Capacity Utilization	60.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	130	845	10	20	1115	110	25	0	15	55	5	200
Future Volume (vph)	130	845	10	20	1115	110	25	0	15	55	5	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	5.9	5.9	2.0	5.9	5.9	5.6	5.6		5.3	5.3	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.97	1.00	0.98		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.99	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85		1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1733	3433	1548	1623	3466	1533	1785	1467		1758	1558	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.30	1.00		0.75	1.00	
Satd. Flow (perm)	1733	3433	1548	1623	3466	1533	569	1467		1380	1558	
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	157	1018	12	24	1343	133	30	0	18	66	6	241
RTOR Reduction (vph)	0	0	3	0	0	38	0	16	0	0	155	0
Lane Group Flow (vph)	157	1018	9	24	1343	95	30	2	0	66	92	0
Confl. Peds. (#/hr)	5		5	5		5			5	5		
Heavy Vehicles (%)	3%	4%	0%	10%	3%	1%	0%	0%	7%	1%	0%	3%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		
Actuated Green, G (s)	16.0	77.8	77.8	3.5	65.3	65.3	12.2	12.2		12.5	12.5	
Effective Green, g (s)	17.0	78.8	78.8	4.5	66.3	66.3	13.2	13.2		13.5	13.5	
Actuated g/C Ratio	0.15	0.72	0.72	0.04	0.60	0.60	0.12	0.12		0.12	0.12	
Clearance Time (s)	3.0	6.9	6.9	3.0	6.9	6.9	6.6	6.6		6.3	6.3	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	267	2459	1108	66	2089	923	68	176		169	191	
v/s Ratio Prot	c0.09	0.30		0.01	c0.39			0.00			c0.06	
v/s Ratio Perm			0.01			0.06	0.05			0.05		
v/c Ratio	0.59	0.41	0.01	0.36	0.64	0.10	0.44	0.01		0.39	0.48	
Uniform Delay, d1	43.2	6.3	4.4	51.4	14.2	9.3	45.0	42.7		44.5	45.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.3	0.5	0.0	3.4	1.5	0.2	4.5	0.0		1.5	1.9	
Delay (s)	46.5	6.8	4.5	54.7	15.7	9.5	49.5	42.7		46.0	46.9	
Level of Service	D	A	A	D	B	A	D	D		D	D	
Approach Delay (s)		12.0			15.8			46.9			46.7	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	18.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	72.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
2: Site Access (West) & Kingston Road

Future Total (10 Year) AM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	770	0	0	1010	0	0
Future Volume (Veh/h)	770	0	0	1010	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	885	0	0	1161	0	0
Pedestrians					5	
Lane Width (m)					3.3	
Walking Speed (m/s)					1.2	
Percent Blockage					0	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				153		
pX, platoon unblocked					0.78	
vC, conflicting volume			890		1470	448
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			890		1051	448
tC, single (s)			4.1		7.1	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.6	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			767		159	562

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1
Volume Total	442	442	0	0	580	580	0
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	0	0
cSH	1700	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.26	0.26	0.00	0.00	0.34	0.34	0.00
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS							A
Approach Delay (s)	0.0			0.0			0.0
Approach LOS							A

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	31.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
1: Kingston Road & Rosebank Road

Future Total (10 Year) AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	670	10	15	930	65	0	0	5	95	5	120
Future Volume (vph)	30	670	10	15	930	65	0	0	5	95	5	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5
Total Lost time (s)	5.0	5.6		5.0	5.6			5.6		5.6	5.6	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99			0.85		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00			1.00		0.95	1.00	
Satd. Flow (prot)	1694	3427		1745	3429			1597		1694	1609	
Flt Permitted	0.95	1.00		0.95	1.00			1.00		0.75	1.00	
Satd. Flow (perm)	1694	3427		1745	3429			1597		1344	1609	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	34	761	11	17	1057	74	0	0	6	108	6	136
RTOR Reduction (vph)	0	1	0	0	4	0	0	5	0	0	116	0
Lane Group Flow (vph)	34	771	0	17	1127	0	0	1	0	108	26	0
Confl. Peds. (#/hr)	5					5						
Heavy Vehicles (%)	3%	4%	0%	0%	3%	1%	0%	0%	0%	3%	0%	0%
Bus Blockages (#/hr)	0	0	11	0	0	11	0	0	0	0	0	0
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	5.2	64.5		2.9	62.2			13.4		13.4	13.4	
Effective Green, g (s)	6.2	65.5		3.9	63.2			14.4		14.4	14.4	
Actuated g/C Ratio	0.06	0.66		0.04	0.63			0.14		0.14	0.14	
Clearance Time (s)	6.0	6.6		6.0	6.6			6.6		6.6	6.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	105	2244		68	2167			229		193	231	
v/s Ratio Prot	c0.02	0.23		0.01	c0.33			0.00			0.02	
v/s Ratio Perm										c0.08		
v/c Ratio	0.32	0.34		0.25	0.52			0.00		0.56	0.11	
Uniform Delay, d1	44.9	7.7		46.6	10.1			36.7		39.8	37.2	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	1.8	0.4		1.9	0.9			0.0		3.5	0.2	
Delay (s)	46.7	8.1		48.6	11.0			36.7		43.3	37.4	
Level of Service	D	A		D	B			D		D	D	
Approach Delay (s)		9.7			11.5			36.7			40.0	
Approach LOS		A			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	14.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	16.2
Intersection Capacity Utilization	49.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Whites Road & Kingston Road

Future Total (10 Year) AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	95	405	665	295	700	360	235	475	445	150	1330	125
Future Volume (vph)	95	405	665	295	700	360	235	475	445	150	1330	125
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.3	3.3	3.5	3.3	3.3	3.5	3.3	3.3	3.5	3.3
Total Lost time (s)	2.0	6.0	3.0	2.0	6.0	3.0	2.0	6.1	2.0	2.0	6.1	6.1
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1678	3400	1510	1694	3466	1505	1818	5079	1463	1722	5079	1486
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.13	1.00	1.00	0.45	1.00	1.00
Satd. Flow (perm)	1678	3400	1510	1694	3466	1505	238	5079	1463	811	5079	1486
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	104	445	731	324	769	396	258	522	489	165	1462	137
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	85	0	0	88
Lane Group Flow (vph)	104	445	731	324	769	396	258	522	404	165	1462	49
Confl. Peds. (#/hr)	15		5	5		15	10		15	15		10
Heavy Vehicles (%)	4%	5%	2%	3%	3%	2%	1%	1%	4%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	2	0	0	4
Turn Type	Prot	NA	Free	Prot	NA	Free	pm+pt	NA	pm+ov	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases			Free			Free	8		8	4		4
Actuated Green, G (s)	13.3	38.4	140.0	27.6	52.7	140.0	56.9	44.9	72.5	48.9	39.9	39.9
Effective Green, g (s)	14.3	39.4	140.0	28.6	53.7	140.0	57.9	45.9	74.5	50.9	40.9	40.9
Actuated g/C Ratio	0.10	0.28	1.00	0.20	0.38	1.00	0.41	0.33	0.53	0.36	0.29	0.29
Clearance Time (s)	3.0	7.0		3.0	7.0		3.0	7.1	3.0	3.0	7.1	7.1
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	171	956	1510	346	1329	1505	267	1665	778	359	1483	434
v/s Ratio Prot	0.06	0.13		c0.19	c0.22		c0.10	0.10	0.11	0.03	c0.29	
v/s Ratio Perm			0.48			0.26	0.30		0.17	0.13		0.03
v/c Ratio	0.61	0.47	0.48	0.94	0.58	0.26	0.97	0.31	0.52	0.46	0.99	0.11
Uniform Delay, d1	60.2	41.6	0.0	54.8	34.2	0.0	30.8	35.2	21.2	31.4	49.3	36.3
Progression Factor	1.14	0.84	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.6	1.2	0.8	32.1	1.8	0.4	45.3	0.5	0.6	0.9	20.2	0.5
Delay (s)	73.1	36.1	0.8	86.9	36.0	0.4	76.2	35.7	21.8	32.3	69.5	36.8
Level of Service	E	D	A	F	D	A	E	D	C	C	E	D
Approach Delay (s)		19.0			37.6			38.6			63.5	
Approach LOS		B			D			D			E	

Intersection Summary			
HCM 2000 Control Delay	41.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.1
Intersection Capacity Utilization	106.9%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Site Access (East)/Steeple Hill & Kingston Road

Future Total (10 Year) AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	665	65	155	875	30	100	0	375	125	0	35
Future Volume (vph)	40	665	65	155	875	30	100	0	375	125	0	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.3	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5
Total Lost time (s)	5.0	5.3		5.0	5.3		5.7	5.7		5.7	5.7	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.97		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00		1.00	0.85		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1678	3399		1631	3477		1454	1557		1686	1521	
Flt Permitted	0.95	1.00		0.95	1.00		0.73	1.00		0.25	1.00	
Satd. Flow (perm)	1678	3399		1631	3477		1118	1557		436	1521	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	47	782	76	182	1029	35	118	0	441	147	0	41
RTOR Reduction (vph)	0	4	0	0	1	0	0	292	0	0	27	0
Lane Group Flow (vph)	47	854	0	182	1063	0	118	149	0	147	14	0
Confl. Peds. (#/hr)	5					5			10	10		
Heavy Vehicles (%)	4%	4%	0%	7%	2%	3%	20%	0%	0%	3%	0%	5%
Bus Blockages (#/hr)	0	0	0	0	0	13	0	0	0	0	0	0
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	4.8	53.8		20.9	69.9		46.3	46.3		46.3	46.3	
Effective Green, g (s)	5.8	54.8		21.9	70.9		47.3	47.3		47.3	47.3	
Actuated g/C Ratio	0.04	0.39		0.16	0.51		0.34	0.34		0.34	0.34	
Clearance Time (s)	6.0	6.3		6.0	6.3		6.7	6.7		6.7	6.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	69	1330		255	1760		377	526		147	513	
v/s Ratio Prot	0.03	c0.25		c0.11	0.31			0.10			0.01	
v/s Ratio Perm							0.11			c0.34		
v/c Ratio	0.68	0.64		0.71	0.60		0.31	0.28		1.00	0.03	
Uniform Delay, d1	66.2	34.6		56.1	24.6		34.3	33.9		46.4	31.0	
Progression Factor	1.00	1.00		1.19	0.72		1.00	1.00		1.00	1.00	
Incremental Delay, d2	24.2	2.4		7.5	1.3		0.5	0.3		74.2	0.0	
Delay (s)	90.4	37.0		74.1	19.0		34.8	34.2		120.6	31.0	
Level of Service	F	D		E	B		C	C		F	C	
Approach Delay (s)		39.8			27.1			34.4			101.0	
Approach LOS		D			C			C			F	

Intersection Summary			
HCM 2000 Control Delay	37.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	79.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Whites Road & Bayly Street

Future Total (10 Year) AM Peak Hour

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	95	315	630	80	485	535
Future Volume (vph)	95	315	630	80	485	535
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.5	3.3	3.3	3.5
Total Lost time (s)	5.4	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	0.95	1.00	0.91	0.91
Frpb, ped/bikes	1.00	1.00	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	0.99
Satd. Flow (prot)	1662	1516	3500	1476	1542	3308
Flt Permitted	0.95	1.00	1.00	1.00	0.95	0.99
Satd. Flow (perm)	1662	1516	3500	1476	1542	3308
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	104	346	692	88	533	588
RTOR Reduction (vph)	0	36	0	49	0	0
Lane Group Flow (vph)	104	310	692	39	362	759
Confl. Peds. (#/hr)				5	5	
Heavy Vehicles (%)	5%	3%	2%	4%	3%	2%
Turn Type	Perm	pm+ov	NA	Perm	Split	NA
Protected Phases		2	5		2	2
Permitted Phases	8	8		5		
Actuated Green, G (s)	12.4	61.7	27.9	27.9	49.3	49.3
Effective Green, g (s)	13.4	63.7	28.9	28.9	50.3	50.3
Actuated g/C Ratio	0.12	0.58	0.26	0.26	0.46	0.46
Clearance Time (s)	6.4	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	202	960	919	387	705	1512
v/s Ratio Prot		0.15	c0.20		c0.23	0.23
v/s Ratio Perm	c0.06	0.06		0.03		
v/c Ratio	0.51	0.32	0.75	0.10	0.51	0.50
Uniform Delay, d1	45.3	12.0	37.3	30.7	21.2	21.0
Progression Factor	1.00	1.00	1.00	1.00	0.92	0.92
Incremental Delay, d2	2.2	0.2	3.5	0.1	2.6	1.2
Delay (s)	47.5	12.2	40.8	30.8	22.1	20.4
Level of Service	D	B	D	C	C	C
Approach Delay (s)	20.3		39.7			21.0
Approach LOS	C		D			C

Intersection Summary			
HCM 2000 Control Delay	27.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.4
Intersection Capacity Utilization	59.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: Highway 401 WB Off-Ramp & Kingston Road

Future Total (10 Year) AM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	920	10	360	645	615	90
Future Volume (vph)	920	10	360	645	615	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.3	3.5	3.3	3.3
Total Lost time (s)	6.2		2.0	6.2	4.4	4.4
Lane Util. Factor	0.95		1.00	0.95	0.97	1.00
Frt	1.00		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3420		1711	3500	3286	1531
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3420		1711	3500	3286	1531
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	1057	11	414	741	707	103
RTOR Reduction (vph)	1	0	0	0	0	26
Lane Group Flow (vph)	1067	0	414	741	707	77
Heavy Vehicles (%)	4%	25%	2%	2%	3%	2%
Turn Type	NA		Prot	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases						8
Actuated Green, G (s)	45.6		27.7	76.3	31.1	31.1
Effective Green, g (s)	46.6		28.7	77.3	32.1	32.1
Actuated g/C Ratio	0.39		0.24	0.64	0.27	0.27
Clearance Time (s)	7.2		3.0	7.2	5.4	5.4
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1328		409	2254	879	409
v/s Ratio Prot	c0.31		c0.24	0.21	c0.22	
v/s Ratio Perm						0.05
v/c Ratio	0.80		1.01	0.33	0.80	0.19
Uniform Delay, d1	32.6		45.6	9.6	41.0	33.9
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	5.2		47.6	0.4	5.4	0.2
Delay (s)	37.9		93.3	10.0	46.4	34.1
Level of Service	D		F	B	D	C
Approach Delay (s)	37.9			39.9	44.8	
Approach LOS	D			D	D	

Intersection Summary			
HCM 2000 Control Delay	40.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.6
Intersection Capacity Utilization	75.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
10: Whites Road & Highway 401 EB Off-Ramp

Future Total (10 Year) AM Peak Hour

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	715	380	0	945	640	0
Future Volume (vph)	715	380	0	945	640	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.5	3.5	3.5	3.5
Total Lost time (s)	4.5	4.5		5.7	5.7	
Lane Util. Factor	0.97	0.88		0.95	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	3319	2668		3570	3570	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	3319	2668		3570	3570	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	753	400	0	995	674	0
RTOR Reduction (vph)	0	247	0	0	0	0
Lane Group Flow (vph)	753	153	0	995	674	0
Confl. Peds. (#/hr)			5			5
Heavy Vehicles (%)	2%	3%	0%	0%	0%	0%
Turn Type	Prot	Perm		NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4				
Actuated Green, G (s)	31.8	31.8		66.0	66.0	
Effective Green, g (s)	32.8	32.8		67.0	67.0	
Actuated g/C Ratio	0.30	0.30		0.61	0.61	
Clearance Time (s)	5.5	5.5		6.7	6.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	989	795		2174	2174	
v/s Ratio Prot	c0.23			c0.28	0.19	
v/s Ratio Perm		0.06				
v/c Ratio	0.76	0.19		0.46	0.31	
Uniform Delay, d1	35.0	28.7		11.7	10.4	
Progression Factor	1.00	1.00		0.34	1.00	
Incremental Delay, d2	3.5	0.1		0.6	0.4	
Delay (s)	38.6	28.9		4.6	10.7	
Level of Service	D	C		A	B	
Approach Delay (s)	35.2			4.6	10.7	
Approach LOS	D			A	B	

Intersection Summary			
HCM 2000 Control Delay	18.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	10.2
Intersection Capacity Utilization	61.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
9: Car Dealer Site Access/Delta Boulevard & Kingston Road

Future Total (10 Year) AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	130	860	10	20	1130	110	25	0	15	55	5	200
Future Volume (vph)	130	860	10	20	1130	110	25	0	15	55	5	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	5.9	5.9	2.0	5.9	5.9	5.6	5.6		5.3	5.3	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.97	1.00	0.98		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.99	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85		1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1733	3433	1548	1623	3466	1533	1785	1467		1758	1558	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.30	1.00		0.75	1.00	
Satd. Flow (perm)	1733	3433	1548	1623	3466	1533	565	1467		1380	1558	
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	157	1036	12	24	1361	133	30	0	18	66	6	241
RTOR Reduction (vph)	0	0	3	0	0	38	0	16	0	0	154	0
Lane Group Flow (vph)	157	1036	9	24	1361	95	30	2	0	66	93	0
Confl. Peds. (#/hr)	5		5	5		5			5	5		
Heavy Vehicles (%)	3%	4%	0%	10%	3%	1%	0%	0%	7%	1%	0%	3%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		
Actuated Green, G (s)	16.0	77.7	77.7	3.5	65.2	65.2	12.3	12.3		12.6	12.6	
Effective Green, g (s)	17.0	78.7	78.7	4.5	66.2	66.2	13.3	13.3		13.6	13.6	
Actuated g/C Ratio	0.15	0.72	0.72	0.04	0.60	0.60	0.12	0.12		0.12	0.12	
Clearance Time (s)	3.0	6.9	6.9	3.0	6.9	6.9	6.6	6.6		6.3	6.3	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	267	2456	1107	66	2085	922	68	177		170	192	
v/s Ratio Prot	c0.09	0.30		0.01	c0.39			0.00			c0.06	
v/s Ratio Perm			0.01			0.06	0.05			0.05		
v/c Ratio	0.59	0.42	0.01	0.36	0.65	0.10	0.44	0.01		0.39	0.48	
Uniform Delay, d1	43.2	6.4	4.5	51.4	14.4	9.3	44.9	42.6		44.4	44.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.3	0.5	0.0	3.4	1.6	0.2	4.5	0.0		1.5	1.9	
Delay (s)	46.5	6.9	4.5	54.7	16.0	9.5	49.4	42.6		45.8	46.8	
Level of Service	D	A	A	D	B	A	D	D		D	D	
Approach Delay (s)		12.0			16.0			46.9			46.6	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	18.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	72.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	795	0	0	1050	0	0
Future Volume (Veh/h)	795	0	0	1050	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	914	0	0	1207	0	0
Pedestrians					5	
Lane Width (m)					3.3	
Walking Speed (m/s)					1.2	
Percent Blockage					0	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				153		
pX, platoon unblocked					0.77	
vC, conflicting volume			919		1522	462
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			919		1081	462
tC, single (s)			4.1		7.1	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.6	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			748		149	550

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1
Volume Total	457	457	0	0	604	604	0
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	0	0
cSH	1700	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.27	0.27	0.00	0.00	0.35	0.35	0.00
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS							A
Approach Delay (s)	0.0			0.0			0.0
Approach LOS							A

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	32.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	695	10	15	970	65	0	0	5	95	5	120
Future Volume (vph)	30	695	10	15	970	65	0	0	5	95	5	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5
Total Lost time (s)	5.0	5.6		5.0	5.6			5.6		5.6	5.6	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99			0.85		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00			1.00		0.95	1.00	
Satd. Flow (prot)	1694	3427		1745	3430			1597		1694	1609	
Flt Permitted	0.95	1.00		0.95	1.00			1.00		0.75	1.00	
Satd. Flow (perm)	1694	3427		1745	3430			1597		1344	1609	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	34	790	11	17	1102	74	0	0	6	108	6	136
RTOR Reduction (vph)	0	1	0	0	3	0	0	5	0	0	116	0
Lane Group Flow (vph)	34	800	0	17	1173	0	0	1	0	108	26	0
Confl. Peds. (#/hr)	5					5						
Heavy Vehicles (%)	3%	4%	0%	0%	3%	1%	0%	0%	0%	3%	0%	0%
Bus Blockages (#/hr)	0	0	11	0	0	11	0	0	0	0	0	0
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	5.2	64.5		2.9	62.2			13.4		13.4	13.4	
Effective Green, g (s)	6.2	65.5		3.9	63.2			14.4		14.4	14.4	
Actuated g/C Ratio	0.06	0.66		0.04	0.63			0.14		0.14	0.14	
Clearance Time (s)	6.0	6.6		6.0	6.6			6.6		6.6	6.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	105	2244		68	2167			229		193	231	
v/s Ratio Prot	c0.02	0.23		0.01	c0.34			0.00			0.02	
v/s Ratio Perm										c0.08		
v/c Ratio	0.32	0.36		0.25	0.54			0.00		0.56	0.11	
Uniform Delay, d1	44.9	7.8		46.6	10.3			36.7		39.8	37.2	
Progression Factor	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	1.8	0.4		1.9	1.0			0.0		3.5	0.2	
Delay (s)	46.7	8.2		48.6	11.3			36.7		43.3	37.4	
Level of Service	D	A		D	B			D		D	D	
Approach Delay (s)		9.8			11.8			36.7			40.0	
Approach LOS		A			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	14.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	16.2
Intersection Capacity Utilization	50.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Whites Road & Kingston Road

