BA Group

603-643 & 645-699 Kingston Road

Mixed-Use Development

City of Pickering

Urban Transportation Considerations

Prepared For: Director Industrial Holdings Limited

April 2020

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April 1, 2020

Director Industrial Holdings Limited c/o
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VP, Development
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RE: 603-643 & 645-699 KINGSTON ROAD
MIXED-USE DEVELOPMENT

Dear James:

We are pleased to submit our transportation study in relation to the planned mixed-use development located at 603-643 & 645-699 Kingston Road in Pickering, Ontario.

This report is different than most in that it is broken down into three major sections, which are outlined below.

The first is a typical traffic impact study that reviews the transportation elements of the proposed redevelopment.

The second is a discussion of the merits of revisiting the previously considered, but not adopted, proposal for a new GO Transit station (Whites Station) located just south of Highway 401. We suggest this issue be considered by stakeholders in parallel to, but independent of, the proposed redevelopment.

The third is a description of the Vissim microsimulation model prepared showing future conditions with the build out of the proposed development and the implementation of the Kingston Road Bus Rapid Transit project. While this report describes the methodology and results of the microsimulation review, the model is best viewed in the video format, which is accessed at the following link:

https://youtu.be/QtYrQH9sGXw

If you have any comments or questions please feel free to call.

Sincerely,
BA Consulting Group Ltd.

Steve W. Krossey, P. Eng.
Principal

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A EXECUTIVE SUMMARY

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 April 6, 2020, 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.

A.1 KEY FINDINGS

Proposed Development

1. The proposed development includes six high-rise towers, two mid-rise towers, and four townhouse blocks. A total of 2,884 residential units are proposed.

2. Three of the high-rise buildings contain approximately 2,232 square metres of retail uses, primarily at-grade along Kingston Road. Podium 5 of one of the high-rise buildings contains approximately 4,448 square metres of office uses.

3. Approximately 3,997 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 private road network.

Planning Context

5. 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.

6. 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.

7. 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

8. 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.

9. 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.

10. 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).

11. 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.

12. 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.

13. 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.

14. 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.

15. 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.

16. 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.

17. 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

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

19. 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

20. 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

21. 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 5,341 parking spaces, including 5,083 residential parking spaces and 258 non-residential parking spaces. For an effective residential parking supply ratio of 1.76 spaces per unit.

22. The application of the City's City Centre zoning by-law, By-law 7553-17, to the development proposal results in a requirement of 2,958 parking spaces, including 2,444 residential parking spaces and 514 non-residential parking spaces. For an effective residential parking supply ratio of 0.85 spaces per unit.

23. It is proposed to provide parking at the City Centre parking rates, with the exception of the following supply ratios:
    - Townhouses: 1.0 parking spaces per unit
    - Retail uses: 3.0 parking spaces per 100 m^2 retail GFA

    The resulting recommended supply is 2,780 parking spaces, including 2,336 residential parking spaces and 444 non-resident parking spaces. For an effective residential parking supply ratio of 0.81 spaces per unit.

24. 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.

25. Currently a total of 2,830 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

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

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

28. The application of the City's City Centre zoning by-law, By-law 7553-17, to the development proposal results in a requirement of 1,521 parking spaces, including 1,514 residential parking spaces and 7 non-residential parking spaces.

29. 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.

Multi-Modal Travel Demand Forecasting

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

31. 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.

32. 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.

33. 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.

34. 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.

35. 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

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

37. 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.

38. The net new Site vehicular trips generated by the proposed development are in the order of 800 and 705 two-way vehicle trips during the weekday morning and afternoon peak hours, respectively.

Traffic Operations Review

39. 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.

40. 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.

41. 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.

42. 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.

43. 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.

44. 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.

45. 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.

46. 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 sift 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.

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

Site Plan Review

48. 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.

49. 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 10 parking spaces utilizes shared loading provisions and shared loading facilities that can serve more than one tower.

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

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**.

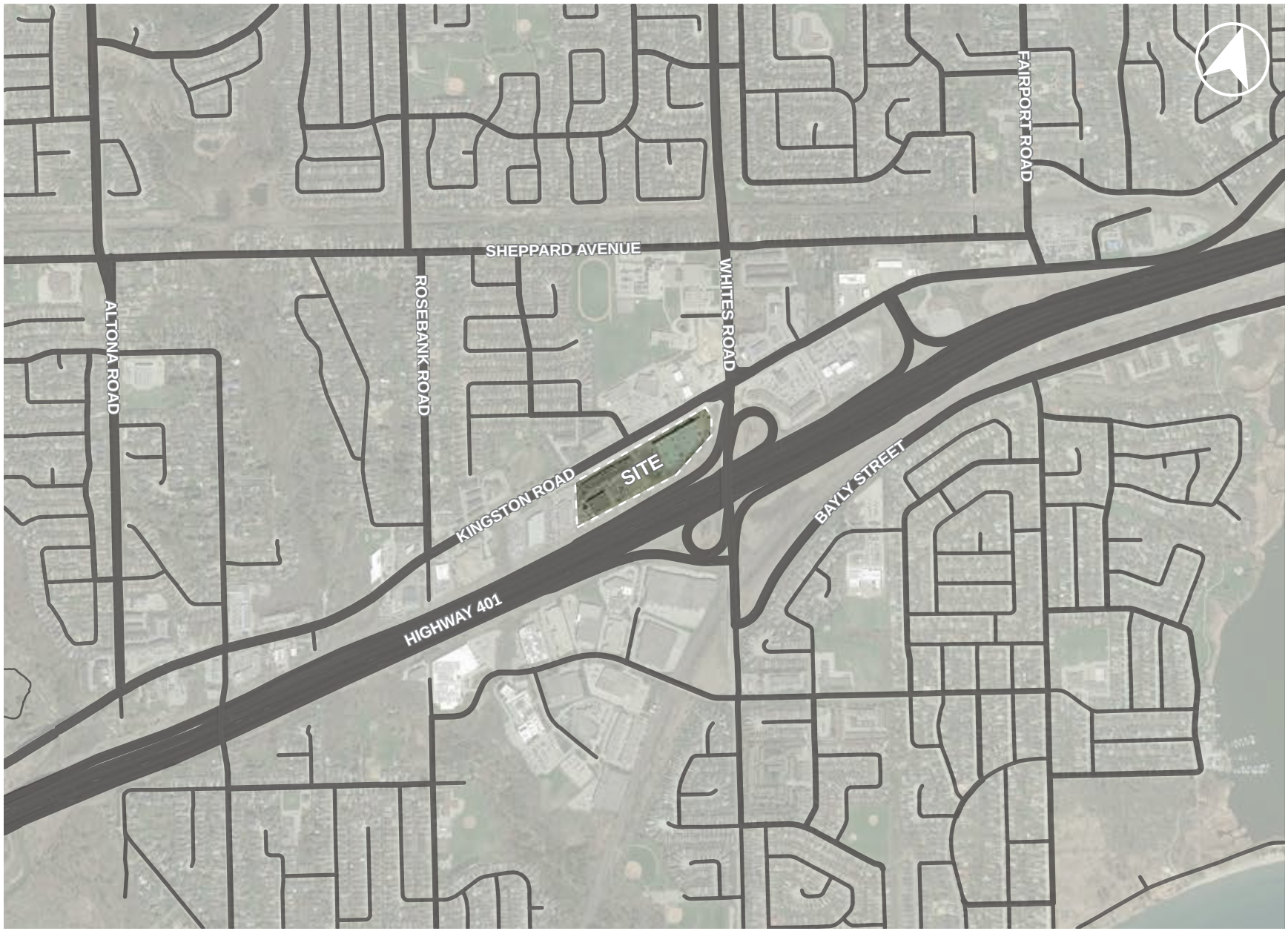

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FIGURE 1 SITE LOCATION

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FIGURE 2 SITE CONTEXT

2.0 PROPOSED DEVELOPMENT CONCEPT

2.1 OVERVIEW

The Project consists of the following key elements:

1. Blocks 1 to 4 are 4-storey townhouse blocks with stacked back-to-back units. Blocks 1 and 2 are located toward the northwest corner of the Site. Blocks 3 and 4 are located toward the northeast corner of the Site.

2. Towers 1, 2 and 3 are located along the south property line, at the west side of the Site. The towers range in height from 29 to 36 storeys, which are connected by a 4-storey podium (Podium 1).

3. Towers 4 and 5 are each “U”-shaped buildings and are located along the north property line, at the centre of the Site. Both mid-rise towers are 18 storeys.

4. Towers 6 and 7 are located along the south property line, near the centre of the Site. The towers range in height from 29 to 42 storeys, which are connected by a 4-storey podium (Podium 4).

5. Tower 8 is located at the northeast corner of the Site. The tower is 24 storeys, with a commercial area located within a 4-storey podium (Podium 5).

6. At-grade parks will be provided at the south side of the Site (between Towers 3 and 6), and the northeast and northwest corners of the Site.

7. A private internal road network with two access points off of Kingston Road and access to the below grade parking.

8. The concept development includes two levels of underground parking, as well as parking in Podiums 1 and 4. The below-grade parking beneath Podium 1 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	2,232 square metres of retail space located on the ground floor of Podium 2, 3 and 5.
Office	4,448 square metres of office spaces located in the 4-storeys of Podium 5.
Residential	2,884 residential units in eight towers and four blocks of townhouses
Park	3,997 square metres of parkland is proposed within three parks provided between the buildings on-site
Transportation Elements	
Pedestrian Access	Multiple grade-related accesses from Whites Road, Kingston Road and the internal private road network.
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 2,830 parking spaces are proposed to accommodate the Project within two levels of below-grade parking and within Podium 1 and 4. 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.

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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:

- 2014 Provincial Policy Statement;
- Places to Grow: Growth Plan for the Greater Golden Horseshoe (2019);
- Ontario's Five Year Climate Change Action Plan (2016-2020);
- 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 2014 Provincial Policy Statement

The 2014 *Provincial Policy Statement* (PPS) encourages TDM strategies to be implemented within new developments to increase the efficiency of existing and planned transportation infrastructure. Furthermore, the PPS encourages density being added to lands that adopt a mix of land uses to encourage the use of non-auto based travel modes and to limit the length and number of vehicular trips generated by the Site. In accordance with the PPS, minimum density targets should be established and met along transit corridors (existing or planned) before the boundaries of a settlement area are expanded.

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

The *Growth Plan for the Greater Golden Horseshoe* (Growth Plan) report outlines the importance of reducing reliance on the automobile and promoting transit and active transportation. Planning along priority transit corridors and major transit station areas (MTSA) are to be prioritized and planned to achieve minimum density targets.

A MTSA is defined as "the area within an approximate 500 to 800 metre radius of a transit station, representing about a 10-minute walk". 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.

3.1.3 Ontario's Five Year Climate Change Action Plan

Ontario's *Five Year Climate Change Action Plan* outlines the importance of supporting active transportation and reducing single-passenger vehicle trips through TDM plans. The policy document also indicates that minimum parking requirements should be eliminated in transit corridors and walkable communities, as it impedes the development of complete communities. While a previous government released the Plan, it remains an indicator of the direction of climate action policy.

3.1.4 MTO Transit-Supportive Guidelines

The *Transit-Supportive Guidelines* are intended to assist municipalities in implementing the policies and objectives of the PPS and Growth Plan. The guidelines aim to create an environment that is supportive of transit, and to develop services and programs to increase transit ridership. The guidelines also support the use of TDM strategies, especially in close proximity to transit stations. This includes the reduction of maximum and minimum parking requirements upon the adoption of TDM measures, the sharing of parking between uses, and the use of on-street parking during off-peak hours.

3.1.5 2041 Regional Transportation Plan

The Metrolinx 2041 *Regional Transportation Plan* (RTP), an update to The Big Move (2008), specifies a series of planned higher order public transit projects, including the Durham-Scarborough BRT. A key strategy of the plan is the integration of transit and land use by focusing development at mobility hubs and major transit station areas. Embedding TDM strategies in land use planning and development to prioritize cycling, walking and transit use is highlighted in the plan. Furthermore, the RTP encourages best practices in parking management, such as reducing minimum parking standards especially for developments near transit stations.

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**.

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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**.

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**.

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FIGURE 5 EXISTING AREA ROAD NETWORK

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 Tauton 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.

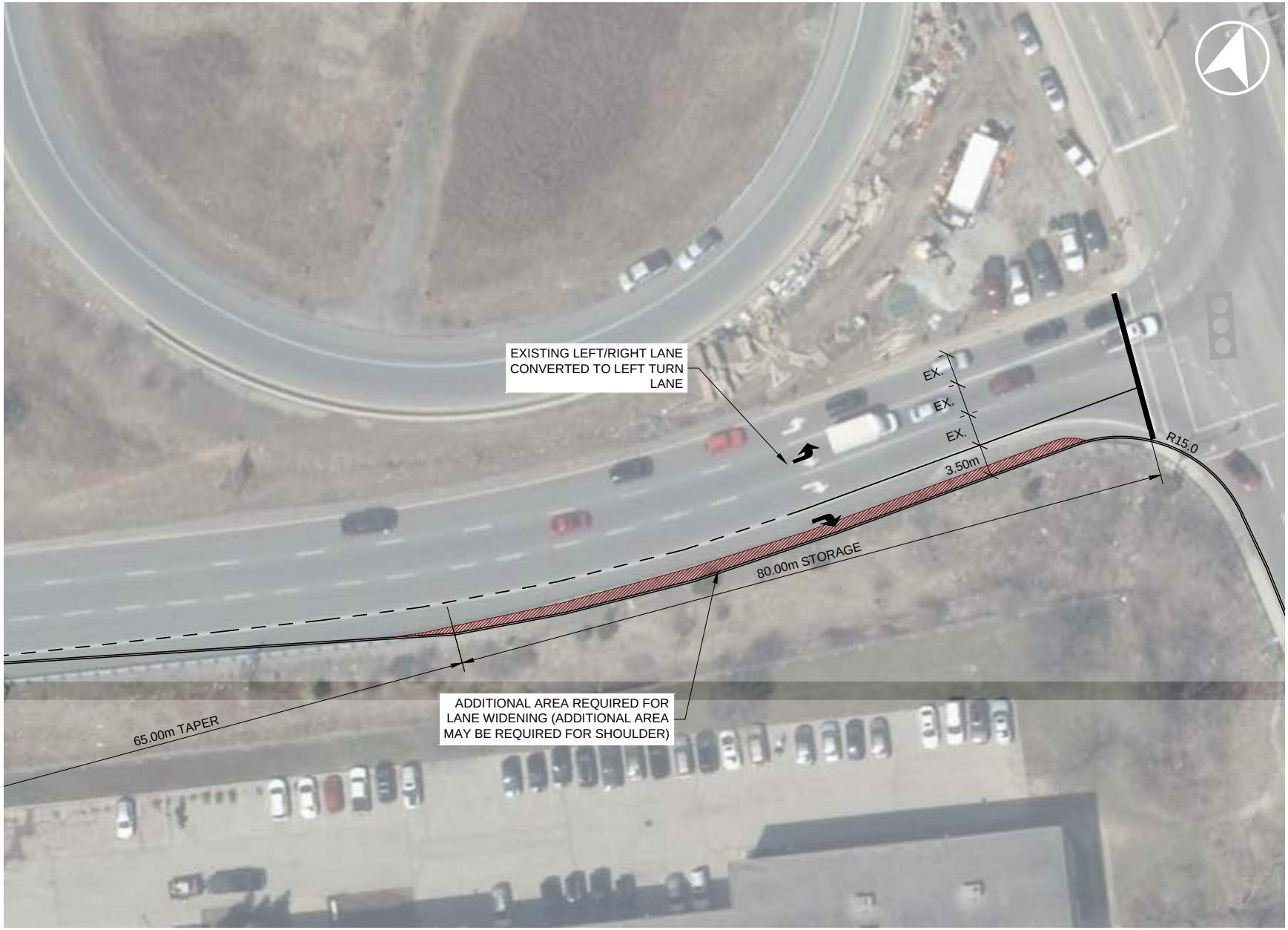

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FIGURE 6 POTENTIAL EXPANSION OF THE 401 EASTBOUND OFF-RAMP AT WHITES ROAD

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**.

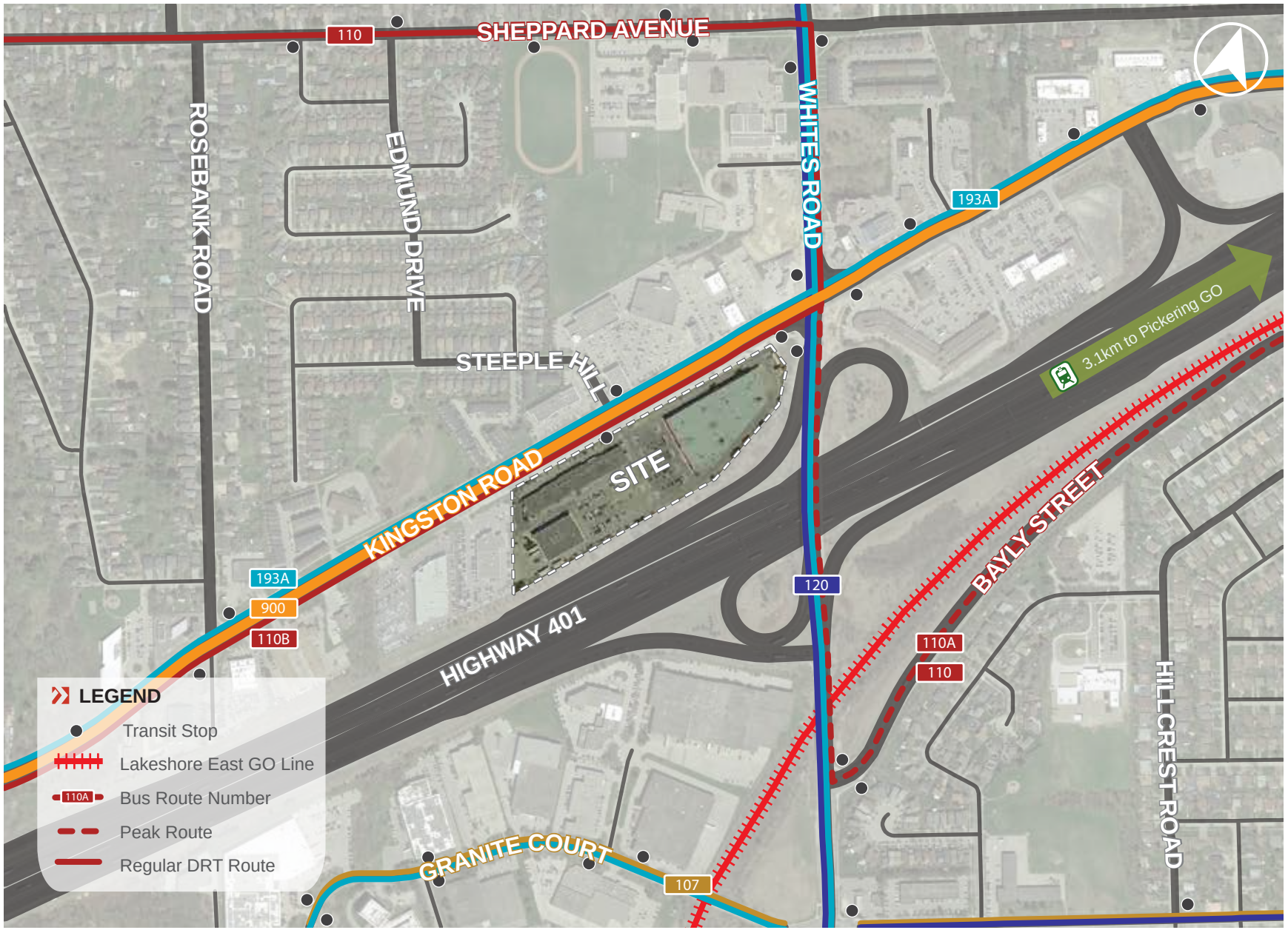

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FIGURE 7 EXISTING AREA TRANSIT NETWORK

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 runningway. Adjacent to the Site, the proposed route will be in the centre median. The proposed BRT design is illustrated in **Figure 8**.

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FIGURE 8 DURHAM-SCARBOROUGH BRT PROPOSED DESIGN

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.

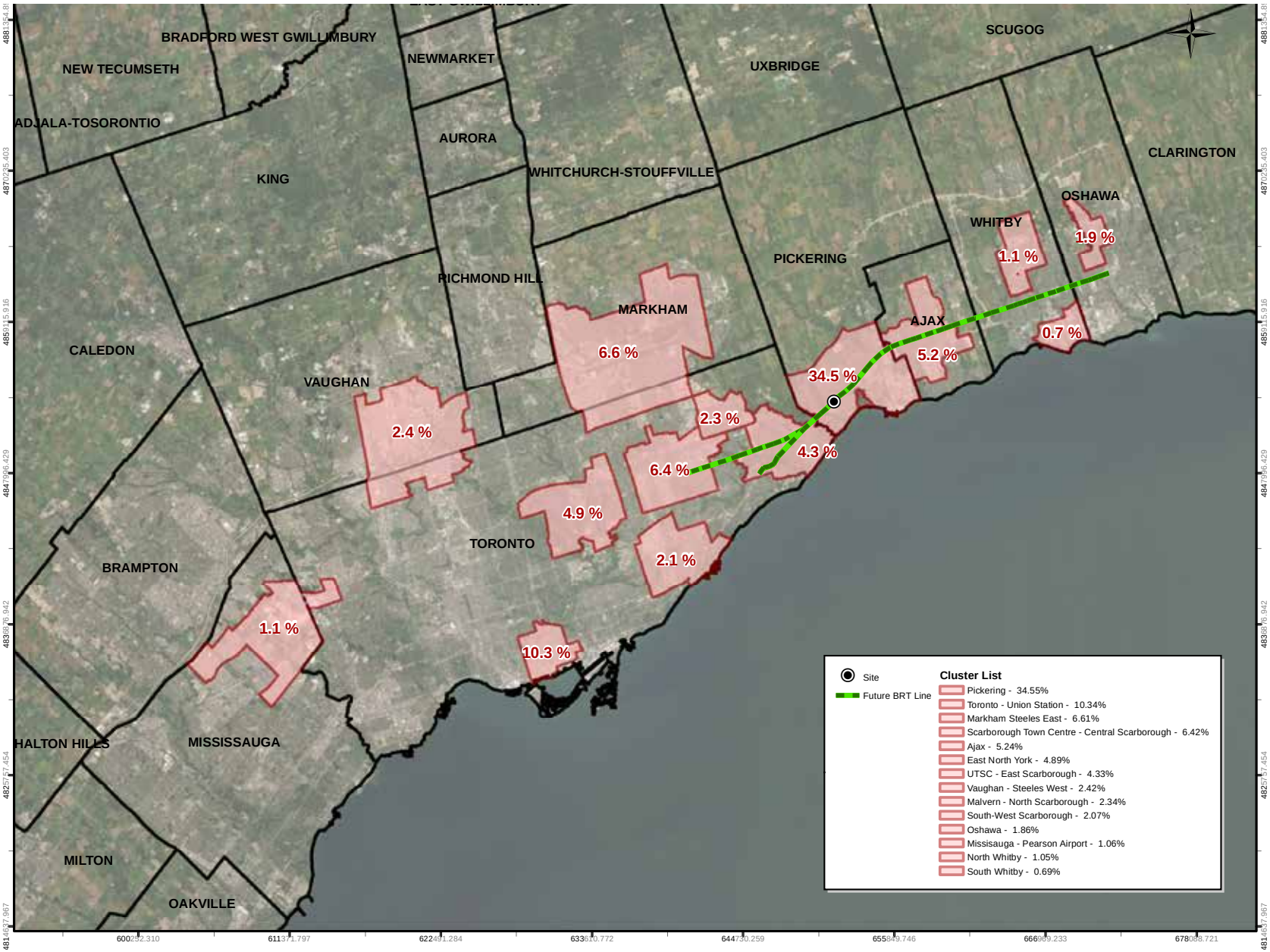

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FIGURE 9 BRT CONNECTIVITY - KEY DESIGNATIONS

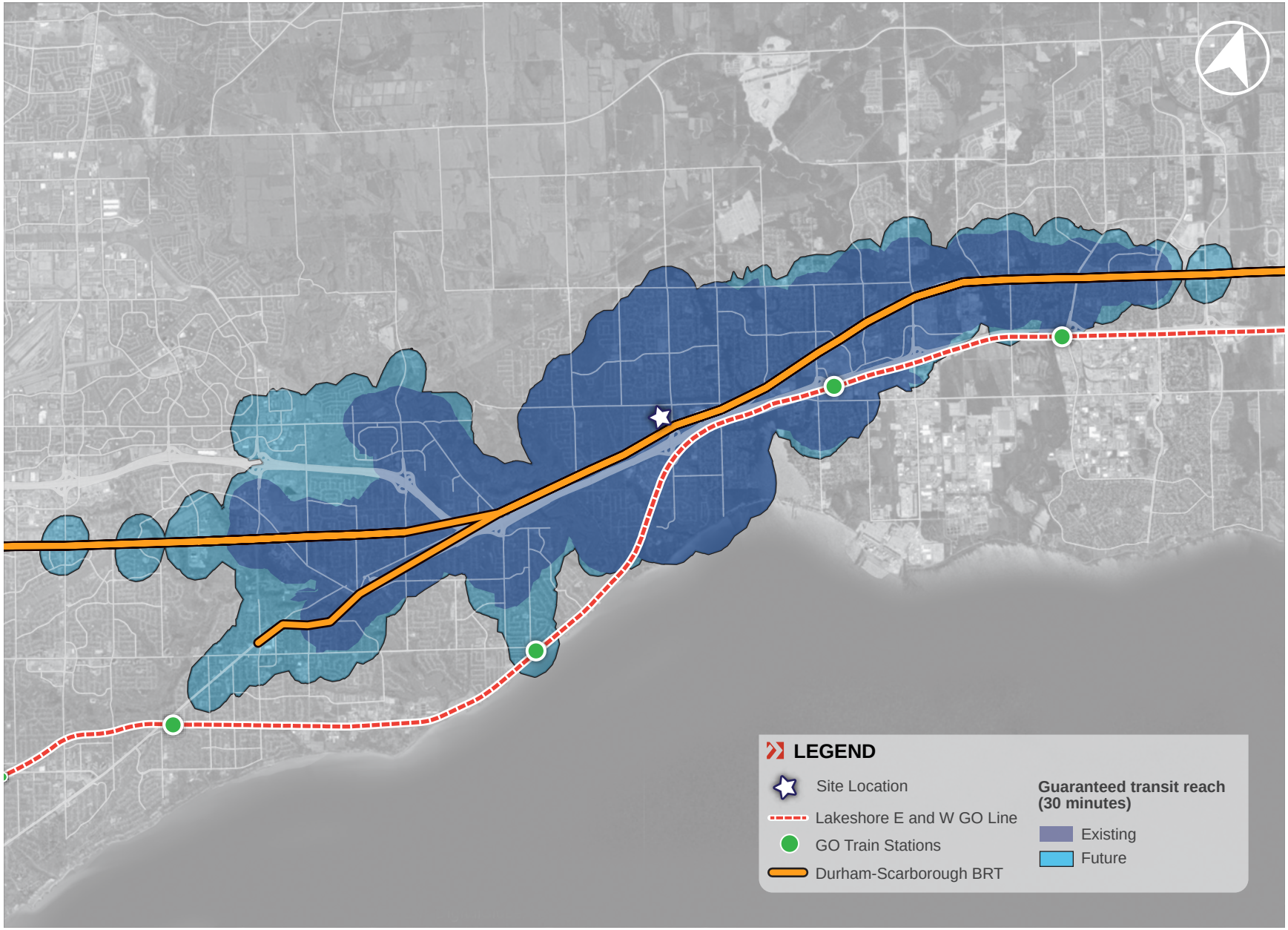

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FIGURE 10 EXISTING VS FUTURE BRT GUARANTEED 30 MINUTE TRANSIT REACH

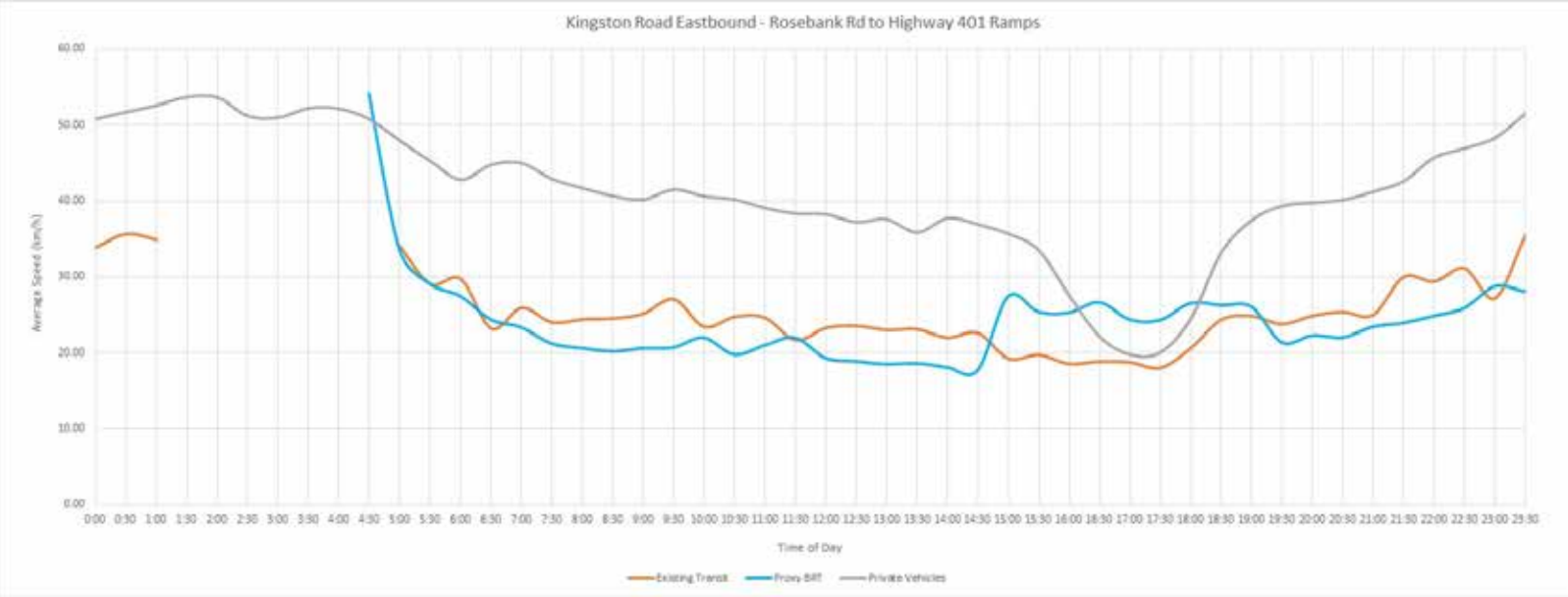

FIGURE 11 PRIVATE VEHICLE AND BRT SPEED COMPARISON

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**.