Future Total (15 Year) AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	95	420	675	295	730	360	245	495	450	150	1390	125
Future Volume (vph)	95	420	675	295	730	360	245	495	450	150	1390	125
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.3	3.3	3.5	3.3	3.3	3.5	3.3	3.3	3.5	3.3
Total Lost time (s)	2.0	6.0	3.0	2.0	6.0	3.0	2.0	6.1	2.0	2.0	6.1	6.1
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1678	3400	1510	1694	3466	1505	1818	5079	1463	1722	5079	1486
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.13	1.00	1.00	0.43	1.00	1.00
Satd. Flow (perm)	1678	3400	1510	1694	3466	1505	238	5079	1463	783	5079	1486
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	104	462	742	324	802	396	269	544	495	165	1527	137
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	80	0	0	88
Lane Group Flow (vph)	104	462	742	324	802	396	269	544	415	165	1527	49
Confl. Peds. (#/hr)	15		5	5		15	10		15	15		10
Heavy Vehicles (%)	4%	5%	2%	3%	3%	2%	1%	1%	4%	1%	1%	1%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	2	0	0	4
Turn Type	Prot	NA	Free	Prot	NA	Free	pm+pt	NA	pm+ov	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases			Free			Free	8		8	4		4
Actuated Green, G (s)	13.3	38.4	140.0	27.6	52.7	140.0	56.9	44.9	72.5	48.9	39.9	39.9
Effective Green, g (s)	14.3	39.4	140.0	28.6	53.7	140.0	57.9	45.9	74.5	50.9	40.9	40.9
Actuated g/C Ratio	0.10	0.28	1.00	0.20	0.38	1.00	0.41	0.33	0.53	0.36	0.29	0.29
Clearance Time (s)	3.0	7.0		3.0	7.0		3.0	7.1	3.0	3.0	7.1	7.1
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	171	956	1510	346	1329	1505	267	1665	778	351	1483	434
v/s Ratio Prot	0.06	0.14		c0.19	c0.23		c0.11	0.11	0.11	0.03	c0.30	
v/s Ratio Perm			0.49			0.26	0.31		0.17	0.14		0.03
v/c Ratio	0.61	0.48	0.49	0.94	0.60	0.26	1.01	0.33	0.53	0.47	1.03	0.11
Uniform Delay, d1	60.2	41.8	0.0	54.8	34.6	0.0	32.1	35.4	21.4	31.4	49.5	36.3
Progression Factor	1.11	0.90	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.5	1.3	0.9	32.1	2.0	0.4	57.0	0.5	0.7	1.0	31.3	0.5
Delay (s)	71.4	38.8	0.9	86.9	36.6	0.4	89.1	35.9	22.1	32.4	80.9	36.8
Level of Service	E	D	A	F	D	A	F	D	C	C	F	D
Approach Delay (s)		19.9			37.9			41.6			73.2	
Approach LOS		B			D			D			E	

Intersection Summary			
HCM 2000 Control Delay	45.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.1
Intersection Capacity Utilization	107.5%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Site Access (East)/Steeple Hill & Kingston Road

Future Total (15 Year) AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	690	65	155	915	30	100	0	375	125	0	35
Future Volume (vph)	40	690	65	155	915	30	100	0	375	125	0	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.3	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5
Total Lost time (s)	5.0	5.3		5.0	5.3		5.7	5.7		5.7	5.7	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.97		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00		1.00	0.85		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1678	3400		1631	3478		1454	1557		1686	1521	
Flt Permitted	0.95	1.00		0.95	1.00		0.73	1.00		0.25	1.00	
Satd. Flow (perm)	1678	3400		1631	3478		1118	1557		436	1521	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	47	812	76	182	1076	35	118	0	441	147	0	41
RTOR Reduction (vph)	0	4	0	0	1	0	0	292	0	0	27	0
Lane Group Flow (vph)	47	884	0	182	1110	0	118	149	0	147	14	0
Confl. Peds. (#/hr)	5					5			10	10		
Heavy Vehicles (%)	4%	4%	0%	7%	2%	3%	20%	0%	0%	3%	0%	5%
Bus Blockages (#/hr)	0	0	0	0	0	13	0	0	0	0	0	0
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	4.8	53.8		20.9	69.9		46.3	46.3		46.3	46.3	
Effective Green, g (s)	5.8	54.8		21.9	70.9		47.3	47.3		47.3	47.3	
Actuated g/C Ratio	0.04	0.39		0.16	0.51		0.34	0.34		0.34	0.34	
Clearance Time (s)	6.0	6.3		6.0	6.3		6.7	6.7		6.7	6.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	69	1330		255	1761		377	526		147	513	
v/s Ratio Prot	0.03	c0.26		c0.11	0.32			0.10			0.01	
v/s Ratio Perm							0.11			c0.34		
v/c Ratio	0.68	0.66		0.71	0.63		0.31	0.28		1.00	0.03	
Uniform Delay, d1	66.2	35.0		56.1	25.0		34.3	33.9		46.4	31.0	
Progression Factor	1.00	1.00		1.21	0.70		1.00	1.00		1.00	1.00	
Incremental Delay, d2	24.2	2.6		7.4	1.4		0.5	0.3		74.2	0.0	
Delay (s)	90.4	37.7		75.4	18.9		34.8	34.2		120.6	31.0	
Level of Service	F	D		E	B		C	C		F	C	
Approach Delay (s)		40.3			26.8			34.4			101.0	
Approach LOS		D			C			C			F	

Intersection Summary			
HCM 2000 Control Delay	37.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	80.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	95	315	660	80	485	560
Future Volume (vph)	95	315	660	80	485	560
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.5	3.3	3.3	3.5
Total Lost time (s)	5.4	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	0.95	1.00	0.91	0.91
Frpb, ped/bikes	1.00	1.00	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	0.99
Satd. Flow (prot)	1662	1516	3500	1476	1542	3312
Flt Permitted	0.95	1.00	1.00	1.00	0.95	0.99
Satd. Flow (perm)	1662	1516	3500	1476	1542	3312
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	104	346	725	88	533	615
RTOR Reduction (vph)	0	32	0	47	0	0
Lane Group Flow (vph)	104	314	725	41	373	775
Confl. Peds. (#/hr)				5	5	
Heavy Vehicles (%)	5%	3%	2%	4%	3%	2%
Turn Type	Perm	pm+ov	NA	Perm	Split	NA
Protected Phases		2	5		2	2
Permitted Phases	8	8		5		
Actuated Green, G (s)	12.4	60.6	29.0	29.0	48.2	48.2
Effective Green, g (s)	13.4	62.6	30.0	30.0	49.2	49.2
Actuated g/C Ratio	0.12	0.57	0.27	0.27	0.45	0.45
Clearance Time (s)	6.4	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	202	945	954	402	689	1481
v/s Ratio Prot		0.15	c0.21		c0.24	0.23
v/s Ratio Perm	c0.06	0.06		0.03		
v/c Ratio	0.51	0.33	0.76	0.10	0.54	0.52
Uniform Delay, d1	45.3	12.6	36.7	29.9	22.2	21.9
Progression Factor	1.00	1.00	1.00	1.00	0.94	0.94
Incremental Delay, d2	2.2	0.2	3.5	0.1	2.9	1.3
Delay (s)	47.5	12.8	40.2	30.0	23.8	21.8
Level of Service	D	B	D	C	C	C
Approach Delay (s)	20.8		39.1			22.5
Approach LOS	C		D			C

Intersection Summary			
HCM 2000 Control Delay	27.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.4
Intersection Capacity Utilization	60.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	940	10	375	645	645	95
Future Volume (vph)	940	10	375	645	645	95
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.3	3.5	3.3	3.3
Total Lost time (s)	6.2		2.0	6.2	4.4	4.4
Lane Util. Factor	0.95		1.00	0.95	0.97	1.00
Frt	1.00		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3420		1711	3500	3286	1531
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3420		1711	3500	3286	1531
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	1080	11	431	741	741	109
RTOR Reduction (vph)	1	0	0	0	0	26
Lane Group Flow (vph)	1090	0	431	741	741	83
Heavy Vehicles (%)	4%	25%	2%	2%	3%	2%
Turn Type	NA		Prot	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases						8
Actuated Green, G (s)	45.6		26.8	75.4	32.0	32.0
Effective Green, g (s)	46.6		27.8	76.4	33.0	33.0
Actuated g/C Ratio	0.39		0.23	0.64	0.28	0.28
Clearance Time (s)	7.2		3.0	7.2	5.4	5.4
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1328		396	2228	903	421
v/s Ratio Prot	c0.32		c0.25	0.21	c0.23	
v/s Ratio Perm						0.05
v/c Ratio	0.82		1.09	0.33	0.82	0.20
Uniform Delay, d1	33.0		46.1	10.0	40.7	33.3
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	5.8		71.1	0.4	6.0	0.2
Delay (s)	38.8		117.2	10.5	46.8	33.6
Level of Service	D		F	B	D	C
Approach Delay (s)	38.8			49.7	45.1	
Approach LOS	D			D	D	

Intersection Summary			
HCM 2000 Control Delay	44.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.6
Intersection Capacity Utilization	77.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
10: Whites Road & Highway 401 EB Off-Ramp

Future Total (15 Year) AM Peak Hour

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	745	400	0	975	645	0
Future Volume (vph)	745	400	0	975	645	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.5	3.5	3.5	3.5
Total Lost time (s)	4.5	4.5		5.7	5.7	
Lane Util. Factor	0.97	0.88		0.95	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	3319	2668		3570	3570	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	3319	2668		3570	3570	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	784	421	0	1026	679	0
RTOR Reduction (vph)	0	240	0	0	0	0
Lane Group Flow (vph)	784	181	0	1026	679	0
Confl. Peds. (#/hr)			5			5
Heavy Vehicles (%)	2%	3%	0%	0%	0%	0%
Turn Type	Prot	Perm		NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4				
Actuated Green, G (s)	32.8	32.8		65.0	65.0	
Effective Green, g (s)	33.8	33.8		66.0	66.0	
Actuated g/C Ratio	0.31	0.31		0.60	0.60	
Clearance Time (s)	5.5	5.5		6.7	6.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	1019	819		2142	2142	
v/s Ratio Prot	c0.24			c0.29	0.19	
v/s Ratio Perm		0.07				
v/c Ratio	0.77	0.22		0.48	0.32	
Uniform Delay, d1	34.6	28.3		12.3	10.9	
Progression Factor	1.00	1.00		0.33	1.00	
Incremental Delay, d2	3.6	0.1		0.7	0.4	
Delay (s)	38.1	28.4		4.8	11.3	
Level of Service	D	C		A	B	
Approach Delay (s)	34.7			4.8	11.3	
Approach LOS	C			A	B	

Intersection Summary			
HCM 2000 Control Delay	18.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	10.2
Intersection Capacity Utilization	63.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
9: Car Dealer Site Access/Delta Boulevard & Kingston Road

Future Total (15 Year) AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	130	880	10	20	1160	110	25	0	15	55	5	200
Future Volume (vph)	130	880	10	20	1160	110	25	0	15	55	5	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	5.9	5.9	2.0	5.9	5.9	5.6	5.6		5.3	5.3	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.97	1.00	0.98		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.99	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85		1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1733	3433	1548	1623	3466	1533	1785	1467		1758	1558	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.30	1.00		0.75	1.00	
Satd. Flow (perm)	1733	3433	1548	1623	3466	1533	565	1467		1380	1558	
Peak-hour factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	157	1060	12	24	1398	133	30	0	18	66	6	241
RTOR Reduction (vph)	0	0	3	0	0	38	0	16	0	0	153	0
Lane Group Flow (vph)	157	1060	9	24	1398	95	30	2	0	66	94	0
Confl. Peds. (#/hr)	5		5	5		5			5	5		
Heavy Vehicles (%)	3%	4%	0%	10%	3%	1%	0%	0%	7%	1%	0%	3%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		
Actuated Green, G (s)	16.0	77.7	77.7	3.5	65.2	65.2	12.3	12.3		12.6	12.6	
Effective Green, g (s)	17.0	78.7	78.7	4.5	66.2	66.2	13.3	13.3		13.6	13.6	
Actuated g/C Ratio	0.15	0.72	0.72	0.04	0.60	0.60	0.12	0.12		0.12	0.12	
Clearance Time (s)	3.0	6.9	6.9	3.0	6.9	6.9	6.6	6.6		6.3	6.3	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	267	2456	1107	66	2085	922	68	177		170	192	
v/s Ratio Prot	c0.09	0.31		0.01	c0.40			0.00			c0.06	
v/s Ratio Perm			0.01			0.06	0.05			0.05		
v/c Ratio	0.59	0.43	0.01	0.36	0.67	0.10	0.44	0.01		0.39	0.49	
Uniform Delay, d1	43.2	6.4	4.5	51.4	14.6	9.3	44.9	42.6		44.4	45.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.3	0.6	0.0	3.4	1.7	0.2	4.5	0.0		1.5	1.9	
Delay (s)	46.5	7.0	4.5	54.7	16.4	9.5	49.4	42.6		45.8	46.9	
Level of Service	D	A	A	D	B	A	D	D		D	D	
Approach Delay (s)		12.0			16.4			46.9			46.7	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	18.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	73.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
2: Site Access (West) & Kingston Road

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1560	170	0	1090	0	0
Future Volume (Veh/h)	1560	170	0	1090	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	1625	177	0	1135	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				153		
pX, platoon unblocked					0.80	
vC, conflicting volume			1802		2192	812
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1802		1991	812
tC, single (s)			4.1		6.8	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			347		43	316

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1
Volume Total	812	812	177	0	568	568	0
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	177	0	0	0	0
cSH	1700	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.48	0.48	0.10	0.00	0.33	0.33	0.00
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS							A
Approach Delay (s)	0.0			0.0			0.0
Approach LOS							A

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	46.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
1: Kingston Road & Rosebank Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	130	1655	5	5	1015	70	5	5	15	60	0	70
Future Volume (vph)	130	1655	5	5	1015	70	5	5	15	60	0	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5
Total Lost time (s)	5.0	5.4		5.0	5.4		5.2	5.2		5.2	5.2	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		0.99	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99		1.00	0.89		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1745	3533		1745	3491		1732	1664		1745	1549	
Flt Permitted	0.95	1.00		0.95	1.00		0.71	1.00		0.74	1.00	
Satd. Flow (perm)	1745	3533		1745	3491		1292	1664		1366	1549	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	138	1761	5	5	1080	74	5	5	16	64	0	74
RTOR Reduction (vph)	0	0	0	0	4	0	0	14	0	0	67	0
Lane Group Flow (vph)	138	1766	0	5	1150	0	5	7	0	64	7	0
Confl. Peds. (#/hr)	10					10	5					5
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	1%
Bus Blockages (#/hr)	0	0	11	0	0	11	0	0	0	0	0	0
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	13.1	71.2		1.3	59.4		8.9	8.9		8.9	8.9	
Effective Green, g (s)	14.1	72.2		2.3	60.4		9.9	9.9		9.9	9.9	
Actuated g/C Ratio	0.14	0.72		0.02	0.60		0.10	0.10		0.10	0.10	
Clearance Time (s)	6.0	6.4		6.0	6.4		6.2	6.2		6.2	6.2	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	246	2550		40	2108		127	164		135	153	
v/s Ratio Prot	c0.08	c0.50		0.00	0.33			0.00			0.00	
v/s Ratio Perm							0.00			c0.05		
v/c Ratio	0.56	0.69		0.12	0.55		0.04	0.04		0.47	0.05	
Uniform Delay, d1	40.1	7.7		47.9	11.7		40.7	40.8		42.6	40.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.9	1.6		1.4	1.0		0.1	0.1		2.6	0.1	
Delay (s)	43.0	9.3		49.3	12.7		40.9	40.9		45.2	40.9	
Level of Service	D	A		D	B		D	D		D	D	
Approach Delay (s)		11.7			12.9			40.9			42.9	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	13.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.6
Intersection Capacity Utilization	73.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	205	1050	575	255	875	565	340	1015	750	190	780	150
Future Volume (vph)	205	1050	575	255	875	565	340	1015	750	190	780	150
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.3	3.3	3.5	3.3	3.3	3.5	3.3	3.3	3.5	3.3
Total Lost time (s)	2.0	6.0	3.0	2.0	6.0	3.0	2.0	6.1	2.0	2.0	6.1	6.1
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1745	3535	1538	1728	3535	1533	1744	5079	1514	1744	5129	1457
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.21	1.00	1.00	0.16	1.00	1.00
Satd. Flow (perm)	1745	3535	1538	1728	3535	1533	380	5079	1514	285	5129	1457
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	211	1082	593	263	902	582	351	1046	773	196	804	155
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	110	0	0	56
Lane Group Flow (vph)	211	1082	593	263	902	582	351	1046	663	196	804	99
Confl. Peds. (#/hr)	20		10	10		20	10		20	20		10
Heavy Vehicles (%)	0%	1%	0%	1%	1%	0%	0%	1%	0%	0%	0%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	2	0	0	4
Turn Type	Prot	NA	Free	Prot	NA	Free	pm+pt	NA	pm+ov	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases			Free			Free	8		8	4		4
Actuated Green, G (s)	19.1	43.0	140.0	21.0	44.9	140.0	58.9	42.2	63.2	51.6	37.9	37.9
Effective Green, g (s)	20.1	44.0	140.0	22.0	45.9	140.0	59.9	43.2	65.2	53.6	38.9	38.9
Actuated g/C Ratio	0.14	0.31	1.00	0.16	0.33	1.00	0.43	0.31	0.47	0.38	0.28	0.28
Clearance Time (s)	3.0	7.0		3.0	7.0		3.0	7.1	3.0	3.0	7.1	7.1
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	250	1111	1538	271	1158	1533	347	1567	705	262	1425	404
v/s Ratio Prot	0.12	c0.31		c0.15	0.26		c0.14	0.21	c0.15	0.08	0.16	
v/s Ratio Perm			c0.39			0.38	0.29		0.29	0.21		0.07
v/c Ratio	0.84	0.97	0.39	0.97	0.78	0.38	1.01	0.67	0.94	0.75	0.56	0.24
Uniform Delay, d1	58.4	47.4	0.0	58.7	42.5	0.0	31.6	42.1	35.6	31.5	43.3	39.2
Progression Factor	1.29	0.55	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	9.7	11.6	0.3	46.3	5.2	0.7	51.3	2.3	20.7	11.1	1.6	1.4
Delay (s)	84.9	37.8	0.3	105.0	47.7	0.7	82.8	44.4	56.3	42.6	44.9	40.6
Level of Service	F	D	A	F	D	A	F	D	E	D	D	D
Approach Delay (s)		31.3			40.7			54.9			43.9	
Approach LOS		C			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	43.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.1
Intersection Capacity Utilization	110.5%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	90	1400	70	295	975	95	65	10	235	195	0	50
Future Volume (vph)	90	1400	70	295	975	95	65	10	235	195	0	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.3	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5
Total Lost time (s)	5.0	5.3		5.0	5.3		5.7	5.7		3.0	5.7	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.97		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	0.86		1.00	0.85	
Flt Protected	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Satd. Flow (prot)	1837	3511		1837	3474		1837	1560		1834	1597	
Flt Permitted	1.00	1.00		1.00	1.00		0.72	1.00		0.21	1.00	
Satd. Flow (perm)	1837	3511		1837	3474		1327	1560		378	1597	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	95	1474	74	311	1026	100	68	11	247	205	0	53
RTOR Reduction (vph)	0	3	0	0	4	0	0	172	0	0	41	0
Lane Group Flow (vph)	95	1545	0	311	1122	0	68	86	0	205	12	0
Confl. Peds. (#/hr)	10					10			15	15		
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	13	0	0	0	0	0	0
Turn Type	Prot	NA		Prot	NA		Perm	NA		pm+pt	NA	
Protected Phases	5	2		1	6			8		7	4	
Permitted Phases							8			4		
Actuated Green, G (s)	11.7	61.7		28.9	78.9		15.4	15.4		30.4	30.4	
Effective Green, g (s)	12.7	62.7		29.9	79.9		16.4	16.4		31.4	31.4	
Actuated g/C Ratio	0.09	0.45		0.21	0.57		0.12	0.12		0.22	0.22	
Clearance Time (s)	6.0	6.3		6.0	6.3		6.7	6.7		4.0	6.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	166	1572		392	1982		155	182		209	358	
v/s Ratio Prot	0.05	c0.44		c0.17	0.32			0.06		c0.08	0.01	
v/s Ratio Perm							0.05			c0.14		
v/c Ratio	0.57	0.98		0.79	0.57		0.44	0.47		0.98	0.03	
Uniform Delay, d1	61.0	38.1		52.1	19.1		57.5	57.8		50.0	42.4	
Progression Factor	1.00	1.00		0.74	2.15		1.00	1.00		1.00	1.00	
Incremental Delay, d2	4.7	19.0		6.8	0.7		2.0	1.9		56.5	0.0	
Delay (s)	65.7	57.1		45.5	41.7		59.5	59.7		106.5	42.5	
Level of Service	E	E		D	D		E	E		F	D	
Approach Delay (s)		57.6			42.5			59.6			93.4	
Approach LOS		E			D			E			F	

Intersection Summary			
HCM 2000 Control Delay	54.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	104.9%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Whites Road & Bayly Street

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	195	640	480	205	945	400
Future Volume (vph)	195	640	480	205	945	400
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.5	3.3	3.3	3.5
Total Lost time (s)	5.4	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	0.95	1.00	0.91	0.91
Frpb, ped/bikes	1.00	1.00	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	0.97
Satd. Flow (prot)	1745	1546	3535	1527	1572	3296
Flt Permitted	0.95	1.00	1.00	1.00	0.95	0.97
Satd. Flow (perm)	1745	1546	3535	1527	1572	3296
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	217	711	533	228	1050	444
RTOR Reduction (vph)	0	51	0	168	0	0
Lane Group Flow (vph)	217	660	533	60	525	969
Confl. Peds. (#/hr)				10	10	
Heavy Vehicles (%)	0%	1%	1%	0%	1%	1%
Turn Type	Perm	pm+ov	NA	Perm	Split	NA
Protected Phases		2	5		2	2
Permitted Phases	8	8		5		
Actuated Green, G (s)	18.9	65.6	24.0	24.0	46.7	46.7
Effective Green, g (s)	19.9	67.6	25.0	25.0	47.7	47.7
Actuated g/C Ratio	0.18	0.61	0.23	0.23	0.43	0.43
Clearance Time (s)	6.4	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	315	1034	803	347	681	1429
v/s Ratio Prot		c0.28	c0.15		c0.33	0.29
v/s Ratio Perm	0.12	0.15		0.04		
v/c Ratio	0.69	0.64	0.66	0.17	0.77	0.68
Uniform Delay, d1	42.2	13.4	38.7	34.2	26.5	25.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	6.2	1.3	2.1	0.2	8.2	2.6
Delay (s)	48.3	14.8	40.8	34.4	34.7	27.6
Level of Service	D	B	D	C	C	C
Approach Delay (s)	22.6		38.9			30.1
Approach LOS	C		D			C

Intersection Summary			
HCM 2000 Control Delay	30.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.4
Intersection Capacity Utilization	71.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: Highway 401 WB Off-Ramp & Kingston Road

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1735	25	275	965	580	80
Future Volume (vph)	1735	25	275	965	580	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.3	3.5	3.3	3.3
Total Lost time (s)	6.2		2.0	6.2	4.4	4.4
Lane Util. Factor	0.95		1.00	0.95	0.97	1.00
Frt	1.00		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3528		1694	3535	3351	1531
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3528		1694	3535	3351	1531
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1826	26	289	1016	611	84
RTOR Reduction (vph)	1	0	0	0	0	20
Lane Group Flow (vph)	1851	0	289	1016	611	64
Heavy Vehicles (%)	1%	0%	3%	1%	1%	2%
Turn Type	NA		Prot	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases						8
Actuated Green, G (s)	73.9		24.1	101.0	26.4	26.4
Effective Green, g (s)	74.9		25.1	102.0	27.4	27.4
Actuated g/C Ratio	0.54		0.18	0.73	0.20	0.20
Clearance Time (s)	7.2		3.0	7.2	5.4	5.4
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1887		303	2575	655	299
v/s Ratio Prot	c0.52		c0.17	0.29	c0.18	
v/s Ratio Perm						0.04
v/c Ratio	0.98		0.95	0.39	0.93	0.21
Uniform Delay, d1	31.9		56.9	7.2	55.4	47.3
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	16.7		39.1	0.5	20.3	0.4
Delay (s)	48.5		96.0	7.7	75.7	47.6
Level of Service	D		F	A	E	D
Approach Delay (s)	48.5			27.3	72.3	
Approach LOS	D			C	E	

Intersection Summary			
HCM 2000 Control Delay	45.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.6
Intersection Capacity Utilization	92.7%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
10: Whites Road & Highway 401 EB Off-Ramp

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	1460	700	0	1120	645	0
Future Volume (vph)	1460	700	0	1120	645	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.5	3.5	3.5	3.5
Total Lost time (s)	4.5	4.5		5.7	5.7	
Lane Util. Factor	0.97	0.88		0.95	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	3385	2720		3570	3570	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	3385	2720		3570	3570	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	1604	769	0	1231	709	0
RTOR Reduction (vph)	0	74	0	0	0	0
Lane Group Flow (vph)	1604	695	0	1231	709	0
Confl. Peds. (#/hr)			10			10
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%
Turn Type	Prot	Perm		NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4				
Actuated Green, G (s)	50.1	50.1		37.7	37.7	
Effective Green, g (s)	51.1	51.1		38.7	38.7	
Actuated g/C Ratio	0.51	0.51		0.39	0.39	
Clearance Time (s)	5.5	5.5		6.7	6.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	1729	1389		1381	1381	
v/s Ratio Prot	c0.47			c0.34	0.20	
v/s Ratio Perm		0.26				
v/c Ratio	0.93	0.50		0.89	0.51	
Uniform Delay, d1	22.7	16.1		28.7	23.4	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	9.1	0.3		9.0	1.4	
Delay (s)	31.8	16.3		37.7	24.8	
Level of Service	C	B		D	C	
Approach Delay (s)	26.8			37.7	24.8	
Approach LOS	C			D	C	

Intersection Summary			
HCM 2000 Control Delay	29.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.2
Intersection Capacity Utilization	87.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
9: Car Dealer Site Access/Delta Boulevard & Kingston Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	145	1520	45	70	1380	95	165	20	130	100	10	150
Future Volume (vph)	145	1520	45	70	1380	95	165	20	130	100	10	150
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	5.9	5.9	2.0	5.7	5.7	5.6	5.6		5.6	5.6	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.95	1.00	0.98		1.00	0.97	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00		0.99	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.87		1.00	0.86	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1785	3535	1541	1785	3535	1517	1761	1604		1773	1569	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.56	1.00		0.59	1.00	
Satd. Flow (perm)	1785	3535	1541	1785	3535	1517	1043	1604		1092	1569	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	148	1551	46	71	1408	97	168	20	133	102	10	153
RTOR Reduction (vph)	0	0	19	0	0	31	0	106	0	0	122	0
Lane Group Flow (vph)	148	1551	27	71	1408	66	168	47	0	102	41	0
Confl. Peds. (#/hr)	10		5	5		10	10		5	5		10
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		
Actuated Green, G (s)	14.3	63.7	63.7	8.4	58.0	58.0	21.4	21.4		21.4	21.4	
Effective Green, g (s)	15.3	64.7	64.7	9.4	59.0	59.0	22.4	22.4		22.4	22.4	
Actuated g/C Ratio	0.14	0.59	0.59	0.09	0.54	0.54	0.20	0.20		0.20	0.20	
Clearance Time (s)	3.0	6.9	6.9	3.0	6.7	6.7	6.6	6.6		6.6	6.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	248	2079	906	152	1896	813	212	326		222	319	
v/s Ratio Prot	c0.08	c0.44		0.04	0.40			0.03			0.03	
v/s Ratio Perm			0.02			0.04	c0.16			0.09		
v/c Ratio	0.60	0.75	0.03	0.47	0.74	0.08	0.79	0.14		0.46	0.13	
Uniform Delay, d1	44.5	16.6	9.5	47.9	19.6	12.4	41.6	35.9		38.5	35.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.8	2.5	0.1	2.3	2.7	0.2	18.1	0.2		1.5	0.2	
Delay (s)	48.3	19.1	9.6	50.2	22.3	12.6	59.7	36.1		40.0	36.0	
Level of Service	D	B	A	D	C	B	E	D		D	D	
Approach Delay (s)		21.3			23.0			48.5			37.5	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	25.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	84.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
2: Site Access (West) & Kingston Road

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1590	170	0	1115	0	0
Future Volume (Veh/h)	1590	170	0	1115	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	1656	177	0	1161	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				153		
pX, platoon unblocked					0.79	
vC, conflicting volume			1833		2236	828
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1833		2036	828
tC, single (s)			4.1		6.8	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			337		40	308

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1
Volume Total	828	828	177	0	580	580	0
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	177	0	0	0	0
cSH	1700	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.49	0.49	0.10	0.00	0.34	0.34	0.00
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS							A
Approach Delay (s)	0.0			0.0			0.0
Approach LOS							A

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	47.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
1: Kingston Road & Rosebank Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	130	1685	5	5	1040	70	5	5	15	60	0	70
Future Volume (vph)	130	1685	5	5	1040	70	5	5	15	60	0	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5
Total Lost time (s)	5.0	5.4		5.0	5.4		5.2	5.2		5.2	5.2	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		0.99	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99		1.00	0.89		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1745	3533		1745	3492		1732	1664		1745	1549	
Flt Permitted	0.95	1.00		0.95	1.00		0.71	1.00		0.74	1.00	
Satd. Flow (perm)	1745	3533		1745	3492		1292	1664		1366	1549	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	138	1793	5	5	1106	74	5	5	16	64	0	74
RTOR Reduction (vph)	0	0	0	0	4	0	0	14	0	0	67	0
Lane Group Flow (vph)	138	1798	0	5	1176	0	5	7	0	64	7	0
Confl. Peds. (#/hr)	10					10	5					5
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	1%
Bus Blockages (#/hr)	0	0	11	0	0	11	0	0	0	0	0	0
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	13.1	71.2		1.3	59.4		8.9	8.9		8.9	8.9	
Effective Green, g (s)	14.1	72.2		2.3	60.4		9.9	9.9		9.9	9.9	
Actuated g/C Ratio	0.14	0.72		0.02	0.60		0.10	0.10		0.10	0.10	
Clearance Time (s)	6.0	6.4		6.0	6.4		6.2	6.2		6.2	6.2	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	246	2550		40	2109		127	164		135	153	
v/s Ratio Prot	c0.08	c0.51		0.00	0.34			0.00			0.00	
v/s Ratio Perm							0.00			c0.05		
v/c Ratio	0.56	0.71		0.12	0.56		0.04	0.04		0.47	0.05	
Uniform Delay, d1	40.1	7.9		47.9	11.8		40.7	40.8		42.6	40.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.9	1.7		1.4	1.1		0.1	0.1		2.6	0.1	
Delay (s)	43.0	9.5		49.3	12.9		40.9	40.9		45.2	40.9	
Level of Service	D	A		D	B		D	D		D	D	
Approach Delay (s)		11.9			13.0			40.9			42.9	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	13.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.6
Intersection Capacity Utilization	74.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Whites Road & Kingston Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	205	1075	580	255	895	565	345	1040	745	190	800	150
Future Volume (vph)	205	1075	580	255	895	565	345	1040	745	190	800	150
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.3	3.3	3.5	3.3	3.3	3.5	3.3	3.3	3.5	3.3
Total Lost time (s)	2.0	6.0	3.0	2.0	6.0	3.0	2.0	6.1	2.0	2.0	6.1	6.1
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1745	3535	1538	1728	3535	1533	1744	5079	1514	1744	5129	1457
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.20	1.00	1.00	0.15	1.00	1.00
Satd. Flow (perm)	1745	3535	1538	1728	3535	1533	363	5079	1514	266	5129	1457
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	211	1108	598	263	923	582	356	1072	768	196	825	155
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	110	0	0	56
Lane Group Flow (vph)	211	1108	598	263	923	582	356	1072	658	196	825	99
Confl. Peds. (#/hr)	20		10	10		20	10		20	20		10
Heavy Vehicles (%)	0%	1%	0%	1%	1%	0%	0%	1%	0%	0%	0%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	2	0	0	4
Turn Type	Prot	NA	Free	Prot	NA	Free	pm+pt	NA	pm+ov	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases			Free			Free	8		8	4		4
Actuated Green, G (s)	19.1	43.0	140.0	21.0	44.9	140.0	58.9	42.1	63.1	51.7	37.9	37.9
Effective Green, g (s)	20.1	44.0	140.0	22.0	45.9	140.0	59.9	43.1	65.1	53.7	38.9	38.9
Actuated g/C Ratio	0.14	0.31	1.00	0.16	0.33	1.00	0.43	0.31	0.46	0.38	0.28	0.28
Clearance Time (s)	3.0	7.0		3.0	7.0		3.0	7.1	3.0	3.0	7.1	7.1
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	250	1111	1538	271	1158	1533	342	1563	704	258	1425	404
v/s Ratio Prot	0.12	c0.31		c0.15	0.26		c0.14	0.21	c0.15	0.08	0.16	
v/s Ratio Perm			c0.39			0.38	0.30		0.29	0.21		0.07
v/c Ratio	0.84	1.00	0.39	0.97	0.80	0.38	1.04	0.69	0.94	0.76	0.58	0.24
Uniform Delay, d1	58.4	47.9	0.0	58.7	42.8	0.0	31.3	42.5	35.5	31.7	43.5	39.2
Progression Factor	1.22	1.06	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	9.1	15.4	0.3	46.3	5.7	0.7	59.7	2.5	19.6	12.1	1.7	1.4
Delay (s)	80.2	66.2	0.3	105.0	48.6	0.7	91.0	45.0	55.0	43.8	45.2	40.6
Level of Service	F	E	A	F	D	A	F	D	E	D	D	D
Approach Delay (s)		47.2			41.2			56.0			44.4	
Approach LOS		D			D			E			D	

Intersection Summary			
HCM 2000 Control Delay	48.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.1
Intersection Capacity Utilization	110.8%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Site Access (East)/Steeple Hill & Kingston Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	90	1430	70	295	1000	95	65	10	235	195	0	50
Future Volume (vph)	90	1430	70	295	1000	95	65	10	235	195	0	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.3	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5
Total Lost time (s)	5.0	5.3		5.0	5.3		5.7	5.7		3.0	5.7	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.97		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	0.86		1.00	0.85	
Flt Protected	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Satd. Flow (prot)	1837	3511		1837	3475		1837	1560		1834	1597	
Flt Permitted	1.00	1.00		1.00	1.00		0.72	1.00		0.21	1.00	
Satd. Flow (perm)	1837	3511		1837	3475		1327	1560		378	1597	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	95	1505	74	311	1053	100	68	11	247	205	0	53
RTOR Reduction (vph)	0	3	0	0	4	0	0	171	0	0	41	0
Lane Group Flow (vph)	95	1576	0	311	1149	0	68	87	0	205	12	0
Confl. Peds. (#/hr)	10					10			15	15		
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	13	0	0	0	0	0	0
Turn Type	Prot	NA		Prot	NA		Perm	NA		pm+pt	NA	
Protected Phases	5	2		1	6			8		7	4	
Permitted Phases							8			4		
Actuated Green, G (s)	11.7	61.7		28.9	78.9		15.4	15.4		30.4	30.4	
Effective Green, g (s)	12.7	62.7		29.9	79.9		16.4	16.4		31.4	31.4	
Actuated g/C Ratio	0.09	0.45		0.21	0.57		0.12	0.12		0.22	0.22	
Clearance Time (s)	6.0	6.3		6.0	6.3		6.7	6.7		4.0	6.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	166	1572		392	1983		155	182		209	358	
v/s Ratio Prot	0.05	c0.45		c0.17	0.33			0.06		c0.08	0.01	
v/s Ratio Perm							0.05			c0.14		
v/c Ratio	0.57	1.00		0.79	0.58		0.44	0.48		0.98	0.03	
Uniform Delay, d1	61.0	38.6		52.1	19.3		57.5	57.8		50.0	42.4	
Progression Factor	1.00	1.00		1.05	0.84		1.00	1.00		1.00	1.00	
Incremental Delay, d2	4.7	23.3		6.6	0.7		2.0	2.0		56.5	0.0	
Delay (s)	65.7	62.0		61.1	17.0		59.5	59.8		106.5	42.5	
Level of Service	E	E		E	B		E	E		F	D	
Approach Delay (s)		62.2			26.3			59.7			93.4	
Approach LOS		E			C			E			F	

Intersection Summary			
HCM 2000 Control Delay	50.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	105.7%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Whites Road & Bayly Street

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	195	640	490	205	945	410
Future Volume (vph)	195	640	490	205	945	410
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.5	3.3	3.3	3.5
Total Lost time (s)	5.4	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	0.95	1.00	0.91	0.91
Frpb, ped/bikes	1.00	1.00	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	0.97
Satd. Flow (prot)	1745	1546	3535	1527	1572	3297
Flt Permitted	0.95	1.00	1.00	1.00	0.95	0.97
Satd. Flow (perm)	1745	1546	3535	1527	1572	3297
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	217	711	544	228	1050	456
RTOR Reduction (vph)	0	49	0	165	0	0
Lane Group Flow (vph)	217	662	544	63	525	981
Confl. Peds. (#/hr)				10	10	
Heavy Vehicles (%)	0%	1%	1%	0%	1%	1%
Turn Type	Perm	pm+ov	NA	Perm	Split	NA
Protected Phases		2	5		2	2
Permitted Phases	8	8		5		
Actuated Green, G (s)	18.9	65.5	24.1	24.1	46.6	46.6
Effective Green, g (s)	19.9	67.5	25.1	25.1	47.6	47.6
Actuated g/C Ratio	0.18	0.61	0.23	0.23	0.43	0.43
Clearance Time (s)	6.4	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	315	1033	806	348	680	1426
v/s Ratio Prot		c0.28	c0.15		c0.33	0.30
v/s Ratio Perm	0.12	0.15		0.04		
v/c Ratio	0.69	0.64	0.67	0.18	0.77	0.69
Uniform Delay, d1	42.2	13.5	38.7	34.2	26.6	25.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	6.2	1.4	2.2	0.3	8.3	2.7
Delay (s)	48.3	14.9	41.0	34.4	34.9	27.9
Level of Service	D	B	D	C	C	C
Approach Delay (s)	22.7		39.0			30.4
Approach LOS	C		D			C

Intersection Summary			
HCM 2000 Control Delay	30.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.4
Intersection Capacity Utilization	71.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: Highway 401 WB Off-Ramp & Kingston Road

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1755	25	280	970	595	80
Future Volume (vph)	1755	25	280	970	595	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.3	3.5	3.3	3.3
Total Lost time (s)	6.2		2.0	6.2	4.4	4.4
Lane Util. Factor	0.95		1.00	0.95	0.97	1.00
Frt	1.00		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3528		1694	3535	3351	1531
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3528		1694	3535	3351	1531
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1847	26	295	1021	626	84
RTOR Reduction (vph)	0	0	0	0	0	19
Lane Group Flow (vph)	1873	0	295	1021	626	65
Heavy Vehicles (%)	1%	0%	3%	1%	1%	2%
Turn Type	NA		Prot	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases						8
Actuated Green, G (s)	73.8		24.0	100.8	26.6	26.6
Effective Green, g (s)	74.8		25.0	101.8	27.6	27.6
Actuated g/C Ratio	0.53		0.18	0.73	0.20	0.20
Clearance Time (s)	7.2		3.0	7.2	5.4	5.4
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1884		302	2570	660	301
v/s Ratio Prot	c0.53		c0.17	0.29	c0.19	
v/s Ratio Perm						0.04
v/c Ratio	0.99		0.98	0.40	0.95	0.22
Uniform Delay, d1	32.4		57.2	7.3	55.5	47.1
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	19.3		45.0	0.5	22.9	0.4
Delay (s)	51.7		102.2	7.8	78.4	47.5
Level of Service	D		F	A	E	D
Approach Delay (s)	51.7			29.0	74.7	
Approach LOS	D			C	E	

Intersection Summary			
HCM 2000 Control Delay	48.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.6
Intersection Capacity Utilization	94.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
10: Whites Road & Highway 401 EB Off-Ramp

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	1490	700	0	1130	655	0
Future Volume (vph)	1490	700	0	1130	655	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.5	3.5	3.5	3.5
Total Lost time (s)	4.5	4.5		5.7	5.7	
Lane Util. Factor	0.97	0.88		0.95	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	3385	2720		3570	3570	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	3385	2720		3570	3570	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	1637	769	0	1242	720	0
RTOR Reduction (vph)	0	72	0	0	0	0
Lane Group Flow (vph)	1637	697	0	1242	720	0
Confl. Peds. (#/hr)			10			10
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%
Turn Type	Prot	Perm		NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4				
Actuated Green, G (s)	50.3	50.3		37.5	37.5	
Effective Green, g (s)	51.3	51.3		38.5	38.5	
Actuated g/C Ratio	0.51	0.51		0.38	0.38	
Clearance Time (s)	5.5	5.5		6.7	6.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	1736	1395		1374	1374	
v/s Ratio Prot	c0.48			c0.35	0.20	
v/s Ratio Perm		0.26				
v/c Ratio	0.94	0.50		0.90	0.52	
Uniform Delay, d1	23.0	15.9		29.0	23.7	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	10.9	0.3		10.0	1.4	
Delay (s)	33.9	16.2		39.0	25.1	
Level of Service	C	B		D	C	
Approach Delay (s)	28.2			39.0	25.1	
Approach LOS	C			D	C	

Intersection Summary			
HCM 2000 Control Delay	30.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.2
Intersection Capacity Utilization	88.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
9: Car Dealer Site Access/Delta Boulevard & Kingston Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	145	1540	45	70	1400	95	165	20	130	100	10	150
Future Volume (vph)	145	1540	45	70	1400	95	165	20	130	100	10	150
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	5.9	5.9	2.0	5.7	5.7	5.6	5.6		5.6	5.6	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.95	1.00	0.98		1.00	0.97	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00		0.99	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.87		1.00	0.86	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1785	3535	1541	1785	3535	1517	1761	1604		1773	1569	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.56	1.00		0.59	1.00	
Satd. Flow (perm)	1785	3535	1541	1785	3535	1517	1043	1604		1092	1569	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	148	1571	46	71	1429	97	168	20	133	102	10	153
RTOR Reduction (vph)	0	0	19	0	0	30	0	106	0	0	122	0
Lane Group Flow (vph)	148	1571	27	71	1429	67	168	47	0	102	41	0
Confl. Peds. (#/hr)	10		5	5		10	10		5	5		10
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		
Actuated Green, G (s)	14.3	63.7	63.7	8.4	58.0	58.0	21.4	21.4		21.4	21.4	
Effective Green, g (s)	15.3	64.7	64.7	9.4	59.0	59.0	22.4	22.4		22.4	22.4	
Actuated g/C Ratio	0.14	0.59	0.59	0.09	0.54	0.54	0.20	0.20		0.20	0.20	
Clearance Time (s)	3.0	6.9	6.9	3.0	6.7	6.7	6.6	6.6		6.6	6.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	248	2079	906	152	1896	813	212	326		222	319	
v/s Ratio Prot	c0.08	c0.44		0.04	0.40			0.03			0.03	
v/s Ratio Perm			0.02			0.04	c0.16			0.09		
v/c Ratio	0.60	0.76	0.03	0.47	0.75	0.08	0.79	0.14		0.46	0.13	
Uniform Delay, d1	44.5	16.8	9.5	47.9	19.8	12.4	41.6	35.9		38.5	35.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.8	2.6	0.1	2.3	2.8	0.2	18.1	0.2		1.5	0.2	
Delay (s)	48.3	19.4	9.6	50.2	22.7	12.6	59.7	36.1		40.0	36.0	
Level of Service	D	B	A	D	C	B	E	D		D	D	
Approach Delay (s)		21.6			23.3			48.5			37.5	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	25.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	85.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
2: Site Access (West) & Kingston Road