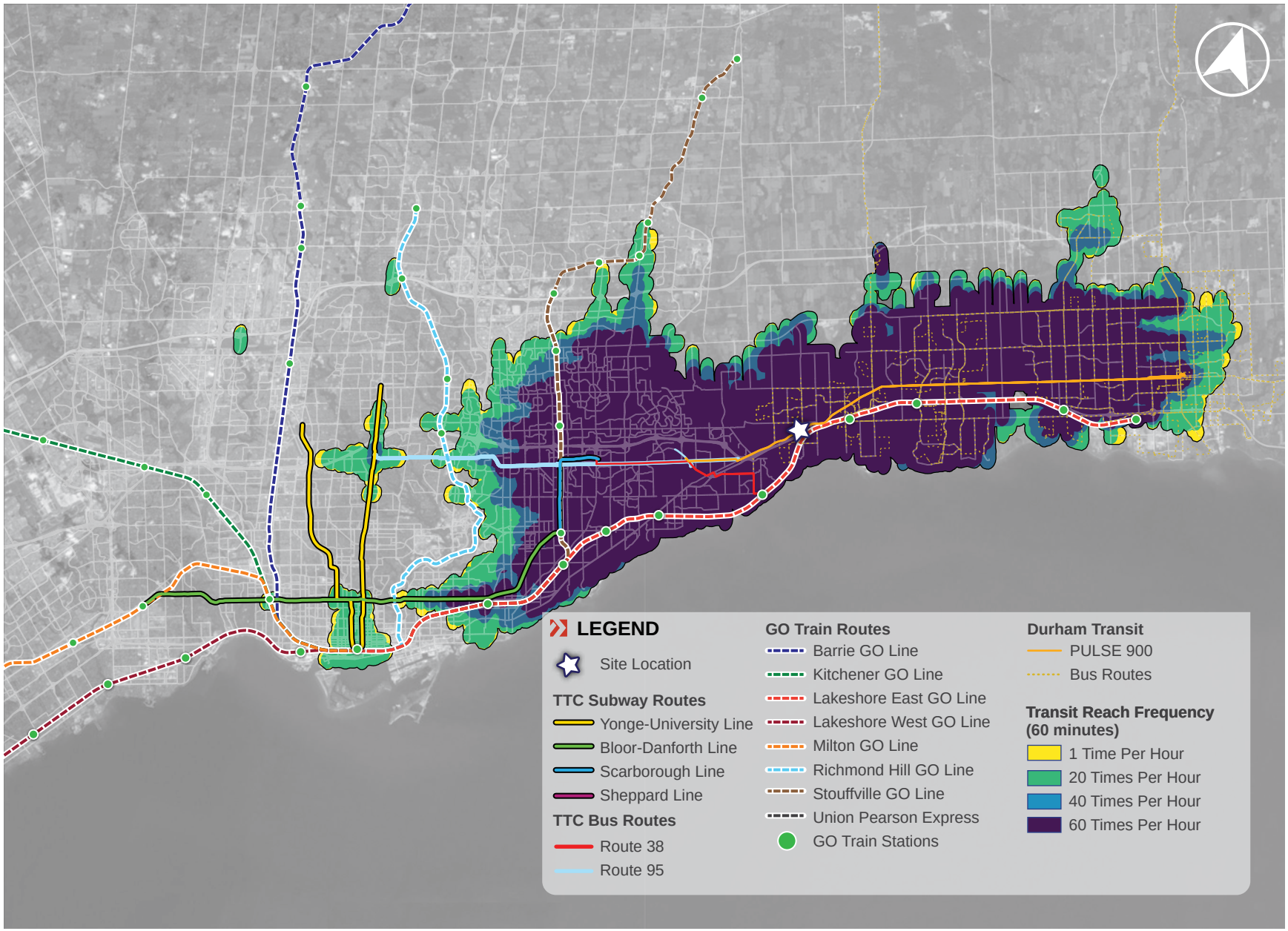

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FIGURE 12 EXISTING 60 MINUTE TRANSIT REACH FREQUENCY

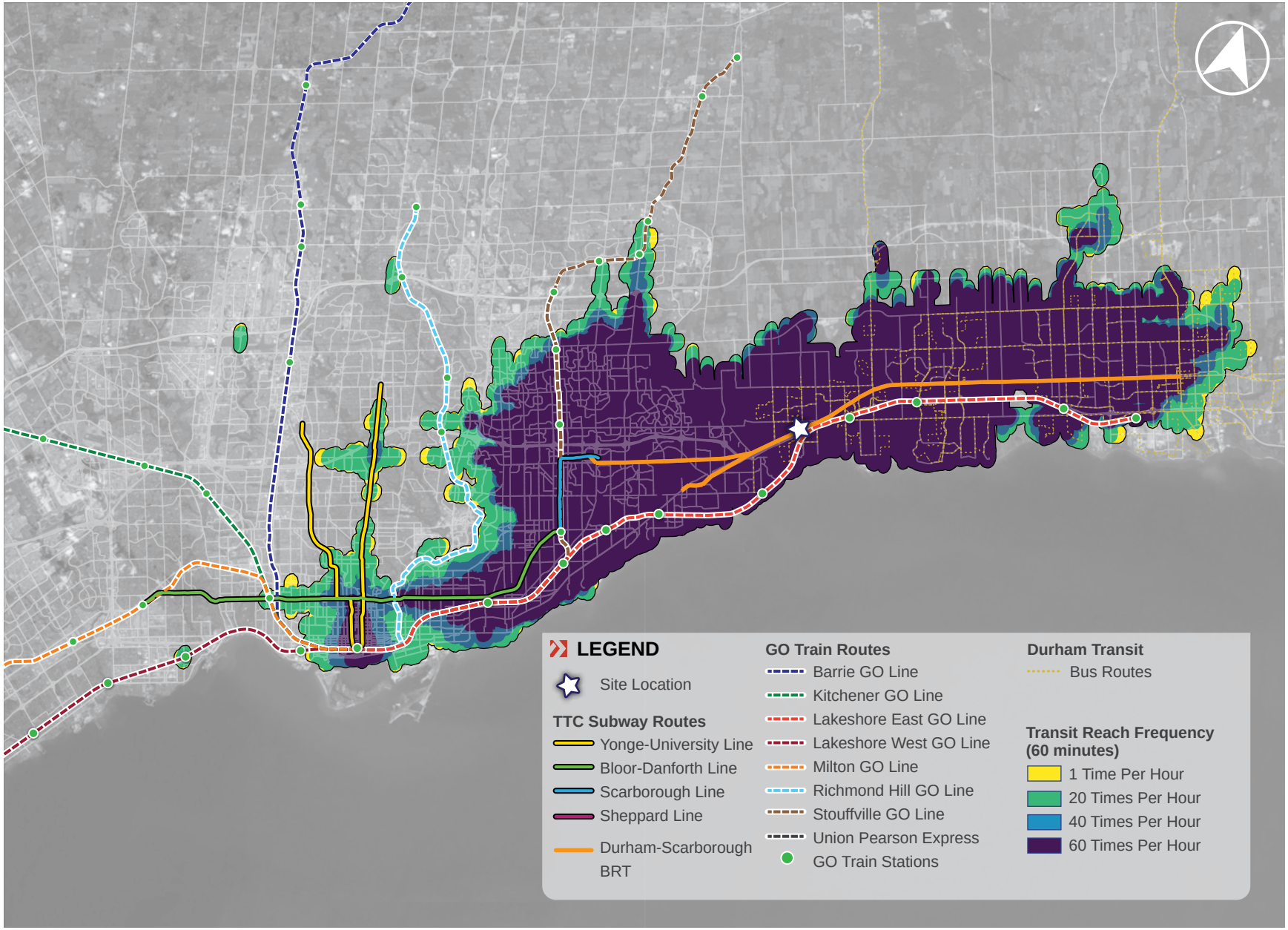

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FIGURE 13 BRT & RER FUTURE 60 MINUTE TRANSIT REACH FREQUENCY

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 18**. 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:*

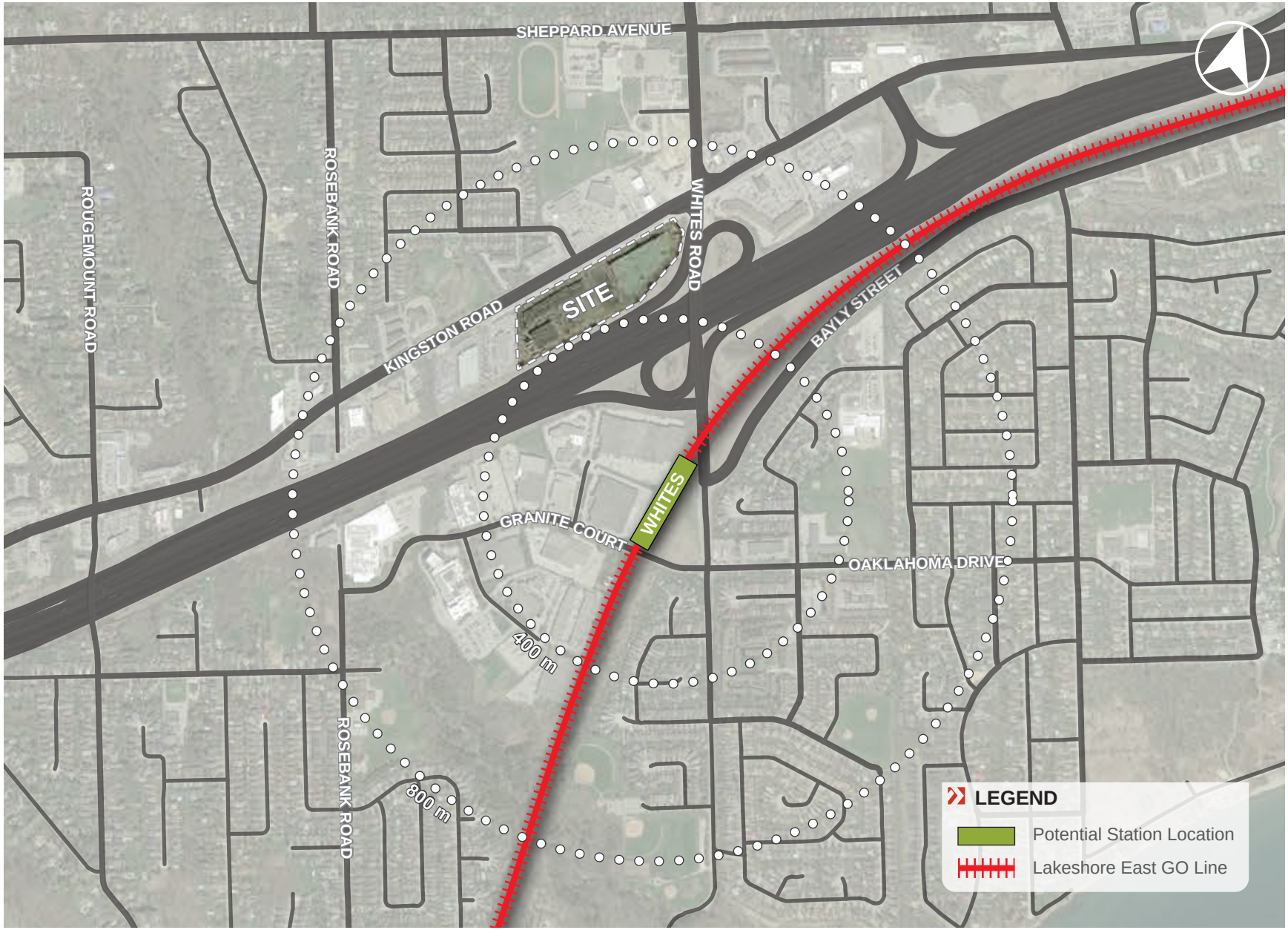

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FIGURE 14 FUTURE WHITES GO STATION

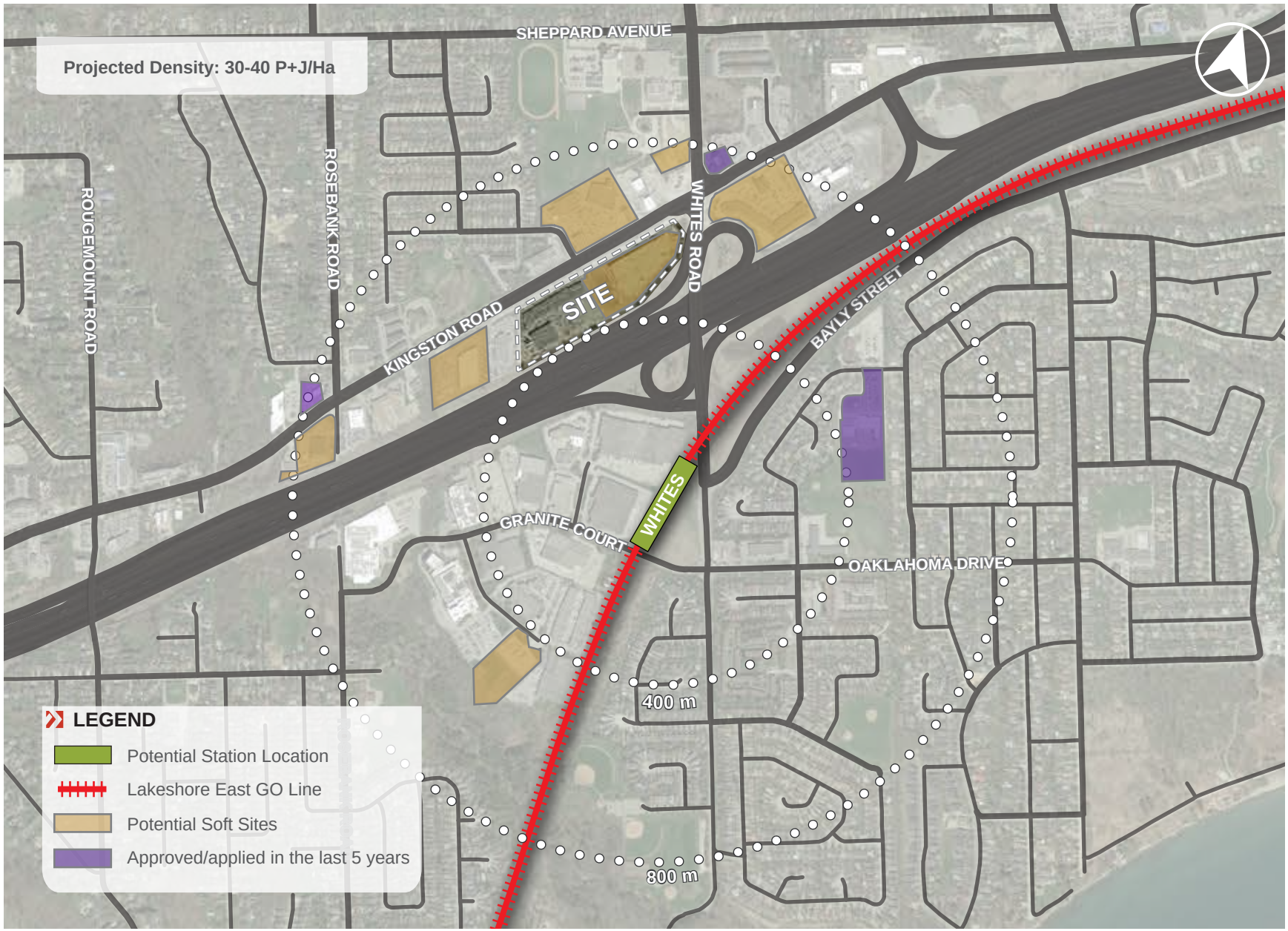

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FIGURE 15 BUSINESS CASE REVIEW OF DENSITY SERVED BY WHITES GO STATION

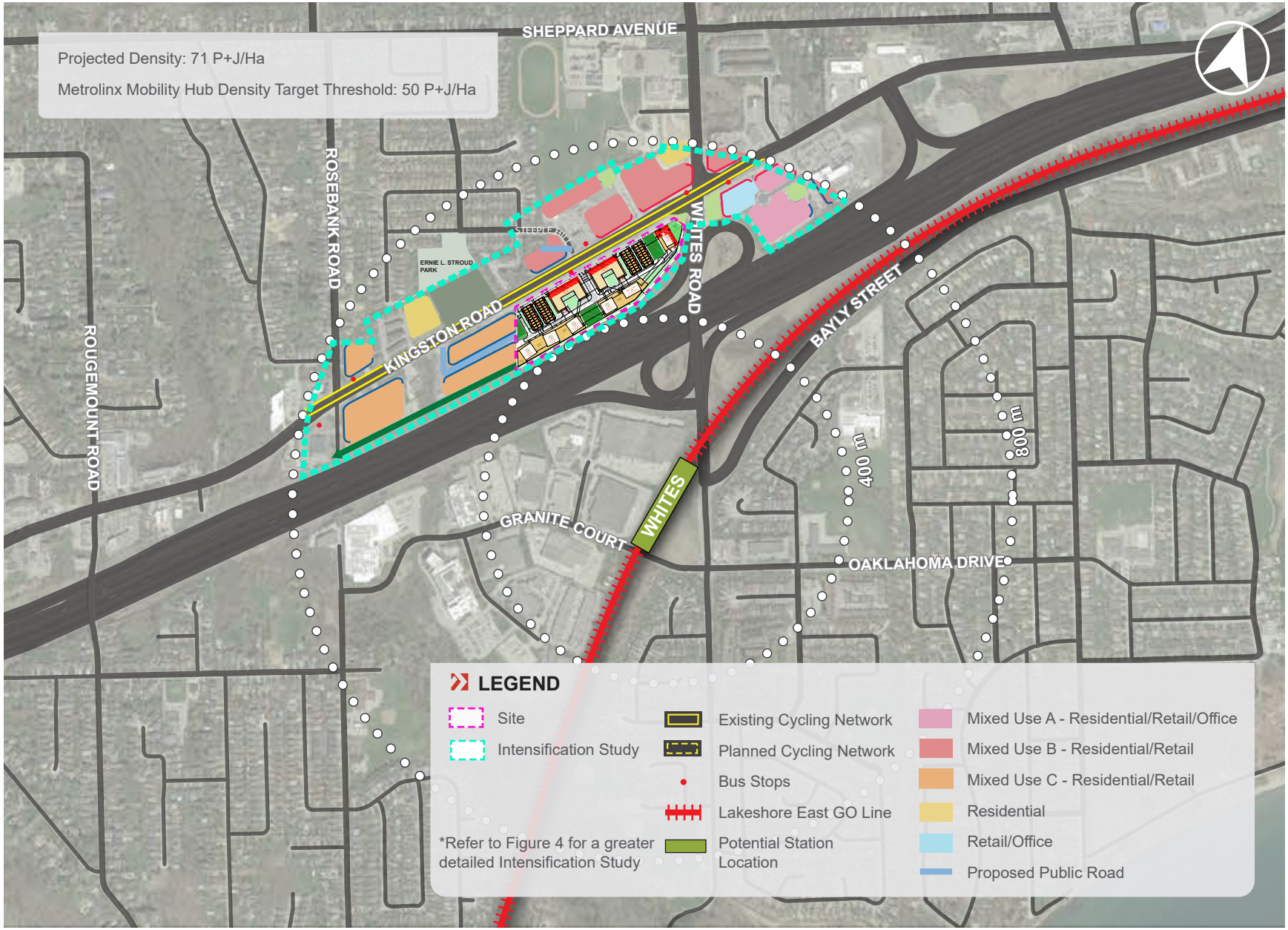

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FIGURE 16 INTENSIFICATION STUDY REVIEW OF DENSITY SERVED BY WHITES GO STATION

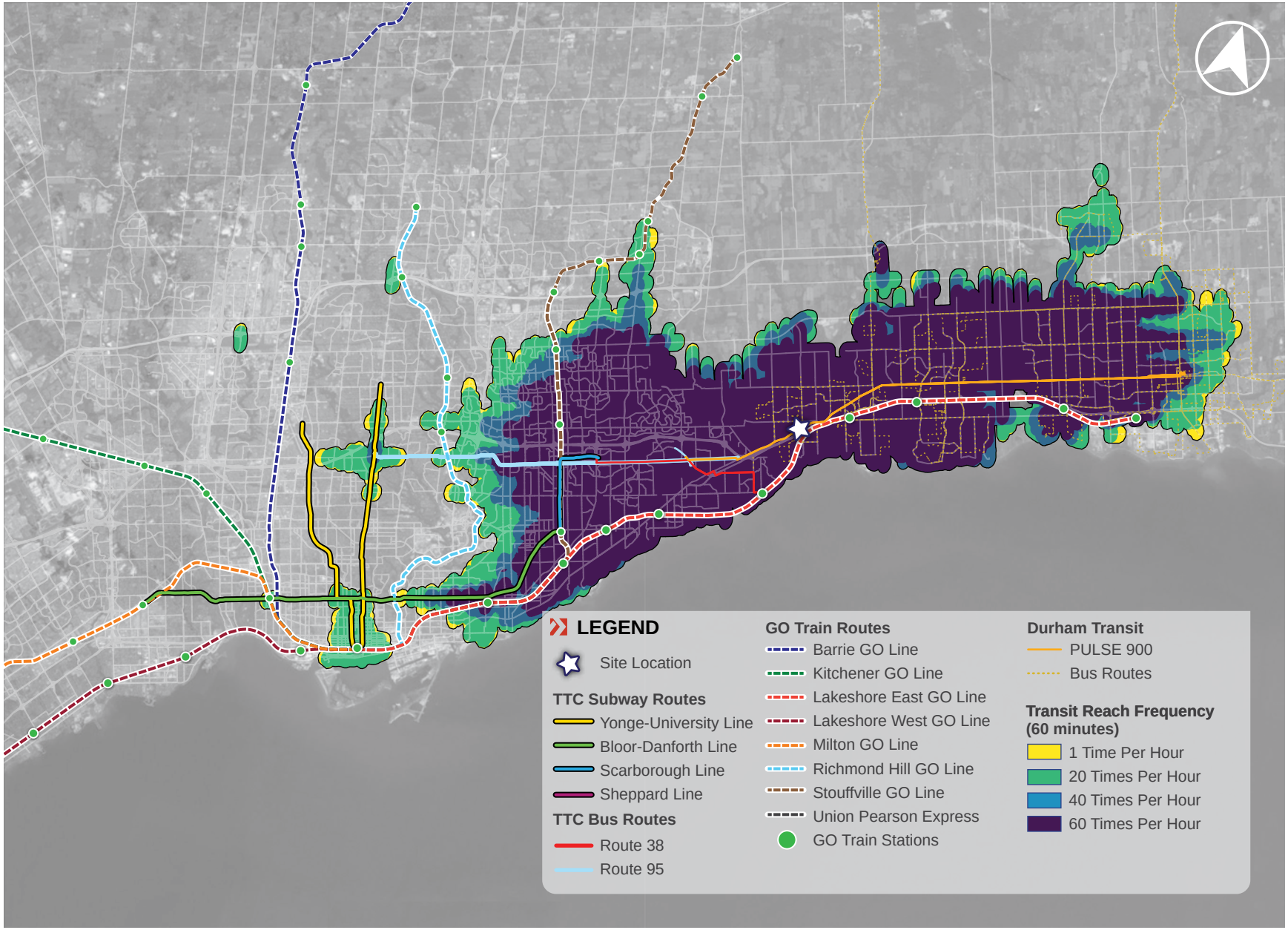

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FIGURE 17 EXISTING 60 MINUTE TRANSIT REACH FREQUENCY

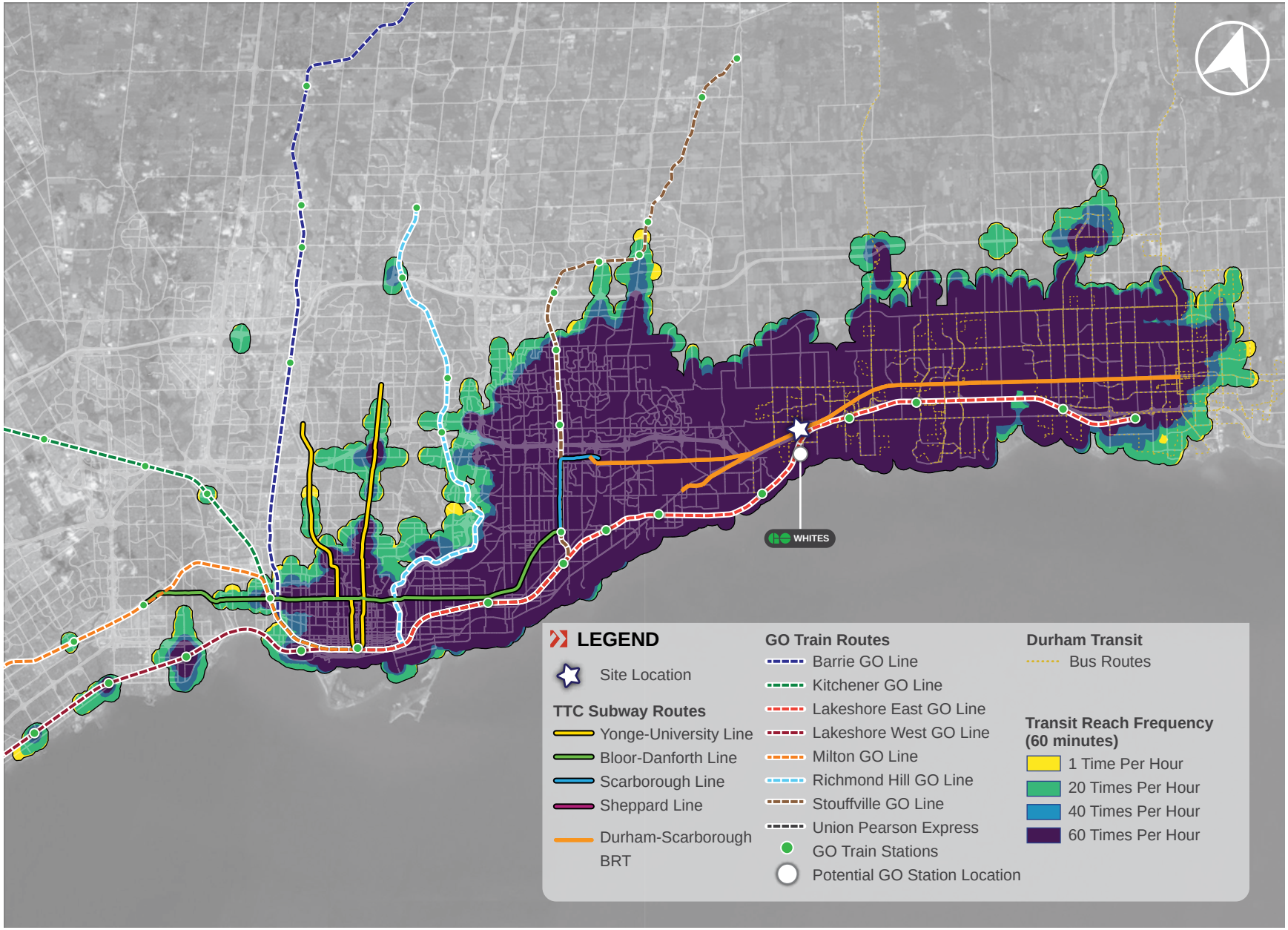

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FIGURE 18 WHITES GO STATION FUTURE 60 MINUTE TRANSIT REACH FREQUENCY

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 19**.

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.

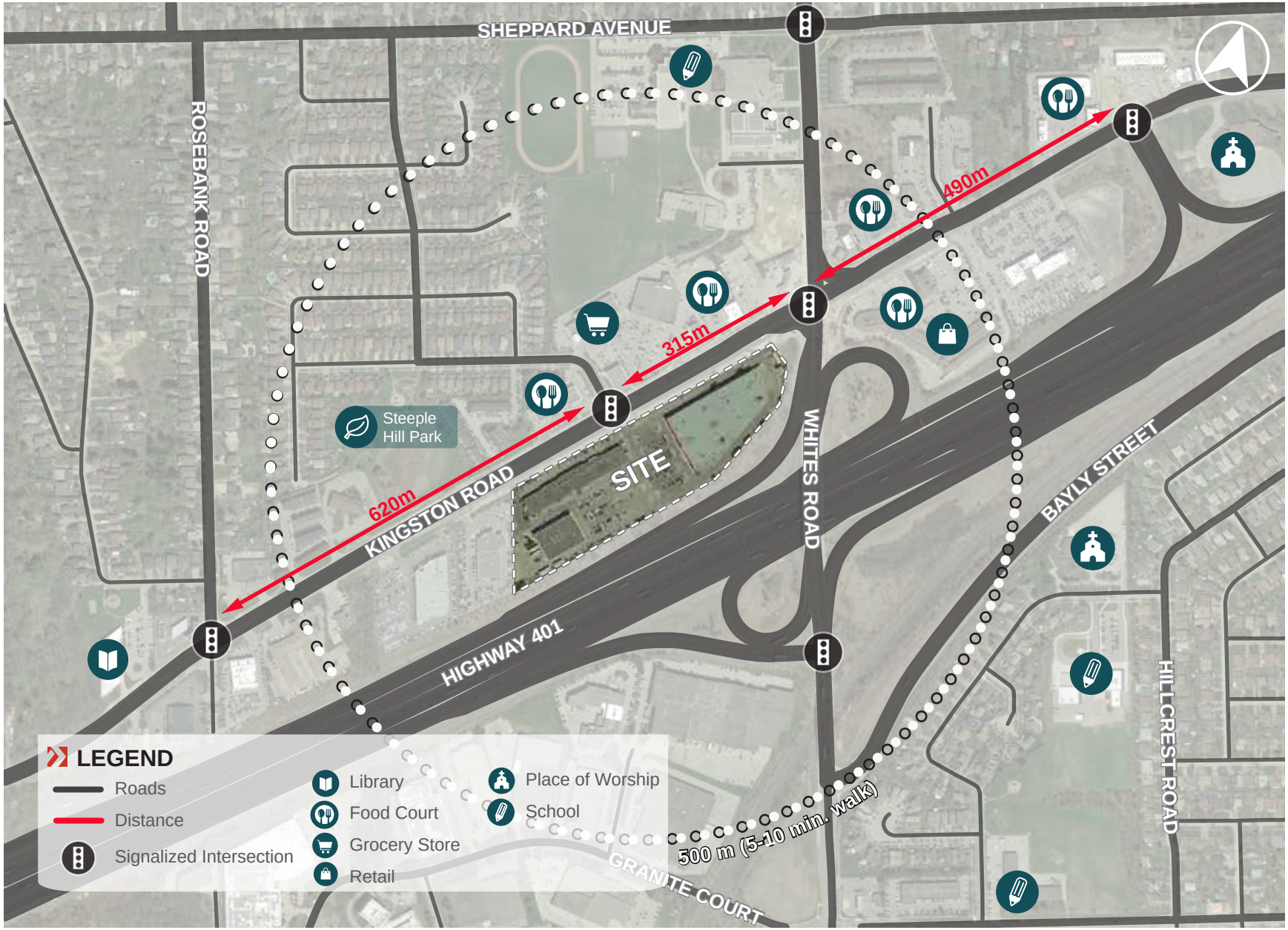

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FIGURE 19 EXISTING AREA PEDESTRIAN DESTINATIONS

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 20**.

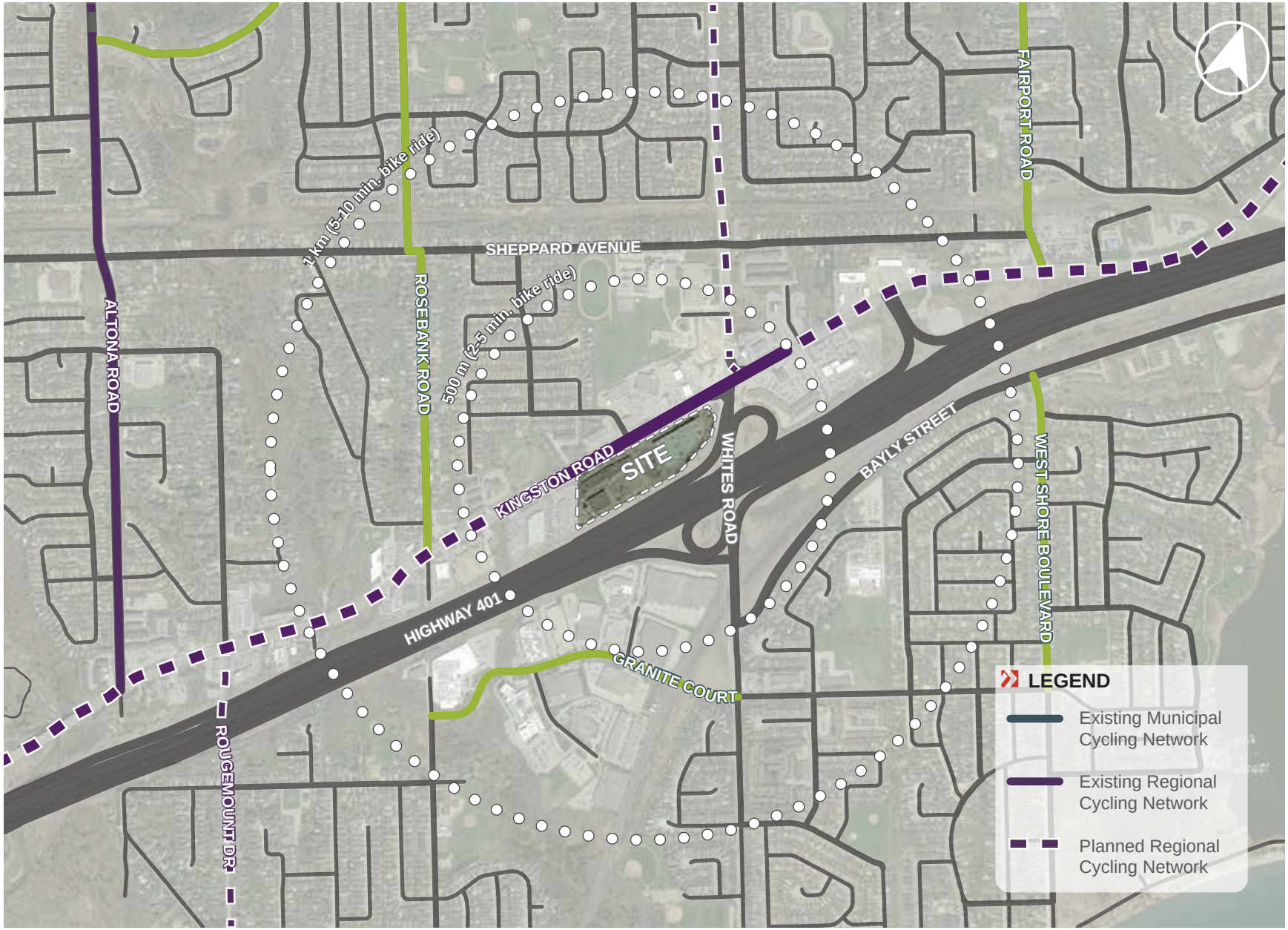

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FIGURE 20 EXISTING AND FUTURE AREA CYCLING NETWORK

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**.