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1670	170	0	1160	0	0
Future Volume (Veh/h)	1670	170	0	1160	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	1740	177	0	1208	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				153		
pX, platoon unblocked					0.78	
vC, conflicting volume			1917		2344	870
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1917		2157	870
tC, single (s)			4.1		6.8	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			313		33	289

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1
Volume Total	870	870	177	0	604	604	0
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	177	0	0	0	0
cSH	1700	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.51	0.51	0.10	0.00	0.36	0.36	0.00
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS							A
Approach Delay (s)	0.0			0.0			0.0
Approach LOS							A

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	49.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
1: Kingston Road & Rosebank Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	130	1765	5	5	1085	70	5	5	15	60	0	70
Future Volume (vph)	130	1765	5	5	1085	70	5	5	15	60	0	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5
Total Lost time (s)	5.0	5.4		5.0	5.4		5.2	5.2		5.2	5.2	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		0.99	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99		1.00	0.89		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1745	3533		1745	3494		1732	1664		1745	1549	
Flt Permitted	0.95	1.00		0.95	1.00		0.71	1.00		0.74	1.00	
Satd. Flow (perm)	1745	3533		1745	3494		1292	1664		1366	1549	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	138	1878	5	5	1154	74	5	5	16	64	0	74
RTOR Reduction (vph)	0	0	0	0	4	0	0	14	0	0	67	0
Lane Group Flow (vph)	138	1883	0	5	1224	0	5	7	0	64	7	0
Confl. Peds. (#/hr)	10					10	5					5
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	1%
Bus Blockages (#/hr)	0	0	11	0	0	11	0	0	0	0	0	0
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	13.1	71.2		1.3	59.4		8.9	8.9		8.9	8.9	
Effective Green, g (s)	14.1	72.2		2.3	60.4		9.9	9.9		9.9	9.9	
Actuated g/C Ratio	0.14	0.72		0.02	0.60		0.10	0.10		0.10	0.10	
Clearance Time (s)	6.0	6.4		6.0	6.4		6.2	6.2		6.2	6.2	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	246	2550		40	2110		127	164		135	153	
v/s Ratio Prot	c0.08	c0.53		0.00	0.35			0.00			0.00	
v/s Ratio Perm							0.00			c0.05		
v/c Ratio	0.56	0.74		0.12	0.58		0.04	0.04		0.47	0.05	
Uniform Delay, d1	40.1	8.3		47.9	12.1		40.7	40.8		42.6	40.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.9	2.0		1.4	1.2		0.1	0.1		2.6	0.1	
Delay (s)	43.0	10.2		49.3	13.2		40.9	40.9		45.2	40.9	
Level of Service	D	B		D	B		D	D		D	D	
Approach Delay (s)		12.5			13.4			40.9			42.9	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	14.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	15.6
Intersection Capacity Utilization	76.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
4: Whites Road & Kingston Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	205	1125	610	255	930	565	355	1090	755	190	835	150
Future Volume (vph)	205	1125	610	255	930	565	355	1090	755	190	835	150
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.3	3.3	3.5	3.3	3.3	3.5	3.3	3.3	3.5	3.3
Total Lost time (s)	2.0	6.0	3.0	2.0	6.0	3.0	2.0	6.1	2.0	2.0	6.1	6.1
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1745	3535	1538	1728	3535	1533	1744	5079	1514	1744	5129	1457
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.18	1.00	1.00	0.13	1.00	1.00
Satd. Flow (perm)	1745	3535	1538	1728	3535	1533	335	5079	1514	231	5129	1457
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	211	1160	629	263	959	582	366	1124	778	196	861	155
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	110	0	0	56
Lane Group Flow (vph)	211	1160	629	263	959	582	366	1124	668	196	861	99
Confl. Peds. (#/hr)	20		10	10		20	10		20	20		10
Heavy Vehicles (%)	0%	1%	0%	1%	1%	0%	0%	1%	0%	0%	0%	3%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	2	0	0	4
Turn Type	Prot	NA	Free	Prot	NA	Free	pm+pt	NA	pm+ov	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases			Free			Free	8		8	4		4
Actuated Green, G (s)	19.1	43.0	140.0	21.0	44.9	140.0	58.9	42.0	63.0	51.8	37.9	37.9
Effective Green, g (s)	20.1	44.0	140.0	22.0	45.9	140.0	59.9	43.0	65.0	53.8	38.9	38.9
Actuated g/C Ratio	0.14	0.31	1.00	0.16	0.33	1.00	0.43	0.31	0.46	0.38	0.28	0.28
Clearance Time (s)	3.0	7.0		3.0	7.0		3.0	7.1	3.0	3.0	7.1	7.1
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	250	1111	1538	271	1158	1533	334	1559	702	249	1425	404
v/s Ratio Prot	0.12	c0.33		c0.15	0.27		c0.15	0.22	c0.15	0.08	0.17	
v/s Ratio Perm			c0.41			0.38	0.32		0.29	0.22		0.07
v/c Ratio	0.84	1.04	0.41	0.97	0.83	0.38	1.10	0.72	0.95	0.79	0.60	0.24
Uniform Delay, d1	58.4	48.0	0.0	58.7	43.4	0.0	30.9	43.2	36.0	32.1	43.9	39.2
Progression Factor	1.30	0.53	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	6.8	27.1	0.2	46.3	6.9	0.7	77.4	2.9	22.7	15.1	1.9	1.4
Delay (s)	82.5	52.6	0.2	105.0	50.3	0.7	108.3	46.1	58.7	47.2	45.8	40.6
Level of Service	F	D	A	F	D	A	F	D	E	D	D	D
Approach Delay (s)		39.3			42.3			60.5			45.3	
Approach LOS		D			D			E			D	

Intersection Summary			
HCM 2000 Control Delay	47.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.1
Intersection Capacity Utilization	112.5%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Site Access (East)/Steeple Hill & Kingston Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	90	1510	70	295	1045	95	65	10	235	195	0	50
Future Volume (vph)	90	1510	70	295	1045	95	65	10	235	195	0	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.3	3.3	3.5	3.5	3.3	3.5	3.5	3.3	3.5	3.5
Total Lost time (s)	5.0	5.3		5.0	5.3		5.7	5.7		3.5	5.7	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.97		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	0.86		1.00	0.85	
Flt Protected	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Satd. Flow (prot)	1837	3512		1837	3477		1837	1560		1834	1597	
Flt Permitted	1.00	1.00		1.00	1.00		0.72	1.00		0.20	1.00	
Satd. Flow (perm)	1837	3512		1837	3477		1327	1560		367	1597	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	95	1589	74	311	1100	100	68	11	247	205	0	53
RTOR Reduction (vph)	0	2	0	0	4	0	0	168	0	0	41	0
Lane Group Flow (vph)	95	1661	0	311	1196	0	68	90	0	205	12	0
Confl. Peds. (#/hr)	10					10			15	15		
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	0	0	0	0	13	0	0	0	0	0	0
Turn Type	Prot	NA		Prot	NA		Perm	NA		pm+pt	NA	
Protected Phases	5	2		1	6			8		7	4	
Permitted Phases							8			4		
Actuated Green, G (s)	11.7	61.7		28.8	78.8		15.5	15.5		30.5	30.5	
Effective Green, g (s)	12.7	62.7		29.8	79.8		16.5	16.5		31.5	31.5	
Actuated g/C Ratio	0.09	0.45		0.21	0.57		0.12	0.12		0.22	0.22	
Clearance Time (s)	6.0	6.3		6.0	6.3		6.7	6.7		4.5	6.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	166	1572		391	1981		156	183		203	359	
v/s Ratio Prot	0.05	c0.47		c0.17	0.34			0.06		c0.08	0.01	
v/s Ratio Perm							0.05			c0.14		
v/c Ratio	0.57	1.06		0.80	0.60		0.44	0.49		1.01	0.03	
Uniform Delay, d1	61.0	38.6		52.2	19.7		57.4	57.8		50.4	42.4	
Progression Factor	1.00	1.00		0.72	2.14		1.00	1.00		1.00	1.00	
Incremental Delay, d2	4.7	39.3		6.1	0.8		1.9	2.1		65.7	0.0	
Delay (s)	65.7	77.9		43.8	43.0		59.4	59.9		116.1	42.4	
Level of Service	E	E		D	D		E	E		F	D	
Approach Delay (s)		77.3			43.1			59.8			101.0	
Approach LOS		E			D			E			F	

Intersection Summary			
HCM 2000 Control Delay	64.0	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	19.5
Intersection Capacity Utilization	108.0%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Whites Road & Bayly Street

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	195	640	520	205	945	435
Future Volume (vph)	195	640	520	205	945	435
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.5	3.3	3.3	3.5
Total Lost time (s)	5.4	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	0.95	1.00	0.91	0.91
Frpb, ped/bikes	1.00	1.00	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	0.97
Satd. Flow (prot)	1745	1546	3535	1527	1572	3300
Flt Permitted	0.95	1.00	1.00	1.00	0.95	0.97
Satd. Flow (perm)	1745	1546	3535	1527	1572	3300
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	217	711	578	228	1050	483
RTOR Reduction (vph)	0	43	0	154	0	0
Lane Group Flow (vph)	217	668	578	74	525	1008
Confl. Peds. (#/hr)				10	10	
Heavy Vehicles (%)	0%	1%	1%	0%	1%	1%
Turn Type	Perm	pm+ov	NA	Perm	Split	NA
Protected Phases		2	5		2	2
Permitted Phases	8	8		5		
Actuated Green, G (s)	18.9	64.7	24.9	24.9	45.8	45.8
Effective Green, g (s)	19.9	66.7	25.9	25.9	46.8	46.8
Actuated g/C Ratio	0.18	0.61	0.24	0.24	0.43	0.43
Clearance Time (s)	6.4	7.0	7.0	7.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	315	1021	832	359	668	1404
v/s Ratio Prot		c0.28	c0.16		c0.33	0.31
v/s Ratio Perm	0.12	0.15		0.05		
v/c Ratio	0.69	0.65	0.69	0.20	0.79	0.72
Uniform Delay, d1	42.2	14.1	38.4	33.8	27.3	26.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	6.2	1.5	2.5	0.3	9.0	3.2
Delay (s)	48.3	15.6	41.0	34.1	36.3	29.3
Level of Service	D	B	D	C	D	C
Approach Delay (s)	23.3		39.0			31.7
Approach LOS	C		D			C

Intersection Summary			
HCM 2000 Control Delay	31.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.4
Intersection Capacity Utilization	71.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
5: Highway 401 WB Off-Ramp & Kingston Road

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1815	25	295	980	620	85
Future Volume (vph)	1815	25	295	980	620	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.5	3.5	3.3	3.5	3.3	3.3
Total Lost time (s)	6.2		2.0	6.2	4.4	4.4
Lane Util. Factor	0.95		1.00	0.95	0.97	1.00
Frt	1.00		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3528		1694	3535	3351	1531
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3528		1694	3535	3351	1531
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1911	26	311	1032	653	89
RTOR Reduction (vph)	0	0	0	0	0	19
Lane Group Flow (vph)	1937	0	311	1032	653	70
Heavy Vehicles (%)	1%	0%	3%	1%	1%	2%
Turn Type	NA		Prot	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases						8
Actuated Green, G (s)	73.8		24.0	100.8	26.6	26.6
Effective Green, g (s)	74.8		25.0	101.8	27.6	27.6
Actuated g/C Ratio	0.53		0.18	0.73	0.20	0.20
Clearance Time (s)	7.2		3.0	7.2	5.4	5.4
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1884		302	2570	660	301
v/s Ratio Prot	c0.55		c0.18	0.29	c0.19	
v/s Ratio Perm						0.05
v/c Ratio	1.03		1.03	0.40	0.99	0.23
Uniform Delay, d1	32.6		57.5	7.4	56.1	47.3
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	28.2		59.7	0.5	32.0	0.4
Delay (s)	60.8		117.2	7.8	88.0	47.7
Level of Service	E		F	A	F	D
Approach Delay (s)	60.8			33.2	83.2	
Approach LOS	E			C	F	

Intersection Summary			
HCM 2000 Control Delay	55.7	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.6
Intersection Capacity Utilization	97.2%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
10: Whites Road & Highway 401 EB Off-Ramp

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	1555	700	0	1160	680	0
Future Volume (vph)	1555	700	0	1160	680	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.3	3.5	3.5	3.5	3.5
Total Lost time (s)	4.5	4.5		5.7	5.7	
Lane Util. Factor	0.97	0.88		0.95	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	3385	2720		3570	3570	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	3385	2720		3570	3570	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	1709	769	0	1275	747	0
RTOR Reduction (vph)	0	65	0	0	0	0
Lane Group Flow (vph)	1709	704	0	1275	747	0
Confl. Peds. (#/hr)			10			10
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%
Turn Type	Prot	Perm		NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4				
Actuated Green, G (s)	50.5	50.5		37.3	37.3	
Effective Green, g (s)	51.5	51.5		38.3	38.3	
Actuated g/C Ratio	0.52	0.52		0.38	0.38	
Clearance Time (s)	5.5	5.5		6.7	6.7	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	1743	1400		1367	1367	
v/s Ratio Prot	c0.50			c0.36	0.21	
v/s Ratio Perm		0.26				
v/c Ratio	0.98	0.50		0.93	0.55	
Uniform Delay, d1	23.8	15.9		29.6	24.1	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	17.1	0.3		12.8	1.6	
Delay (s)	40.8	16.2		42.4	25.6	
Level of Service	D	B		D	C	
Approach Delay (s)	33.2			42.4	25.6	
Approach LOS	C			D	C	

Intersection Summary			
HCM 2000 Control Delay	34.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.2
Intersection Capacity Utilization	91.6%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
9: Car Dealer Site Access/Delta Boulevard & Kingston Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	145	1600	45	70	1435	95	165	20	130	100	10	150
Future Volume (vph)	145	1600	45	70	1435	95	165	20	130	100	10	150
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	5.9	5.9	2.0	5.7	5.7	5.6	5.6		5.6	5.6	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.95	1.00	0.98		1.00	0.97	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00		0.99	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.87		1.00	0.86	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1785	3535	1541	1785	3535	1517	1761	1604		1773	1569	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.56	1.00		0.59	1.00	
Satd. Flow (perm)	1785	3535	1541	1785	3535	1517	1043	1604		1092	1569	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	148	1633	46	71	1464	97	168	20	133	102	10	153
RTOR Reduction (vph)	0	0	19	0	0	30	0	106	0	0	122	0
Lane Group Flow (vph)	148	1633	27	71	1464	67	168	47	0	102	41	0
Confl. Peds. (#/hr)	10		5	5		10	10		5	5		10
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2			6	8			4		
Actuated Green, G (s)	14.3	63.7	63.7	8.4	58.0	58.0	21.4	21.4		21.4	21.4	
Effective Green, g (s)	15.3	64.7	64.7	9.4	59.0	59.0	22.4	22.4		22.4	22.4	
Actuated g/C Ratio	0.14	0.59	0.59	0.09	0.54	0.54	0.20	0.20		0.20	0.20	
Clearance Time (s)	3.0	6.9	6.9	3.0	6.7	6.7	6.6	6.6		6.6	6.6	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	248	2079	906	152	1896	813	212	326		222	319	
v/s Ratio Prot	c0.08	c0.46		0.04	0.41			0.03			0.03	
v/s Ratio Perm			0.02			0.04	c0.16			0.09		
v/c Ratio	0.60	0.79	0.03	0.47	0.77	0.08	0.79	0.14		0.46	0.13	
Uniform Delay, d1	44.5	17.3	9.5	47.9	20.2	12.4	41.6	35.9		38.5	35.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.8	3.1	0.1	2.3	3.1	0.2	18.1	0.2		1.5	0.2	
Delay (s)	48.3	20.4	9.6	50.2	23.3	12.6	59.7	36.1		40.0	36.0	
Level of Service	D	C	A	D	C	B	E	D		D	D	
Approach Delay (s)		22.4			23.8			48.5			37.5	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	26.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	87.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Appendix F:
Vissim Model

1.0 *VISSIM* MODEL DEVELOPMENT

1.1 Introduction

Given the inherent limitations of standard traffic capacity analysis methods (namely the Highway Capacity Manual methodology implemented in Synchro), it was determined that in order to best assess and mitigate the projected impact of the proposed redevelopment 603-643 & 645-699 Kingston Road, *Vissim* microsimulation model of the Kingston Road and Whites Road study area would be developed, calibrated, and utilized.

The main objective of the *Vissim* modelling and simulation exercise described in the following sections of this report is to assess whether the proposed development could be appropriately accommodated without undue impacts on the local transportation network given future proposed changes, including background traffic growth from intensification along Kingston Road, as well as new transit facilities including the future Durham-Scarborough bus rapid transit (BRT) line. Specifically, this analysis has been conducted to assess existing and future traffic conditions along Kingston Road and Whites Road.

The *Vissim* microsimulation model-based analysis is complimentary to the Synchro, Highway Capacity Manual based analysis provided in the *603-643 & 645-699 Kingston Road Mixed-Use Development, Urban Transportation Considerations Report* (herein referred to as the "Urban Transportations Considerations Report"). The Synchro analysis provided in the Urban Transportation Considerations report focuses on future projected impacts at the intersection turning movement level, while the *Vissim* microsimulation analysis provides future projected impacts both network wide and on specific intersection operations (focusing on metrics that are not available with standard traffic capacity analysis methods).

1.2 Extent of the *Vissim* Model and Study Area

The *Vissim* traffic microsimulation model covers the Kingston Road corridor from Rosebank Road to the Highway 401 ramps, including signalized intersections at Kingston Road and Rosebank Road, Steeple Hill, Whites Road, Delta Boulevard, and the Highway 401 westbound ramps. The model also covers the Whites Road corridor from Sheppard Avenue to Oklahoma Drive/Granite Court, including signalized intersections at Whites Road and Sheppard Avenue, the Highway 401 eastbound off-ramp, Bayly Street, and Oklahoma Drive/Granite Court. Among other transportation system components, the model includes the following:

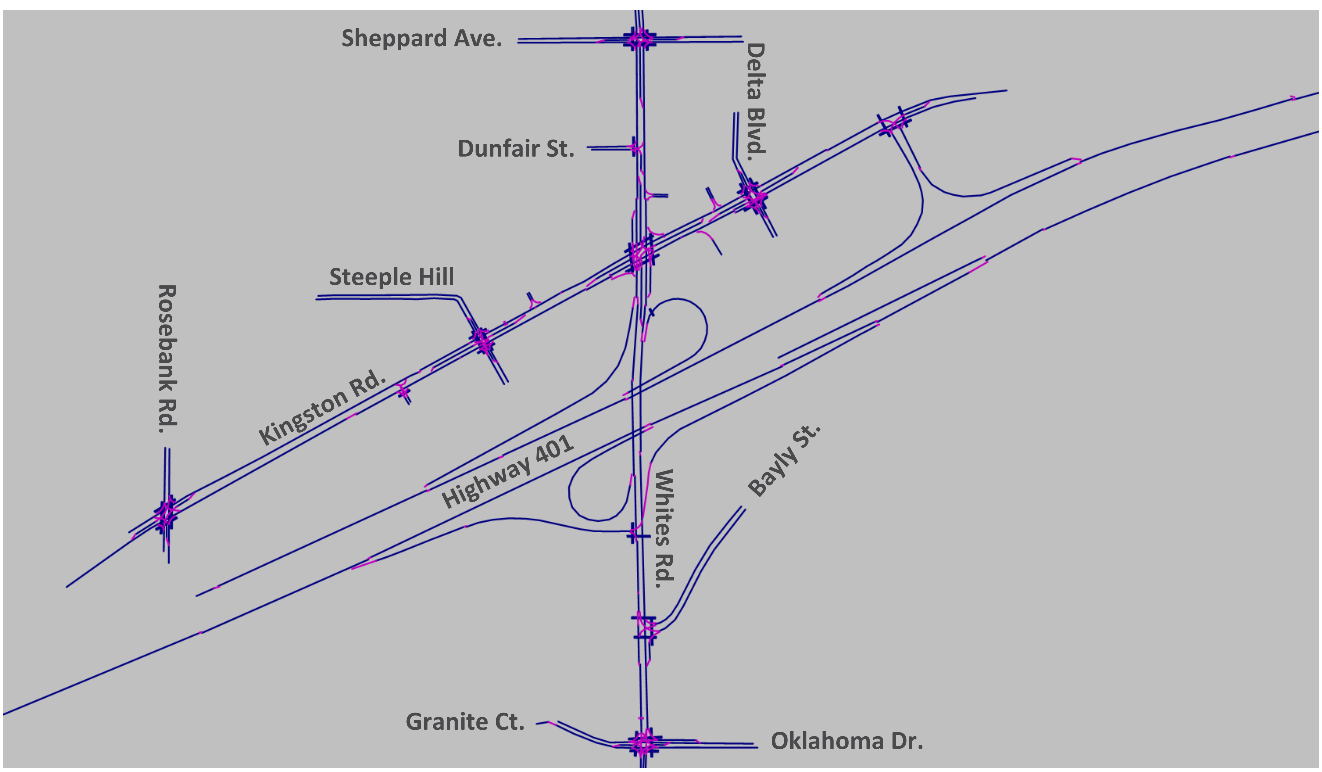
- All signalized intersections on the Kingston Road and Whites Road corridors located within the study area;
- Significant unsignalized access driveways on Kingston Road and Whites Road within the study area, notably including the west site access; and
- Existing transit facilities (bus stops) and transit vehicles operating on Kingston Road and Whites Road.

The future conditions *Vissim* traffic microsimulation model incorporates the Durham-Scarborough BRT corridor, as proposed in the *Durham-Scarborough Bus Rapid Transit Study Initial Business Case Report*, dated spring 2019 (herein referred to as the Initial Business Case). According to the service pattern proposed in the Initial Business Case, three BRT routes would operate through the study area in fully separated, dedicated bus lanes in the median of Kingston Road. Between the three routes, a combined frequency of 26 buses per hour, or about 13 buses per direction (approximately, one bus every 5 minutes) would be provided during the weekday morning peak period. There are two BRT stops proposed within the study area along Kingston Road, at Rosebank Road and Whites Road.

Figure 1 illustrates the area covered by the *Vissim* traffic microsimulation model, while **Figure 2** provides a snapshot of the model as represented in the *Vissim* development environment.

Figure 1: 603-643 & 645-699 Kingston Road *Vissim* Microsimulation Model Study Area

Figure 2: 603-643 & 645-699 Kingston Road Vissim Microsimulation Model



1.3 Data Collection & Information Gathering

In order to develop a representative model of existing traffic conditions of the surrounding area road network, several different pieces of information were gathered and incorporated into the *Vissim* microsimulation model.

1.3.1 Road Alignment & Intersection Lane Configurations

The alignments of existing roads located within the study area were determined primarily through aerial photographs provided by Bing Maps through the *Vissim* network development interface. The detailed intersection lane configurations were informed by a combination of the Bing Maps aerial photographs, as well as Google Earth and Street View imagery.

The future configuration of Kingston Road after the construction of the Durham-Scarborough BRT was determined from the details provided in the Initial Business Case. Detailed technical design information was not available during the creation of the model. An approximation of Kingston Road's cross section with the BRT was included in the "*City of Pickering's Kingston Road Corridor and Specialty Retailing Node Study's Urban Design Guidelines"* report dated November 2019 and was assumed to be the future road geometry of Kingston Road in Pickering.

1.3.2 Turning Movement Counts, Pedestrian Volumes & Signal Timing Plans

Turning movement counts, including pedestrian volumes, at all signalized and some unsignalized intersections throughout the study area were obtained from field data collection exercises conducted during the weekday morning (AM) and afternoon (PM) peak periods on behalf of BA Group.

Current signal timing plans at all signalized intersections located within the study area were provided by the Regional Municipality of Durham and incorporated into the *Vissim* traffic microsimulation model.

Detailed turning movement count data summary sheets are provided in **Appendix C of the Urban Transportation Considerations Report** while signal timing plans are included in **Appendix D of the Urban Transportation Considerations Report**.

1.3.3 Vehicle Travel Times

Vehicle travel times along the Kingston Road corridor between Rosebank Road and the Highway 401 ramps, along the Whites Road corridor between Sheppard Avenue and Oklahoma Drive/Granite Court, and along the Highway 401 eastbound off-ramp at Whites Road, were obtained with the Google Maps Distance Matrix API. Use of the Google Maps Distance Matrix API provides real-time vehicle travel times throughout the weekday morning (AM) and afternoon (PM) peak hours, allowing for a much larger sample size of individual vehicle travel times than if they were collected by typical/standard data collection methods.

The collected real-time vehicle travel times were used to define a range of measured vehicle travel times and an average vehicle travel time for each road segment within the study area.

1.4 Microsimulation Model Coding

All *Vissim* microsimulation model components and network elements were coded in accordance with engineering and modelling guidelines detailed in several documents published by various transportation agencies operating across North America. These include but are not limited to:

- VDOT *Vissim* User Guide, Virginia Department of Transportation (January 2020)
- *VISSIM Modeling Guidance*, Maryland Department of Transportation (August 2017)
- *WisDOT Microsimulation Guidelines*, Wisconsin Department of Transportation (November 2014)
- *Protocol for Vissim Simulation*, Washington State Department of Transportation (September 2014)
- *Protocol for Vissim Simulation*, Oregon Department of Transportation (June 2011)
- *Guidelines for Applying Traffic Microsimulation Modeling Software*, FHWA (June 2004)

The *Vissim* microsimulation model utilizes static vehicle inputs and routing decisions to assign turning movement volumes associated with the existing conditions, future background, and future total analysis scenarios. The intersection turning movement volumes are based on the existing counts and traffic assignment prepared as part of the Synchro analysis presented in **Section 9.2**, **Section 9.3**, and **Section 9.5 of the Urban Transportation Considerations Report**.

The following lists detail the specific microsimulation parameters and values assigned to each in the Kingston Road and Whites Road *Vissim* traffic microsimulation model.

- Desired and Reduced Speeds
  - Freeway: 100 km/h
  - Loop ramps: 40 to 60 km/h
  - Right turns: 12 to 25 km/hr
  - Left turns: 15 to 25 km/hr

- Maximum and Desired Acceleration
  - Maximum auto acceleration: 3.50 m/s^2
  - Desired auto acceleration: 3.50 m/s^2
  - Maximum auto deceleration: -7.50 m/s^2
  - Desired auto deceleration: -2.75 m/s^2

- Wiedemann 74 Driving Behaviour Parameters
  - Average standstill distance: 2.00 m
  - Additive safety distance parameter: 1.50 to 4.00
  - Multiplicative safety distance parameter: 2.50 to 5.00

- Conflict Area Gap Acceptance Parameters
  - FrontGapDef Parameter: 0.5 to 0.75
  - RearGapDef Parameter: 0.5 to 0.75
  - SatDistFactDef Parameter: 1.5 to 1.75
  - AddStopDist Parameter: 0.0 to 0.5

- Priority Rule Gap Acceptance Parameters
  - Min. Gap Time Parameter: 0.0 to 10.0 s
  - Min. Headway Parameter: 5.0 to 30.0 m
  - Max. Speed Parameter: 10.0 km/h or 180.0 km/h

2.0 EXISTING CONDITIONS *VISSIM* MODEL CALIBRATION

2.1 Objective

The general objective of calibrating the Kingston Road and Whites Road *Vissim* traffic microsimulation model was, as is the case with every calibration exercise, to ensure that the model could sensibly replicate today's existing traffic conditions as a starting point, from which predictions and forecasts regarding future traffic operations on the area road network would be obtained.

The outcome of the calibration exercise was therefore a model of existing conditions which, when used in conjunction with travel demand forecasts derived by BA Group, could credibly produce private vehicle, transit, and pedestrian-related predictions regarding future multi-modal traffic operations throughout the study area.

2.2 Model Calibration Process & Target Metrics

Data pertaining to two types of metrics describing existing traffic operations throughout the study area's transportation network were collected, summarized, and used to establish targets to be replicated by the calibrated *Vissim* model.

Simulation runs were conducted and outputs corresponding to each metric were extracted and compared to their target values. Model parameters were then adjusted, simulation sets were re-run and performance metrics re-outputted and compared to their target values. This process was repeated iteratively until model outputs were determined to match existing network metrics. The existing conditions models were calibrated with intersection turning movement count data and vehicle travel time data.

1) **Turning movement count data** was collected via turning movement counts conducted by Spectrum on behalf of BA Group at all signalized intersections and significant unsignalized intersections located throughout the study area.

2) **Vehicle travel time data** was obtained along the Kingston Road corridor between Rosebank Road and the Highway 401 ramps east of Delta Boulevard in both eastbound and westbound directions, the Whites Road corridor between Sheppard Avenue and Oklahoma Drive/Granite Court in both northbound and southbound directions, and the Highway 401 eastbound off-ramp at Whites Road. Vehicle travel time targets were set according to the Google Maps Distance Matrix API.

The outputs (of 10 simulations) from the calibrated Kingston Road and Whites Road *Vissim* existing conditions model were summarized and compared with the collected turning movement count and vehicle travel time data, and model calibration was evaluated with the Ministry of Transportation Ontario calibration criteria ("MTO calibration criteria").

2.3 Model Calibration Results

2.3.1 Intersection Traffic Volumes

Turning movement counts were conducted at all intersections throughout the study area, and outputs from the calibrated Kingston Road and Whites Road *Vissim* existing conditions model (of 10 simulations) are summarized and compared to calibration target values (i.e. field data collected via turning movement counts) in **Table 1**.

Table 1 Existing Model Calibration Turning Movement Counts (GEH)

	Turning Movement											
	NBL	**NBT**	**NBR**	**SBL**	**SBT**	**SBR**	**EBL**	**EBT**	**EBR**	**WBL**	**WBT**	**WBR**
Kingston Road & Rosebank Road												
Field Data	0 (5)	0 (5)	5 (15)	95 (60)	5 (0)	120 (70)	30 (130)	525 (1330)	10 (5)	15 (5)	740 (900)	65 (70)
***Vissim* Output**	0 (5)	0 (6)	5 (15)	88 (58)	5 (0)	122 (74)	30 (125)	518 (1344)	12 (5)	14 (5)	734 (873)	66 (72)
GEH	0 (0)	0 (0.4)	0 (0)	0.7 (0.3)	0 (0)	0.2 (0.5)	0 (0.4)	0.3 (0.4)	0.6 (0)	0.3 (0)	0.2 (0.9)	0.1 (0.2)
Kingston Road & West Site Access												
Field Data	5 (10)	--	0 (20)	--	--	--	--	620 (1365)	5 (40)	0 (10)	815 (965)	--
***Vissim* Output**	5 (9)	--	0 (20)	--	--	--	--	607 (1376)	5 (41)	0 (12)	815 (945)	--
GEH	0 (0.3)	--	0 (0)	--	--	--	--	0.5 (0.3)	0 (0.2)	0 (0.6)	0 (0.6)	--
Kingston Road & Steeple Hill/East Site Access												
Field Data	5 (35)	0 (20)	20 (140)	125 (195)	0 (15)	35 (50)	40 (95)	575 (1255)	5 (35)	30 (105)	775 (890)	30 (100)
***Vissim* Output**	4 (36)	0 (17)	22 (141)	126 (191)	0 (14)	35 (49)	36 (91)	566 (1270)	4 (32)	31 (105)	768 (870)	30 (97)
GEH	0.5 (0.2)	0 (0.7)	0.4 (0.1)	0.1 (0.3)	0 (0.3)	0 (0.1)	0.6 (0.4)	0.4 (0.4)	0.5 (0.5)	0.2 (0)	0.3 (0.7)	0 (0.3)
Kingston Road & Whites Road												
Field Data	155 (230)	440 (955)	435 (740)	150 (190)	1205 (730)	115 (130)	70 (195)	300 (1000)	350 (395)	295 (255)	565 (735)	355 (545)
***Vissim* Output**	148 (222)	445 (944)	444 (735)	142 (181)	1200 (734)	112 (121)	69 (169)	296 (1103)	351 (333)	287 (245)	567 (730)	353 (545)
GEH	0.6 (0.5)	0.2 (0.4)	0.4 (0.2)	0.7 (0.7)	0.1 (0.1)	0.3 (0.8)	0.1 (1.9)	0.2 (3.2)	0.1 (3.2)	0.5 (0.6)	0.1 (0.2)	0.1 (0)
Kingston Road & Delta Boulevard												
Field Data	25 (165)	0 (20)	15 (130)	50 (100)	5 (10)	190 (145)	130 (135)	745 (1480)	10 (45)	20 (70)	1000 (1225)	110 (95)
***Vissim* Output**	28 (166)	0 (18)	14 (130)	49 (102)	5 (9)	190 (142)	130 (144)	743 (1604)	10 (48)	20 (69)	994 (1211)	108 (91)
GEH	0.6 (0.1)	0 (0.5)	0.3 (0)	0.1 (0.2)	0 (0.3)	0 (0.3)	0 (0.8)	0.1 (3.2)	0 (0.4)	0 (0.1)	0.2 (0.4)	0.2 (0.4)
Kingston Road & Highway 401 Ramps												
Field Data	540 (525)	--	85 (75)	--	--	--	--	805 (1685)	5 (25)	335 (260)	590 (865)	--
***Vissim* Output**	539 (521)	--	81 (72)	--	--	--	--	802 (1809)	4 (27)	335 (259)	582 (857)	--
GEH	0 (0.2)	--	0.4 (0.3)	--	--	--	--	0.1 (3)	0.5 (0.4)	0 (0.1)	0.3 (0.3)	--
Whites Road & Sheppard Avenue												
Field Data	137 (126)	707 (1504)	21 (65)	45 (45)	1188 (755)	92 (32)	59 (125)	51 (171)	250 (218)	32 (77)	70 (97)	49 (44)
***Vissim* Output**	137 (120)	705 (1473)	25 (65)	46 (50)	1171 (740)	90 (30)	60 (123)	48 (164)	243 (215)	33 (80)	70 (95)	47 (44)
GEH	0 (0.5)	0.1 (0.8)	0.8 (0)	0.1 (0.7)	0.5 (0.5)	0.2 (0.4)	0.1 (0.2)	0.4 (0.5)	0.4 (0.2)	0.2 (0.3)	0 (0.2)	0.3 (0)

Whites Road & Dunfair Street												
Field Data	0 (0)	865 (1695)	--	--	1470 (1050)	--	0 (0)	--	0 (0)	--	--	--
***Vissim* Output**	0 (0)	866 (1659)	--	--	1450 (1035)	--	0 (0)	--	0 (0)	--	--	--
GEH	0 (0)	0 (0.9)	--	--	0.5 (0.5)	--	0 (0)	--	0 (0)	--	--	--
Highway 401 Ramps North of Highway 401 & Whites Road Overpass												
Field Data	--	1030 (1925)	285 (350)	--	1265 (935)	585 (445)	--	--	--	--	--	--
***Vissim* Output**	--	1027 (1897)	276 (336)	--	1262 (892)	548 (407)	--	--	--	--	--	--
GEH	--	0.1 (0.6)	0.5 (0.8)	--	0.1 (1.4)	1.6 (1.8)	--	--	--	--	--	--
Highway 401 Ramps South of Highway 401 & Whites Road Overpass												
Field Data	--	720 (1015)	185 (100)	--	625 (645)	640 (290)	595 (1260)	--	350 (700)	--	--	--
***Vissim* Output**	--	710 (982)	178 (98)	--	609 (611)	651 (286)	604 (1252)	--	354 (702)	--	--	--
GEH	--	0.4 (1)	0.5 (0.2)	--	0.6 (1.4)	0.4 (0.2)	0.4 (0.2)	--	0.2 (0.1)	--	--	--
Whites Road & Bayly Street												
Field Data	--	590 (475)	80 (205)	465 (935)	510 (410)	--	--	--	--	95 (195)	--	315 (640)
***Vissim* Output**	--	584 (466)	80 (209)	460 (907)	498 (399)	--	--	--	--	97 (205)	--	313 (626)
GEH	--	0.2 (0.4)	0 (0.3)	0.2 (0.9)	0.5 (0.5)	--	--	--	--	0.2 (0.7)	--	0.1 (0.6)
Whites Road & Oklahoma Drive/Granite Court												
Field Data	11 (9)	79 (81)	15 (8)	168 (281)	2 (123)	435 (201)	213 (428)	60 (95)	7 (25)	10 (10)	60 (40)	378 (171)
***Vissim* Output**	9 (8)	80 (80)	14 (8)	167 (279)	1 (123)	428 (200)	210 (427)	62 (94)	6 (24)	10 (11)	61 (42)	375 (165)
GEH	0.6 (0.3)	0.1 (0.1)	0.3 (0)	0.1 (0.1)	0.8 (0)	0.3 (0.1)	0.2 (0)	0.3 (0.1)	0.4 (0.2)	0 (0.3)	0.1 (0.3)	0.2 (0.5)

Note: AM (PM)

As shown in **Table 1**, all turning movements in the *Vissim* model accurately reflect data collected in the field, as demonstrated by the low (i.e. less than 3.0) GEH values corresponding to all individual turning movements throughout the study area.

2.3.2 Travel Times

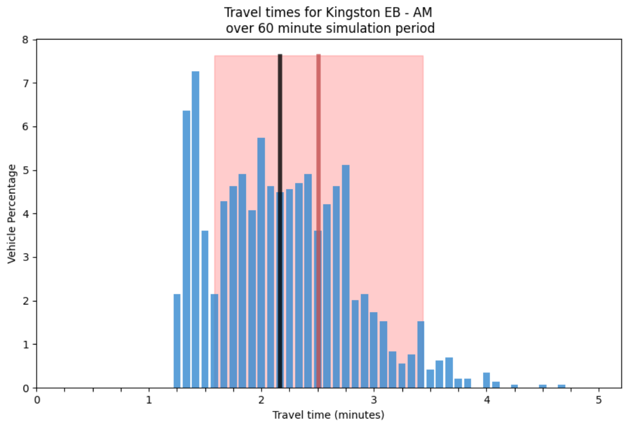
Model simulation travel time outputs for the Kingston Road corridor between Rosebank Road and the Highway 401 ramps east of Delta Boulevard, the Whites Road corridor between Sheppard Avenue and Oklahoma Drive/Granite Court, and the Highway 401 eastbound off-ramp at Whites Road were compared to vehicle travel time target data obtained with the Google Maps Distance Matrix API. Outputs from the Google Maps Distance Matrix API reflect travel times on a typical weekday (Tuesday-Thursday) during the peak morning (AM) and peak afternoon (PM) hours. Calibrated existing conditions *Vissim* model outputs (of 10 simulations) are summarized in **Table 2** and illustrated in **Figure 3** through **Figure 8**.

Table 2 Existing Model Calibration Travel Time Results

Corridor Segment	Analysis Period	Direction	Google API Range[1]	Google API Average[1]	*Vissim* Simulation Output Range[1,2]	*Vissim* Simulation Average[1]	Average % Difference
Kingston Road (Rosebank Road to the Highway 401 ramps east of Delta Boulevard)	Weekday Morning (AM) Peak Hour	Eastbound	95 – 206	151	82 – 202	133	12%
		Westbound	92 – 211	153	105 – 226	167	9%
	Weekday Afternoon (PM) Peak Hour	Eastbound	108 – 290	184	109 – 265	184	0%
		Westbound	95 – 264	173	103 – 225	157	9%
Whites Road (Sheppard Avenue to Oklahoma Drive/Granite Court)	Weekday Morning (AM) Peak Hour	Northbound	99 – 250	163	86 – 222	153	6%
		Southbound	93 – 246	161	90 – 217	157	2%
	Weekday Afternoon (PM) Peak Hour	Northbound	116 – 327	203	98 – 257	182	10%
		Southbound	104 – 265	175	99 – 224	163	7%
Highway 401 eastbound off-ramp at Whites Road	Weekday Morning (AM) Peak Hour	Eastbound	32 – 66	42	21 – 87	44	5%
	Weekday Afternoon (PM) Peak Hour	Eastbound	53 – 140	82	28 – 141	79	4%

Notes:
[1]Units in seconds
[2]90% of the vehicle travel time distribution from 10 *Vissim* simulation runs falls within this range.