5.1.1 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.

5.2 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
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;

		Intent	Implementation
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
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 5,341 parking spaces, including 5,083 residential parking spaces and 258 non-residential parking spaces.

TABLE 5 SITE-SPECIFIC BY-LAWS NO. 1810-84 & 2471-87 PARKING REQUIREMENTS

Use	Units / Floor Area[1]	Rate (Minimum)	Requirement (Minimum)
Residential[2]			
Multiple Family Vertical (Apartment)	2,740 units	1.75 spaces per unit[3]	4,795 sps
Multiple Family Horizontal without attached garage (Townhouse)	144 units	2.00 spaces per unit[3]	288 sps
SUBTOTAL	**2,884 units**	**(1.76 spaces per unit)**	**5,083 sps**
Non-residential			
Western Portion of the Site	767 m^2	4.5 spaces per 100 m^2 of GLA[4]	35 sps
Eastern Portion of the Site	5,914 m^2	3.5 spaces per 93 m^2 of GLA[5]	223 sps
SUBTOTAL			**258 sps**
TOTAL (with sharing)[2]			**5,341 sps**

Notes:
1. Based upon statistics provided Graziani & Corazza Architects dated April 6, 2020.
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 2,958 parking spaces, including 2,444 residential parking spaces and 514 non-residential parking spaces.

6.1.3 Proposed Parking Requirements

The proposed (and recommended) minimum parking requirements for the Site are in line with the minimum parking requirements and sharing provisions of Zoning By-law 7553-17, as seen in **Table 6**. However, there proposed modifications to the townhouse and retail parking standards. The proposed parking requirements are as follows:

- Apartment Dwelling: 0.80 parking spaces per unit
- Townhouses: 1.0 parking space per unit
- Residential Visitors: 0.15 spaces per unit
- Retail: no designated retail parking will be provided, 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 2,780 parking spaces, including 2,336 residential parking spaces and 444 non-resident parking spaces.

Currently, a total of 2,830 parking spaces in two levels of below-grade parking and within Podium 1 and 4 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	2,740 units	0.80 spaces per unit	2,192 spaces	100%							
Back-to-Back Townhouse	144 units	1.75 spaces per unit	252 spaces								
SUBTOTAL	**2,884 units**	**(0.85 spaces per unit)**	**2,444 spaces**	**2,444 spaces**							
Non-Residential											
Residential Visitors	2,884 units	0.15 spaces per unit	433 spaces	87 sps (20%)	87 sps (20%)	260 sps (60%)	433 sps (100%)	87 sps (20%)	87 sps (20%)	260 sps (60%)	433 sps (100%)
Office	4,448 m^2	2.5 spaces per 100 m^2 GLFA	111 spaces	111 sps (100%)	100 sps (90%)	105 sps (95%)	11 sps (10%)	11 sps (10%)	11 sps (10%)	11 sps (10%)	0 sps (0%)
Retail	2,232 m^2	3.5 spaces per 100 m^2 GLFA	78 spaces	51 sps (65%)	70 sps (90%)	70 sps (90%)	70 sps (90%)	62 sps (80%)	78 sps (100%)	78 sps (100%)	55 sps (70%)
SUBTOTAL			**622 spaces**	**249 sps**	**257 sps**	**435 sps**	**514 sps**	**160 sps**	**176 sps**	**349 sps**	**488 sps**
TOTAL (with sharing)[2]			**3,066 spaces**	**2,693 sps**	**2,879 sps**	**2,879 sps**	**2,958 sps**	**2,604 sps**	**2,620 sps**	**2,793 sps**	**2,932 sps**

Notes:
1. Based upon statistics provided Graziani & Corazza Architects dated April 6, 2020.
2. Sharing provision are in accordance with Zoning By-law 7553-17 Section 3.4.

TABLE 7 RECOMMENDED MINIMUM 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	2,740 units	0.80 spaces per unit	2,192 spaces	100%							
Back-to-Back Townhouse	144 units	1.00 spaces per unit	144 spaces								
SUBTOTAL	**2,884 units**	**(0.81 spaces per unit)**	**2,336 spaces**	**2,336 spaces**							
Non-Residential											
Residential Visitors	2,884 units	0.15 spaces per unit	433 spaces	87 sps (20%)	87 sps (20%)	260 sps (60%)	433 sps (100%)	87 sps (20%)	87 sps (20%)	260 sps (60%)	433 sps (100%)
Office	4,448 m^2	2.5 spaces per 100 m^2 GLFA	111 spaces	111 sps (100%)	100 sps (90%)	105 sps (95%)	11 sps (10%)	11 sps (10%)	11 sps (10%)	11 sps (10%)	0 sps (0%)
Retail	2,232 m^2	0 spaces	0 spaces	0 sps (65%)	0 sps (90%)	0 ps (90%)	0 sps (90%)	0 sps (80%)	0 sps (100%)	0 sps (100%)	0 sps (70%)
SUBTOTAL			**544 spaces**	**198 sps**	**187 sps**	**365 sps**	**444 sps**	**98 sps**	**98 sps**	**271 sps**	**433 sps**
TOTAL (with sharing)[2]			**2,893 spaces**	**2,534 sps**	**2,523 sps**	**2,701 sps**	**2,780 sps**	**2,434 sps**	**2,434 sps**	**2,607 sps**	**2,769 sps**

Notes:
1. Based upon statistics provided Graziani & Corazza Architects dated April 6, 2020.
2. Sharing provision are in accordance with Zoning By-law 7553-17 Section 3.4.

6.3 APPROPRIATENESS OF 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 series of parking standards are 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;
- Recent resident parking reduction approvals obtained for residential buildings located within close proximity to an existing surface transit;
- A review of standards applicable to comparable uses and contexts in adjacent Ontario municipalities;
- The mixed-use, urban nature of the proposed development, which will encourage shared parking and interactions between the uses; 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 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 Ontario's Five-Year Climate Change Action Plan

Ontario's Five-Year Climate Change Action Plan (2016-2020) was announced in June 2016. While the Plan was released under a previous government, it is important to take these policies into consideration. The key transportation and land use planning actions outlined in the Plan are summarized as follows:

- ***Support cycling and walking***: Commuter cycling networks will be established across Ontario, targeting routes with high-commuting volume such as between residential communities, major transit stations and employment areas. There will be more cycling facilities in urban areas, including grade separated routes and cycling signals. There will be more bike parking at transit stations and provincially owned, publicly accessible facilities. Ontario will revise provincial road and highway standards to require commuter cycling infrastructure be considered for all road and highway construction projects where it is safe and feasible. Ontario will do the same for major transit corridors.

- ***Reduce single-passenger vehicle trips***: Ontario will provide grants to municipalities and large private employers to implement Transportation Demand Management Plans. The plans will be designed to help increase walking, cycling, carpooling, telecommuting, and flex-work schedules, thereby reducing overall fossil fuel consumption, traffic congestion, and transportation emissions.

- ***Eliminate minimum parking requirements*:** Minimum parking requirements will be eliminated over the next five years for municipal zoning bylaws, especially in transit corridors and other high density, highly walkable communities. Minimum parking requirements are a barrier to creating complete, compact and mixed-use communities. Instead, bylaws will encourage bike lanes, larger sidewalks, and enhanced tree canopies.

The concept to eliminate minimum parking requirements in transit-accessible areas, particularly for apartment buildings, is not a new phenomenon in North America. Developments proposing 'zero' residential parking are being promoted, approved and developed all over North America including Toronto, Calgary, Vancouver, Portland, and Boston. Some cities are even going as far as to eliminate minimum residential parking requirements in downtown/core areas, including the City of London and the City of Ottawa.

6.3.1.2 2041 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."*

6.3.1.3 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.

6.3.1.4 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 Recent Resident Parking Approval Trends

There is a broad spectrum of parking supplies and demands associated with residential buildings across the Greater Toronto Hamilton Area. These parking demands have been changing (reducing) over recent years in response to the changing demographics, economic factors, city policies and planning, and the mobility choices of residents within newer buildings, in particular.

Residential parking standards outlined in municipal zoning by-laws can be considered as conservatively high relative to the actual parking demand generated by residential buildings, as illustrated by the parking sales data discussed in **Section 6.4.3**. This is particularly true in areas that have high levels of transit accessibility.

Given the above, parking provisions at a substantial proportion of new residential (notably condominiums) buildings in close proximity to transit services have been approved at levels that are less than the applicable zoning by-law (often by some margin). Such approvals have been accepted by City staff and secured through City Council, the Ontario Municipal Board, the Local Planning Appeal Tribunal, the Toronto Local Appeal Body, and the Committee of Adjustment for both condominium and rental buildings within transit-accessible areas.

Several recent examples of GTA condominium buildings in close proximity to surface transit that connects the Site to nearby transit stations, similar to the Site's context, with approved reduced resident parking standards are summarized in **Table 9**.

TABLE 9 APPROVED RESIDENTIAL PARKING REDUCTIONS

Address	Approved Residential Rate	Permission Granted Through	Closest Transit Station
2135 Sheppard Avenue E (Sheppard Ave E / Consumers Rd)	***0.54 spaces / unit***	CofA Decision – A0800/17NY	TTC Don Mills Subway Station (Line 4) 1.10 km from site
1478-1496 Kingston Road (Kingston Road / Warden Avenue)	***0.71 spaces / unit***	Site Specific By-laws 1409-2019 & 1410-2019	TTC Victoria Park Subway Station (Line 2) 1.65 km from site
4569 Kingston Road (Kingston Road / Morningside Avenue)	***PA4 Rates***	Site-Specific By-law 1106-2018	Eglinton GO Transit Station (Lakeshore East Line) 5.20 km from site
1021 Markham Road (Ellesmere Road / Markham Road)	***PA4 Rates*** ***0.45 spaces / unit (rental)***	Site Specific By-law 1276-2018	TTC McCowan Subway Station (Line 2) 1.71 km from site
3939-3947 Lawrence Avenue E (Lawrence Avenue E / Orton Park Road)	***0.90 spaces / unit***	CoA Decision - A0105/17SC (2017)	Guildwood GO Transit Station (Lakeshore East Line) 1.10 km from site

The proposed (reduced) residential parking requirement of 0.80 spaces per apartment unit and 1.00 spaces per townhouse unit are considered appropriate given that the Site is located adjacent from the future BRT route, which facilitates connections to Pickering GO Station approximately 3.0 km from the Site. The transportation context of the Site is similar when compared to sites within the GTA where lower resident parking supply ratios were adopted along surface transit routes.

6.3.1 Review of Current Municipal Zoning By-law Parking Requirements

The current parking requirements are relatively high when compared to other surrounding municipalities. BA Group reviewed 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 1-88) to encourage this growth.

The City of Toronto's Comprehensive Zoning By-Law provides a range of parking requirements that are intended to recognize the transit accessibility of the area. The City's bylaw rates for Policy Area 4 (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.

A comparison of the current zoning bylaws for the Site, Pickering City Centre, Mississauga, Vaughan and Toronto, as well as the proposed parking standards for the Site, is summarized in Table 10Table 10.

TABLE 10 COMPARISON OF MUNICIPAL PARKING STANDARDS

Use	Current Zoning (Site-Specific Zoning)	City of Pickering – City Centre (7553-17)	City of Mississauga	City of Vaughan VMC	City of Toronto Policy Area 4	Proposed Standards
Residential	**Multiple Family Vertical:** 1.75 spaces per unit **Multiple Family Horizontal:** 2.0 spaces per unit [2]	**Apartment Dwelling:** 0.80 spaces per unit **Back-to-Back Townhouse:** 1.75 spaces per unit	**City Centre Rates** **Apartment:** 1.0 spaces per unit **Non-City Centre Rates** **Townhouse:** 2.0 spaces per unit	**Bachelor/1-bed:** 0.7 spaces per unit **2-bed:** 0.9 spaces per unit **3-bed**: 1.0 spaces per unit **Townhouse:** 1.0 space per unit	**Bachelor:** 0.7 spaces per unit **1-bed:** 0.8 spaces per unit **2-bed:** 0.9 spaces per unit **3-bed:** 1.1 spaces per unit **Townhouse:** 1.0 space per unit	**Apartment Dwelling:** 0.80 spaces per unit **Back-to-Back Townhouse:** 1.00 spaces per unit
Residential Visitor	Visitor parking included in the residential parking requirements	0.15 spaces per unit	**City Centre Rates** 0.15 spaces per unit[1] **Non-City Centre Rates** **Townhouse**: 0.25 spaces per unit[3]	0.15 spaces per unit	0.15 spaces per unit	0.15 spaces per unit
Retail	**Eastern Portion**: 4.5 spaces per 100 m^2 of GFA **Western Portion:** 3.5 spaces per 93 m^2 of GFA	3.5 spaces per 100 m^2 of GFA	**City Centre Rates** 4.3 spaces per 100 m^2 of GFA	2.0 spaces per 100 m^2 of GFA[4]	1.0 space per 100 m^2 of GFA	3.0 spaces per 100 m^2 of GFA

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).
2. For townhouse dwellings that provide parking without an attached garage.
3. For condominium townhouses.
4. For retail uses where the total GFA of all buildings is less than or equal to 5,000 m^2.

For resident uses, recent applications in the City of Mississauga's City Centre have proposed residential parking rates of 0.80 to 0.92 spaces per unit, with the later approved through the Committee of Adjustment. Developments have also been approved in the City of Vaughan's VMC area at parking rates as low as 0.33 spaces per unit. Similarly, developments in the City of Toronto in similar contexts have been approved at a range of rates lower than the Policy Area 4 standards.

Therefore, the parking standards in these respective zoning by-laws are not absolute and there is recognition that reduced parking standards are appropriate in highly transit-accessible areas with an intensive mix of uses and high quality urban realm.

Another key point of comparison is the City of Vaughan's zoning by-law review carried out by IBI Group in a 2010 report titled "*Review of Parking Standards Contained within the City of Vaughan's Comprehensive Zoning By-law*". This report noted that the current Zoning By-law (1-88) has little consideration for the availability of alternative forms of transportation or the urban context that has evolved in the City of Vaughan. The report reviewed best practices and existing standards to develop a new framework for determining new parking standards.

While not in force today, the proposed parking standards for the City of Vaughan contained a range based on the transportation context of different areas in Vaughan, including high-order transit hubs, local centres, primary centres / intensification areas, and base (other areas).

These drafted / proposed parking standards are based on a comprehensive review of background studies, technical studies and policy input. The range of rates are summarized in **Table 11.**

The proposed parking standards for the Site redevelopment fall within the range that has been drafted / proposed for the higher-order transit hub, local centres and primary centres / intensification areas in the City of Vaughan. The proposed parking standards are appropriate, given that the Site is located along a frequent bus service corridor that facilitates connections to Pickering GO Station, services that will be further improved with the introduction of the Kingston Road BRT and RER.

TABLE 11 PROPOSED CITY OF VAUGHAN PARKING STANDARDS – CITY OF VAUGHAN ZONING BY-LAW REVIEW

Use	Base	Higher-Order Transit Hub	Local Centres	Primary Centres / Intensification Areas
Resident	**1 bed:** 0.90 spaces per unit **2 bed:** 1.10 spaces per unit **Townhouse:** 2.00 spaces per unit	**1 bed:** 0.70 spaces per unit **2 bed:** 0.90 spaces per unit **Townhouse:** 1.00 spaces per unit	**1 bed:** 0.80 spaces per unit **2 bed:** 1.00 spaces per unit **Townhouse:** 1.00 spaces per unit	**1 bed:** 0.85 spaces per unit **2 bed:** 0.95 spaces per unit **Townhouse:** 1.00 spaces per unit
Residential Visitor	0.20 spaces per unit	0.15 spaces per unit	0.20 spaces per unit	0.20 spaces per unit
Retail	4.5 spaces per 100 m^2 of GFA	2.5 spaces per 100 m^2 of GFA	3.0 spaces per 100 m^2 of GFA	3.0 spaces per 100 m^2 of GFA

6.3.2 Mixed-use Nature of the Proposed Development

The proposed development introduces a mix of land uses (residential, 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.

6.3.3 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.

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 12**. The application of the bicycle parking requirements results in a total parking requirement of 1,521 parking spaces, including 1,514 residential parking spaces and 7 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 12 RECOMMENDED (ZONING BY-LAW 7553-17) BICYCLE PARKING REQUIREMENTS

Uses	Unit / Floor Area[1]	Rate (Minimum)	Requirement
Apartment Dwelling	2,740 units	0.50 spaces per unit	1,370 spaces
Stacked Dwelling	144 units	1.0 spaces per unit	144 spaces
Non-residential Uses	6,680 m^2	The greater of 2 or 1.0 spaces per 1,000 m^2 of GLA	7 spaces
Total			**1,521 spaces**

Notes:
1. Based upon statistics provided Graziani & Corazza Architects dated April 6, 2020.

8.0 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.

8.1 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 13**, 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 13**.

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 13 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

8.2 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 14**.

TABLE 14 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 zone 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 14**) 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 represent 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 15**.

Based upon the proxy trip generation methodology, the proposed residential use will generate approximately 785 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 760 and 875 two-way vehicle trips during the weekday morning and afternoon peak hours, respectively.

TABLE 15 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			**0.06**	**0.21**	**0.27**	**0.20**	**0.10**	**0.30**
Residential Townhouse								
Liberty Walk, 760 Lawrence Ave W, North York[4]	Tuesday, November 19, 2019	245	0.05	0.16	0.21	0.15	0.09	0.24
55-125 George Appleton Way, North York[4]	Tuesday, November 19, 2019	244	0.10	0.30	0.40	0.28	0.14	0.42
Hyde Park, Vanderhoof Ave, East York[4]	Tuesday, November 19, 2019	384	0.05	0.29	0.34	0.20	0.06	0.26
Average Trip Rates Per Unit			**0.07**	**0.25**	**0.32**	**0.21**	**0.10**	**0.31**
Overall Trip Generation								
Overall Residential Site Trip Rates Per Unit			**0.06**	**0.21**	**0.27**	**0.20**	**0.10**	**0.30**
Overall Residential Site Trips (2,884 units)			**175**	**610**	**785**	**580**	**285**	**865**

8.3 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 10th 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 16**.

The proposed office use will generate approximately 70 and 55 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 16 OFFICE SITE TRIP GENERATION

Location	Date	GFA (ft^2)	AM Peak Hour			PM Peak Hour		
			In	Out	2-Way	In	Out	2-Way
ITE 10th Edition Trip Generation Rates								
LUC 710 – General Office Building (47,859 ft^2)			1.28	0.21	1.49	0.18	0.95	1.13
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 (47,859 ft^2)			**60**	**10**	**70**	**5**	**50**	**55**

8.4 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 17**.

TABLE 17 NON-RESIDENTIAL PARKING AVAILABILITY

	Peak Period Parking Demand	
	AM Peak Hour	PM Peak Hour
Retail Parking Supply	78 spaces	78 spaces
Time of Day Occupancy Rate	65%	90%
Parking Spaces Occupied by Retail Visitors (Rounded)	**50 spaces**	**70 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 18**.

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 18 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	**25**	**25**	**50**	**35**	**35**	**70**

The proposed retail use will generate approximately 50 and 70 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.

8.5 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 19**.

TABLE 19 SITE MULTI-MODAL TRIP SUMMARY

	AM Peak Hour			PM Peak Hour		
	In	Out	2-Way	In	Out	2-Way
Auto	245	635	880	560	440	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	**315**	**890**	**1,205**	**740**	**570**	**1,310**

Overall, the site is forecast to generate in the order of 1,205 and 1,310 two-way person trips during the weekday morning and afternoon peak hours, respectively.

9.0 VEHICLE TRAVEL DEMANDS

9.1 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 2024, 2029 and 2034 horizon years consistent with MTO reporting requirements.

9.2 EXISTING TRAFFIC VOLUMES

9.2.1 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 Thursday, September 26, 2019.

A listing of the traffic count data and sources are provided in **Table 20**. Existing traffic count data are included in **Appendix C**.

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

TABLE 20 EXISTING TRAFFIC DATA RESOURCES

Intersection	Date	Data Source
Kingston Road / Rosebank Road	Thursday, September 26, 2019	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		

9.2.2 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 Thursday, September 26, 2019 by Spectrum Traffic Data Inc. on behalf of BA Group and are summarized in **Table 21**.

The existing site, as surveyed, generates approximately 80 and 295 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 21 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	45	20	65	120	140	260
Kingston Road / West Site Access	10	5	15	25	10	35
Total Existing Site Traffic	**55**	**25**	**80**	**145**	**150**	**295**

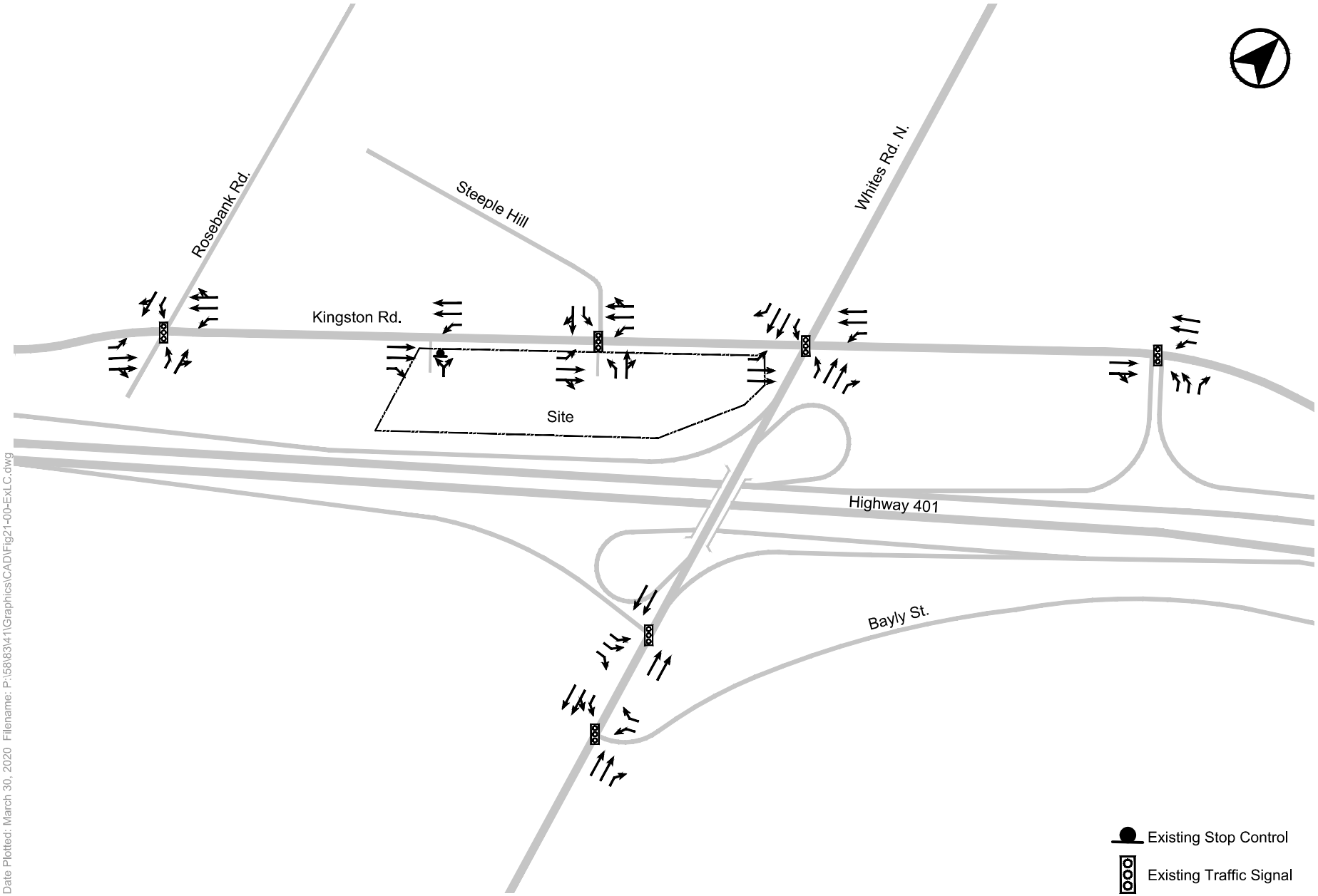

FIGURE 21 EXISTING LANE CONFIGURATIONS

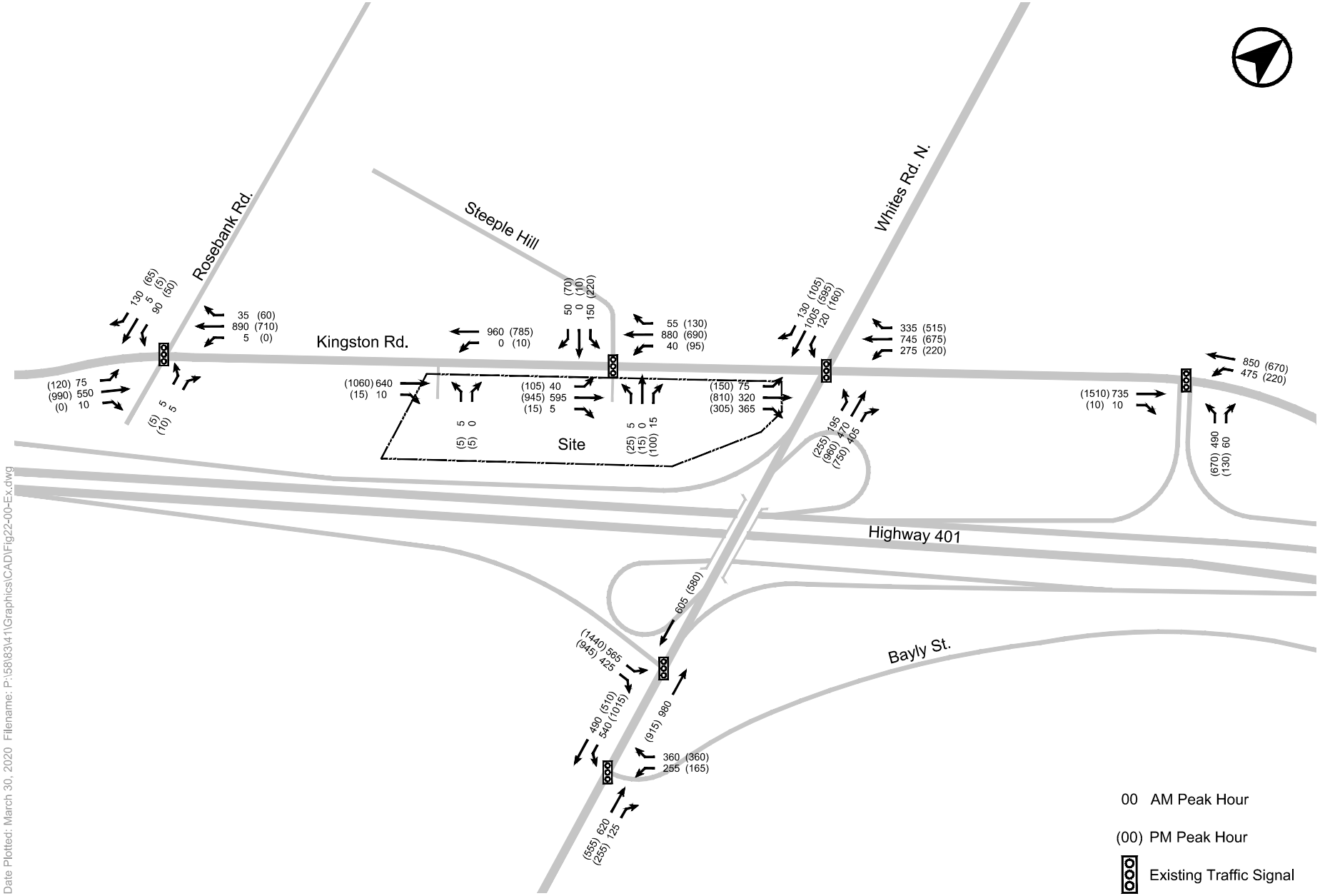

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FIGURE 22 EXISTING TRAFFIC VOLUMES

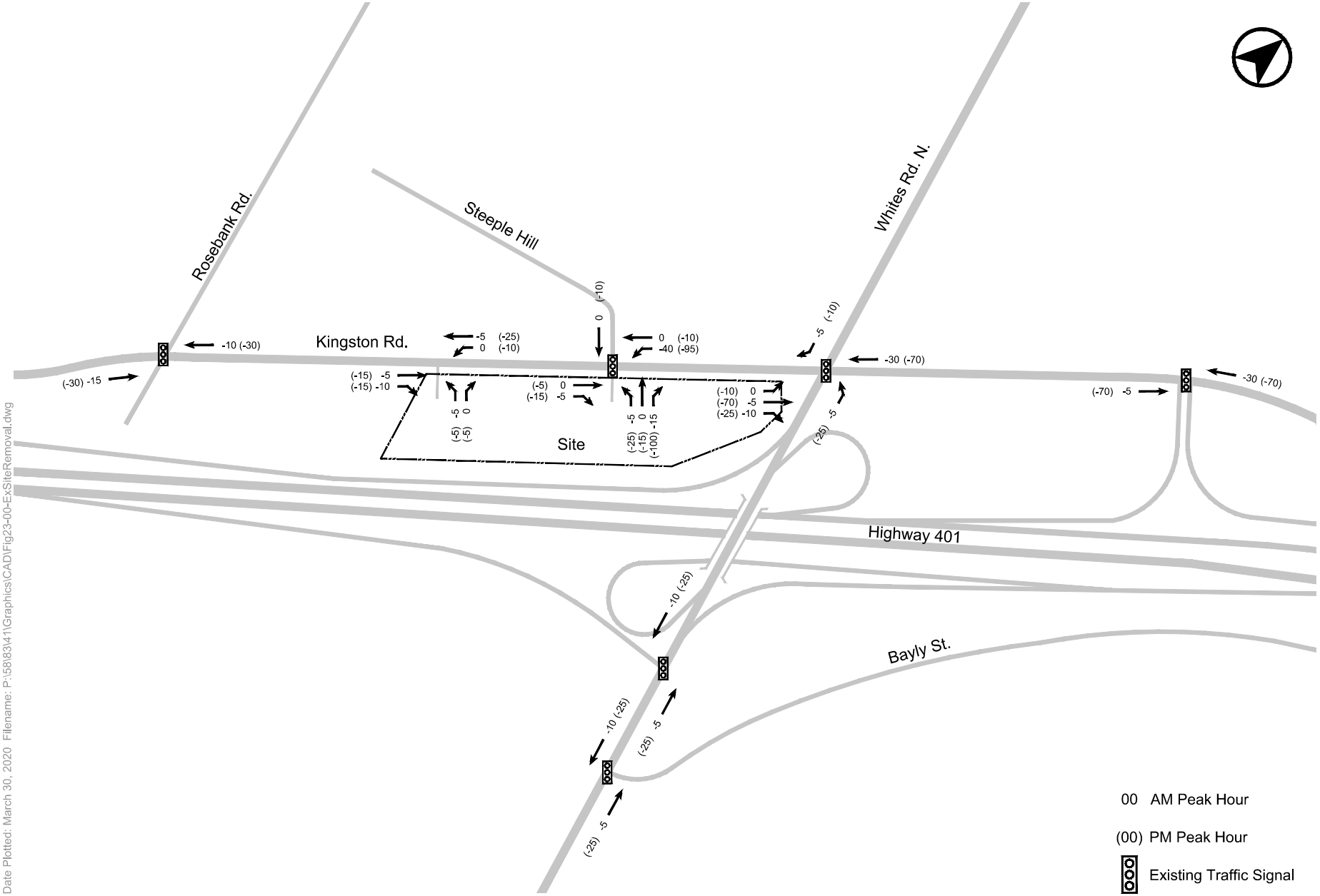

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FIGURE 23 EXISTING SITE TRAFFIC REMOVAL

9.3 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.