Figure 3: Kingston Road - Existing Model Calibration Travel Times (AM)



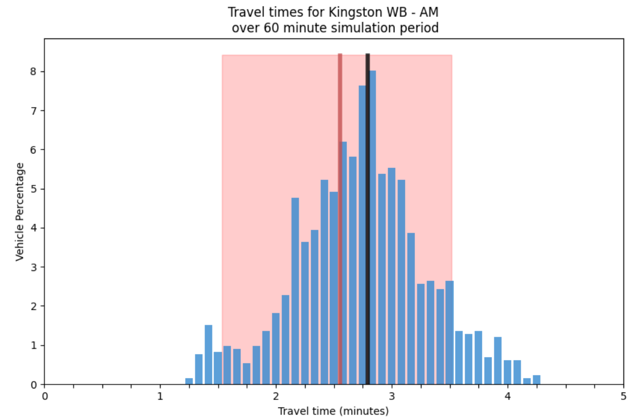
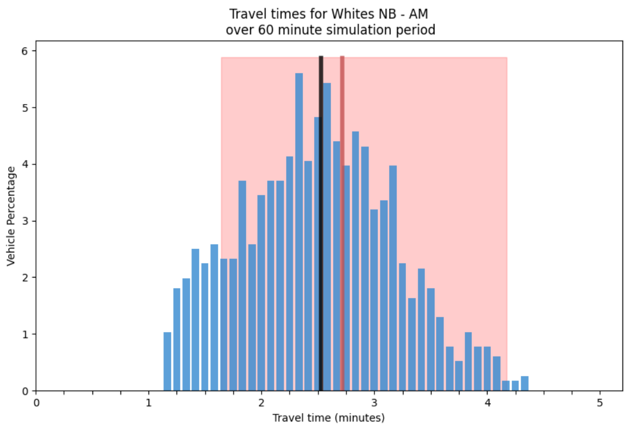


Figure 4: Whites Road - Existing Model Calibration Travel Times (AM)



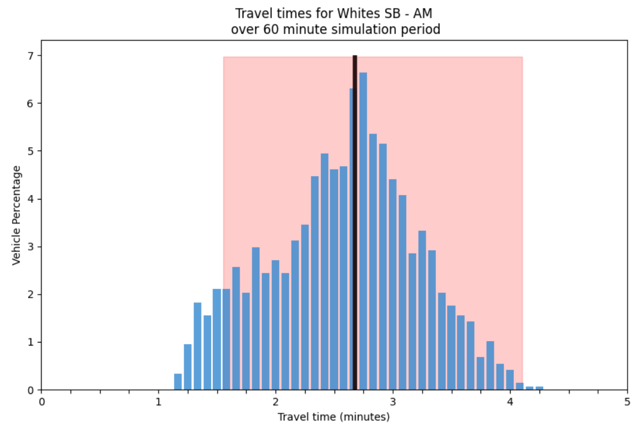


Figure 5: Hwy 401 EB Off-Ramp - Existing Model Calibration Travel Times (AM)

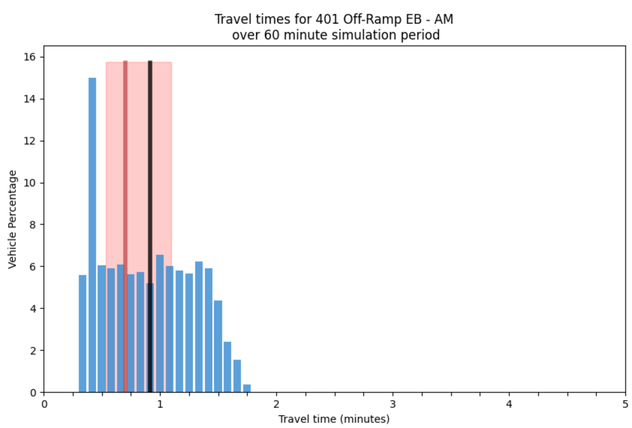


Figure 6: Kingston Road - Existing Model Calibration Travel Times (PM)

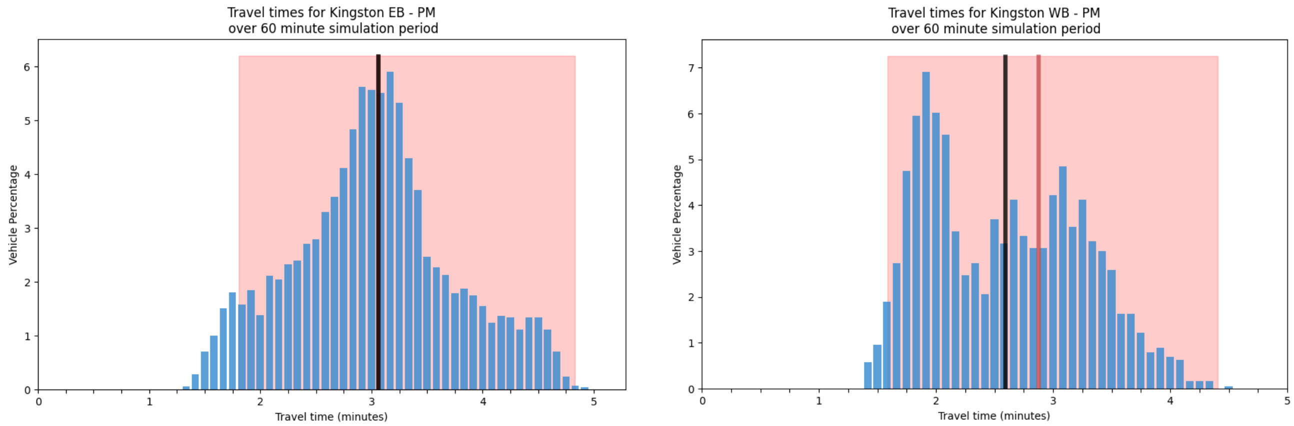


Figure 7: Whites Road - Existing Model Calibration Travel Times (PM)

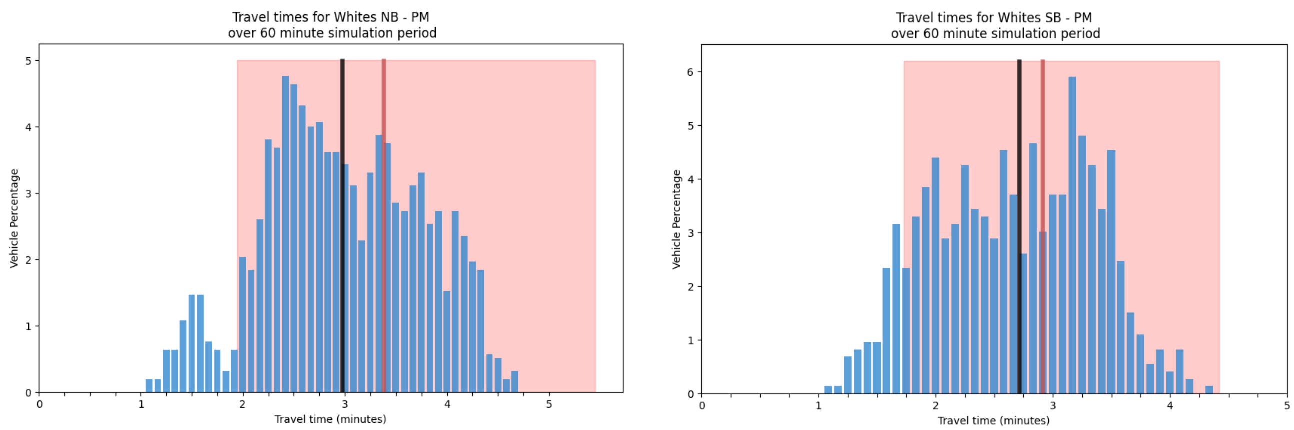
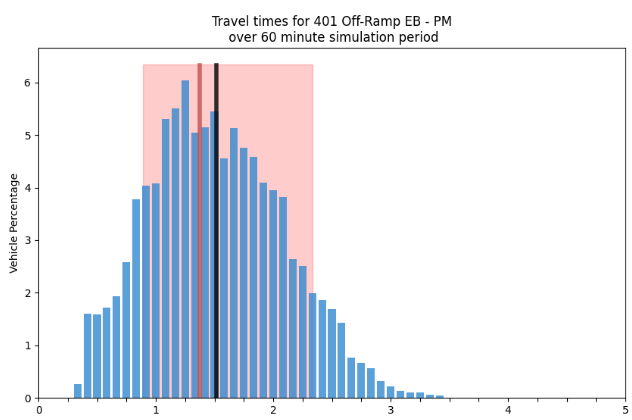


Figure 8: Hwy 401 EB Off-Ramp - Existing Model Calibration Travel Times (PM)



As shown in **Table 2** and **Figure 3** through **Figure 8**, vehicle travel times output from the *Vissim* model accurately reflect the travel time data collected with the Google Maps Distance Matrix API, as demonstrated by the low (i.e. less than 15%) percent differences between the *Vissim* model and target average vehicle travel times, and by the *Vissim* model vehicle travel time ranges falling within or closely reflecting those of the target vehicle travel time ranges.

2.3.3 MTO Calibration Criteria Evaluation

In addition to the discussion provided in **Section 2.3.1** and **Section 2.3.2**, calibration of the existing conditions *Vissim* model was also evaluated with the MTO calibration criteria. The MTO calibration criteria provides multiple metrics related to model volumes and vehicle travel times for evaluating existing conditions model calibration.

The weekday morning (AM) and afternoon (PM) existing conditions peak hour models meet the volume focused evaluation criteria thresholds, specifically those related to the model demand input, corridor screenline volumes, and turning movement volumes as illustrated in **Table 3**, **Table 4**, and **Table 5** respectively.

The weekday morning (AM) and afternoon (PM) existing conditions peak hour models also meet the model travel time evaluation criteria thresholds as illustrated in **Table 6**.

Table 3 Existing Model Demand Input Results

	Calibration Thresholds	Weekday Morning (AM)	Weekday Afternoon (PM)
% input volumes within 5% of Model / Observed	≥ 85%	100 %	100 %

Table 4 Existing Model Corridor Screenline Results

	Calibration Thresholds	Weekday Morning (AM)	Weekday Afternoon (PM)
% of links with GEH ≤ 5	≥ 85 %	100 %	100 %
% of links with GEH ≤ 10	≥ 95 %	100 %	100 %
% of links with GEH > 10	≤ 5 %	0 %	0 %
% of links with volumes between 700 and 2700 veh/h ≤ 15% Model / Observed	≥ 85%	100 %	100 %
% of links with volumes < 700 veh/h ≤ 100 vehicles of Observed	≥ 85%	100 %	99 %
Sum of all link flows	≤ 5% of sum of all link counts	0.8 %	0.6%
	GEH < 4 for sum of all link counts	GEH = 1.6	GEH = 1.3

Table 5 Existing Model Turning Movement Results

	Calibration Thresholds	Weekday Morning (AM)	Weekday Afternoon (PM)
% of turning movements with GEH ≤ 5	≥ 85 %	100 %	100 %
% of turning movements GEH ≤ 10	≥ 95 %	100 %	100 %
% of turning movements GEH > 10	≤ 5 %	0 %	0 %

Table 6 Existing Model Travel Time Results

	Calibration Thresholds	Weekday Morning (AM)	Weekday Afternoon (PM)
% of segment travel times within 15% of Model / Observed or within 60 seconds	≥ 85%	100 %	100 %

The calibration results and evaluation provided in **Section 2.3.1**, **Section 2.3.2**, and **Section 2.3.3** demonstrate that the *Vissim* simulation model of existing conditions is well calibrated and accurately reflects current traffic operations throughout the study area during the weekday morning (AM) and weekday afternoon (PM) peak hours. Therefore, the model is considered to be a suitable tool for evaluating the impact of different projected future traffic scenarios on the road network surrounding the 603-643 & 645-699 Kingston Road redevelopment.

3.0 FUTURE CONDITIONS *VISSIM* MODEL ANALYSIS

The calibrated *Vissim* microsimulation model was used to analyze and quantify the projected impacts of the 603-643 & 645-699 Kingston Road redevelopment on both the weekday morning (AM) and weekday afternoon (PM) peak hours.

Vissim microsimulation models were developed for both future background and future total scenarios. The future background model represents future conditions (i.e. accounting for future growth and local background developments) without the 603-643 & 645-699 Kingston Road redevelopment while the future total represents the future conditions with the 603-643 & 645-699 Kingston Road redevelopment. The future background and future total *Vissim* models represent a 2039 horizon year and traffic volumes are consistent with those provided in **Section 9.3** and **Section 9.5 of the Urban Transportation Considerations Report**.

As discussed previously, the future conditions *Vissim* models include planned infrastructure improvements, most notably the Durham-Scarborough BRT corridor, which operates through the study area in fully separated dedicated bus lanes in the median of Kingston Road. Snapshots of the Durham-Scarborough BRT corridor incorporated into the future conditions *Vissim* microsimulation models are provided in **Figure 9**.

As detailed in **Section 4.1.3 of the Urban Transportation Considerations Report**, network improvements have been proposed to accommodate future traffic conditions and operations associated with the Durham-Scarborough BRT. Proposed network improvements include signal timing modifications along Kingston Road and Whites Road in both the future background and future total scenario models and an additional turn lane at the Highway 401 eastbound off-ramp and Whites Road intersection resulting in an eastbound approach lane configuration of 2 dedicated left-turn lanes and 2 dedicated right-turn lanes in only the future total scenario model.

The proposed network modifications have been incorporated into the future background and future total *Vissim* microsimulation models and are consistent with the provided Highway Capacity Manual methodology-based analysis provided in **Section 10.0 of the Urban Transportation Considerations Report**.

Figure 9: Durham-Scarborough BRT at Kingston Road and Whites Road

3.1 Key performance Metrics

The projected impact of the 603-643 & 645-699 Kingston Road redevelopment have been primarily assessed through this modelling exercise with vehicle travel times along study area road segments, and vehicle queuing and delays at key study area intersections to ensure that the traffic impacts associated with the site redevelopment can be accommodated by the road network.

The analysis metrics are evaluated through a comparison of existing conditions, and projected future background and future total conditions. This provides a clear representation of the future transportation conditions throughout the area road network attributed to background growth and local background developments, as well as redevelopment of the site, allowing for the determination of whether the local road network can accommodate the projected future conditions.

Traditional Highway Capacity Manual methodology analysis outputs were provided as part of the Urban Transportation Considerations Report and taken together with the network vehicle travel time, intersection vehicle queuing and delay analysis, and a review of network average vehicle travel speed plots provided below, offer a full picture of the performance of the future road network.

3.2 Analysis Results

3.2.1 Vehicle Travel Times

The vehicle travel time analysis was conducted along the following corridor segments within the study area:

- Kingston Road between Rosebank Road and the Highway 401 ramps east of Delta Boulevard in both the eastbound and westbound direction;
- Whites Road between Sheppard Avenue and Oklahoma Drive/Granite Court in both the northbound and southbound direction; and
- Along the Highway 401 eastbound off-ramp at Whites Road.

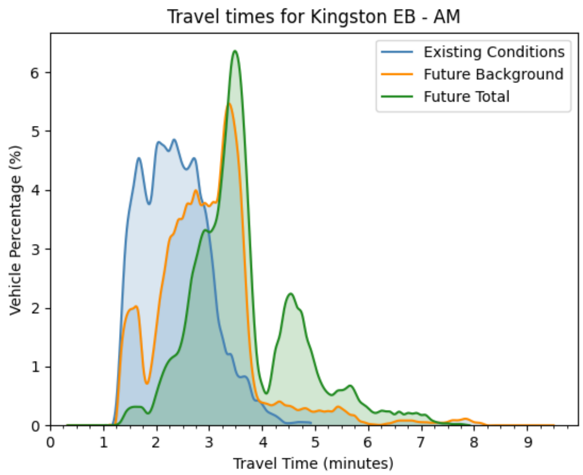
The future conditions *Vissim* model travel time results, along with a comparison of the existing conditions, future background and future total scenario travel time outputs are provided in **Table 7**. Furthermore, travel time plots comparing the projected future background, future total, and existing conditions travel times are provided in **Figure 10** through **Figure 15**.

Table 7 Future Model Analysis Projected Travel Time Results

Corridor Segment	Analysis Period	Direction	Existing Conditions		Future Background		Future Total	
			Range[1]	Average	Range[1]	Average	Range[1]	Average
Kingston Road (Rosebank Road to the Highway 401 ramps east of Delta Boulevard)	Weekday Morning (AM) Peak Hour	Eastbound	82 to 202 s	133 s	84 to 263 s	170 s	130 to 330 s	213 s
		Westbound	105 to 226 s	167 s	131 to 215 s	173 s	138 to 223 s	184 s
	Weekday Afternoon (PM) Peak Hour	Eastbound	109 to 265 s	184 s	118 to 317 s	205 s	145 to 341 s	220 s
		Westbound	103 to 225 s	157 s	119 to 250 s	183 s	144 to 244 s	197 s
Whites Road (Sheppard Avenue to Oklahoma Drive/Granite Court)	Weekday Morning (AM) Peak Hour	Northbound	86 to 222 s	153 s	75 to 199 s	133 s	88 to 240 s	156 s
		Southbound	90 to 217 s	157 s	103 to 217 s	149 s	121 to 278 s	192 s
	Weekday Afternoon (PM) Peak Hour	Northbound	98 to 257 s	182 s	105 to 272 s	184 s	114 to 291 s	198 s
		Southbound	99 to 224 s	163 s	133 to 268 s	188 s	137 to 292 s	207 s
Highway 401 eastbound off-ramp at Whites Road	Weekday Morning (AM) Peak Hour	Eastbound	21 to 87 s	44 s	27 to 124 s	76 s	33 to 175 s	98 s
	Weekday Afternoon (PM) Peak Hour	Eastbound	28 to 141 s	79 s	26 to 125 s	74 s	22 to 104 s	59 s

Notes:
[1]90% of the vehicle travel time distribution from 10 *Vissim* simulations falls within this range

Figure 10: Kingston Road - Travel Time Comparison Plots (AM)



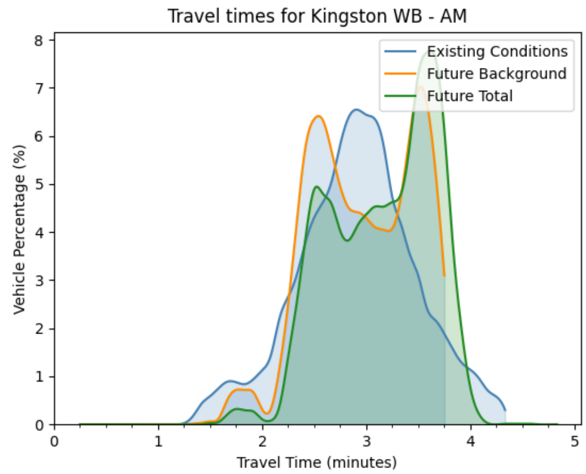
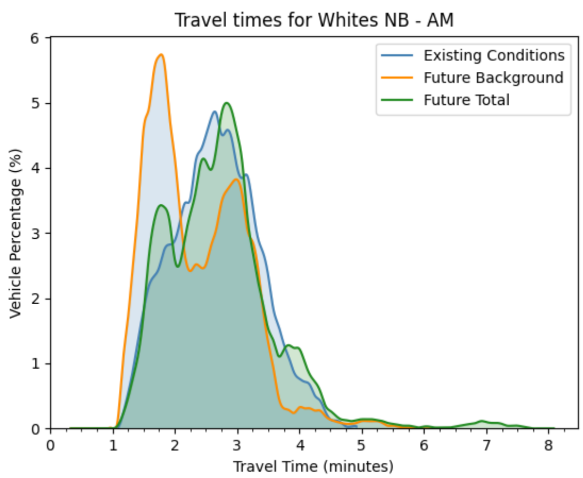


Figure 11: Whites Road - Travel Time Comparison Plots (AM)



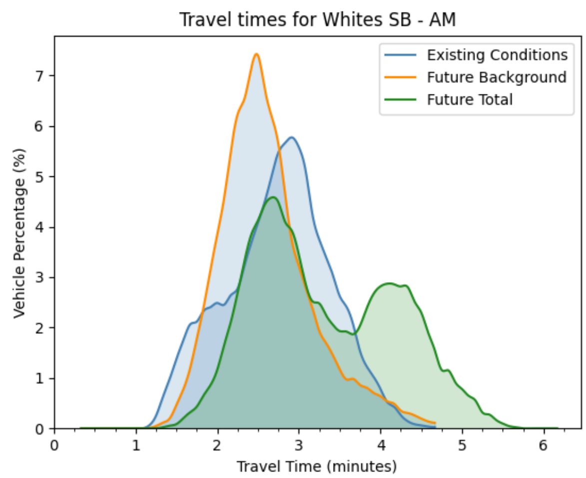


Figure 12: Hwy 401 EB Off-Ramp - Travel Time Comparison Plots (AM)

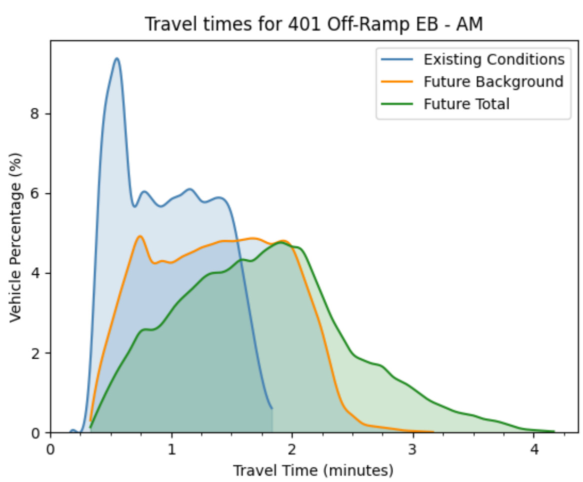


Figure 13: Kingston Road - Travel Time Comparison Plots (PM)

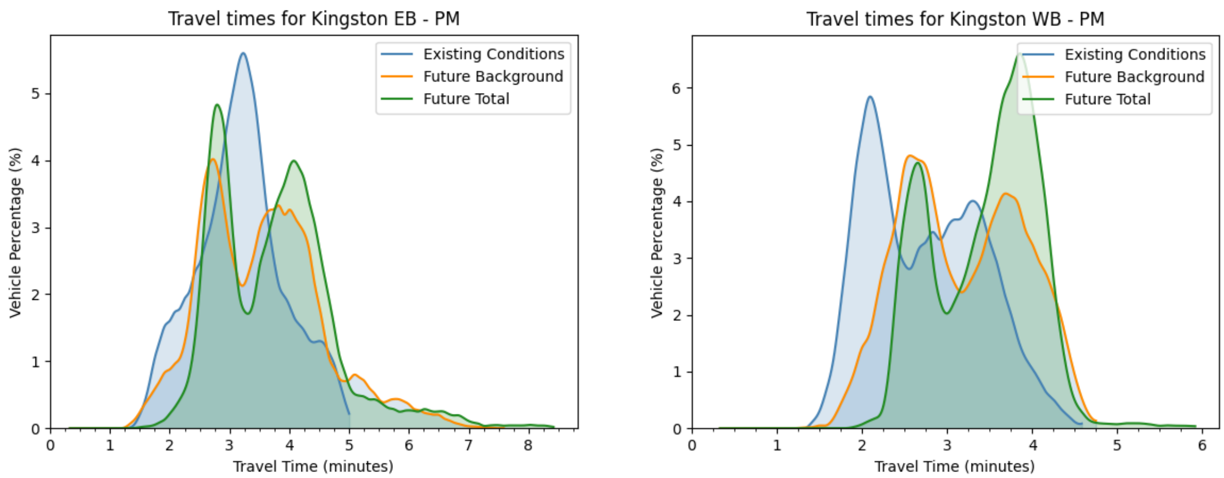


Figure 14: Whites Road - Travel Time Comparison Plots (PM)

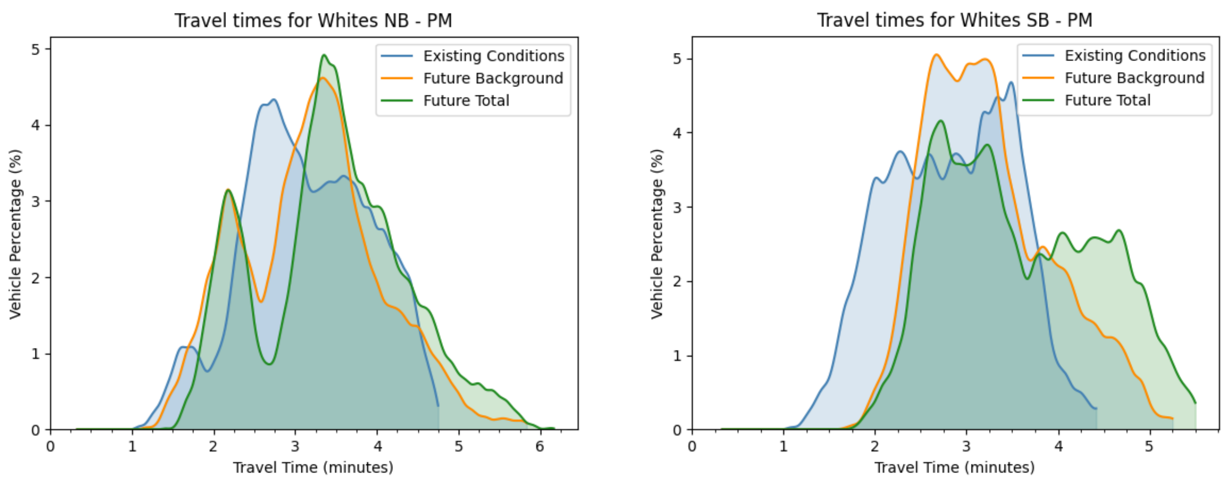
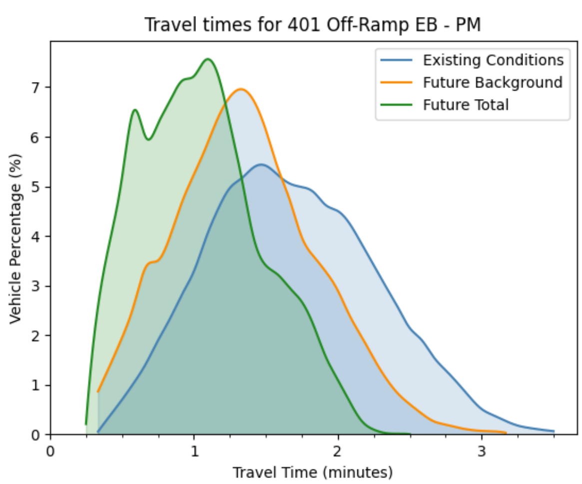


Figure 15: Hwy 401 EB Off-Ramp - Travel Time Comparison Plots (PM)



As presented in **Table 7**, and illustrated with the travel time comparison plots (**Figure 10** through **Figure 15**), it is projected that vehicular travel times will not increase significantly throughout the study area in both the weekday morning (AM) and afternoon (PM) peak hours due to the proposed redevelopment.

EXISTING AND FUTURE BACKGROUND COMPARISONS

Comparisons between the existing and future background *Vissim* model scenarios, demonstrate that average travel times are projected to increase along Kingston Road in both the eastbound and westbound directions in the order of 6 to 37 seconds during the morning (AM) peak hour and 21 to 26 seconds during the afternoon (PM) peak hour.

Average travel times along Whites Road are projected to vary for both the northbound and southbound directions with a decrease in the order of 8 to 20 seconds during the morning (AM) peak hour and an increase in the order of 2 to 25 seconds during the afternoon (PM) peak hour.

Travel time increases on Kingston Road and Whites Road are the result of the future operations associated with background traffic growth and the implementation of the future Durham-Scarborough BRT line.

Finally, when comparing existing and future background travel times along the Highway 401 eastbound off-ramp, an increase in travel times is observed only during the morning (AM) peak hour of approximately 30 seconds, due to proposed signal timing adjustments to accommodate traffic increases at the intersection.

FUTURE BACKGROUND AND FUTURE TOTAL COMPARISONS

When comparing the future background and future total *Vissim* model scenarios, average travel times are projected to increase along Kingston Road in both the eastbound and westbound directions in the order of 11 to 43 seconds during the morning (AM) peak hour and 14 to 15 seconds during the afternoon (PM) peak hour.

Average travel times are also projected to increase along Whites Road in both the northbound and southbound directions in the order of 23 to 43 seconds during the morning (AM) peak hour and 14 to 19 seconds during the afternoon (PM) peak hour.

Travel time increases on Kingston Road and Whites Road in the future total scenario are due to the additional site traffic along these corridors. These travel time increases are less than 45 seconds for all segments when comparing to the existing conditions, with the exception of the eastbound direction on Kingston Rd during the morning (AM) peak hour, due to an increase in both background and site traffic travelling towards the Highway 401 westbound on-ramp at Kingston Road.

Finally, a comparison of the future background and future total travel times along the Highway 401 eastbound off-ramp illustrate a projected increase of 22 seconds during the weekday morning (AM) peak hour and a decrease of 15 seconds during the weekday afternoon (PM) peak hour, despite volumes increasing by 125 vehicles in the weekday morning (AM) peak hour and by 220 vehicles in the weekday afternoon (PM) peak hour, as a result of the proposed additional eastbound right-turn lane and signal timing adjustments at the intersection.

Overall, the future total model analysis results provided, including the travel time comparison plots, demonstrate that corridor travel times throughout the study area are not projected to increase significantly. Specifically, travel time increases are all less than 45 seconds across the study area road segments and therefore, the projected vehicle travel time impacts of the proposed 603-643 & 645-699 Kingston Road redevelopment can be appropriately accommodated by the future road network.

3.2.2 Intersection Vehicle Queuing Analysis Results

The vehicle queueing analysis was conducted at the following key study area intersections:

- Kingston Road and Steeple Hill/East Site Access;
- Kingston Road and Whites Road;
- Kingston Road and the Highway 401 westbound on/off-ramp; and
- Whites Road and the Highway 401 eastbound off-ramp.

The existing conditions, future background, and future total scenario *Vissim* model intersection vehicle queuing results, are provided in **Table 8**.

Table 8 Average Vehicle Queuing Results

Turning Movement	Storage Length	Existing Conditions		Future Background		Future Total	
		AM	PM	AM	PM	AM	PM
Kingston Road & Steeple Hill/East Site Access							
EBL	80 m	3.9 m	9.7 m	10.7 m	26.2 m	11 m	24.4 m
EBT/EBR	155 m	28.7 m	82.6 m	36.5 m	150 m	53.5 m	149.2 m
NBL	85 m	0.8 m	5.1 m	1.3 m	15.5 m	40.8 m	41.3 m
NBT/NBR	85 m	0.4 m	12 m	0.2 m	27 m	40.7 m	48.3 m
SBL	15 m	19.1 m	37.5 m	32.9 m	60.1 m	28.4 m	109.9 m
SBT/SBR	225 m	4.1 m	8 m	13.2 m	35.2 m	10.5 m	74.1 m
WBL	65 m	2.9 m	19.3 m	11 m	31.1 m	47.3 m	80 m
WBT/WBR	315 m	43.2 m	85 m	9.4 m	39.4 m	18.6 m	42.1 m
Kingston Road & Whites Road							
EBL	140 m	12.4 m	36.8 m	22.9 m	124.5 m	36.1 m	165.9 m
EBT	315 m	18.7 m	85.6 m	42.4 m	138.7 m	82.2 m	193.6 m
EBR	120 m	32.4 m	18.6 m	31.6 m	35.6 m	88.4 m	110.1 m
NBL	70 m	22 m	33 m	28.8 m	55.8 m	54.9 m	107.2 m
NBT	480 m	39.3 m	91.9 m	33.2 m	126 m	37.9 m	125 m
NBR	45 m	32.3 m	85.8 m	30 m	129.2 m	33.6 m	128.4 m
SBL	85 m	23.6 m	37.7 m	15 m	36.2 m	21.6 m	49.6 m
SBT	360 m	93.8 m	45.7 m	97.5 m	74.8 m	176.5 m	112.6 m
SBR	45 m	1.2 m	1.3 m	6.8 m	6.5 m	10.5 m	11.7 m
WBL	95 m	69.5 m	57.1 m	85.4 m	91.4 m	84 m	103.4 m
WBT	225 m	53.8 m	54.6 m	55.2 m	81.9 m	65.4 m	101.5 m
WBR	65 m	23.5 m	38.7 m	29 m	36.2 m	38.8 m	72.4 m
Kingston Road & Highway 401 Ramps							
EBT/EBR	280 m	46.8 m	105.4 m	48.8 m	191.2 m	53.3 m	153.9 m
NBL	110 m	51.5 m	52.1 m	76.7 m	73.4 m	93.4 m	119.1 m
NBR	70 m	51.5 m	52.1 m	76.4 m	73.2 m	93.2 m	118.9 m
WBL	45 m	43.2 m	71.4 m	80.9 m	96.8 m	85.5 m	122.8 m
WBT	340 m	31.4 m	52.2 m	29.8 m	82 m	31.5 m	103.1 m

Highway 401 Ramps South of Highway 401 & Whites Road Overpass							
EBL	490 m	53.2 m	210.1 m	77.2 m	218.2 m	110.6 m	214.9 m
EBR	220 m	53.3 m	210.2 m	77.2 m	218.2 m	110.6 m	214.9 m
NBT	175 m	50 m	75 m	20.2 m	77.4 m	20.6 m	99.3 m
SBT	480 m	30.6 m	44.1 m	52.6 m	77.1 m	48.2 m	80.1 m

As presented in **Table 8**, vehicle queueing within the proposed study area between the existing and future background scenarios is expected to increase in both the morning (AM) peak hours and afternoon (PM) peak hours. This queueing continues to increase between the future background and future total scenarios although to a smaller degree.

EXISTING AND FUTURE BACKGROUND COMPARISONS

Most notable queueing increases between the existing and future background scenarios occur during the afternoon (PM) peak hours along the Kingston corridor in the eastbound direction for the following movements:

- EBT/EBR at Kingston Road and Steeple Hill/East Site Access of approximately 67 metres.
- EBL at Kingston Road and Whites Road of approximately 53 metres.
- EBT at Kingston Road and Whites Road of approximately 88 metres.
- NBR at Kingston Road and Whites Road of approximately 43 metres.
- EBT/EBR at Kingston Road and Highway 401 Ramps of approximately 86 metres.

Projected vehicle queuing increases in the future background scenario are due to the reduction in eastbound and westbound vehicle capacity along Kingston Road associated with the implementation of the future Durham-Scarborough BRT line. Although vehicle queues are projected to increase, **Table 8** illustrates that the projected queues are contained within available storage areas and are not expected to cause intersection spillbacks and/or congestion.

FUTURE BACKGROUND AND FUTURE TOTAL COMPARISONS

Between the future background and future total scenarios, queueing is expected to increase in response to the addition of the proposed site traffic.

During the weekday morning (AM) peak hour, vehicle queuing increases are observed at the following intersection turning movements:

- WBL at Kingston Road and Steeple Hill/East Site Access of approximately 36 metres.
- EBT at Kingston Road and Whites Road of approximately 40 metres.
- EBR at Kingston Road and Whites Road of approximately 57 meters.
- SBT at Kingston Road and Whites Road of approximately 79 metres.

The intersection turning movements where morning (AM) peak hour vehicle queuing increases are observed align with turning movements where volumes have increased due to the addition of proposed site traffic to the network. As illustrated in **Table 8**, the resulting morning (AM) peak hour queues remain contained within available storage areas and continue to not be expected to cause intersection queue spillbacks and/or congestion.

During the weekday afternoon (PM) peak hour, vehicle queuing increases are observed at the following intersection turning movements:

- WBL at Kingston Road and Steeple Hill/East Site Access of approximately 48 metres.
- EBL at Kingston Road and Whites Road of approximately 66 metres.
- EBT at Kingston Road and Whites Road of approximately 80 metres.
- NBL at Kingston Road and Whites Road of approximately 50 metres.
- NBL at Kingston Road and Highway 401 Westbound off-ramp of approximately 56 metres.
- NBR at Kingston Road and Highway 401 Westbound off-ramp of approximately 56 metres.

The intersection turning movements where afternoon (PM) peak hour vehicle queuing increases are observed once again align with turning movements where volumes have increased due to the addition of proposed site traffic to the network. As illustrated in **Table 8**, the resulting afternoon (PM) peak hour queues remain contained within available storage areas and continue to not be expected to cause intersection queue spillbacks and/or congestion.

Overall, the future conditions model analysis results provided, demonstrate that projected future vehicle queues are not expected to increase significantly and can be accommodated within available storage areas. Therefore, the projected vehicle queuing impacts of the proposed 603-643 & 645-699 Kingston Road redevelopment can be appropriately accommodated by the future road network.

3.2.3 Intersection Vehicle Turn Delay Results

The average vehicle delay analysis was conducted at the following intersections within the study area:

- Kingston Road and Steeple Hill/Site Access;
- Kingston Road and Whites Road;
- Kingston Road and the Highway 401 westbound on/off-ramp; and
- Whites Road and the Highway 401 eastbound off-ramp.

The existing, future background, and future total conditions *Vissim* model intersection average vehicle turn delay results, are provided in **Table 9**.

Table 9 Average Vehicle Turning Movement Delay Results

Turning Movement	Existing Conditions		Future Background		Future Total	
	AM	PM	AM	PM	AM	PM
Kingston Road & Steeple Hill/East Site Access						
EBL	28 s	33 s	67 s	58 s	77 s	51 s
EBT/EBR	12 s	19 s	11 s	30 s	21 s	32 s
NBL	31 s	32 s	42 s	53 s	40 s	77 s
NBT/NBT	8 s	35 s	9 s	47 s	18 s	76 s
SBL	29 s	36 s	48 s	62 s	39 s	145 s
SBT/SBR	4 s	40 s	50 s	63 s	38 s	136 s
WBL	14 s	48 s	83 s	69 s	95 s	68 s
WBT/WBR	12 s	21 s	3 s	12 s	4 s	13 s

Kingston Road & Whites Road						
EBL	41 s	57 s	74 s	80 s	84 s	77 s
EBT	29 s	43 s	63 s	42 s	85 s	54 s
EBR	21 s	15 s	16 s	10 s	33 s	17 s
NBL	40 s	34 s	52 s	45 s	52 s	42 s
NBT	25 s	37 s	30 s	44 s	31 s	37 s
NBR	13 s	25 s	12 s	15 s	13 s	12 s
SBL	46 s	56 s	32 s	61 s	44 s	86 s
SBT	43 s	35 s	24 s	45 s	46 s	68 s
SBR	14 s	7 s	18 s	15 s	38 s	31 s
WBL	79 s	78 s	100 s	116 s	95 s	120 s
WBT	32 s	27 s	41 s	41 s	47 s	47 s
WBR	13 s	26 s	8 s	14 s	10 s	17 s
Kingston Road & Highway 401 Ramps						
EBT/EBR	18 s	13 s	17 s	27 s	18 s	33 s
NBL	35 s	44 s	60 s	50 s	69 s	96 s
NBR	6 s	11 s	7 s	6 s	12 s	22 s
WBL	28 s	75 s	50 s	84 s	47 s	109 s
WBT	13 s	14 s	8 s	27 s	9 s	25 s
Highway 401 Ramps South of Highway 401 & Whites Road Overpass						
EBL	32 s	42 s	51 s	35 s	68 s	23 s
EBR	14 s	32 s	15 s	18 s	18 s	8 s
NBT	16 s	27 s	5 s	27 s	5 s	40 s
SBT	13 s	26 s	25 s	43 s	22 s	41 s

As presented in **Table 9**, vehicle delays within the proposed study area are consistent with the vehicle queuing analysis. Average vehicle delays are projected to increase at a few specific movements in the future background and future total scenarios in both the weekday morning (AM) peak hour and afternoon (PM) peak hour. The following discusses these projected average vehicle delay increases.

EXISTING AND FUTURE BACKGROUND COMPARISONS

Average vehicle delay increases between the existing and future background scenarios are observed along Kingston Road due to the reduction in eastbound and westbound vehicle capacity along Kingston Road associated with the implementation of the future Durham-Scarborough BRT line.

Average vehicle delay increases are projected for the following intersection turning movements during the weekday morning (AM):

- EBL at Kingston Road and Steeple Hill/East Site Access of approximately 39 seconds.
- WBL at Kingston Road and Steeple Hill/East Site Access of approximately 69 seconds.
- EBL at Kingston Road and Whites Road of approximately 33 seconds.
- EBT at Kingston Road and Whites Road of approximately 33 seconds.

Average vehicle delay increases are projected for the following intersection turning movements during the weekday afternoon (PM):

- EBL at Kingston Road and Steeple Hill/East Site Access of approximately 26 seconds.
- EBT/EBR at Kingston Road and Steeple Hill/East Site Access of approximately 18 seconds.
- EBL at Kingston Road and Whites Road of approximately 23 seconds.

FUTURE BACKGROUND AND FUTURE TOTAL COMPARISONS

Average vehicle delays are projected to increase for a few intersections turning movements due to the addition of proposed site traffic to the network in both the weekday morning (AM) and afternoon (PM) peak hours.

Average vehicle delay increases are projected for the following intersection turning movements during the weekday morning (AM):

- EBT at Kingston Road and Whites Road of approximately 22 seconds.
- EBR at Kingston Road and Whites Road of approximately 18 seconds.
- SBT at Kingston Road and Whites Road of approximately 22 seconds.
- SBR at Kingston Road and Whites Road of approximately 20 seconds.

Average vehicle delay increases are projected for the following intersection turning movements during the weekday afternoon (PM):

- NBL at Kingston Road and Highway 401 Westbound off-ramp of approximately 46 seconds.

The future conditions model analysis results provided, demonstrate that projected future average vehicle delays are not expected to increase significantly with increases typically less than 25 seconds. Where average vehicle delays are observed exceeding 25 seconds, these are due to signal timing adjustments required to accommodate traffic volume increases at intersections and are not expected to have significant impacts on intersection performance. Overall, the projected vehicle delay impacts of the proposed 603-643 & 645-699 Kingston Road redevelopment can be appropriately accommodated by the future road network.

3.2.4 Vehicle Average Travel Speed Plots

Network vehicle average travel speed plots, a valuable set of traffic operations metrics that aggregates the information associated with numerous detailed attributes (i.e. vehicle travel times, queuing, delays, etc.) into all-encompassing values (i.e. colour-coded average speeds) provide an overall snapshot of study area traffic conditions. Existing conditions, future background and future total scenario vehicle average travel speed plots for both the weekday morning (AM) and afternoon (PM) peak hours are presented in **Figure 16** and **Figure 17**, respectively.

It is important to note that the vehicle average travel speed plots are presented for illustrative purposes and are meant to visualize the findings of the impact analysis provided in **Section 3.2.1**, **Section 3.2.2** and **Section 3.2.3**. As expected, a reduction in vehicle average travel speeds is observed along Kingston Rd in the future background and future total scenarios as a result of a reduction in eastbound and westbound vehicle capacity along Kingston Road associated with the implementation of the future Durham-Scarborough BRT line. Furthermore, a comparison between future background and future total vehicle average travel speed plots illustrates the negligible impacts on overall network performance associated with the addition of the proposed site traffic.