9.3.1 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 22**. 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 82 residential units, 194 m^2 of car-wash facility GFA, 211 m^2 convenience store GFA and 112 m^2 fast-food restaurant GFA.

TABLE 22 AREA BACKGROUND DEVELOPMENTS

Site Location	Development Statistics	Trip Generation Notes / Sources
682 & 698 Kingston Road	194 m^2 car-wash facility 211 m^2 convenience store 112 m^2 fast-food restaurant with drive-thru	WSP, August 2019
760-770 Kingston Road	82 residential units	Stantac, May 2019

9.3.2 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 2024 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 (as is the case here), 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 2024 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.

9.3.3 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** through

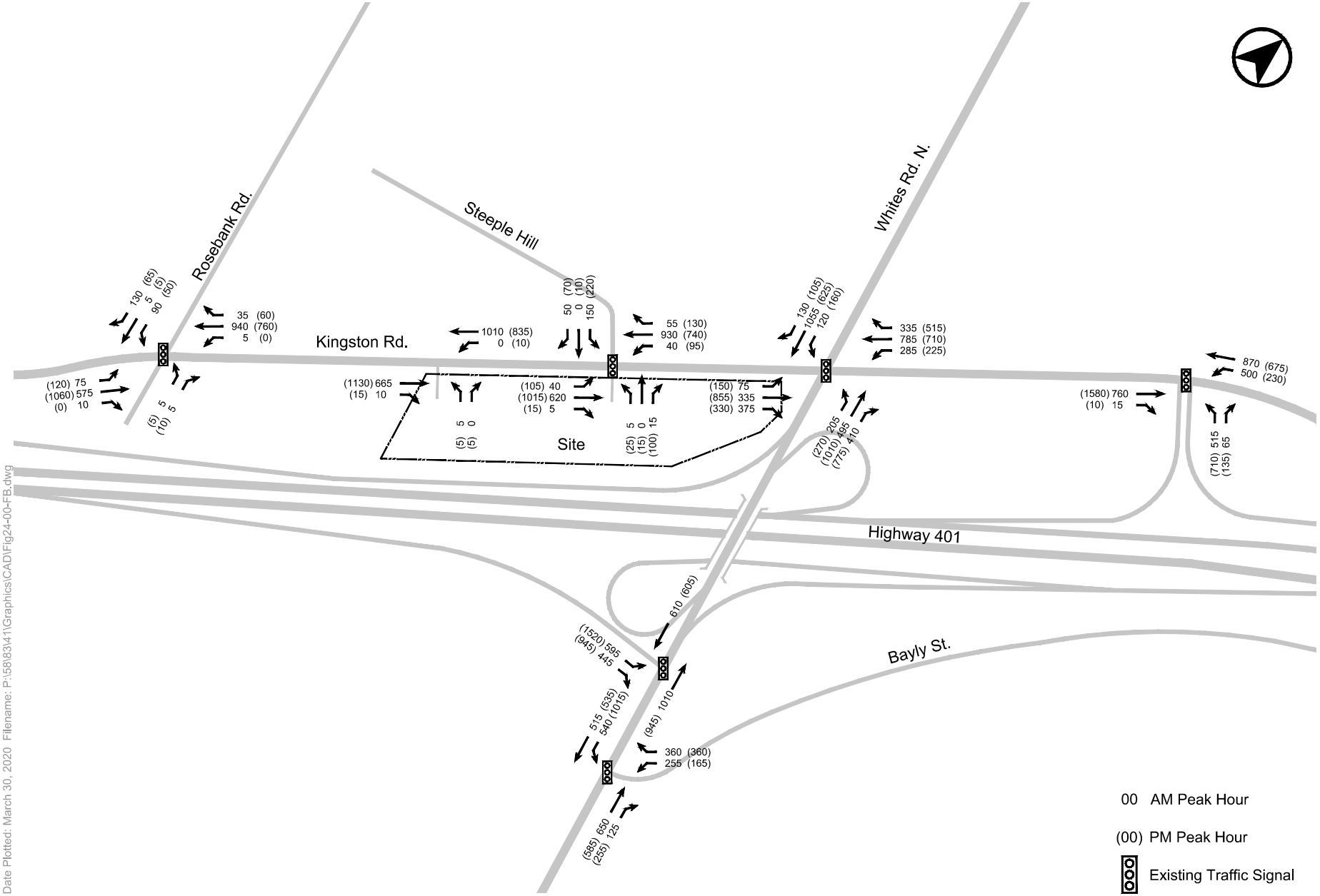

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FIGURE 24 FUTURE BACKGROUND TRAFFIC VOLUMES

9.4 SITE TRAFFIC VOLUMES

Site traffic was developed for two scenarios: an intensification study condition and a proposed condition.

The intensification study condition is based on the increase in density within this Whites Precinct that is recommended in the *Kingston Road Corridor and Specialty Retailing Node Intensification Study.* It is our understanding that the proposed intensification would yield approximately 7,622 residents and 2,536 jobs, or approximately 2,077 residential units and 7,933 m^2 GFA of retail space on-site.

The as proposed trip generation forecast is associated with the planned uses on the Site in accordance with the current site plan.

The comparison of these two rates provides an indication of the relative change between the proposed and currently permitted uses on the Site.

9.4.1 Intensification Study Site Traffic Generation

The intensification study generation for the Site was calculated based upon the current residential and retail trip generated rates used for the proposed development.

TABLE 23 INTENSIFICATION STUDY SITE VEHICLE TRAFFIC

Land Use	AM Peak Hour			PM Peak Hour		
	In	Out	2-Way	In	Out	2-Way
Residential	115	430	545	375	255	630
Retail	80	80	160	110	110	220
Total	**195**	**510**	**705**	**485**	**365**	**850**

Notes:
1. All trips rounded to the nearest 5.

The intensification study condition is anticipated to generate approximately 705 and 850 two-way trips during the weekday morning and afternoon peak hours, respectively.

9.4.2 As Proposed Site Traffic Generation

Multi-modal travel forecasts were generated for the proposed development in **Section 8.0**. The resultant vehicular site traffic is summarized in **Table 24**.

TABLE 24 PROPOSED SITE VEHICLE TRAFFIC

	AM Peak Hour			PM Peak Hour		
	In	Out	2-Way	In	Out	2-Way
Residential	160	600	760	520	355	875
Office	60	10	70	5	50	55
Retail	25	25	50	35	35	70
Total	**245**	**635**	**880**	**560**	**440**	**1,000**

Notes:
1. All trips rounded to the nearest 5.

The Site is forecasted to generate a total of 880 and 1,000 two-way vehicle trips during the weekday morning and afternoon peak hours, respectively. Note these trips will include trips made to / from the proposed parking and pick-up / drop-off facilities.

9.4.3 Intensification Study Condition to Proposed Condition Comparison

A comparison of the intensification study condition to the proposed condition trip generation of the Site is provided in **Table 25**.

TABLE 25 "AS-OF-RIGHT" TRIP GENERATION COMPARISON

	AM Peak Hour			PM Peak Hour		
	In	Out	2-Way	In	Out	2-Way
As-Of-Right	195	510	705	485	365	850
As Proposed	245	635	880	560	440	1,000
Total	**50**	**125**	**175**	**75**	**75**	**150**

Notes:
1. All trips rounded to the nearest 5.

The results demonstrate that the proposed development plan would generate additional two-way trips during the weekday morning and afternoon peak hours than the intensification study condition. The new development plan would generate approximately 175 and 150 additional two-way trips during the weekday morning and afternoon peak hours, respectively. This indicates that the development plan would have a slightly greater traffic impact than the intensification study condition.

9.4.4 Overall Site Traffic Generation

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

Based on the foregoing, the Site is anticipated to generate in the order of 800 and 705 two-way net-new vehicle trips during the weekday morning and afternoon peak hours, respectively.

TABLE 26 PROPOSED SITE VEHICLE TRAFFIC

	AM Peak Hour			PM Peak Hour		
	In	Out	2-Way	In	Out	2-Way
Existing Site Traffic[1]	55	25	80	145	150	295
Forecast Site Traffic						
New Residential-Related Site Traffic (2,884 units)	160	600	760	520	355	875
New Office-Related Site Traffic (4,448 m^2)	60	10	70	5	50	55
New Retail-Related Site Traffic (2,232 m^2)	25	25	50	35	35	70
Total New Site Traffic	245	635	880	560	440	1,000
Forecast Net New Site Traffic						
Forecast Net-New Site Traffic	**190**	**610**	**800**	**415**	**290**	**705**

Notes:
1. Based upon traffic counts conducted at existing site access driveways by Spectrum Data on behalf of BA Group on March 26, 2019.
2. All trips rounded to the nearest 5.

9.4.5 Site Traffic Distribution and Assignment

Residential Use

The trip distribution pattern for the residential 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 27**.

Office Use

The trip distribution patter for the office use was established based upon a review of 2016 Transportation Tomorrow Survey (TTS) for work-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 27**.

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).

TABLE 27 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.

The net-new site traffic assignment of the proposed development for the weekday morning and afternoon peak hours is shown in **Figure 25**.

9.5 FUTURE TOTAL TRAFFIC VOLUMES

Future total traffic volumes, which is the sum of background traffic volumes and forecast net-new site traffic volumes, are illustrated in **Figure 26** through **Figure 28**.

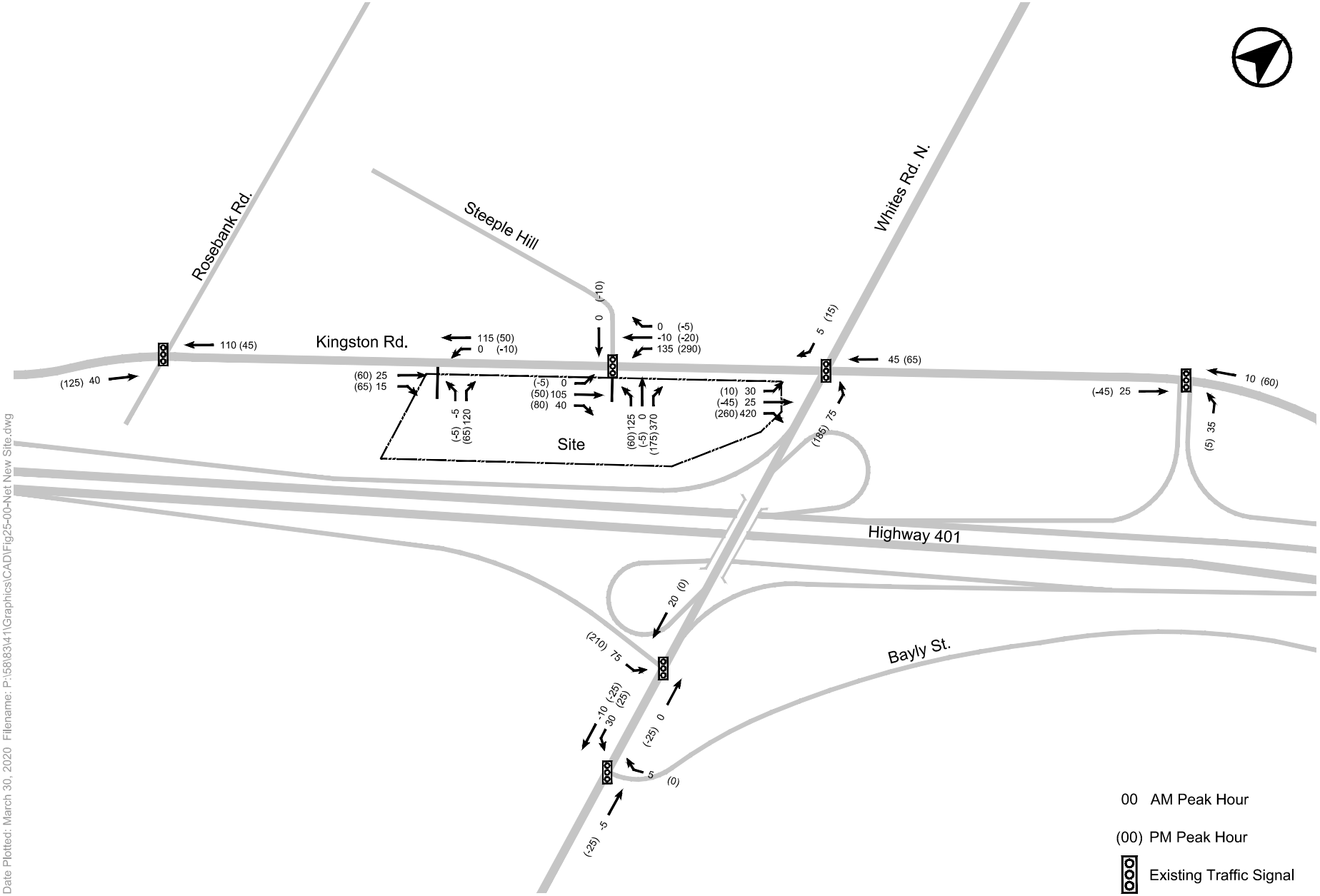

FIGURE 25 FORECAST NET-NEW SITE TRAFFIC VOLUMES

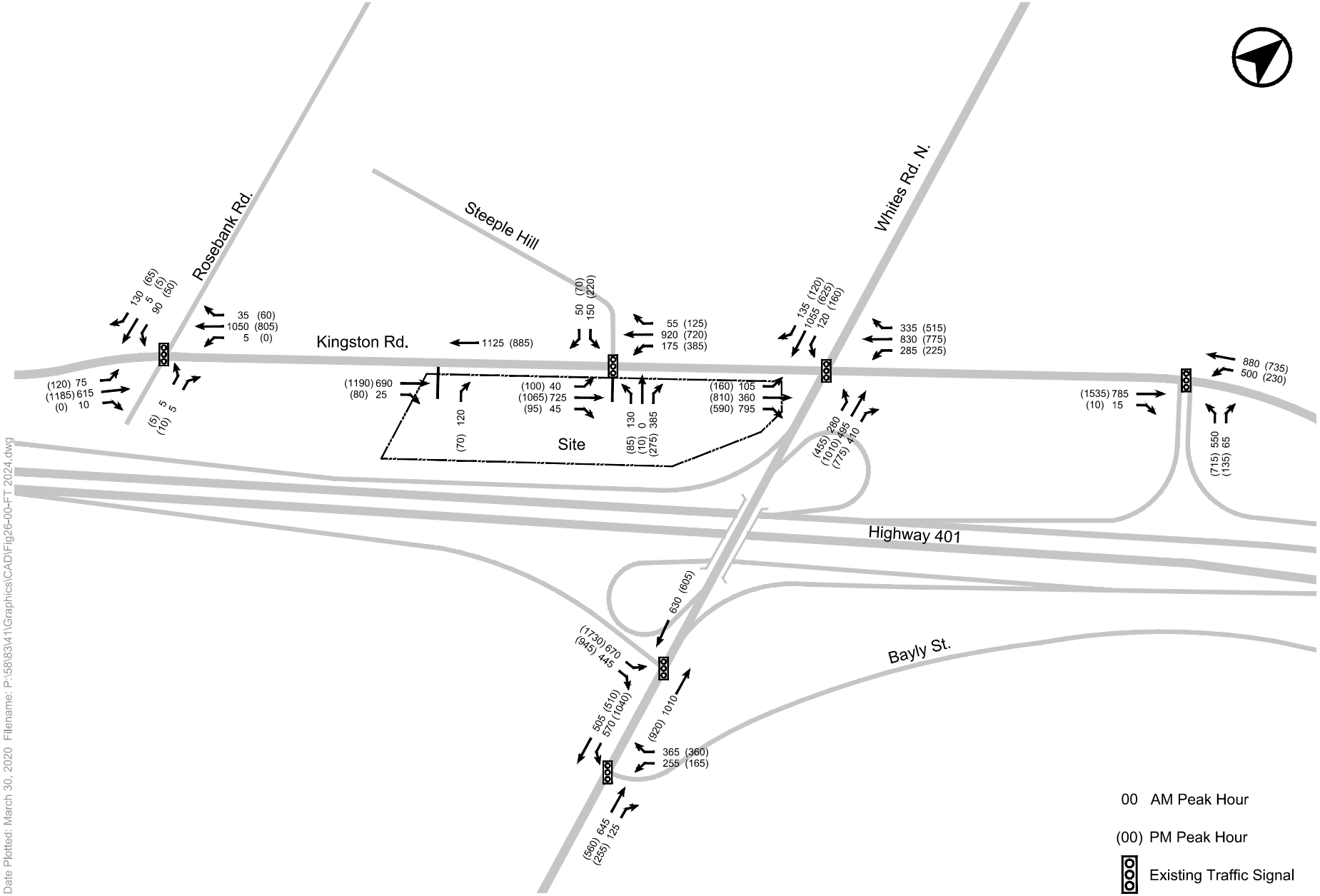

FIGURE 26 FUTURE TOTAL 2024 TRAFFIC VOLUMES

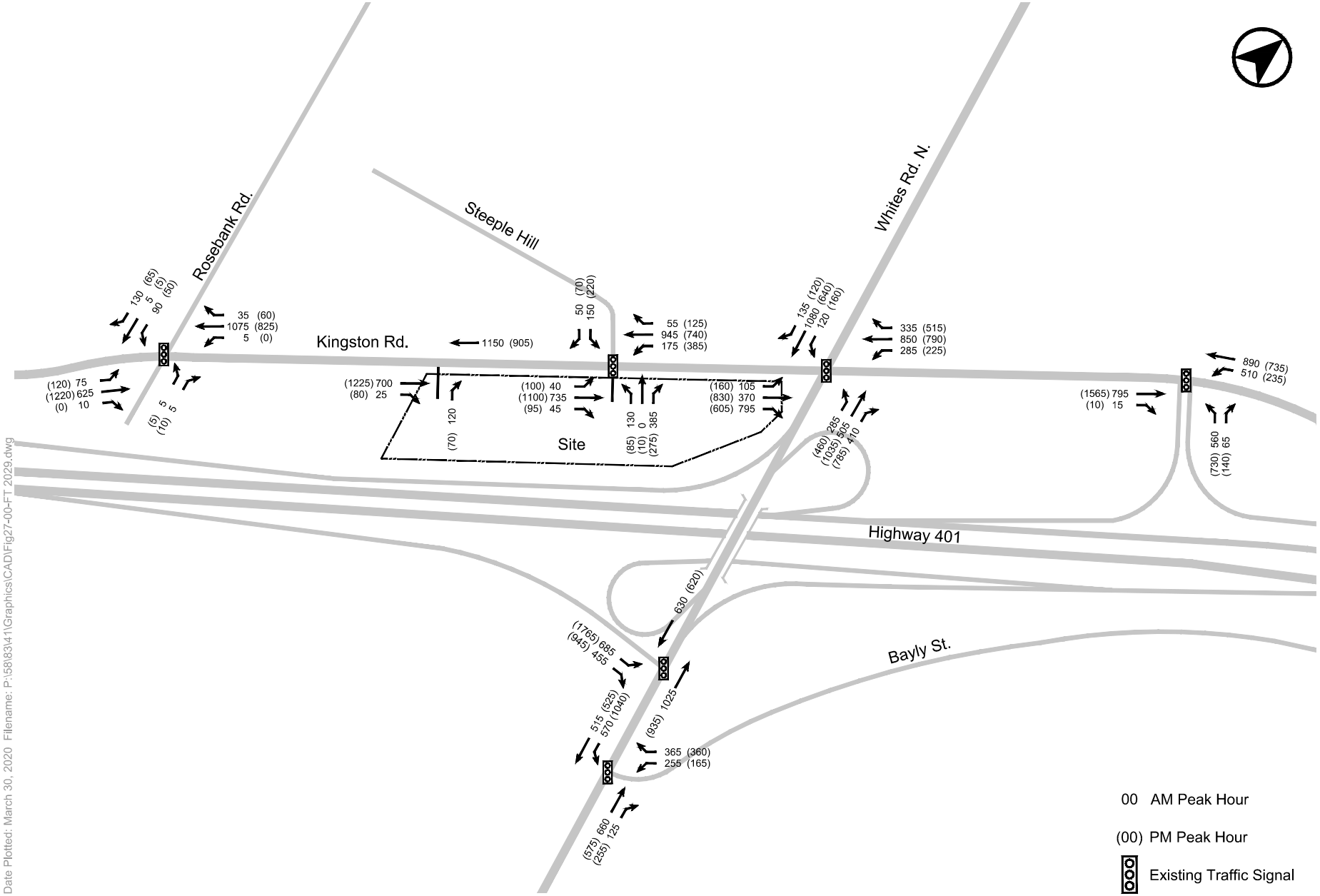

FIGURE 27 FUTURE TOTAL 2029 TRAFFIC VOLUMES

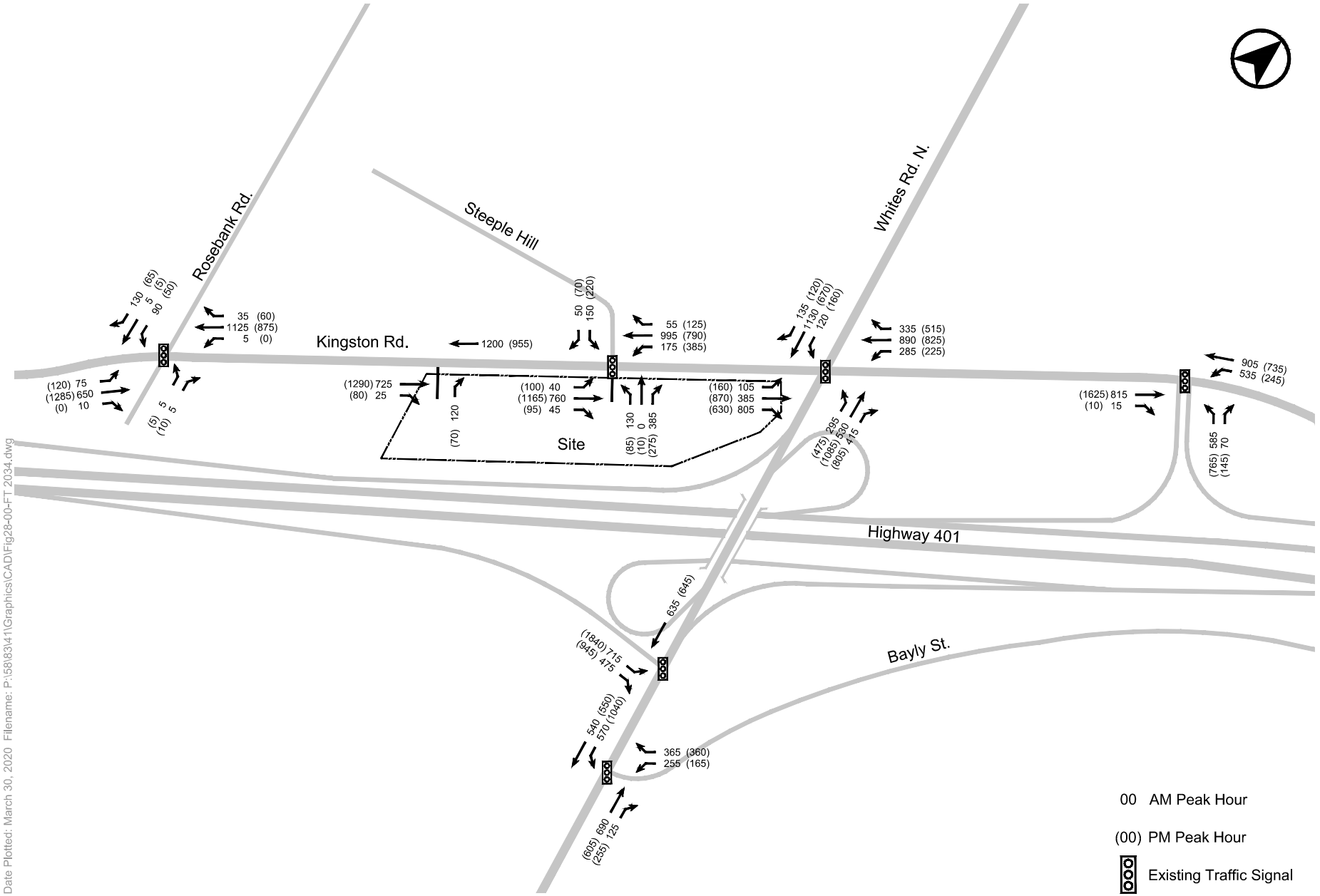

FIGURE 28 FUTURE TOTAL 2034 TRAFFIC VOLUMES

10.0 TRAFFIC OPERATIONS

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
- 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 a horizon period of 2024, 2029 and 2034.

10.1 ANALYSIS METHODOLOGY

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

10.1.1 Signalized Intersection Methodology

Analyses of intersection operating under traffic signal control have been undertaken using the methodologies and procedures outlined in the Highway Capacity Manual (HCM) 2000 and in accordance with the Durham Region's TIS guidelines.

The product of the signalized intersection evaluation is an intersection performance index (volume to capacity ratio, or v/c), where a v/c index of 1.00 indicates 'at or near capacity' conditions.

10.1.2 Unsignalized Intersection Methodology

Unsignalized intersection analyses have been undertaken using standard capacity procedures for intersection 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 the unsignalized intersection evaluation is a level of service (LOS) designation, ranging form LOS A to F, which provides a relative indication of the level of delay experienced by motorists completing a turning manoeuvre at an intersection. LOS A represents conditions under which motorists would experience little delay and LOS F reflect conditions where more extended delays can be expected.

10.2 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.

10.2.1 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.

10.2.2 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.

10.2.3 Lost Time Adjustments

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.

10.2.4 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 future conditions.

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

10.2.5 Road Network

The existing road network configuration was assumed for this analysis and is consistent across all future scenarios.

The existing road network intersection lane configurations are shown in **Figure 21.**

10.2.6 Peak Hour Factors

Peak hour factors were calculated based on the existing traffic volume data extracted from the traffic counts utilized in this study for the operations analysis. The calculated peak hour factors are summarized in **Table 28**.

TABLE 28 PEAK HOUR FACTORS

Intersection	AM Peak Hour	PM Peak Hour
Signalized Intersections		
Kingston Road / Rosebank Road	0.82	0.97
Kingston Road / Steeple Hill & Site Access Driveway	0.83	0.97
Kingston Road / Highway 401 WB Ramps	0.94	0.95
Whites Road / Kingston Road	0.96	0.99
Whites Road / Highway 401 EB Off-Ramp	0.96	0.97
Whites Road / Bayly Street	0.94	0.93
Unsignalized Intersections		
Kingston Road / Site Access Driveway	0.80	0.98

10.3 TRAFFIC OPERATIONS ANALYSIS

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.**

10.3.1 Signalized Intersection Analysis

Traffic analysis was undertaken at all signalized intersections during the weekday morning and afternoon peak hours within the study area is summarized in **Table 29**.

Kingston Road / Rosebank Road

Under existing conditions, the Kingston Road / Rosebank Road signalized intersection operates acceptably with an overall v/c ratio of 0.46 and 0.37 in the morning and afternoon peak hours, respectively.

Under both future background and future total conditions, the Kingston Road / Rosebank Road intersection continues to operate acceptably with overall v/c ratio of 0.53 and 0.44 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 0.53 and 0.56 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 0.53 and 0.51, respectively. Note that the signal timings and cycle length were adjusted in the afternoon peak hour.

Under future total conditions, with added site traffic activity, the intersection continues to operate acceptably with an overall v/c ratio of 0.71 and 0.79 during the respective weekday morning and afternoon peak hours. In the afternoon peak hour, the southbound left movement is approaching capacity with an individual v/c ratio of 0.96.

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 0.63 and 0.87 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 0.68 and 0.89, respectively. Note that the signal timing and cycle length were adjusted in the afternoon peak hour.

Under future total conditions, with added site traffic activity, the intersection continues to operate acceptably with an overall v/c ratio of 0.71 and 0.88 during the respective weekday morning and afternoon peak hours. In the afternoon peak hour, the eastbound through-right movement is approaching capacity with an individual v/c ratio of 0.90.

As part of the Ministry of Transportation (MTO) Traffic Impact Study Guidelines, further analysis was conducted for an additional 5-year and 10-year horizon years beyond the 5-year build-out horizon. Under future total 2029 and 2039 traffic conditions, the intersection operates with overall v/c ratios of 0.77 and 0.94 during the respective weekday morning and afternoon peak hours. In the morning peak hours, the westbound left movement is above capacity with an individual v/c ratio of 1.01.

Whites Road / Kingston Road

Under existing conditions, the Whites Road / Kingston Road signalized intersection operates acceptably with an overall v/c ratio of 0.74 and 0.87 in the morning and afternoon peak hours, respectively. In the morning peak hour, the northbound left movement is approaching capacity with an individual v/c ratio of 0.99. In the afternoon peak hour, the northbound right movement is approaching capacity with an individual v/c ratio of 0.99.

Under future background conditions, the intersection operates acceptably in the morning and afternoon peak hours with overall v/c ratios of 0.78 and 0.86, respectively. Note that the signal timing and cycle length were adjusted in the morning and 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 0.83 and 0.90 during the respective weekday morning and afternoon peak hours. In the morning and afternoon peak hours, the northbound left movement is approaching capacity with an individual v/c ratio of 1.00 and 0.98, 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 0.53 and 0.87 in the morning and afternoon peak hours, respectively. In the afternoon peak hour, the eastbound movement is approaching capacity with an individual v/c ratio of 0.99.

Under future background conditions, the intersection operates acceptably in the morning and afternoon peak hours with overall v/c ratios of 0.55 and 0.83, 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, with added site traffic activity, the intersection continues to operate acceptably with an overall v/c ratio of 0.57 and 0.89 during the respective weekday morning and afternoon peak hours. In the afternoon peak hour, the eastbound left movement is approaching capacity with an individual v/c ratio of 0.92.

As part of the Ministry of Transportation (MTO) Traffic Impact Study Guidelines, further analysis was conducted for an additional 5-year and 10-year horizon years beyond the 5-year build-out horizon. Under future total 2029 and 2039 traffic conditions, the intersection operates with overall v/c ratios of 0.60 and 0.95 during the respective weekday morning and afternoon peak hours. In the afternoon peak hours, the eastbound left movement is approaching capacity with an individual v/c ratio of 0.97.

Whites Road / Bayly Street

Under existing conditions, the Whites Road / Bayly Street signalized intersection operates acceptably with an overall v/c ratio of 0.62 and 0.78 in the morning and afternoon peak hours, respectively.

Under both future background and future total conditions, the White Road / Bayly Street intersection continues to operate acceptably with overall v/c ratio of 0.64 and 0.80 in the morning and afternoon peak hours, respectively.

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.