Figure 16: Vehicle Average Travel Speed Plots (AM)

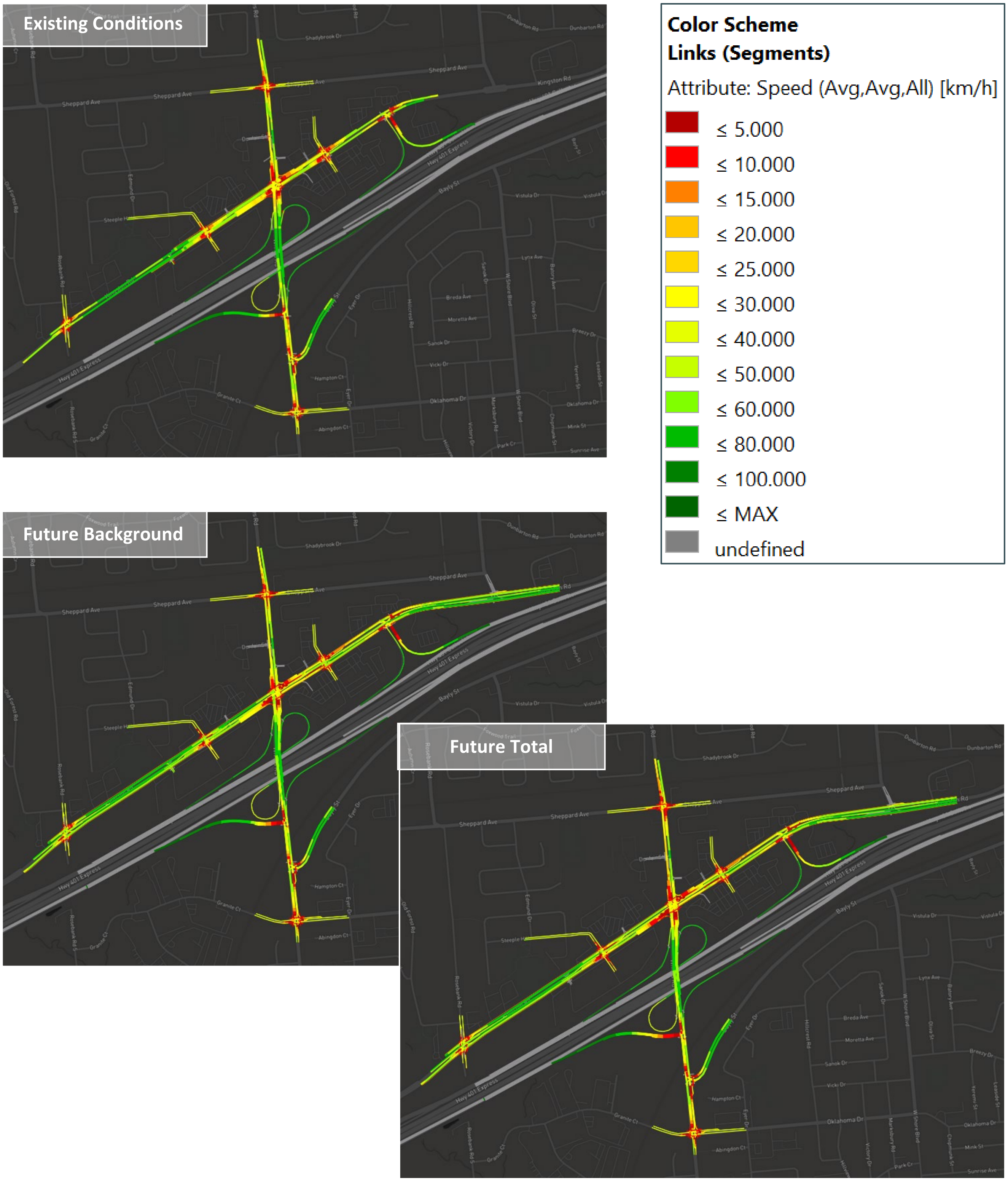
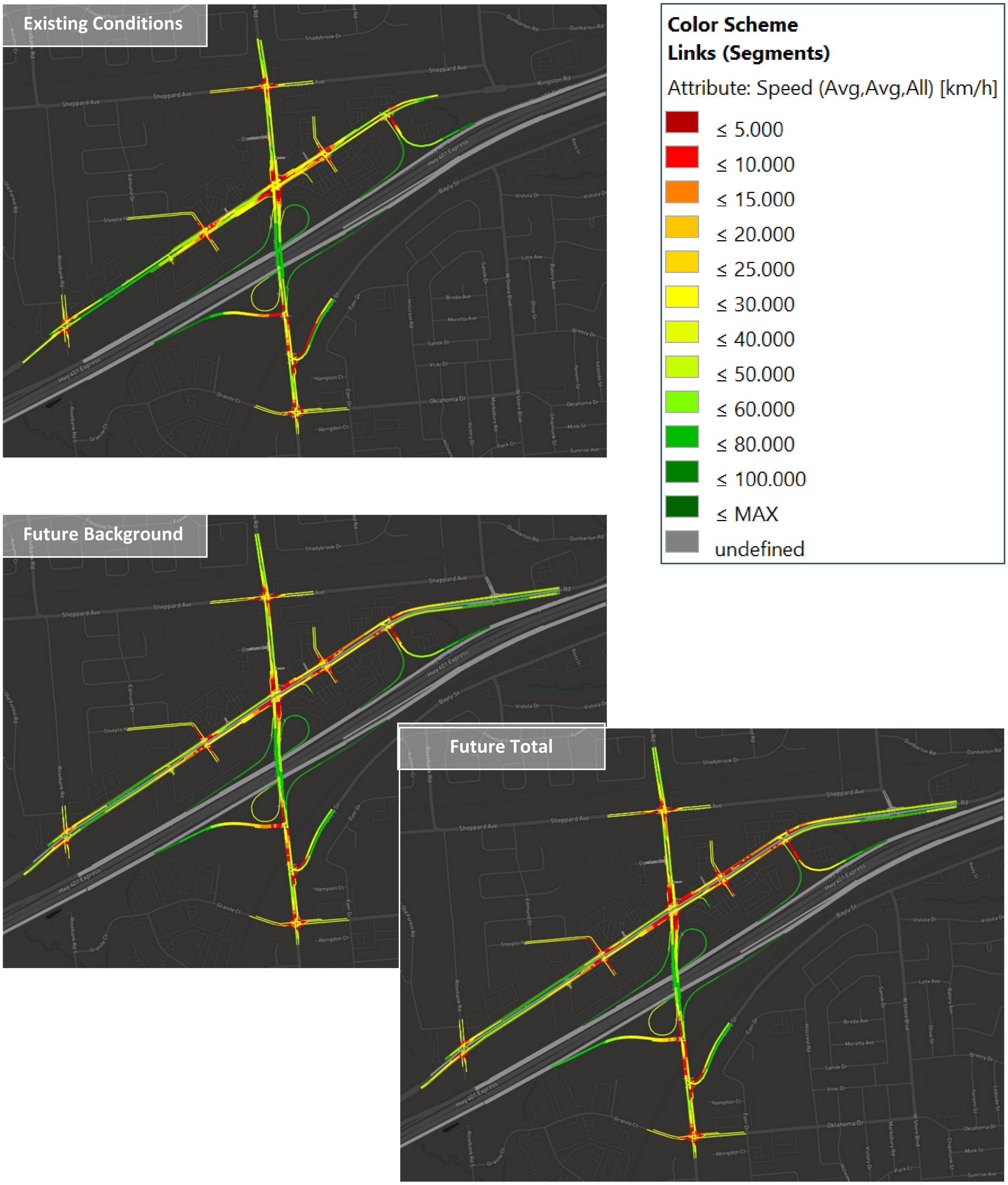


Figure 17: Vehicle Average Travel Speed Plots (PM)



4.0 *VISSIM* CONCLUSIONS & RECOMMENDATIONS

A *Vissim* microsimulation traffic model was developed, calibrated, and utilized to assess whether the area road network could appropriately accommodate the transportation-related impacts of background growth and local study area background developments, the proposed redevelopment, network improvements (i.e. signal timing adjustments along Kingston Road and Whites Road and an additional turn lane at the Highway 401 eastbound off-ramp and Whites Road intersection) and the planned Durham-Scarborough BRT line. The main conclusions and recommendations derived from this modelling exercise are presented below.

Vehicle Travel Times

KINGSTON ROAD CORRIDOR

- Future background average vehicle travel times are projected to increase along Kingston Road in both the eastbound and westbound directions in the order of 6 to 37 seconds during the morning (AM) peak hour and 21 to 26 seconds during the afternoon (PM) peak hour.
- Future total average vehicle travel times are projected to increase along Kingston Road in both the eastbound and westbound directions in the order of 11 to 43 seconds during the morning (AM) peak hour and 14 to 15 seconds during the afternoon (PM) peak hour.

WHITES ROAD CORRIDOR

- Future background average vehicle travel times along Whites Road are projected to vary for both the northbound and southbound directions with a decrease in the order of 8 to 20 seconds during the morning (AM) peak hour and an increase in the order of 2 to 25 seconds during the afternoon (PM) peak hour.
- Future total average vehicle travel times along Whites Road are projected to vary for both the northbound and southbound directions with a decrease in the order of 23 to 43 seconds during the morning (AM) peak hour and an increase in the order of 14 to 19 seconds during the afternoon (PM) peak hour.

HIGHWAY 401 EASTBOUND OFF-RAMP AT WHITES ROAD

- Future background average vehicle travel time increases along the Highway 401 eastbound off-ramp are projected to occur only during the morning (AM) peak hour of approximately 30 seconds.
- Future total average vehicle travel times along the Highway 401 eastbound off-ramp are projected to increase by 22 seconds during the weekday morning (AM) peak hour and decrease by 15 seconds during the weekday afternoon (PM) peak hour.

Projected future background average vehicle travel time increases on Kingston Road and Whites Road are the result of the future operations associated with background traffic growth and the implementation of the future Durham-Scarborough BRT line.

Projected future total average vehicle travel time increases on Kingston Road and Whites Road in the future total scenario are due to the additional site traffic along these corridors and these travel time increases are less than 45 seconds for all segments when comparing to existing conditions, with the exception of the eastbound direction on Kingston Rd during the morning (AM) peak hour, due to an increase in both background and site traffic travelling towards the Highway 401 westbound on-ramp at Kingston Road.

Finally, the increasing and decreasing average vehicle travel times along the Highway 401 eastbound off-ramp in both the future background and future total scenarios despite volume increases of 125 vehicles in the weekday morning (AM) peak hour and 220 vehicles in the weekday afternoon (PM) peak hour, are due to the addition of the proposed eastbound right-turn lane and signal timing adjustments at the intersection.

Overall, the future total model analysis results provided, including the travel time comparison plots, demonstrate that corridor travel times throughout the study area are not projected to increase significantly. Specifically, travel time increases are all less than 45 seconds across the study area road segments and therefore, the projected vehicle travel time impacts of the proposed 603-643 & 645-699 Kingston Road redevelopment can be appropriately accommodated by the future road network.

Intersection Vehicle Queuing

KINGSTON ROAD AND WHITES ROAD

- Future background average vehicle queuing is projected to increase at the intersection of Kingston Road and Whites Road in the weekday afternoon (PM) peak hour at the eastbound left, eastbound through and northbound right turning movements in the order of 43 to 88 metres.
- Future total average vehicle queuing is projected to increase at the intersection of Kingston Road and Whites Road in the weekday morning (AM) peak hour at the eastbound through, eastbound right, and southbound through turning movements in the order of 40 to 79 metres.
- Future total average vehicle queuing is projected to increase at the intersection of Kingston Road and Whites Road in the weekday afternoon (PM) peak hour at the eastbound left, eastbound through, and northbound left turning movements in the order of 50 to 80 metres.

KINGSTON ROAD AND STEEPLE HILL / EAST SITE ACCESS

- Future background average vehicle queuing is projected to increase at the intersection of Kingston Road and Steeple Hill / East Site Access in the weekday afternoon (PM) peak hour at the eastbound through-right turning movement by 67 metres.
- Future total average vehicle queuing is projected to increase at the intersection of Kingston Road and Steeple Hill / East Site Access in the weekday morning (AM) peak hour at the westbound left turning movement by 36 metres.
- Future total average vehicle queuing is projected to increase at the intersection of Kingston Road and Steeple Hill / East Site Access in the weekday afternoon (PM) peak hour at the westbound left turning movement by 48 metres.

HIGHWAY 401 OFF-RAMP AT KINGSTON ROAD

- Future background average vehicle queuing is projected to increase at the Highway 401 Off-Ramp at Kingston Road intersection in the weekday afternoon (PM) peak hour at the eastbound through-right turning movement by 86 metres.
- Future total average vehicle queuing is projected to increase at the Highway 401 Off-Ramp at Kingston Road intersection in the weekday afternoon (PM) peak hour at the northbound left and northbound right turning movements by 56 metres.

Projected average vehicle queuing increases in the future background scenario are due to the reduction in eastbound and westbound vehicle capacity along Kingston Road associated with the implementation of the future Durham-Scarborough BRT line. Whereas the additional average vehicle queues in the future total scenarios are due to the addition of proposed site traffic to the network.

Overall, the future conditions model analysis demonstrates that projected future average vehicle queues are not expected to increase significantly and can be accommodated within available storage areas. Therefore, the projected vehicle queuing impacts of the proposed 603-643 & 645-699 Kingston Road redevelopment can be appropriately accommodated by the future road network.

Intersection Vehicle Turn Delays

KINGSTON ROAD AND WHITES ROAD

- Future background vehicle delays are projected to increase at the intersection of Kingston Road and Whites Road in the weekday morning (AM) peak hour at the eastbound left, and eastbound through turning movements by 33 seconds.
- Future background vehicle delays are projected to increase at the intersection of Kingston Road and Whites Road in the weekday afternoon (PM) peak hour at the eastbound left turning movement by 23 seconds.
- Future total vehicle delays are projected to increase at the intersection of Kingston Road and Whites Road in the weekday morning (AM) peak hour at the eastbound through, eastbound right, southbound through, and southbound right turning movements in the order of 18 to 22 seconds.

KINGSTON ROAD AND STEEPLE HILL / EAST SITE ACCESS

- Future background vehicle delays are projected to increase at the intersection of Kingston Road and Steeple Hill / East Site Access in the weekday morning (AM) peak hour at the eastbound left and westbound left turning movements by 39 seconds and 69 seconds, respectively.
- Future background vehicle delays are projected to increase at the intersection of Kingston Road and Steeple Hill / East Site Access in the weekday afternoon (PM) peak hour at the eastbound left and eastbound through-right turning movements by 26 seconds and 18 seconds, respectively.

HIGHWAY 401 OFF-RAMP AT KINGSTON ROAD

- Future total vehicle delays are projected to increase at the Highway 401 Off-Ramp at Kingston Road intersection in the weekday afternoon (PM) peak hour at the northbound left turning movement by 46 seconds.

As with the vehicle average queues, projected intersection vehicle turn delay increases in the future background scenario due to the reduction in eastbound and westbound vehicle capacity along Kingston Road associated with the implementation of the future Durham-Scarborough BRT line. Whereas the vehicle turn delay increases in the future total scenarios are due to the addition of proposed site traffic to the network.

Overall, the future conditions model analysis demonstrates that projected future intersection vehicle turn delays are not expected to increase significantly (increases typically less than 25 seconds) and where vehicle turn delays are observed exceeding 25 seconds, these are due to signal timing adjustments required to accommodate traffic volume increases at intersections and will not have significant impacts on intersection performance. Overall, the projected vehicle delay impacts of the proposed 603-643 & 645-699 Kingston Road redevelopment can be appropriately accommodated by the future road network.

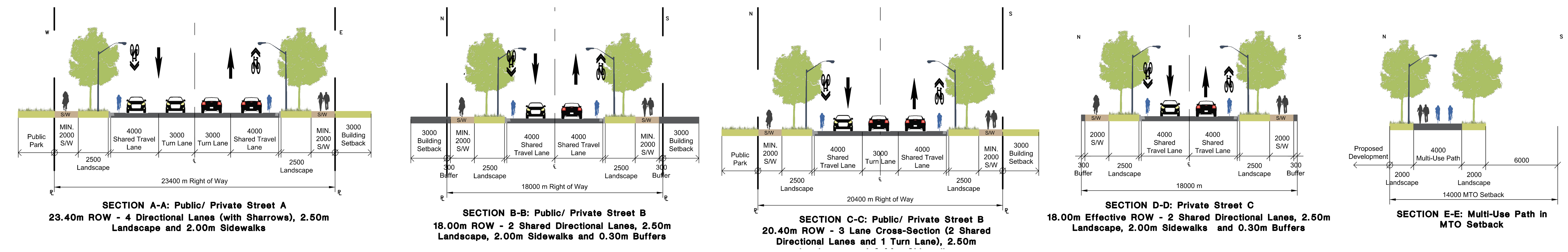
Vehicle Average Travel Speed Plots

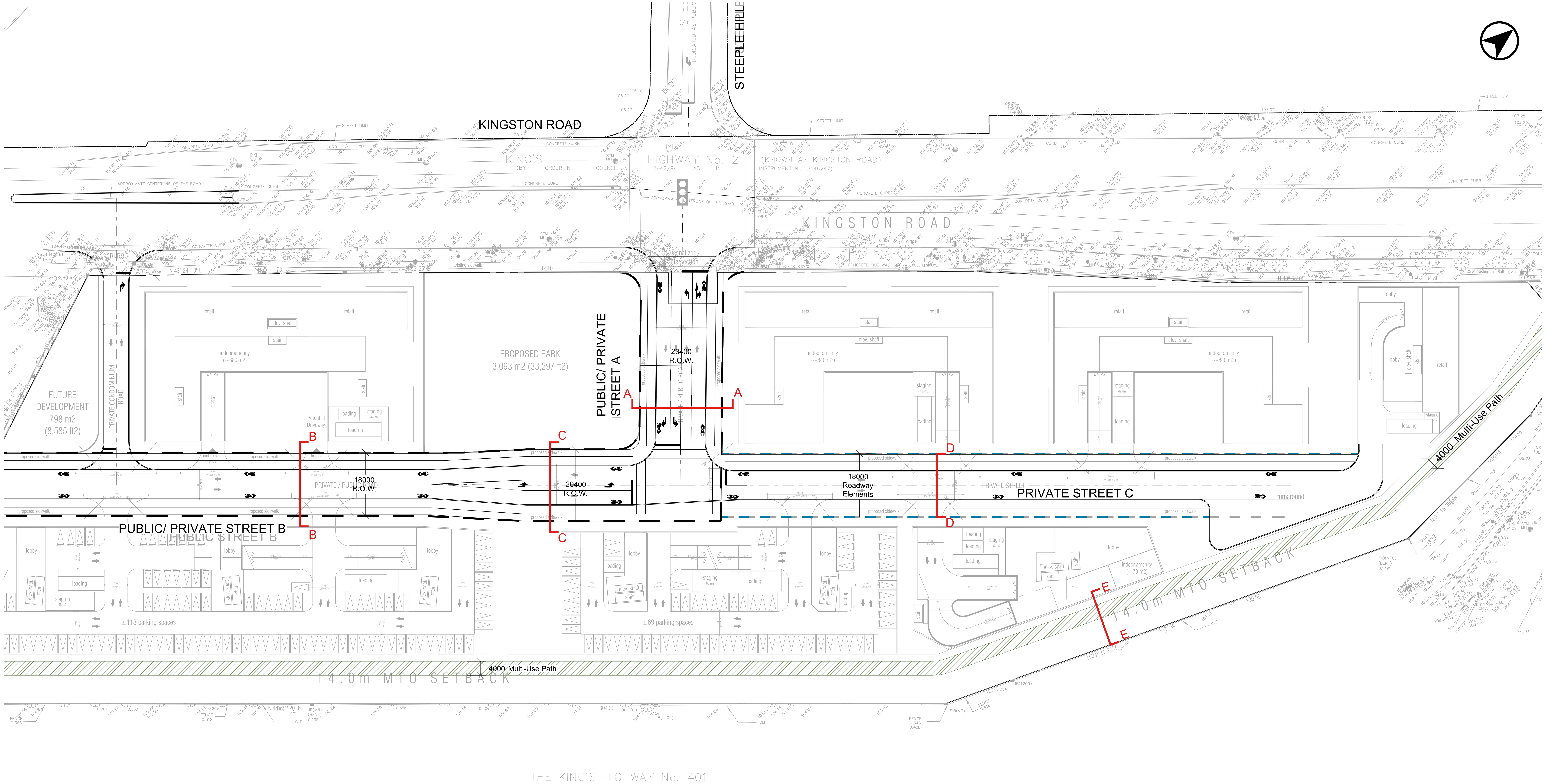
Existing conditions, future background, and future total scenario network vehicle average travel speed plots illustrate a reduction in average vehicle travel speeds along Kingston Rd in the future background and future total scenarios due to the reduction in eastbound and westbound vehicle capacity along Kingston Road associated with the implementation of the future Durham-Scarborough BRT line. Furthermore, a comparison between future background and future total vehicle average travel speed plots illustrates the negligible impacts on overall network performance associated with the addition of the proposed site traffic.

Overall, the *Vissim* microsimulation model analysis results demonstrate that study area travel times, intersection vehicle queueing and turn delays are not projected to increase significantly along Kingston Road, Whites Road, the Highway 401 eastbound off-ramp, and the Highway 401 westbound on/off-ramp during the weekday morning (AM) and afternoon (PM) peak hours due to the proposed redevelopment and that the projected impacts of the proposed 603-643 & 645-699 Kingston Road redevelopment can be appropriately accommodated by the future road network.

Appendix G:
Functional Road Plan

PROPOSED CROSS-SECTIONS





GENERAL NOTES

1. BASE SURVEY PLAN DATED NOVEMBER 12, 2018, PREPARED BY R. AVIS SURVEYING INC.

2. ARCHITECTURAL SITE PLAN DATED OCTOBER 19, 2023 PREPARED BY GRAZIANI + CORAZZA ARCHITECTS.

GENERAL LEGEND

- EXISTING SIGNALIZED INTERSECTION
- PUBLIC/ PRIVATE RIGHT OF WAY
- EXTENT OF PRIVATE ROAD
- MULTI-USE PATH

01	10-24-23	CAM	ISSUED FOR RESUBMISSION
00	09-06-19	CAM	ISSUED TO CLIENT FOR REVIEW

BA Group
BA Consulting Group Ltd.
300 - 45 St. Clair Ave. W.
Toronto ON M4V 1K9
TEL 416 961 7110
EMAIL bagroup@bagroup.com
MOVEMENT IN URBAN ENVIRONMENTS
BAGROUP.COM

WHITES ROAD AND KINGSTON ROAD

ROAD PLAN

Date: September 6, 2019

Project No.: 5883-41

Scale: 1:500 (0 5 10 15 20m)

RP-01