TABLE 29 SIGNALIZED INTERSECTION ANALYSIS SUMMARY

Intersection / Traffic Movement	Existing		Future Background		Future Total (2024)		Future Total (2029)		Future Total (2034)	
	v/c	LOS	v/c	LOS	v/c	LOS	v/c	LOS	v/c	LOS
Kingston Road / Rosebank Road										
EBL	0.30 (0.25)	A (A)	0.32 (0.27)	A (A)	0.38 (0.28)	A (A)	0.40 (0.29)	B (A)	0.43 (0.31)	B (A)
EBTR	0.27 (0.37)	A (A)	0.29 (0.40)	A (A)	0.30 (0.45)	A (A)	0.31 (0.46)	A (A)	0.32 (0.49)	A (A)
WBL	0.01 (0.00)	A (A)	0.01 (0.00)	A (A)	0.01 (0.00)	A (A)	0.01 (0.00)	A (A)	0.01 (0.00)	A (A)
WBTR	0.45 (0.30)	A (A)	0.47 (0.32)	A (A)	0.53 (0.33)	A (A)	0.54 (0.34)	A (A)	0.56 (0.36)	A (A)
NBL	0.04 (0.04)	D (D)	0.04 (0.04)	D (D)	0.04 (0.04)	D (D)	0.04 (0.04)	D (D)	0.04 (0.04)	D (D)
NBTR	0.00 (0.01)	D (D)	0.00 (0.01)	D (D)	0.00 (0.01)	D (D)	0.00 (0.01)	D (D)	0.00 (0.01)	D (D)
SBL	0.54 (0.35)	D (D)	0.54 (0.35)	D (D)	0.54 (0.35)	D (D)	0.54 (0.35)	D (D)	0.54 (0.35)	D (D)
SBTR	0.30 (0.07)	D (D)	0.35 (0.07)	D (D)	0.44 (0.07)	D (D)	0.46 (0.07)	D (D)	0.49 (0.07)	D (D)
Overall	**0.46 (0.37)**	**A (A)**	**0.48 (0.40)**	**A (A)**	**0.53 (0.44)**	**A (A)**	**0.54 (0.45)**	**A (A)**	**0.56 (0.47)**	**B (A)**
Kingston Road / Steeple Hill & Site Access Driveway										
EBL	0.18 (0.31)	B (B)	0.18 (0.30)	A (B)	0.31 (0.41)	C (C)	0.33 (0.42)	C (C)	0.38 (0.44)	C (C)
EBTR	0.34 (0.50)	B (B)	0.33 (0.49)	A (B)	0.64 (0.81)	C (D)	0.65 (0.83)	C (D)	0.68 (0.88)	C (D)
WBL	0.10 (0.27)	A (B)	0.09 (0.28)	A (A)	0.65 (0.84)	C (E)	0.65 (0.86)	C (E)	0.67 (0.87)	D (E)
WBTR	0.47 (0.38)	A (B)	0.48 (0.38)	A (A)	0.63 (0.38)	B (A)	0.64 (0.39)	B (A)	0.68 (0.41)	B (A)
NBL	0.02 (0.08)	D (C)	0.09 (0.20)	D (E)	0.52 (0.54)	D (E)	0.52 (0.54)	D (E)	0.51 (0.54)	D (E)
NBTR	0.01 (0.10)	D (C)	0.01 (0.16)	D (E)	0.83 (0.23)	E (E)	0.83 (0.23)	D (E)	0.83 (0.23)	D (E)
SBL	0.70 (0.77)	D (D)	0.73 (0.81)	D (E)	0.78 (0.96)	D (F)	0.78 (0.96)	D (F)	0.78 (0.96)	D (F)
SBTR	0.04 (0.07)	D (C)	0.04 (0.07)	D (D)	0.04 (0.05)	C (D)	0.04 (0.05)	C (D)	0.04 (0.05)	C (D)
Overall	**0.53 (0.56)**	**B (B)**	**0.53 (0.51)**	**B (B)**	**0.71 (0.79)**	**C (D)**	**0.72 (0.80)**	**C (D)**	**0.74 (0.83)**	**C (D)**

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Intersection / Traffic Movement	Existing		Future Background		Future Total (2024)		Future Total (2029)		Future Total (2034)	
	v/c	LOS	v/c	LOS	v/c	LOS	v/c	LOS	v/c	LOS
Kingston Road / Highway 401 WB Ramps										
EBTR	0.49 (0.90)	B (C)	0.54 (0.93)	B (C)	0.58 (0.90)	C (C)	0.60 (0.93)	C (C)	0.62 (0.98)	C (C)
WBL	0.87 (0.86)	C (E)	0.91 (0.88)	D (E)	0.93 (0.88)	D (E)	0.94 (0.89)	D (E)	1.01 (0.91)	E (E)
WBT	0.38 (0.31)	A (A)	0.39 (0.31)	A (B)	0.40 (0.33)	A (B)	0.41 (0.34)	A (B)	0.42 (0.34)	A (B)
NBL	0.74 (0.82)	D (D)	0.76 (0.85)	D (E)	0.78 (0.85)	D (E)	0.78 (0.86)	D (E)	0.80 (0.88)	D (E)
NBR	0.13 (0.25)	D (C)	0.14 (0.28)	C (D)	0.14 (0.28)	C (D)	0.13 (0.29)	C (D)	0.15 (0.30)	C (D)
Overall	**0.63 (0.87)**	**C (C)**	**0.68 (0.89)**	**C (C)**	**0.71 (0.88)**	**C (C)**	**0.73 (0.90)**	**C (C)**	**0.77 (0.94)**	**C (D)**
Whites Road / Kingston Road										
EBL	0.31 (0.50)	B (B)	0.38 (0.55)	C (C)	0.56 (0.64)	C (D)	0.57 (0.65)	C (D)	0.61 (0.68)	C (D)
EBT	0.28 (0.66)	C (C)	0.30 (0.87)	C (D)	0.32 (0.82)	C (D)	0.33 (0.84)	C (D)	0.34 (0.89)	C (E)
EBR	0.57 (0.29)	C (A)	0.27 (0.22)	A (A)	0.57 (0.39)	A (A)	0.57 (0.40)	A (A)	0.58 (0.41)	A (A)
WBL	0.64 (0.88)	B (D)	0.74 (0.86)	C (D)	0.77 (0.83)	C (D)	0.78 (0.84)	C (D)	0.79 (0.86)	C (D)
WBT	0.60 (0.55)	C (C)	0.66 (0.63)	C (C)	0.72 (0.69)	C (C)	0.73 (0.70)	C (C)	0.77 (0.73)	C (C)
WBR	0.37 (0.75)	B (C)	0.23 (0.34)	A (A)	0.23 (0.34)	A (A)	0.23 (0.34)	A (A)	0.23 (0.34)	A (A)
NBL	1.03 (0.78)	F (D)	0.78 (0.66)	C (C)	1.00 (0.98)	E (E)	1.02 (1.00)	F (E)	1.05 (1.05)	F (F)
NBT	0.40 (0.75)	C (C)	0.40 (0.76)	C (D)	0.40 (0.76)	C (D)	0.41 (0.78)	C (D)	0.43 (0.82)	C (D)
NBR	0.39 (0.99)	B (E)	0.41 (0.89)	A (D)	0.43 (0.90)	A (D)	0.44 (0.91)	B (D)	0.46 (0.94)	B (D)
SBL	0.34 (0.82)	C (D)	0.32 (0.65)	C (C)	0.32 (0.65)	C (D)	0.33 (0.66)	C (D)	0.34 (0.70)	C (D)
SBT	0.84 (0.47)	D (C)	0.92 (0.53)	D (D)	0.93 (0.66)	D (D)	0.95 (0.68)	D (D)	0.99 (0.71)	E (D)
SBR	0.14 (0.08)	C (C)	0.11 (0.07)	C (C)	0.12 (0.08)	C (D)	0.12 (0.08)	C (D)	0.12 (0.08)	C (D)
Overall	**0.74 (0.87)**	**C (C)**	**0.78 (0.86)**	**C (C)**	**0.83 (0.90)**	**C (D)**	**0.85 (0.92)**	**C (D)**	**0.89 (0.96)**	**C (D)**
Whites Road / Highway 401 EB Off-Ramp										
EBL	0.69 (0.99)	D (D)	0.73 (0.83)	D (C)	0.75 (0.92)	D (C)	0.75 (0.93)	D (C)	0.76 (0.97)	D (C)
EBR	0.71 (0.99)	D (E)	0.26 (0.61)	C (B)	0.27 (0.59)	C (B)	0.28 (0.59)	C (B)	0.31 (0.60)	C (B)
NBT	0.46 (0.70)	B (B)	0.47 (0.84)	B (C)	0.49 (0.85)	B (C)	0.50 (0.87)	B (C)	0.53 (0.91)	B (C)
SBT	0.28 (0.45)	A (C)	0.28 (0.54)	A (C)	0.30 (0.56)	B (C)	0.31 (0.58)	B (C)	0.31 (0.61)	B (C)
Overall	**0.53 (0.87)**	**C (D)**	**0.55 (0.83)**	**C (C)**	**0.57 (0.89)**	**C (C)**	**0.58 (0.91)**	**C (C)**	**0.60 (0.95)**	**C (C)**

Intersection / Traffic Movement	Existing		Future Background		Future Total (2024)		Future Total (2029)		Future Total (2034)	
	v/c	LOS	v/c	LOS	v/c	LOS	v/c	LOS	v/c	LOS
Whites Road / Bayly Street										
WBL	0.78 (0.62)	D (D)	0.78 (0.62)	D (D)	0.78 (0.62)	D (D)	0.78 (0.62)	D (D)	0.78 (0.62)	D (D)
WBR	0.25 (0.25)	C (D)	0.25 (0.25)	C (D)	0.26 (0.25)	C (D)	0.26 (0.25)	C (D)	0.26 (0.25)	C (D)
NBT	0.65 (0.51)	C (C)	0.68 (0.53)	C (C)	0.68 (0.51)	C (C)	0.69 (0.52)	C (C)	0.72 (0.55)	D (C)
NBR	0.14 (0.24)	C (C)	0.15 (0.26)	C (C)	0.14 (0.24)	C (C)	0.15 (0.25)	C (C)	0.15 (0.27)	C (C)
SBL	0.45 (0.76)	B (C)	0.46 (0.77)	B (B)	0.47 (0.78)	B (B)	0.48 (0.79)	B (B)	0.49 (0.80)	B (C)
SBLT	0.46 (0.61)	A (B)	0.48 (0.63)	A (A)	0.49 (0.62)	A (A)	0.49 (0.63)	A (A)	0.51 (0.65)	A (A)
Overall	**0.62 (0.78)**	**C (C)**	**0.64 (0.79)**	**C (C)**	**0.64 (0.80)**	**C (C)**	**0.65 (0.80)**	**C (C)**	**0.67 (0.82)**	**C (C)**

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

10.3.2 Unsignalized Intersection Analysis Summary

Traffic operations analysis results for the area unsignalized intersections is summarized in **Table 30**.

Existing Traffic Conditions

All unsignalized intersections operate acceptably under existing traffic conditions, with individual traffic movements operating with a level-of-service (LOS) of LOS D or better during weekday peak hours.

Future Background Traffic Conditions

Under future background traffic conditions, the traffic analysis herein indicates minor increases in average delay for motorists conducting STOP-controlled or yield traffic movements during both analyzed weekday peak hours. Additional delay of less than 3 seconds can be anticipated during weekday morning and afternoon peak hours, respectively, relative to the existing traffic condition.

Future Total Traffic Conditions

With construction of the proposed development, the existing site access driveway onto Kingston Road will be maintained, but it will only permit right-in / right-out vehicle manoeuvres.

Recognizing that the Site will be redeveloped and the Site access driveway will change to a right-in / right-out access, it is anticipated that the movements under the future total traffic condition at the driveway will function at a LOS B or better during the weekday peak hours..

Based on the foregoing, the Site driveway will operate acceptably with redevelopment of the Site; the area street network can accommodate the proposed development as planned.

TABLE 30 UNSIGNALIZED TRAFFIC ANALYSIS INTERSECTION SUMMARY

Intersection Traffic Movement	Existing		Future Background		Future Total (2024)		Future Total (2029)		Future Total (2034)	
	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS
Kingston Road / Site Access Driveway										
WBL	0.0 (10.7)	A (B)	0.0 (11.0)	A (B)	-- (--)	-- (--)	-- (--)	-- (--)	-- (--)	-- (--)
NBLR	26.8 (23.6)	D (C)	29.6 (26.4)	D (D)	13.3 (14.6)	B (B)	13.5 (15.0)	B (B)	13.8 (15.6)	B (C)

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

10.4 KINGSTON ROAD WITH BRT

As discussed in **Section 4.2.2**, the Durham-Scarborough BRT has been identified as a planned future transit expansion that will be aligned with Kingston Road right-of-way in the area of the Site. A future BRT will impact traffic operations and travel characteristics in the immediate study area. As such, a sensitivity and preliminary traffic operations analysis was undertaken to quantify, at a high level, these impacts within the Site environs.

Given the uncertainty regarding the design details of the Durham-Scarborough BRT along Kingston Road at this time, the following assumptions were made for the purpose of this analysis:

- The bus only lanes along Kingston Road will be eliminated and the BRT will operate within a dedicated centre median along Kingston Road.
- Signal timing plans were adjusted to allow eastbound and westbound left-turn movements along Kingston Road to advance only on a protected phases, as these movements would be required to cross the BRT lanes.
- The analysis was undertaken for the 2024, 2029 and 2034 horizon years based on the 'future total traffic' volume set.
- The sensitivity analysis study area includes the following intersections:
    - Kingston Road / Rosebank Road;
    - Kingston Road / Steeple Hill & Site Access Driveway;
    - Kingston Road / Highway 401 WB Ramps; and
    - Whites Road / Kingston Road.

The operations assessment results of the Durham-Scarborough BRT along Kingston Road sensitivity analysis are summarized in **Table 31**. Synchro analysis worksheets are provided in **Appendix E**.

Traffic operations with the implementation of the Durham-Scarborough BRT along Kingston Road are summarized in the following:

- The **Kingston Road / Rosebank Road** intersection operates at acceptable conditions with overall v/c ratios of 0.60 and 0.47 in the weekday morning and afternoon peak hours, respectively;
- The **Kingston Road / Steeple Hill & Site Access Driveway** intersection operates at acceptable conditions with overall v/c ratios of 0.80 and 0.87 in the weekday morning and afternoon peak hours, respectively;
- The **Kingston Road / Highway 401 WB Ramps** intersection operates at busy, yet acceptable conditions with overall v/c ratios of 0.85 and 0.97 in the weekday morning and afternoon peak hours, respectively; and
- The **Whites Road / Kingston Road** intersection operates at busy conditions above theoretical capacity with overall v/c ratios of 1.01 and 1.00 in the weekday morning and afternoon peak hours, respectively;.

Based on the foregoing, the signalized intersections along Kingston Road operate at busy conditions above theoretical capacity. However, considering the BRT expansion is a significant transit improvement 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 BRT implemented. Further, while the intersections overall operate acceptably, individual movements may require further analysis and calibration. This would accompany the feasibility and design studies for the BRT expansion, allowing for further monitoring and a deeper level of analysis.

TABLE 31 DURHAM-SCARBOROUGH BRT ALONG KINGSTON ROAD SENSITIVITY ANALYSIS RESULTS

Key Movements / Intersections	Future Total (2024)		Future Total (2029)		Future Total (2034)	
	v/c	LOS	v/c	LOS	v/c	LOS
Kingston Road / Rosebank Road						
EBL	0.46 (0.52)	E (E)	0.46 (0.52)	E (E)	0.46 (0.52)	E (E)
EBTR	0.30 (0.42)	A (A)	0.31 (0.44)	A (A)	0.32 (0.46)	A (A)
WBL	0.09 (0.00)	E (A)	0.09 (0.00)	E (A)	0.09 (0.00)	E (A)
WBTR	0.59 (0.39)	A (B)	0.60 (0.40)	A (B)	0.63 (0.42)	A (B)
NBL	0.07 (0.04)	D (E)	0.07 (0.04)	D (E)	0.07 (0.04)	D (E)
NBTR	0.00 (0.01)	D (E)	0.00 (0.01)	D (E)	0.00 (0.01)	D (E)
SBL	0.64 (0.41)	E (E)	0.64 (0.41)	E (E)	0.64 (0.41)	E (E)
SBTR	0.22 (0.08)	E (E)	0.24 (0.08)	E (E)	0.27 (0.08)	E (E)
Overall	**0.57 (0.44)**	**B (B)**	**0.58 (0.45)**	**B (B)**	**0.60 (0.47)**	**B (B)**
Kingston Road / Steeple Hill & Site Access Driveway						
EBL	0.43 (0.52)	E (E)	0.43 (0.52)	E (E)	0.43 (0.52)	E (E)
EBTR	0.71 (0.81)	D (D)	0.72 (0.83)	D (D)	0.74 (0.88)	D (D)
WBL	0.77 (0.99)	F (F)	0.78 (0.99)	F (F)	0.78 (1.00)	F (F)
WBTR	0.72 (0.47)	B (B)	0.74 (0.49)	C (B)	0.78 (0.51)	C (B)
NBL	0.53 (0.53)	D (E)	0.53 (0.52)	D (E)	0.53 (0.52)	D (E)
NBTR	0.86 (0.61)	E (E)	0.86 (0.62)	E (E)	0.86 (0.64)	E (E)
SBL	0.73 (0.96)	D (F)	0.73 (0.96)	D (F)	0.73 (0.96)	D (F)
SBTR	0.04 (0.05)	C (D)	0.04 (0.05)	C (D)	0.04 (0.05)	C (D)
Overall	**0.77 (0.84)**	**D (D)**	**0.78 (0.85)**	**D (D)**	**0.80 (0.87)**	**D (D)**

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Key Movements / Intersections	Future Total (2024)		Future Total (2029)		Future Total (2034)	
	v/c	LOS	v/c	LOS	v/c	LOS
Kingston Road / Highway 401 WB Ramps						
EBTR	0.70 (0.92)	D (C)	0.72 (0.94)	D (C)	0.75 (0.97)	D (C)
WBL	0.87 (0.87)	E (F)	0.88 (0.88)	E (F)	0.90 (0.92)	E (F)
WBT	0.37 (0.32)	A (A)	0.38 (0.32)	A (A)	0.38 (0.32)	A (A)
NBL	0.89 (0.94)	E (E)	0.90 (0.96)	E (E)	0.93 (1.00)	E (F)
NBR	0.17 (0.31)	D (D)	0.17 (0.32)	D (D)	0.19 (0.34)	D (D)
Overall	**0.80 (0.91)**	**D (D)**	**0.82 (0.93)**	**D (D)**	**0.85 (0.97)**	**D (D)**
Whites Road / Kingston Road						
EBL	0.53 (0.77)	E (E)	0.53 (0.77)	E (E)	0.53 (0.77)	E (E)
EBT	0.41 (0.86)	D (E)	0.42 (0.88)	D (E)	0.43 (0.93)	D (E)
EBR	0.57 (0.39)	A (A)	0.57 (0.40)	A (A)	0.58 (0.41)	A (A)
WBL	0.99 (0.97)	F (F)	0.99 (0.97)	F (F)	0.99 (0.97)	F (F)
WBT	0.75 (0.78)	D (D)	0.77 (0.80)	D (D)	0.81 (0.83)	D (D)
WBR	0.23 (0.34)	A (A)	0.23 (0.34)	A (A)	0.23 (0.34)	A (A)
NBL	0.99 (0.98)	F (E)	1.00 (1.00)	F (E)	1.08 (1.05)	F (F)
NBT	0.42 (0.76)	C (D)	0.42 (0.78)	C (D)	0.44 (0.82)	C (D)
NBR	0.42 (0.91)	C (D)	0.43 (0.93)	C (D)	0.44 (0.95)	C (E)
SBL	0.35 (0.65)	C (D)	0.36 (0.66)	C (D)	0.37 (0.70)	C (D)
SBT	1.00 (0.66)	E (D)	1.02 (0.68)	F (D)	1.07 (0.71)	F (D)
SBR	0.13 (0.08)	C (D)	0.13 (0.08)	C (D)	0.13 (0.08)	C (D)
Overall	**0.95 (0.95)**	**D (D)**	**0.97 (0.97)**	**D (D)**	**1.01 (1.00)**	**D (D)**

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

11.0 MICROSIMULATION ANALYSIS

11.1 *VISSIM* MODEL DEVELOPMENT

A Vissim modelling and microsimulation analysis exercise has been conducted 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 due to intensification along Kingston Road, as well as new transit facilities including the proposed Durham-Scarborough bus rapid transit (BRT) line. This analysis focuses on the existing and future traffic conditions along Kingston Road and Whites Road and is detailed 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 **Appendix F**.

11.1.1 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 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.

The area covered by the *Vissim* traffic microsimulation model is illustrated in **Figure 29**.

11.1.2 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 where 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 was determined from the details provided in the Initial Business Case;
- Turning movement counts at all signalized and some unsignalized intersections through the study area were obtained from field data collection exercises conducted during the weekday morning (AM) and afternoon (PM) peak periods;
- Signal timing plans at all signalized intersections located within the study area were provided by the Regional Municipality of Durham; and
- Vehicle travel times along the Kingston Road corridor, the Whites Road corridor and along the Highway 401 eastbound off-ramp at Whites Road, were 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**.

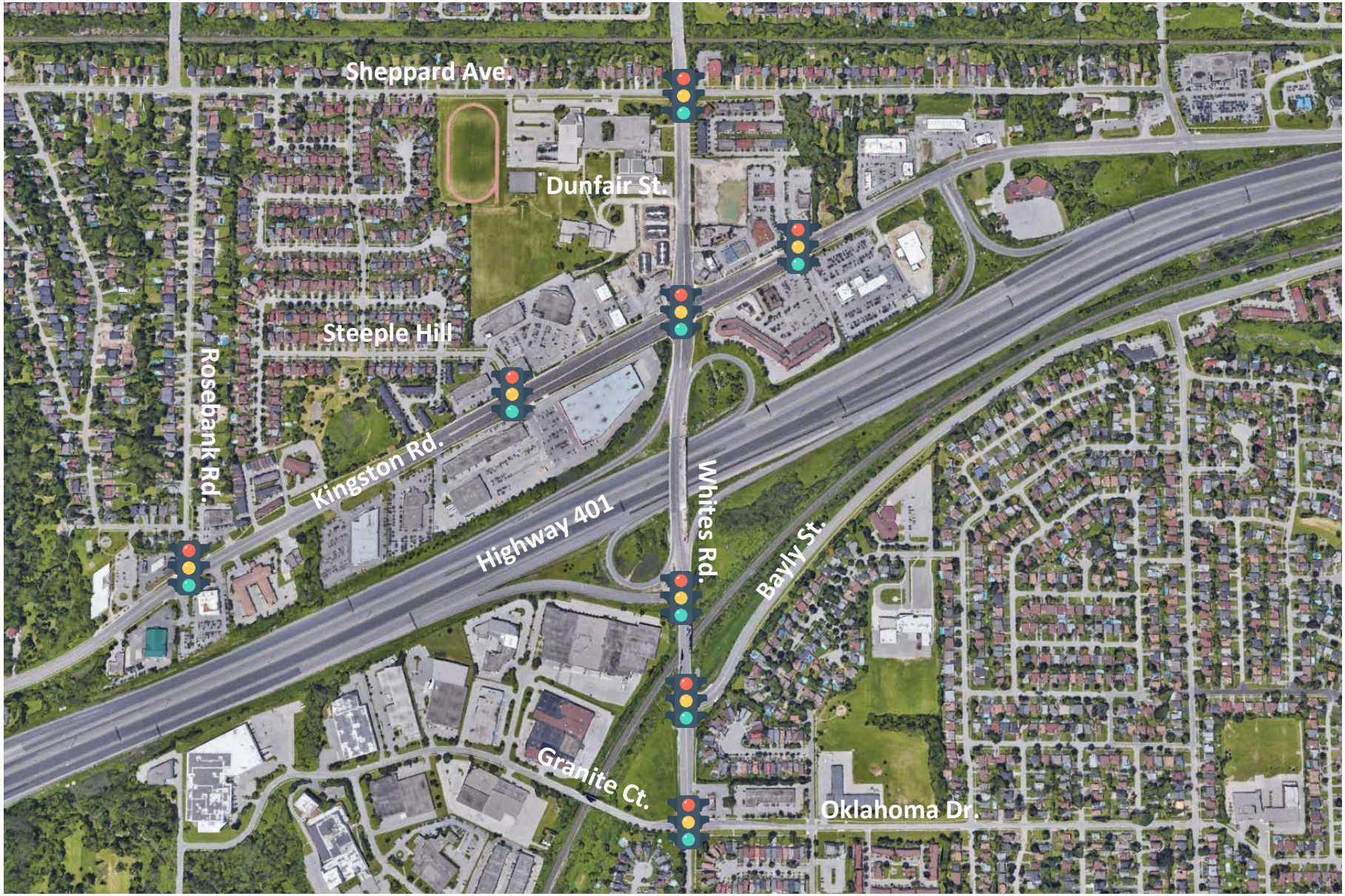


FIGURE 29: 603-643 & 645-699 KINGSTON ROAD *VISSIM* MICROSIMULATION MODEL STUDY AREA

11.2 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 **Appendix F**.

11.2.1 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. Vehicle traffic volumes and vehicle travel times were the network metrics used as targets during the calibration exercise.

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 **Appendix F**.

Vissim microsimulation existing conditions model results, specifically the turning movement counts and corridor segment travel times provided in 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.

11.2.2 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 **Appendix F**. All turning movements in the Vissim model accurately reflected 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 **Appendix F**, calibrated existing conditions *Vissim* model travel time outputs reflect the travel time targets during both the weekday morning (AM) and weekday afternoon (PM) peak hours along all corridors.

Section 2 of **Appendix F** demonstrate that the model 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 projected future traffic scenarios on the road network surrounding the Project.

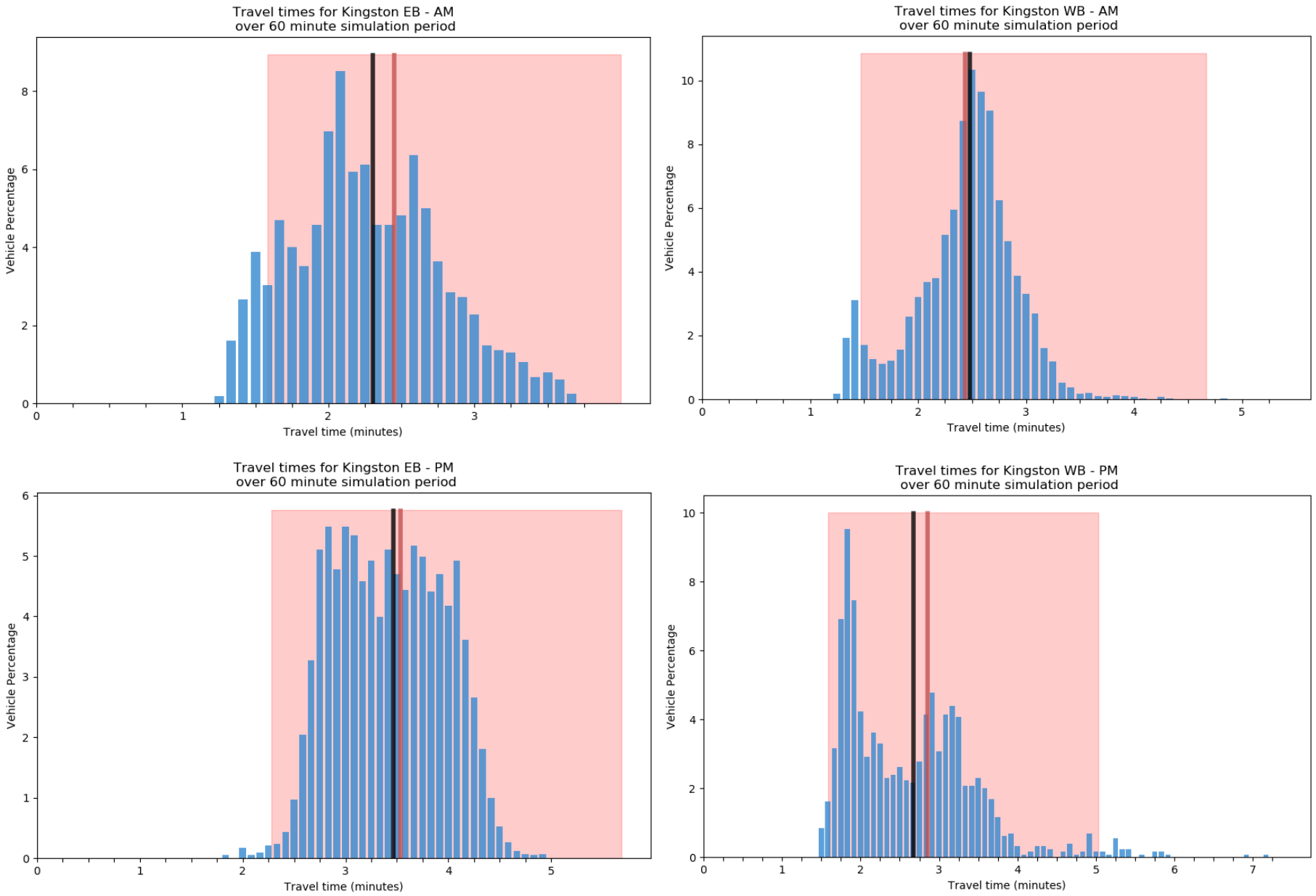


FIGURE 30: KINGSTON ROAD EASTBOUND AND WESTBOUND - EXISTING MODEL CALIBRATION TRAVEL TIMES (AM AND PM)

11.3 FUTURE CONDITIONS MODEL ANALYSIS

The projected impact of the 603-643 & 645-699 Kingston Road redevelopment were primarily assessed through this modelling exercise using corridor vehicle travel times in the surrounding road network to ensure that the traffic impacts associated with the Site redevelopment would not result in excessive travel time increases. The following provides a brief summary of the future conditions model analysis results and is provided in greater detail in **Section 3** of **Appendix F**.

The future conditions *Vissim* model includes planned infrastructure improvements, most notably the Durham-Scarborough BRT (illustrated as modeled in **Figure 31**). Network improvements have been proposed to accommodate future traffic conditions and operations associated with the Durham-Scarborough BRT including signal timing modifications along Kingston Road and Whites Road and an additional turn lane at the Highway 401 eastbound off-ramp and Whites Road intersection.

FIGURE 31: DURHAM-SCARBOROUGH BRT AT KINGSTON ROAD AND WHITES ROAD

11.3.1 Travel Time Analysis Results

Travel time analysis is provided through a comparison of projected future corridor travel times and existing conditions corridor travel times. As detailed in **Section 3.2.1** of **Appendix F**, projected 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.

Average travel times are projected to increase along Kingston Road, in the order of 25 to 72 seconds in the eastbound and westbound directions and along Whites Road in the southbound direction by approximately 50 seconds. These increases are primarily the result of the future operations associated with the implementation of the future Durham-Scarborough BRT line.

Highway 401 eastbound off-ramp traffic volumes are projected to increase by 150 to 400 vehicles, however average travel times are projected to decrease slightly as a result of the proposed additional eastbound turn lane and signal timing adjustments at the intersection.

Error! Not a valid bookmark self-reference. provides 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 **Appendix F**.

The *Vissim* microsimulation future conditions model results provided in **Section 3** of **Appendix F**, project that vehicular travel times will not increase significantly along Kingston Road and Whites Road in the weekday morning (AM) and weekday afternoon (PM) peak hours due to the proposed redevelopment. Thus, the projected impacts of the 603-

643 & 645-699 Kingston Road redevelopment can be appropriately accommodated by the future road network.

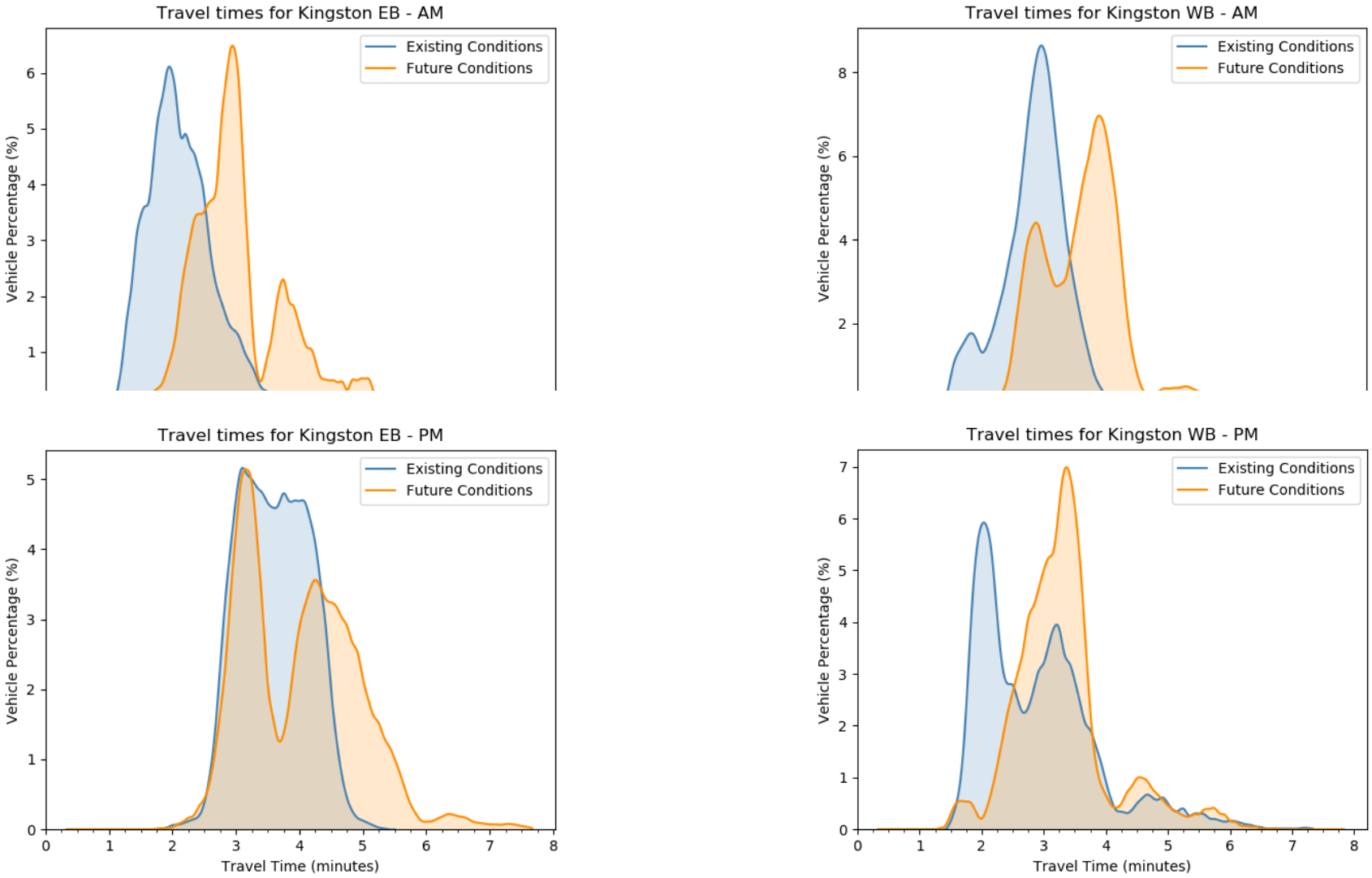


FIGURE 32: KINGSTON ROAD EASTBOUND AND WESTBOUND - TRAVEL TIME COMPARISON PLOTS (AM AND PM)

12.0 SITE PLAN REVIEW

As part of the site plan review, BA Group assessed the number of loading spaces to support the proposed development, as well as the possible locations of the loading facilities within the core of each building.

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 10 parking spaces, utilizing shared loading provisions and arranging shared loading facilities that can serve more than one tower, is summarized in **Table 32**.

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.

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

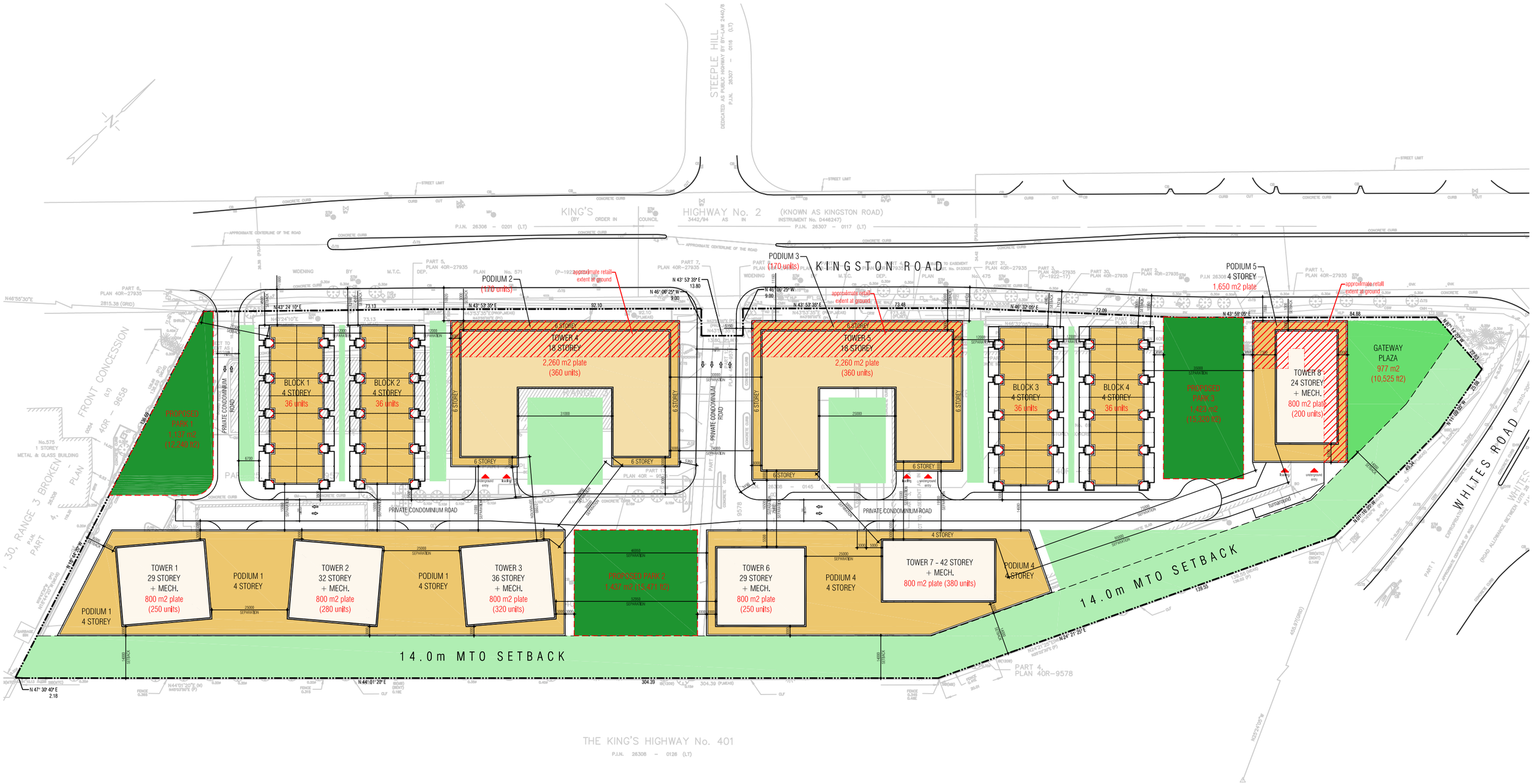
TABLE 32 RECOMMENDED (CITY OF TORONTO ZONING BY-LAW 569-2013) LOADING REQUIREMENTS

Use	Use	Unit / Floor Area[1]	Range	Type A	Type B	Type C	Type G	Total
Building 1								
Tower 1	Residential	250 units	31 to 399 units	-	-	-	1 space	1 space
Tower 2	Residential	280 units	31 to 399 units	-	-	-	1 space	1 space
Tower 3	Residential	320 units	31 to 399 units	-	-	-	1 space	1 space
Total (w sharing)[2]	**Tower 1 & 2**	**530 units**	**400 units or more**	**-**	**-**	**1 space**	**1 space**	**2 spaces**
	Tower 3	**320 units**	**31 to 399 units**	**-**	**-**	**-**	**1 space**	**1 space**
Building 2								
Tower 4 & Podium 2	Residential	530 units	400 units or more	-	-	1 space	1 space	2 spaces
	Retail	767 m^2	500 – 1,999 m^2	-	1 space	-	-	1 space
Total (w sharing)[3]				**-**	**-**	**1 space**	**1 space**	**2 spaces**
Building 3								
Tower 5 & Podium 3	Residential	530 units	400 units or more	-	-	1 space	1 space	2 spaces
	Retail	704 m^2	500 – 1,999 m^2	-	1 space	-	-	1 space
Total (w sharing)[3]				**-**	**-**	**1 space**	**1 space**	**2 spaces**
Building 4								
Tower 6	Residential	250 units	31 to 399 units	-	-	-	1 space	1 space
Tower 7	Residential	380 units	31 to 399 units	-	-	-	1 space	1 space
Total (w sharing)[2]	**Tower 6 & 7**	**630 units**	**400 units or more**	**-**	**-**	**1 space**	**1 space**	**2 spaces**
Building 5								
Tower 8 & Podium 5	Residential	200 units	31 to 399 units	-	-	-	1 space	1 space
	Retail	1,521 m^2	500 – 1,999 m^2	-	1 space	-	-	1 space
Total (w sharing)[3]				**-**	**-**	**-**	**1 space**	**1 space**
			TOTAL OF SITE	**-**	**-**	**4 spaces**	**6 spaces**	**10 spaces**

Notes:
1. Based upon statistics provided Based upon statistics provided Graziani & Corazza Architects dated January 10, 2020.
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).

APPENDICES

APPENDIX A:
Reduced Scale Architectural Plans



CONCEPTUAL SITE PLAN

▪ Sorbara Group of Companies ▪ Whites Road & Hwy 401 ▪ 1682.19 ▪ Apr. 6, 2020

PROPOSED

1:1200

GRAZIANI + CORAZZA ARCHITECTS

APPENDIX B:
Transit Reach & Impact Analysis

WHITES ROAD & KINGSTON ROAD

PROPOSED MIXED-USE DEVELOPMENT

PICKERING, ONTARIO

Appendix B:

Transit Service Area Analysis

Prepared For: The Sorbara Group

APRIL 2020

BA Group

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1.0 INTRODUCTION

BA Group has conducted a series of analyses to access transit accessibility of the 603 Kingston Road Site (herein referred to as the Site). These analyses specifically look at the service area of a transit network that a resident or visitor of the Site has access to in a given time range. This type of analysis is useful in understanding the transit accessibility. It can also be used to quantify the impact of transit service changes.

Given that major transit improvements are expected to be in place when the Site is redeveloped, it is imperative that the future transit context be assessed.

This technical report is concerned with the outputs of analysing existing and future transit conditions, as well as the methodology associated for such analysis.

This memo will also outline the inputs and assumptions used creating the models required conduct this analysis, and the assumptions required to model future transit improvements.

For the purpose of this development, the following four scenarios were analysed:

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

The inputs for these models are further discussed in **Section 3.0**.

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.

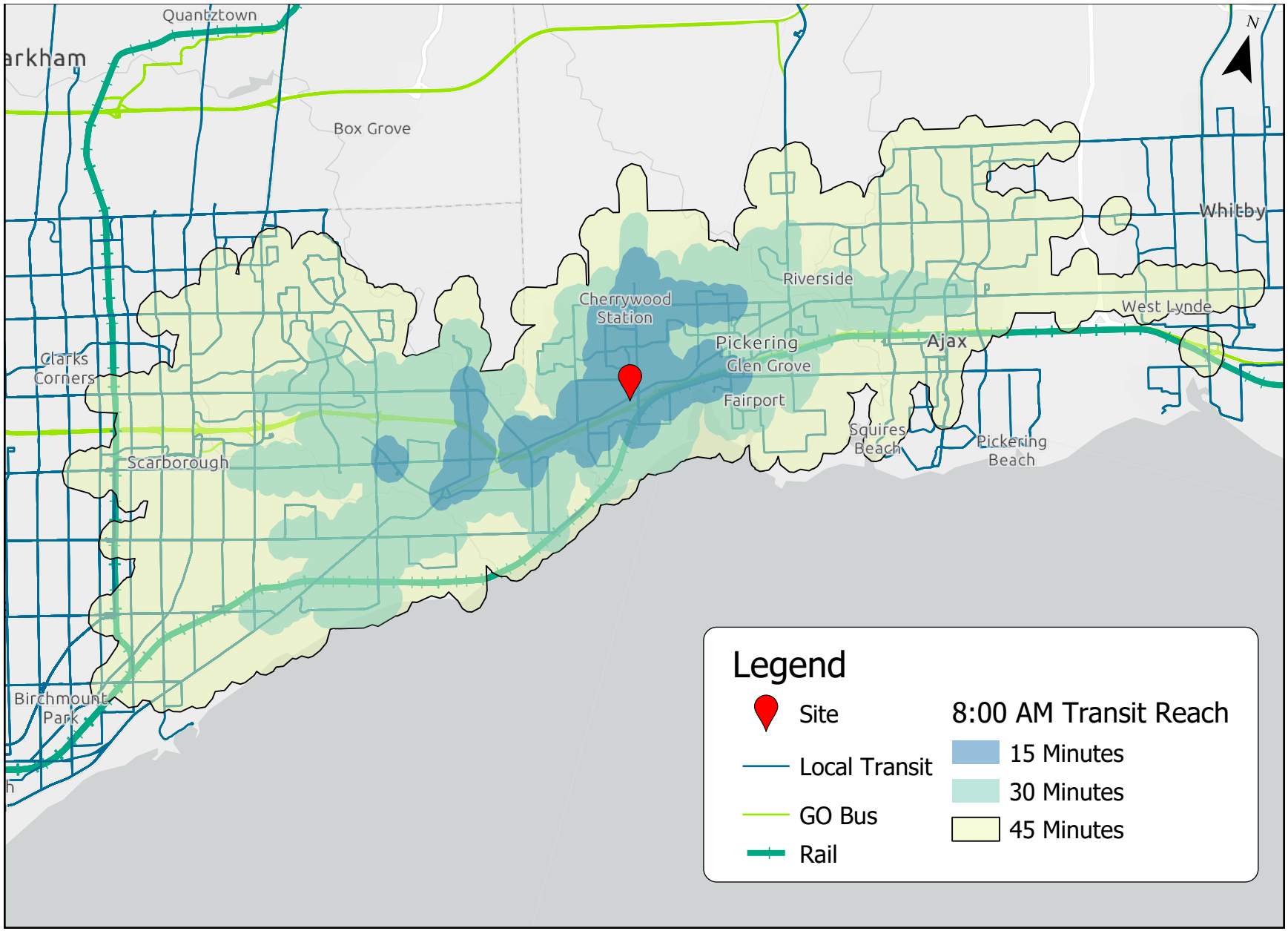

FIGURE B1 EXISTING TRANSIT SERVICE AREA AT 8:00 AM

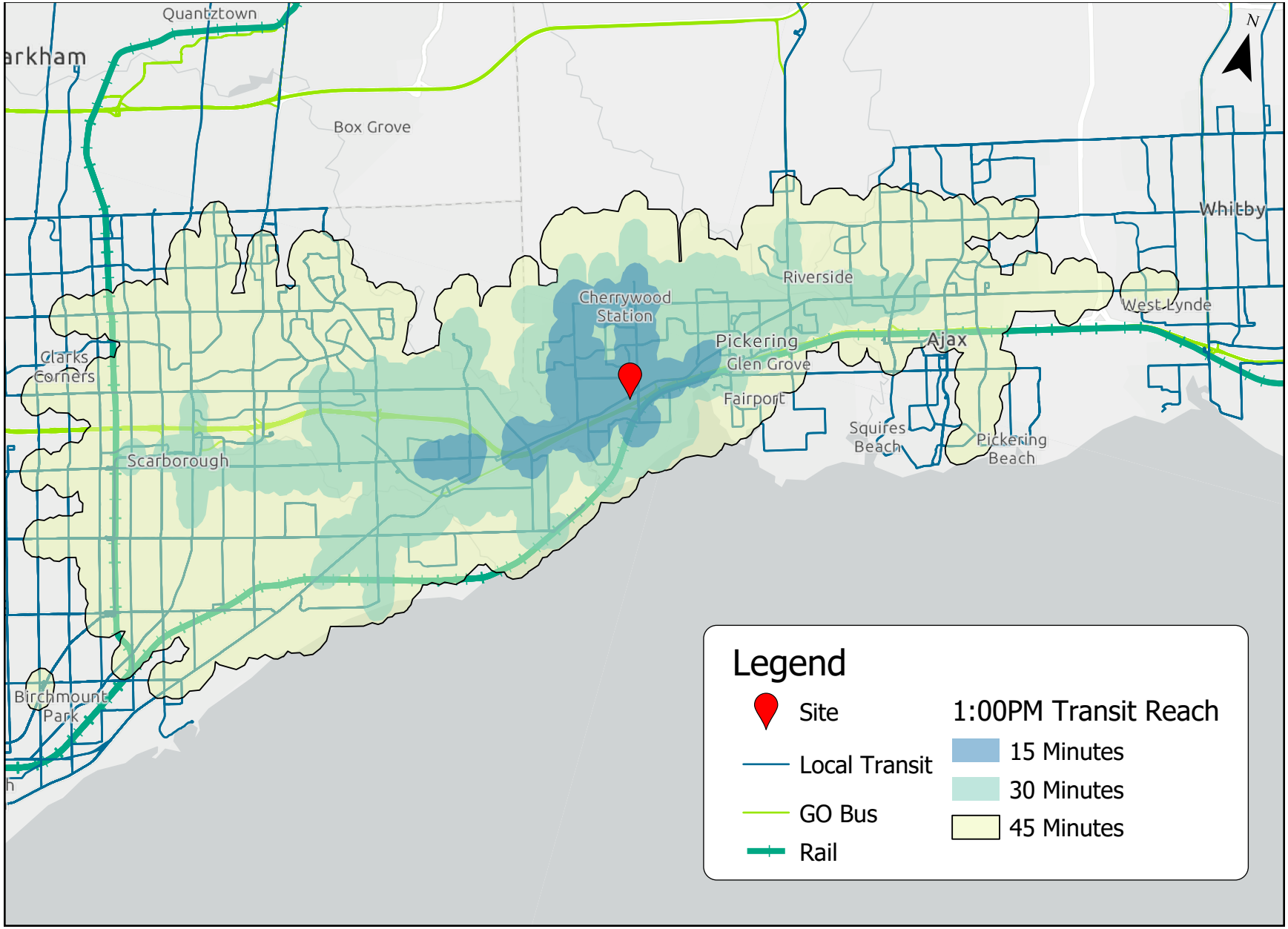

FIGURE B2 EXISTING TRANSIT SERVICE AREA AT 1:00 PM

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).

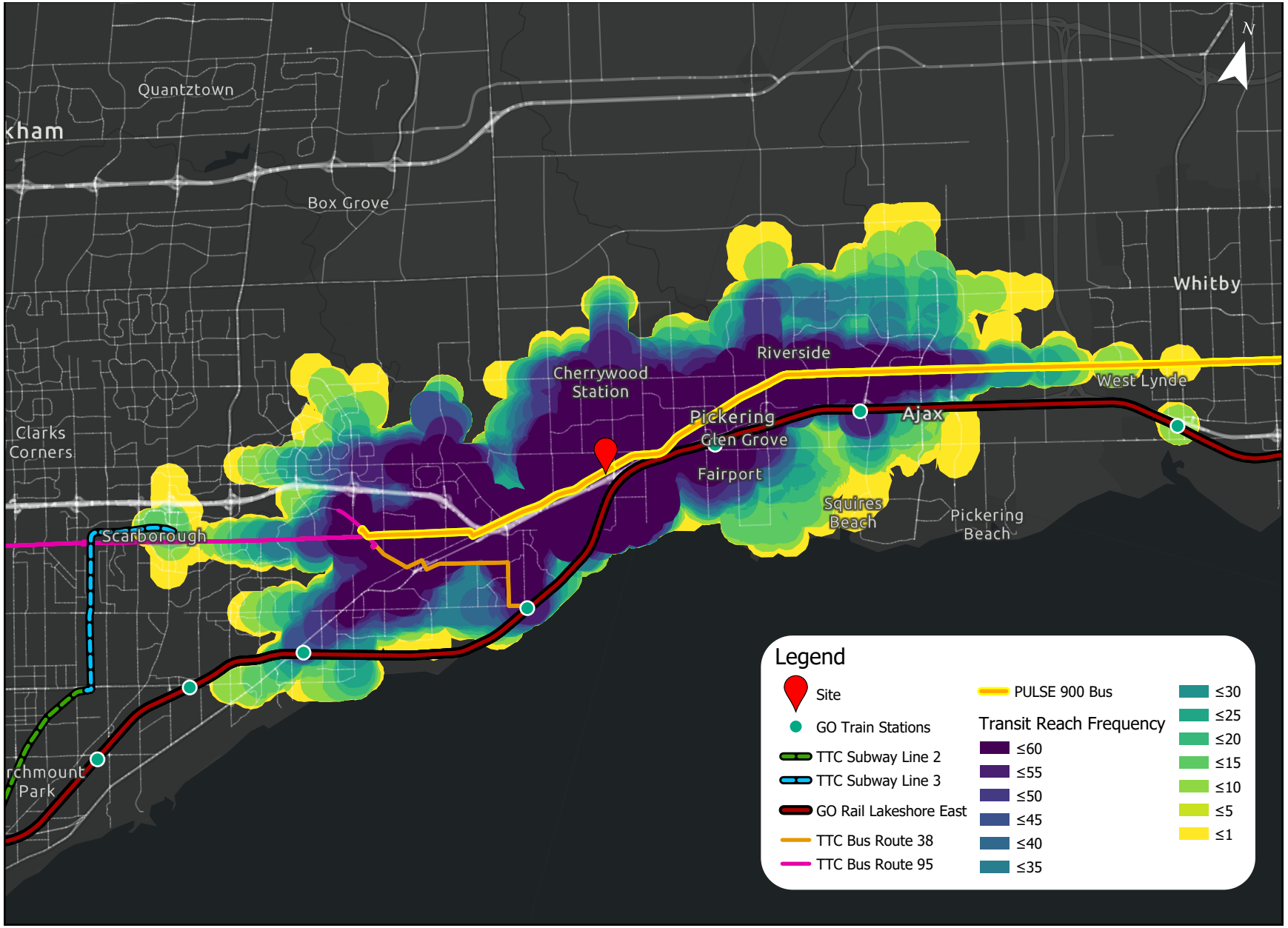

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FIGURE B3 EXISTING TRANSIT SERVICE AREA BETWEEN 8:00 AM AND 9:00 AM

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.

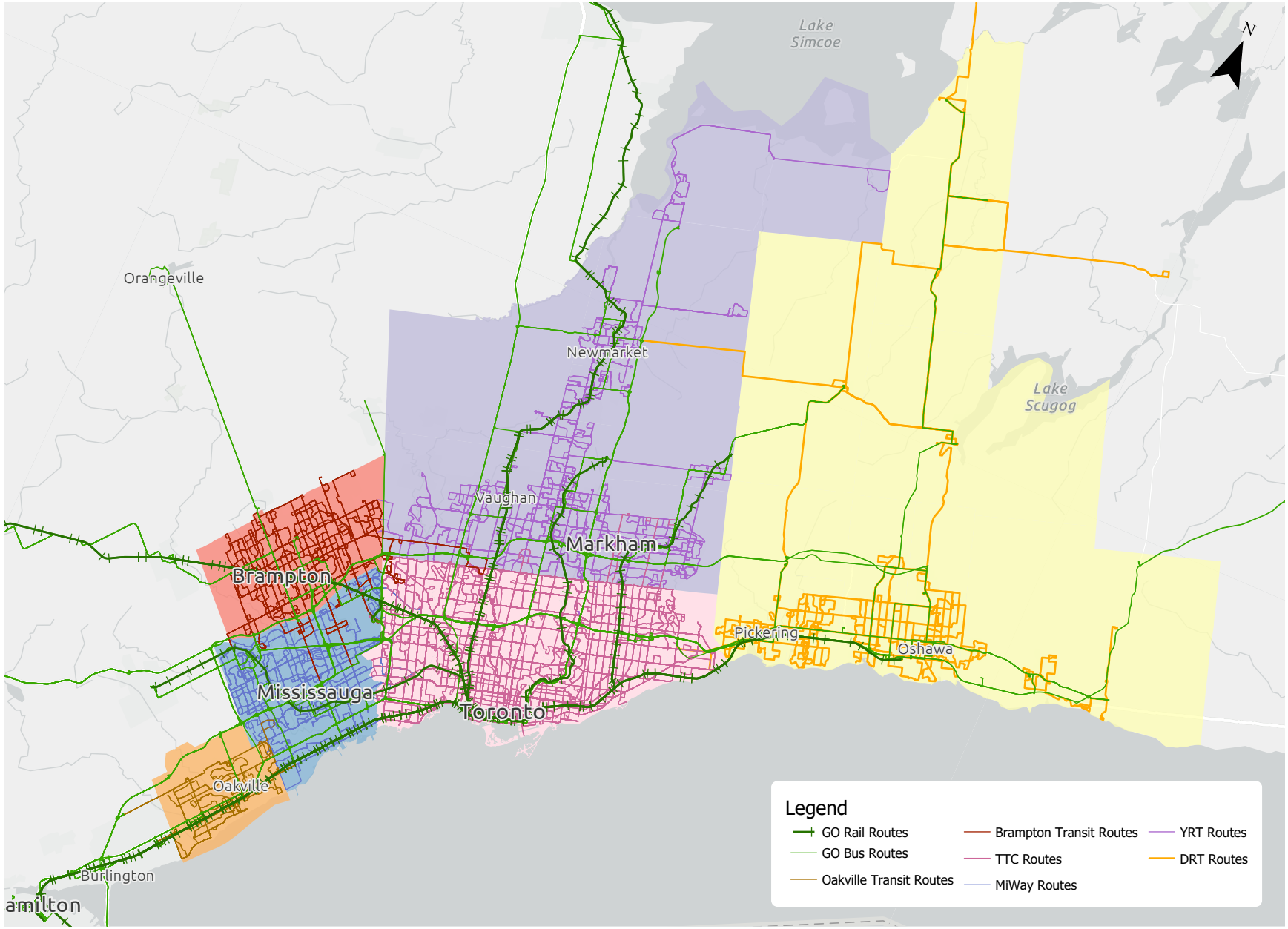

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FIGURE B4 EXISTING GTA TRANSIT NETWORK MODEL

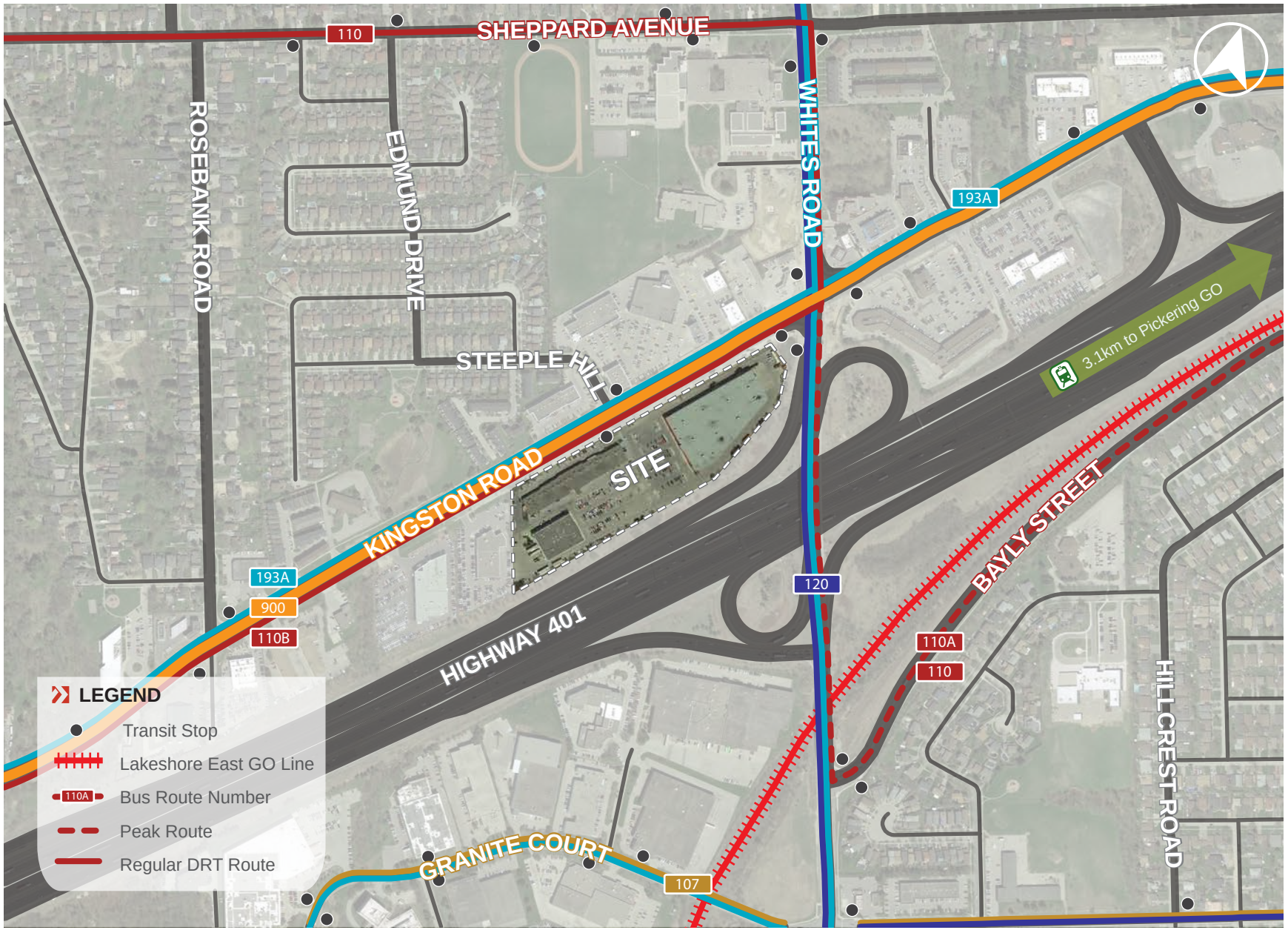

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FIGURE B5 EXISTING TRANSIT NETWORK WITHIN SITE VICINITY

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

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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.

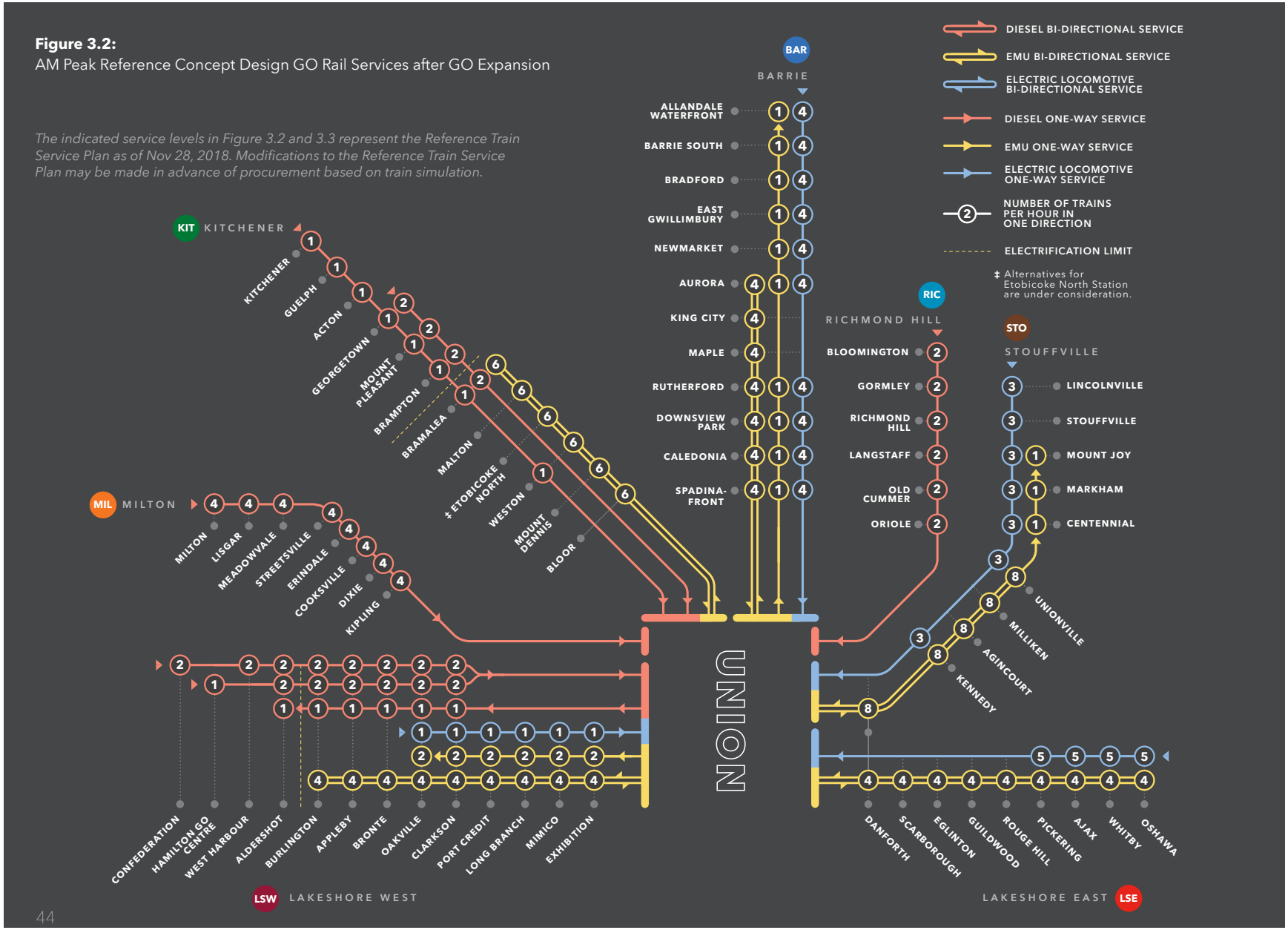

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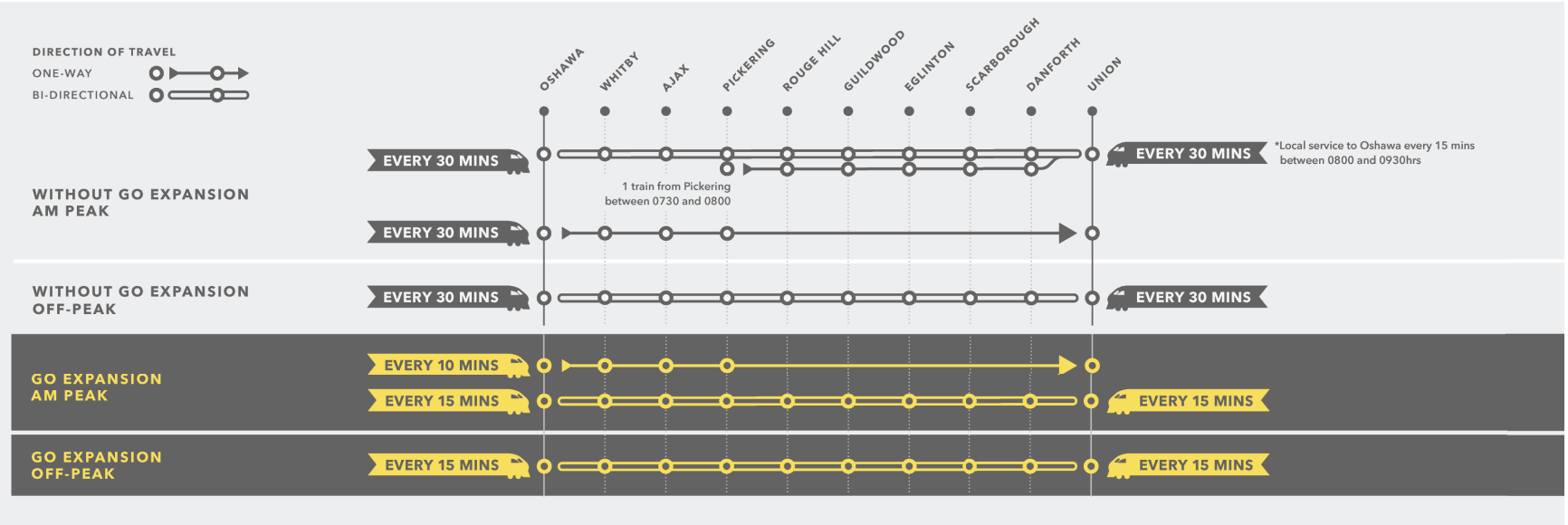
FIGURE B8 AM PEAK REFERENCE CONCEPT DESIGN GO RAIL SERVICES AFTER GO EXPANSION



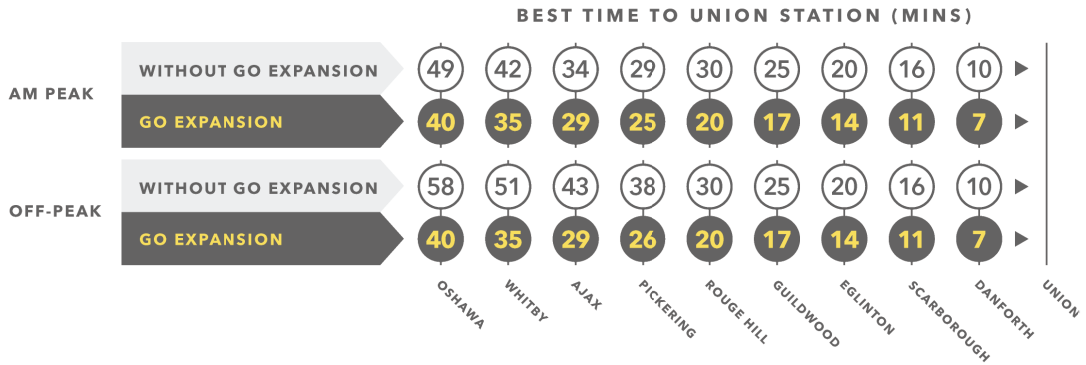


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FIGURE B9 LAKESHORE EAST TRAVEL TIME CHANGE FROM GO EXPANSION

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**.

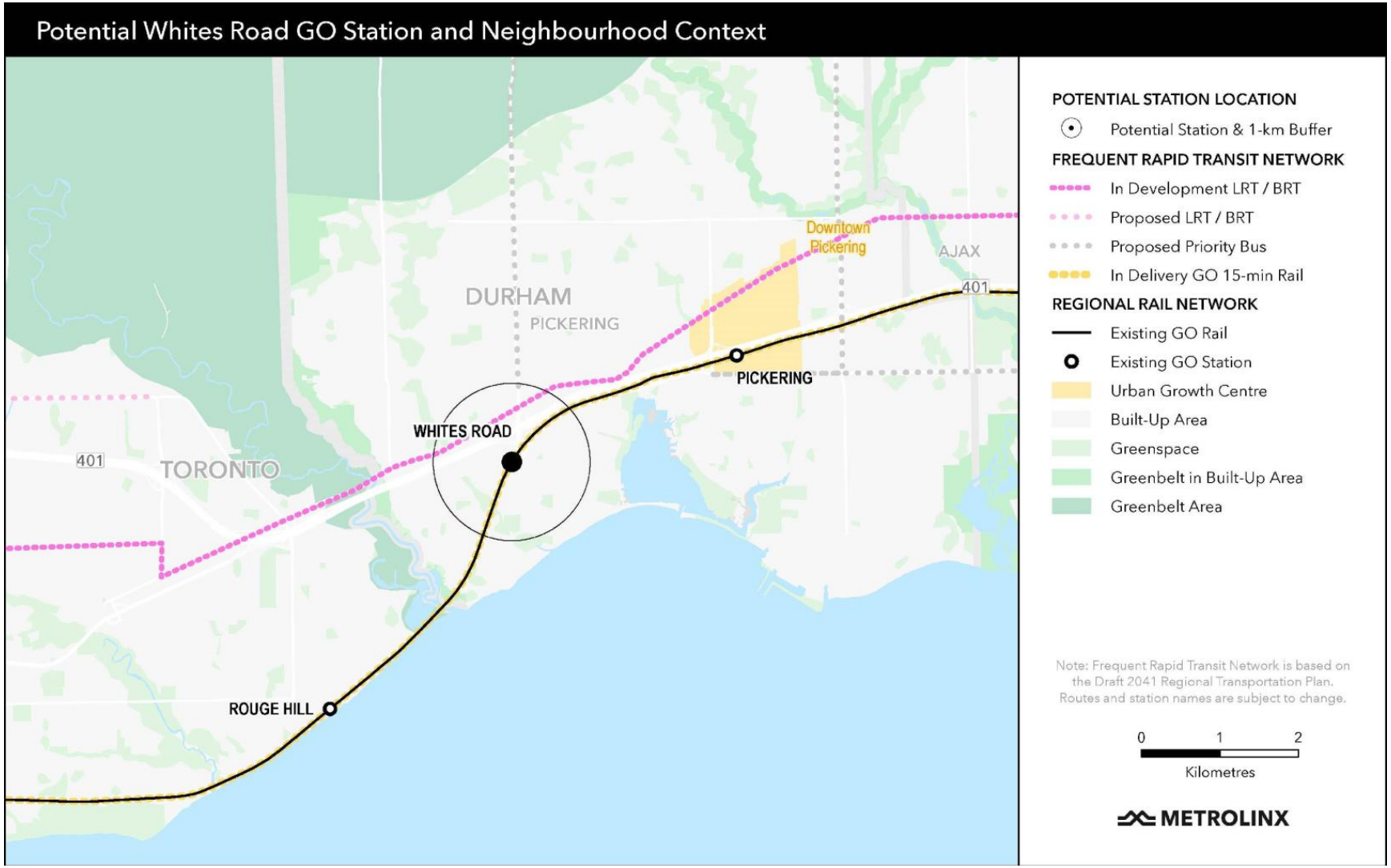

FIGURE B10 POTENTIAL WHITES ROAD GO STATION LOCATION

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.

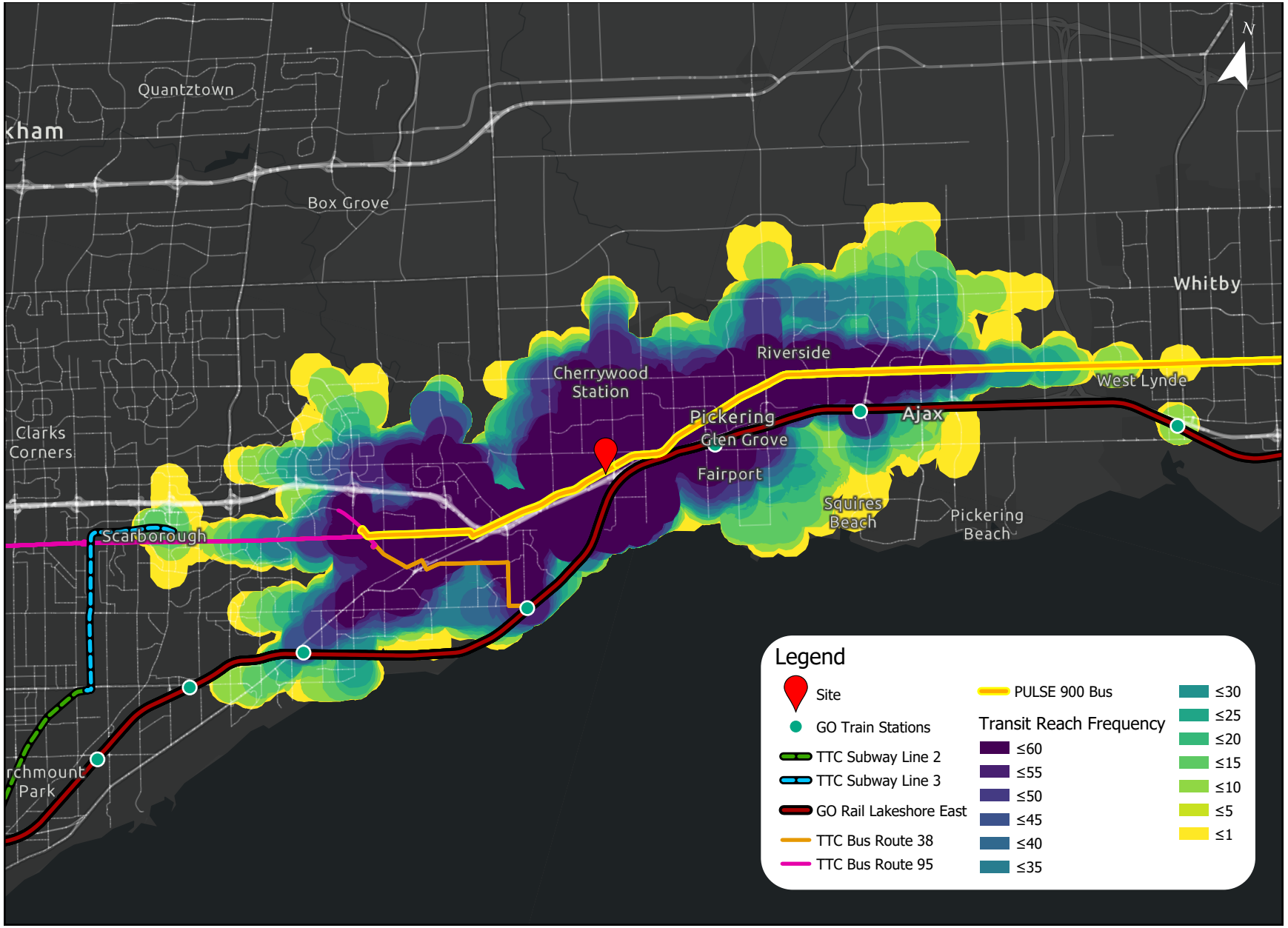

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FIGURE B11 EXISTING 30 MIN TRANSIT SERVICE AREA BETWEEN 8:00 AM AND 9:00 AM

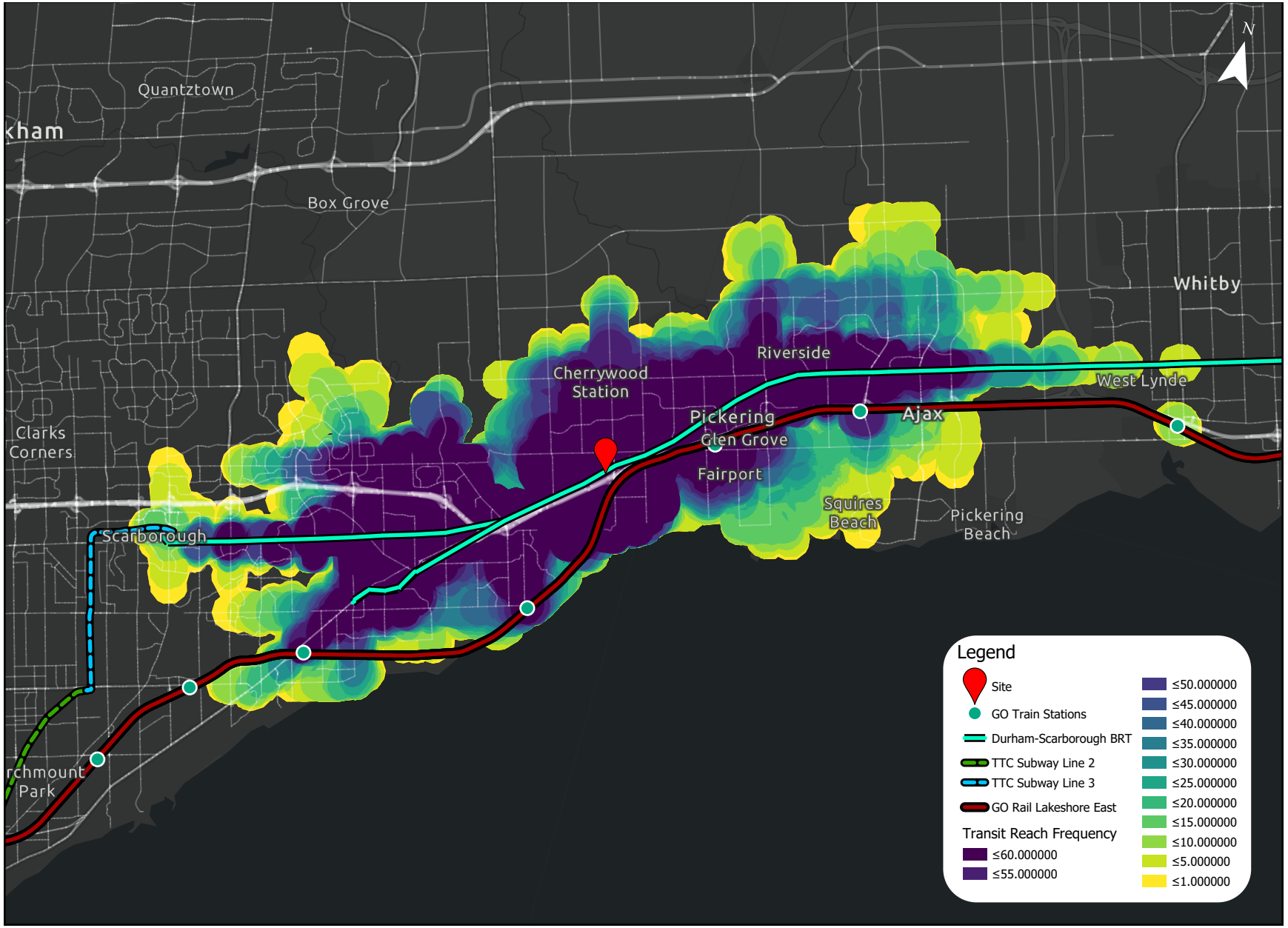

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FIGURE B12 FUTURE 30 MIN TRANSIT SERVICE AREA BETWEEN 8:00 AM AND 9:00 AM

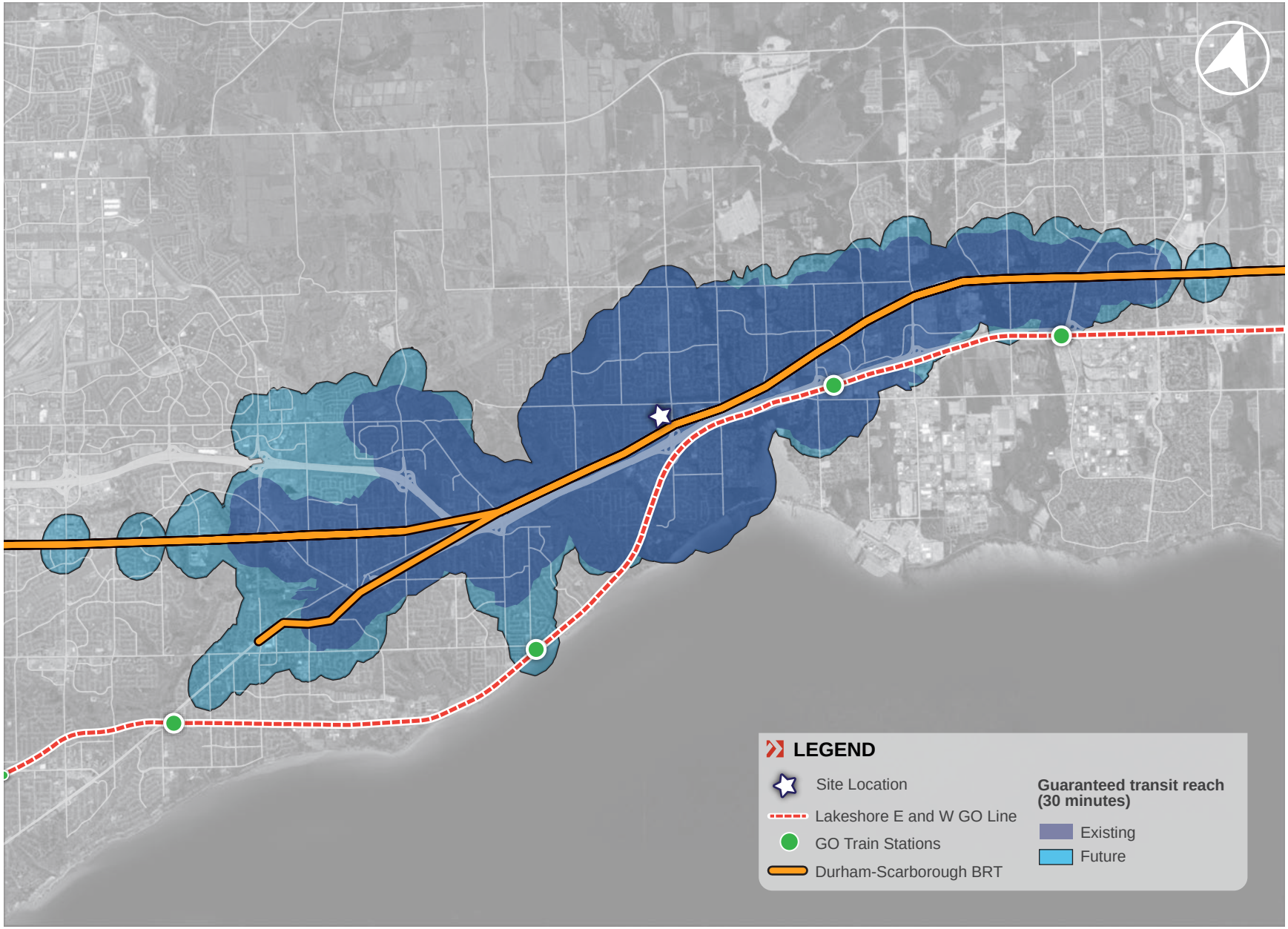

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FIGURE B13 EXISTING VS FUTURE WITH BRT GUARANTEED 30 MIN TRANSIT SERVICE AREA

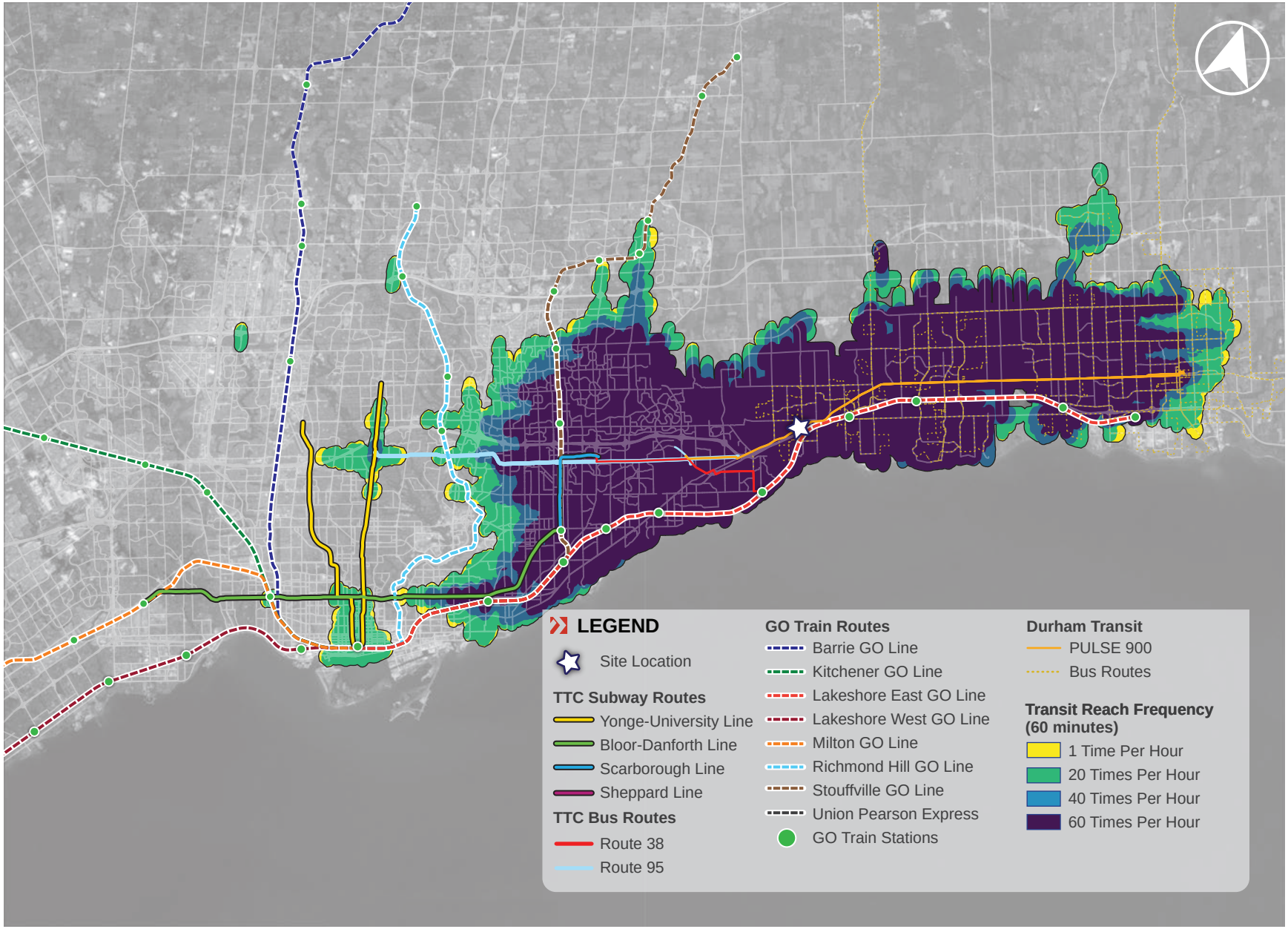

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FIGURE B14 EXISTING 60 MIN TRANSIT SERVICE AREA 8:00 AM AND 9:00 AM

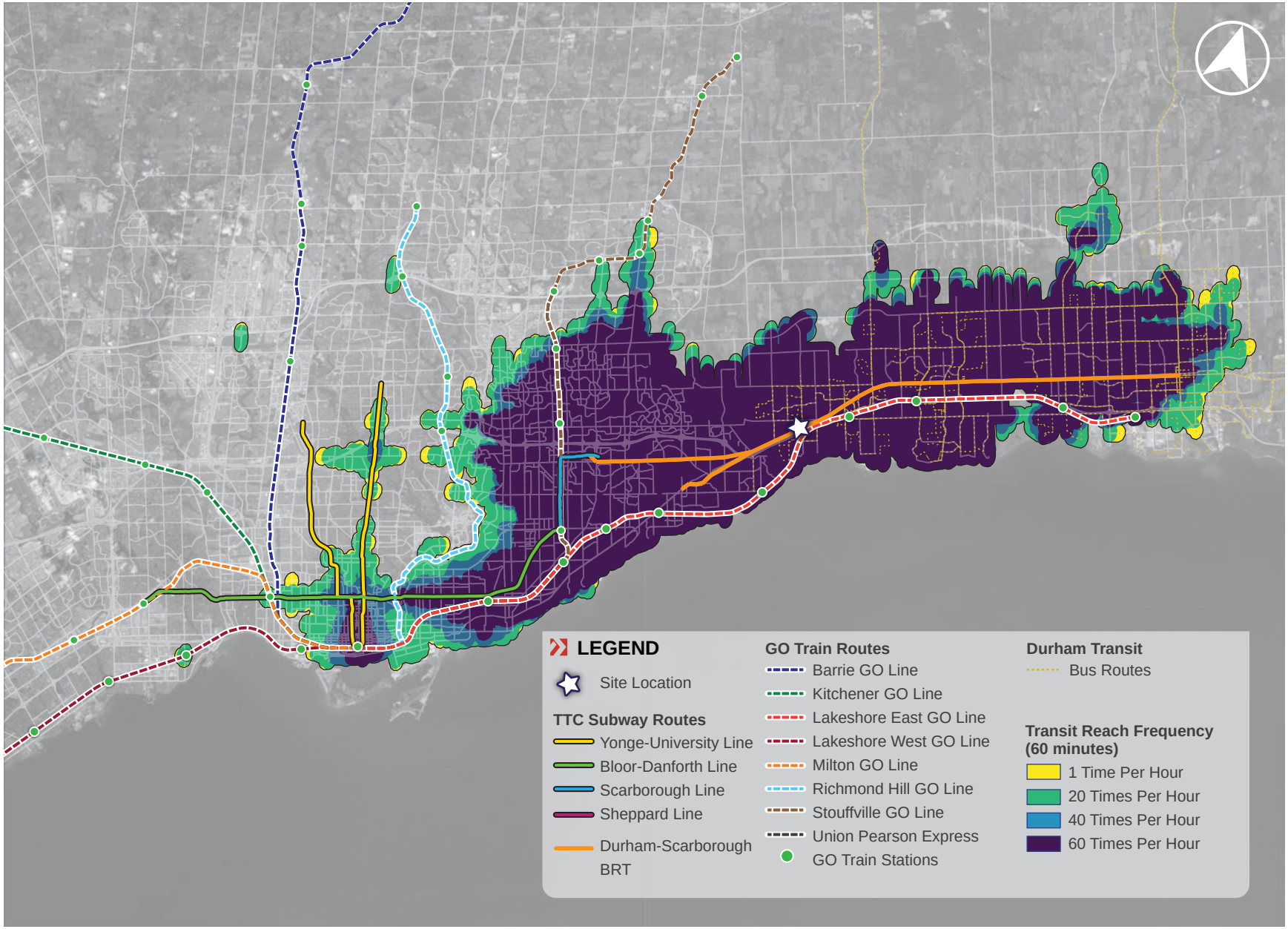

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FIGURE B15 FUTURE WITH GO EXPANSION 60 MIN TRANSIT SERVICE AREA BETWEEN 8:00 AM AND 9:00 AM

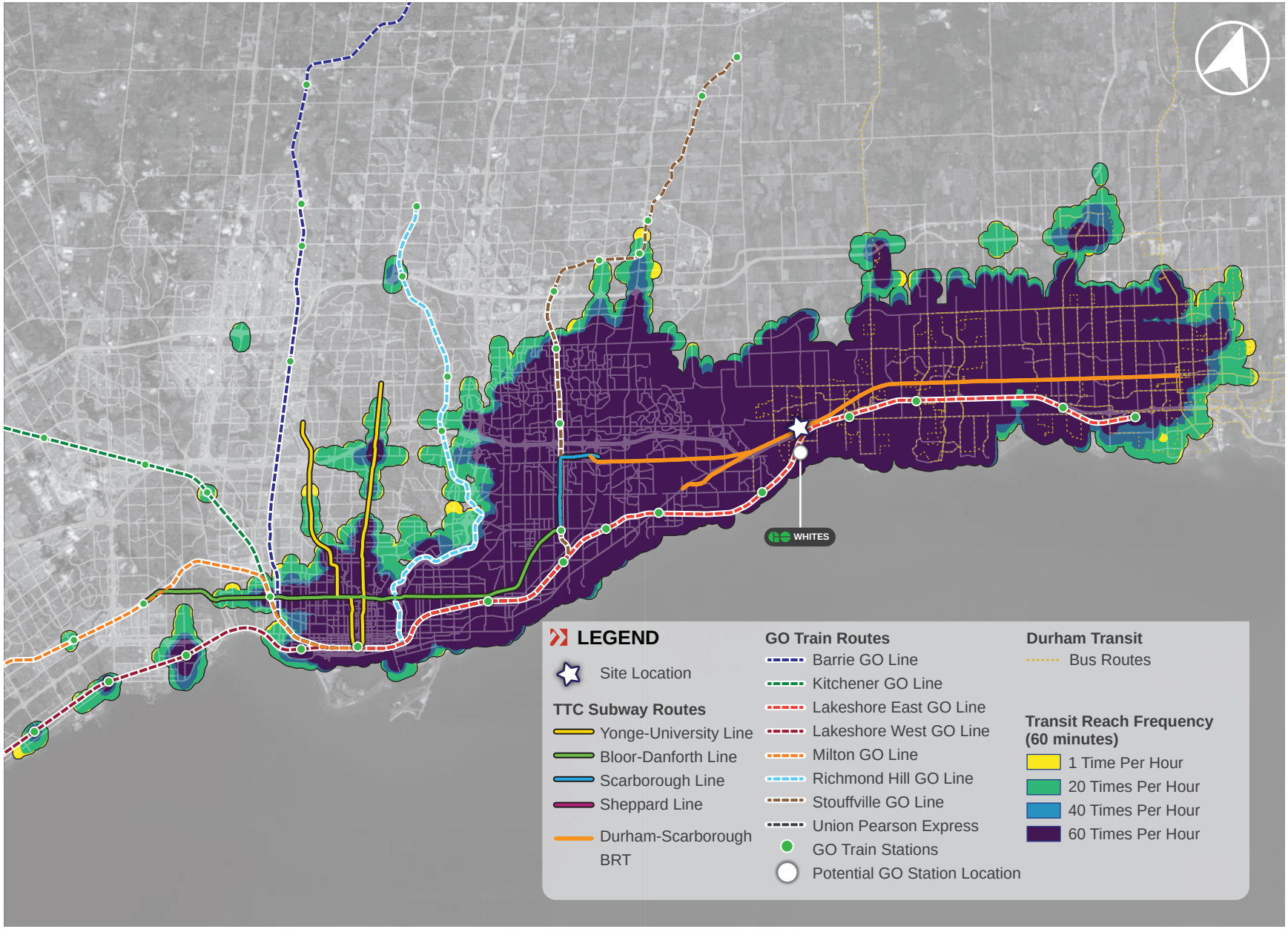

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FIGURE B16 FUTURE WITH WHITES GO 60 MIN TRANSIT SERVICE AREA BETWEEN 8:00 AM AND 9:00 AM

MOVEMENT
IN URBAN
ENVIRONMENTS

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APPENDIX C:
Turning Movement Counts

Turning Movement Count (5 . KINGSTON RD & HWY 401 WB ACCESS)

Start Time	E Approach					S Approach					W Approach					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	173	87	0	0	260	1	60	0	0	61	2	62	0	0	64	385	
07:15:00	201	112	0	0	313	7	58	0	0	65	1	93	0	0	94	472	
07:30:00	211	133	0	0	344	7	76	0	0	83	6	100	0	0	106	533	
07:45:00	252	125	0	0	377	6	72	0	0	78	5	128	0	0	133	588	1978
08:00:00	227	145	0	0	372	9	109	0	0	118	4	119	0	0	123	613	2206
08:15:00	218	135	0	0	353	13	116	0	0	129	2	150	0	0	152	634	2368
08:30:00	202	98	0	1	300	16	141	0	0	157	2	223	0	0	225	682	2517
08:45:00	205	98	0	0	303	23	124	0	0	147	4	243	0	0	247	697	2626
BREAK																	
16:00:00	167	46	0	0	213	21	137	0	0	158	3	392	0	0	395	766	
16:15:00	153	37	0	0	190	39	175	0	0	214	5	384	0	0	389	793	
16:30:00	162	49	0	0	211	42	173	0	0	215	2	372	0	0	374	800	
16:45:00	161	54	0	1	215	30	165	0	0	195	2	368	0	0	370	780	3139
17:00:00	175	67	1	0	243	39	174	0	0	213	4	382	0	0	386	842	3215
17:15:00	174	50	0	0	224	21	159	0	1	180	4	386	0	0	390	794	3216
17:30:00	151	46	0	0	197	23	156	0	1	179	2	401	0	0	403	779	3195
17:45:00	151	44	0	0	195	41	163	0	0	204	2	393	0	0	395	794	3209
Grand Total	2983	1326	1	2	4310	338	2058	0	2	2396	50	4196	0	0	4246	**10952**	-
Approach%	69.2%	30.8%	0%		-	14.1%	85.9%	0%		-	1.2%	98.8%	0%		-	-	-
Totals %	27.2%	12.1%	0%		39.4%	3.1%	18.8%	0%		21.9%	0.5%	38.3%	0%		38.8%	-	-
Heavy	125	22	0		-	5	56	0		-	2	121	0		-	-	-
Heavy %	4.2%	1.7%	0%		-	1.5%	2.7%	0%		-	4%	2.9%	0%		-	-	-
Bicycles	0	0	0		-	0	0	0		-	0	152	0		-	-	-
Bicycle %	0%	0%	0%		-	0%	0%	0%		-	0%	3.6%	0%		-	-	-

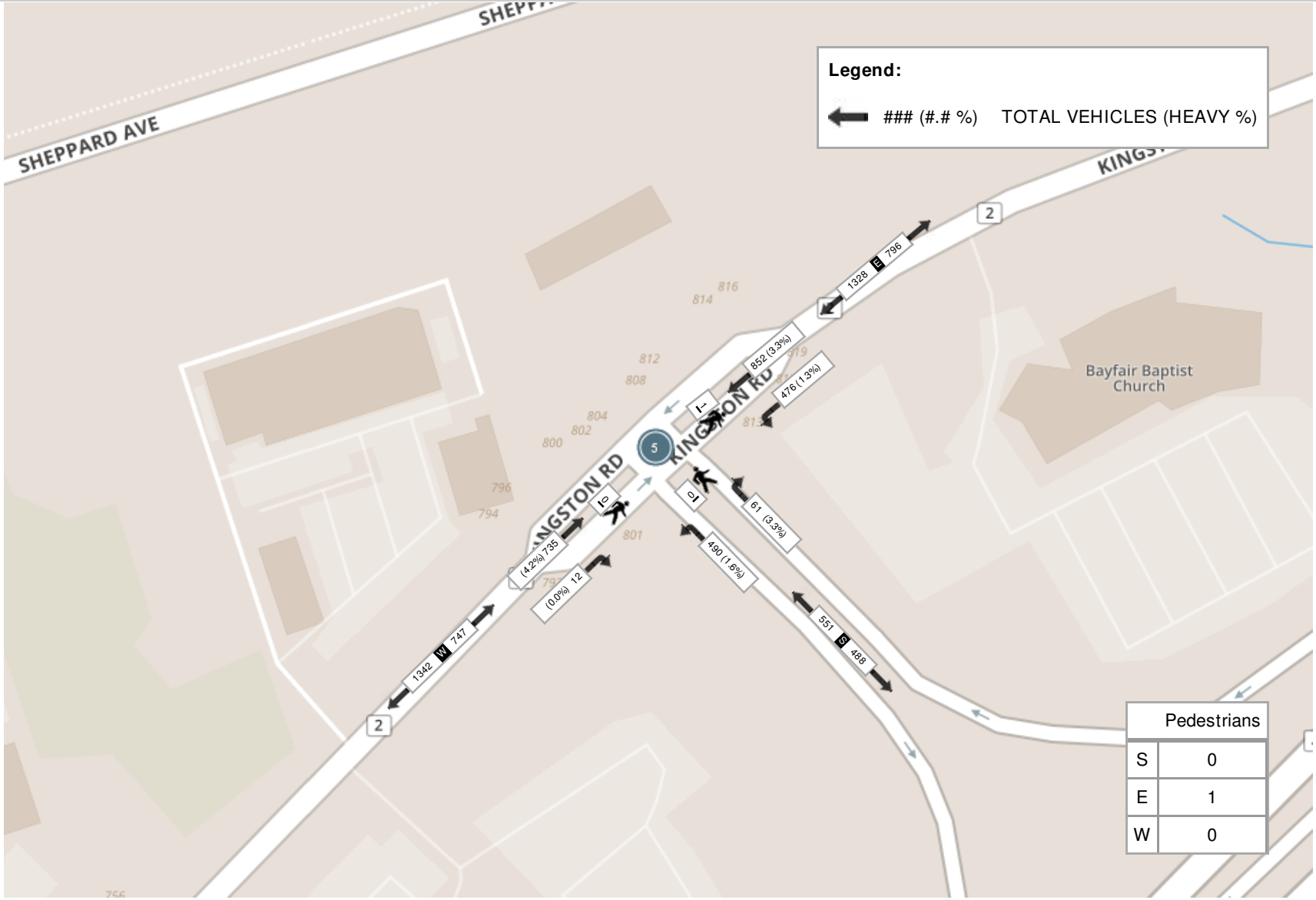
Peak Hour: 08:00 AM - 09:00 AM Weather: Light Intensity Shower Rain (15.81 °C)

Start Time	E Approach					S Approach					W Approach					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	227	145	0	0	372	9	109	0	0	118	4	119	0	0	123	613
08:15:00	218	135	0	0	353	13	116	0	0	129	2	150	0	0	152	634
08:30:00	202	98	0	1	300	16	141	0	0	157	2	223	0	0	225	682
08:45:00	205	98	0	0	303	23	124	0	0	147	4	243	0	0	247	697
Grand Total	852	476	0	1	1328	61	490	0	0	551	12	735	0	0	747	**2626**
Approach%	64.2%	35.8%	0%		-	11.1%	88.9%	0%		-	1.6%	98.4%	0%		-	**-**
Totals %	32.4%	18.1%	0%		50.6%	2.3%	18.7%	0%		21%	0.5%	28%	0%		28.4%	**-**
PHF	0.94	0.82	0		0.89	0.66	0.87	0		0.88	0.75	0.76	0		0.76	**-**
Heavy	28	6	0		34	2	8	0		10	0	31	0		31	**-**
Heavy %	3.3%	1.3%	0%		2.6%	3.3%	1.6%	0%		1.8%	0%	4.2%	0%		4.1%	**-**
Lights	824	470	0		1294	59	482	0		541	12	704	0		716	**-**
Lights %	96.7%	98.7%	0%		97.4%	96.7%	98.4%	0%		98.2%	100%	95.8%	0%		95.9%	**-**
Single-Unit Trucks	26	2	0		28	2	6	0		8	0	18	0		18	**-**
Single-Unit Trucks %	3.1%	0.4%	0%		2.1%	3.3%	1.2%	0%		1.5%	0%	2.4%	0%		2.4%	**-**
Buses	0	1	0		1	0	0	0		0	0	12	0		12	**-**
Buses %	0%	0.2%	0%		0.1%	0%	0%	0%		0%	0%	1.6%	0%		1.6%	**-**
Articulated Trucks	2	3	0		5	0	2	0		2	0	1	0		1	**-**
Articulated Trucks %	0.2%	0.6%	0%		0.4%	0%	0.4%	0%		0.4%	0%	0.1%	0%		0.1%	**-**
Pedestrians	-	-	-	1	-	-	-	-	0	-	-	-	-	0	-	**-**
Pedestrians%	-	-	-	100%		-	-	-	0%		-	-	-	0%		**-**
Bicycles on Road	0	0	0	0	-	0	0	0	0	-	0	152	0	0	-	**-**
Bicycles on Road%	-	-	-	0%		-	-	-	0%		-	-	-	0%		**-**

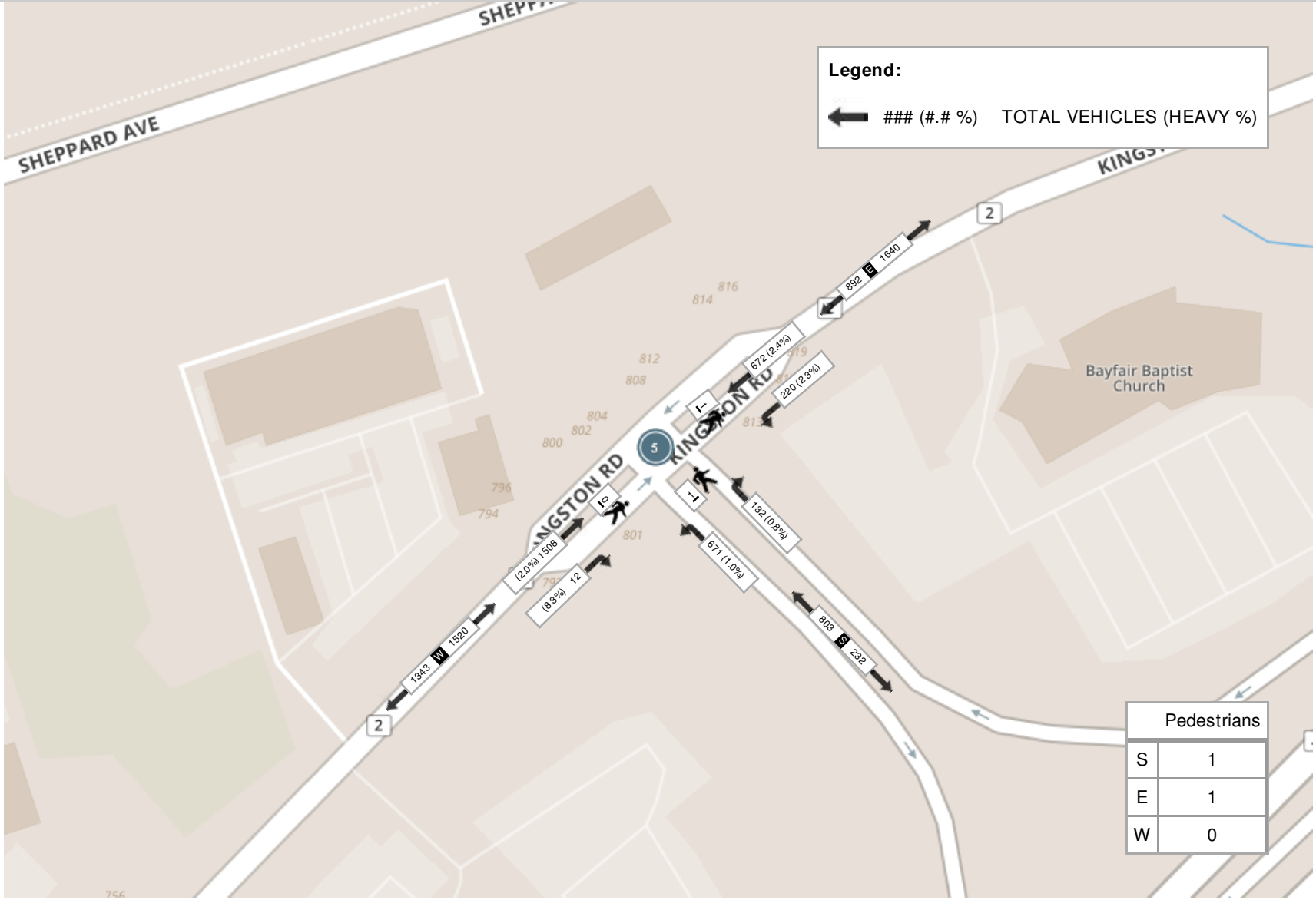
Peak Hour: 04:30 PM - 05:30 PM Weather: Thunderstorm (19.19 °C)

Start Time	E Approach					S Approach					W Approach					Int. Total (15 min)
	Thru	Left	UTurn	Peds	Approach Total	Right	Left	UTurn	Peds	Approach Total	Right	Thru	UTurn	Peds	Approach Total	
16:30:00	162	49	0	0	211	42	173	0	0	215	2	372	0	0	374	800
16:45:00	161	54	0	1	215	30	165	0	0	195	2	368	0	0	370	780
17:00:00	175	67	1	0	243	39	174	0	0	213	4	382	0	0	386	842
17:15:00	174	50	0	0	224	21	159	0	1	180	4	386	0	0	390	794
Grand Total	672	220	1	1	893	132	671	0	1	803	12	1508	0	0	1520	**3216**
Approach%	75.3%	24.6%	0.1%		-	16.4%	83.6%	0%		-	0.8%	99.2%	0%		-	-
Totals %	20.9%	6.8%	0%		27.8%	4.1%	20.9%	0%		25%	0.4%	46.9%	0%		47.3%	-
PHF	0.96	0.82	0.25		0.92	0.79	0.96	0		0.93	0.75	0.98	0		0.97	-
Heavy	16	5	0		21	1	7	0		8	1	30	0		31	-
Heavy %	2.4%	2.3%	0%		2.4%	0.8%	1%	0%		1%	8.3%	2%	0%		2%	-
Lights	656	215	1		872	131	664	0		795	11	1478	0		1489	-
Lights %	97.6%	97.7%	100%		97.6%	99.2%	99%	0%		99%	91.7%	98%	0%		98%	-
Single-Unit Trucks	9	3	0		12	0	5	0		5	1	16	0		17	-
Single-Unit Trucks %	1.3%	1.4%	0%		1.3%	0%	0.7%	0%		0.6%	8.3%	1.1%	0%		1.1%	-
Buses	7	2	0		9	1	1	0		2	0	13	0		13	-
Buses %	1%	0.9%	0%		1%	0.8%	0.1%	0%		0.2%	0%	0.9%	0%		0.9%	-
Articulated Trucks	0	0	0		0	0	1	0		1	0	1	0		1	-
Articulated Trucks %	0%	0%	0%		0%	0%	0.1%	0%		0.1%	0%	0.1%	0%		0.1%	-
Pedestrians	-	-	-	1	-	-	-	-	1	-	-	-	-	0	-	-
Pedestrians%	-	-	-	50%		-	-	-	50%		-	-	-	0%		-
Bicycles on Road	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	-
Bicycles on Road%	-	-	-	0%		-	-	-	0%		-	-	-	0%		-

Peak Hour: 08:00 AM - 09:00 AM Weather: Light Intensity Shower Rain (15.81 °C)



Peak Hour: 04:30 PM - 05:30 PM Weather: Thunderstorm (19.19 °C)



Turning Movement Count (1 . KINGSTON RD & ROSEBANK RD)

Start Time	N Approach						E Approach						S Approach						W Approach						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	21	2	15	0	2	38	2	154	1	0	0	157	0	0	0	0	0	0	0	50	4	0	0	54	249	
07:15:00	22	1	14	0	0	37	10	173	1	0	1	184	0	0	0	0	0	0	0	58	4	0	0	62	283	
07:30:00	33	1	27	0	0	61	4	221	0	0	1	225	2	1	0	0	0	3	3	86	10	0	1	99	388	
07:45:00	53	1	16	0	1	70	5	239	1	0	1	245	0	0	0	0	1	0	3	95	15	0	0	113	428	1348
08:00:00	26	0	24	0	1	50	7	222	0	0	0	229	0	0	1	0	1	1	3	87	13	0	1	103	383	1482
08:15:00	34	1	23	0	3	58	8	208	2	0	0	218	1	0	3	0	0	4	4	124	25	0	3	153	433	1632
08:30:00	38	2	23	0	0	63	11	246	2	0	0	259	2	0	1	0	0	3	1	207	14	0	2	222	547	1791
08:45:00	34	1	18	0	4	53	8	215	0	0	3	223	1	0	2	0	0	3	2	132	21	0	2	155	434	1797
BREAK																										
16:00:00	15	1	7	0	1	23	12	170	1	1	0	184	0	1	1	0	0	2	4	210	28	0	0	242	451	
16:15:00	15	0	5	0	2	20	17	179	3	0	0	199	4	0	2	0	1	6	2	229	27	0	1	258	483	
16:30:00	18	2	11	0	3	31	12	164	1	0	1	177	4	1	2	0	1	7	1	221	28	0	0	250	465	
16:45:00	19	1	6	0	2	26	13	158	1	0	2	172	4	0	0	0	3	4	3	235	33	0	0	271	473	1872
17:00:00	17	1	16	0	1	34	15	173	0	0	1	188	4	2	3	0	1	9	0	252	36	0	0	288	519	1940
17:15:00	12	0	12	0	6	24	15	192	0	0	0	207	0	0	0	0	0	0	1	244	29	0	3	274	505	1962
17:30:00	20	3	15	0	4	38	16	162	0	0	2	178	3	0	0	0	1	3	1	259	30	1	1	291	510	2007
17:45:00	15	0	6	0	1	21	16	183	1	0	1	200	3	0	0	0	1	3	0	233	26	0	0	259	483	2017
Grand Total	392	17	238	0	31	647	171	3059	14	1	13	3245	28	5	15	0	10	48	28	2722	343	1	14	3094	**7034**	-
Approach%	60.6%	2.6%	36.8%	0%		-	5.3%	94.3%	0.4%	0%		-	58.3%	10.4%	31.3%	0%		-	0.9%	88%	11.1%	0%		-	-	-
Totals %	5.6%	0.2%	3.4%	0%		9.2%	2.4%	43.5%	0.2%	0%		46.1%	0.4%	0.1%	0.2%	0%		0.7%	0.4%	38.7%	4.9%	0%		44%	-	-
Heavy	5	0	2	0		-	5	96	0	0		-	0	0	1	0		-	1	72	4	0		-	-	-
Heavy %	1.3%	0%	0.8%	0%		-	2.9%	3.1%	0%	0%		-	0%	0%	6.7%	0%		-	3.6%	2.6%	1.2%	0%		-	-	-
Bicycles	1	0	0	0		-	0	3	0	0		-	0	0	0	0		-	0	151	0	0		-	-	-
Bicycle %	0.3%	0%	0%	0%		-	0%	0.1%	0%	0%		-	0%	0%	0%	0%		-	0%	5.5%	0%	0%		-	-	-

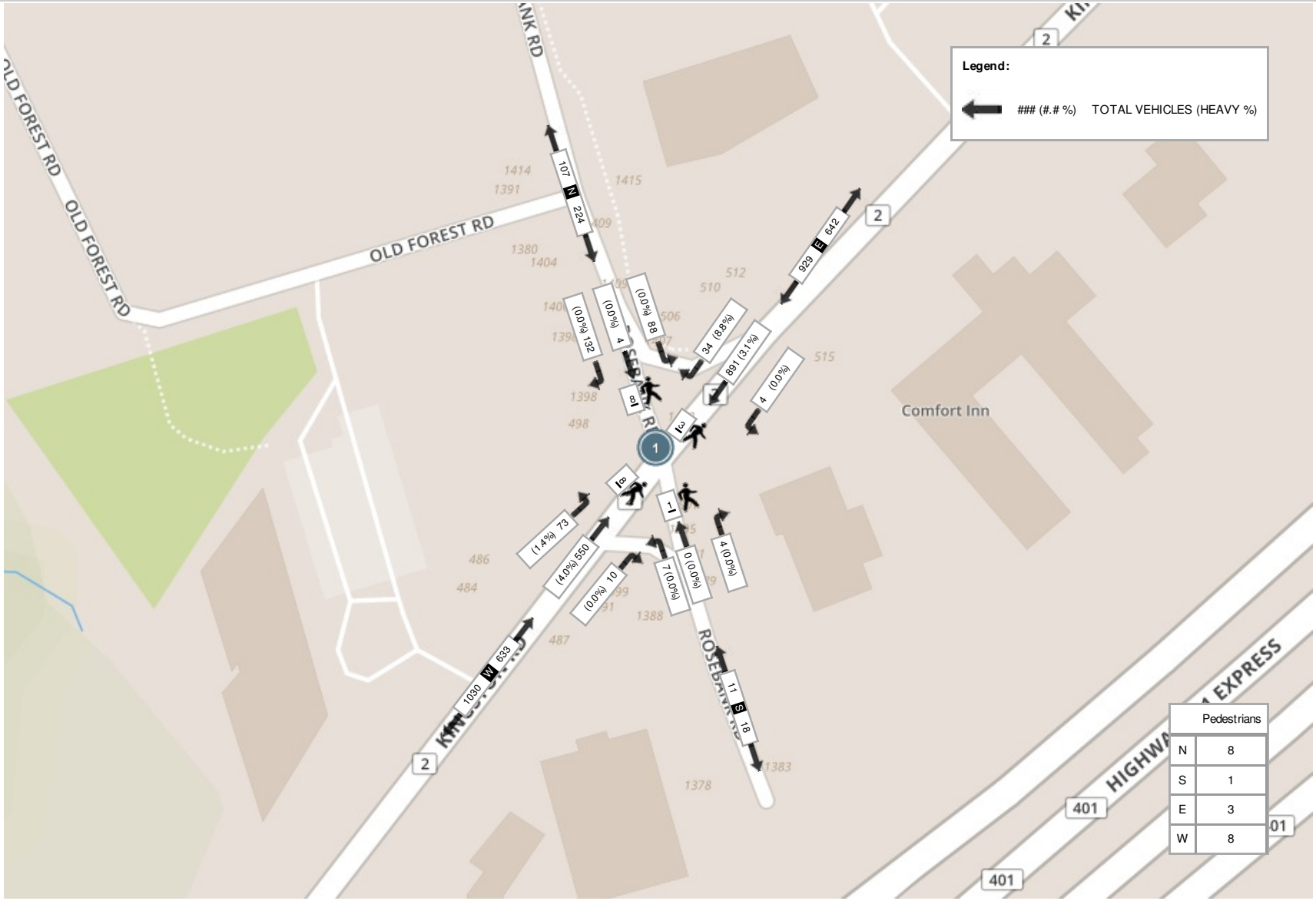
Peak Hour: 08:00 AM - 09:00 AM Weather: Light Intensity Shower Rain (15.81 °C)

Start Time	N Approach						E Approach						S Approach						W Approach						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	26	0	24	0	1	50	7	222	0	0	0	229	0	0	1	0	1	1	3	87	13	0	1	103	383
08:15:00	34	1	23	0	3	58	8	208	2	0	0	218	1	0	3	0	0	4	4	124	25	0	3	153	433
08:30:00	38	2	23	0	0	63	11	246	2	0	0	259	2	0	1	0	0	3	1	207	14	0	2	222	547
08:45:00	34	1	18	0	4	53	8	215	0	0	3	223	1	0	2	0	0	3	2	132	21	0	2	155	434
Grand Total	132	4	88	0	8	224	34	891	4	0	3	929	4	0	7	0	1	11	10	550	73	0	8	633	**1797**
Approach%	58.9%	1.8%	39.3%	0%		-	3.7%	95.9%	0.4%	0%		-	36.4%	0%	63.6%	0%		-	1.6%	86.9%	11.5%	0%		-	-
Totals %	7.3%	0.2%	4.9%	0%		12.5%	1.9%	49.6%	0.2%	0%		51.7%	0.2%	0%	0.4%	0%		0.6%	0.6%	30.6%	4.1%	0%		35.2%	-
PHF	0.87	0.5	0.92	0		0.89	0.77	0.91	0.5	0		0.9	0.5	0	0.58	0		0.69	0.63	0.66	0.73	0		0.71	-
Heavy	0	0	0	0		0	3	28	0	0		31	0	0	0	0		0	0	22	1	0		23	-
Heavy %	0%	0%	0%	0%		0%	8.8%	3.1%	0%	0%		3.3%	0%	0%	0%	0%		0%	0%	4%	1.4%	0%		3.6%	-
Lights	132	4	88	0		224	31	863	4	0		898	4	0	7	0		11	10	528	72	0		610	-
Lights %	100%	100%	100%	0%		100%	91.2%	96.9%	100%	0%		96.7%	100%	0%	100%	0%		100%	100%	96%	98.6%	0%		96.4%	-
Single-Unit Trucks	0	0	0	0		0	1	11	0	0		12	0	0	0	0		0	0	6	0	0		6	-
Single-Unit Trucks %	0%	0%	0%	0%		0%	2.9%	1.2%	0%	0%		1.3%	0%	0%	0%	0%		0%	0%	1.1%	0%	0%		0.9%	-
Buses	0	0	0	0		0	2	17	0	0		19	0	0	0	0		0	0	14	1	0		15	-
Buses %	0%	0%	0%	0%		0%	5.9%	1.9%	0%	0%		2%	0%	0%	0%	0%		0%	0%	2.5%	1.4%	0%		2.4%	-
Articulated Trucks	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	2	0	0		2	-
Articulated Trucks %	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0.4%	0%	0%		0.3%	-
Pedestrians	-	-	-	-	8	-	-	-	-	-	3	-	-	-	-	-	1	-	-	-	-	-	8	-	-
Pedestrians%	-	-	-	-	40%		-	-	-	-	15%		-	-	-	-	5%		-	-	-	-	40%		-
Bicycles on Road	0	0	0	0	0	-	0	2	0	0	0	-	0	0	0	0	0	-	0	151	0	0	0	-	-
Bicycles on Road%	-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-

Peak Hour: 05:00 PM - 06:00 PM Weather: Thunderstorm (19.19 °C)

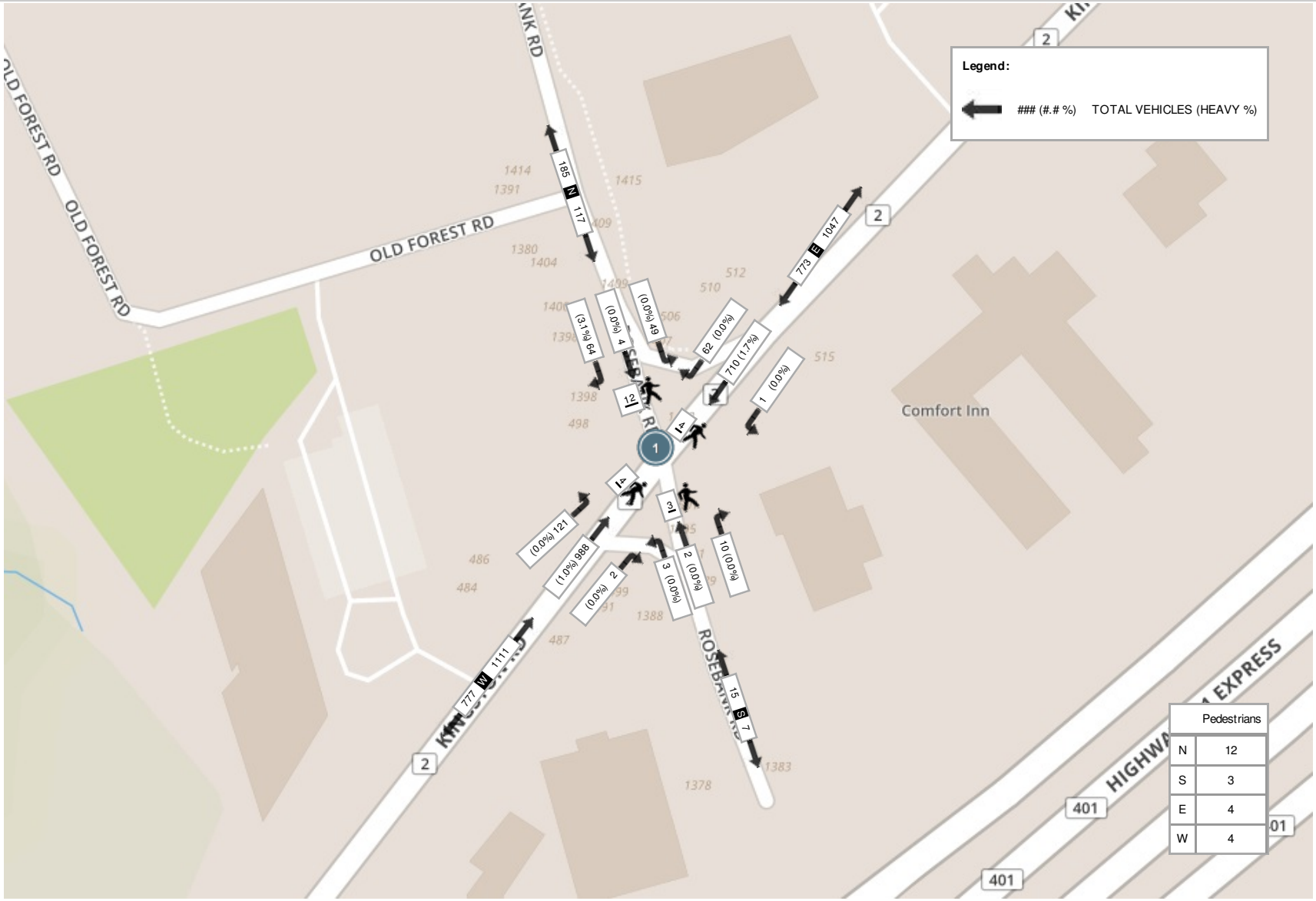
Start Time	N Approach						E Approach						S Approach						W Approach						Int. Total (15 min)
	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	Right	Thru	Left	UTurn	Peds	Approach Total	
17:00:00	17	1	16	0	1	34	15	173	0	0	1	188	4	2	3	0	1	9	0	252	36	0	0	288	519
17:15:00	12	0	12	0	6	24	15	192	0	0	0	207	0	0	0	0	0	0	1	244	29	0	3	274	505
17:30:00	20	3	15	0	4	38	16	162	0	0	2	178	3	0	0	0	1	3	1	259	30	1	1	291	510
17:45:00	15	0	6	0	1	21	16	183	1	0	1	200	3	0	0	0	1	3	0	233	26	0	0	259	483
Grand Total	64	4	49	0	12	117	62	710	1	0	4	773	10	2	3	0	3	15	2	988	121	1	4	1112	**2017**
Approach%	54.7%	3.4%	41.9%	0%		-	8%	91.8%	0.1%	0%		-	66.7%	13.3%	20%	0%		-	0.2%	88.8%	10.9%	0.1%		-	-
Totals %	3.2%	0.2%	2.4%	0%		5.8%	3.1%	35.2%	0%	0%		38.3%	0.5%	0.1%	0.1%	0%		0.7%	0.1%	49%	6%	0%		55.1%	-
PHF	0.8	0.33	0.77	0		0.77	0.97	0.92	0.25	0		0.93	0.63	0.25	0.25	0		0.42	0.5	0.95	0.84	0.25		0.96	-
Heavy	2	0	0	0		2	0	12	0	0		12	0	0	0	0		0	0	10	0	0		10	-
Heavy %	3.1%	0%	0%	0%		1.7%	0%	1.7%	0%	0%		1.6%	0%	0%	0%	0%		0%	0%	1%	0%	0%		0.9%	-
Lights	62	4	49	0		115	62	698	1	0		761	10	2	3	0		15	2	978	121	1		1102	-
Lights %	96.9%	100%	100%	0%		98.3%	100%	98.3%	100%	0%		98.4%	100%	100%	100%	0%		100%	100%	99%	100%	100%		99.1%	-
Single-Unit Trucks	2	0	0	0		2	0	2	0	0		2	0	0	0	0		0	0	1	0	0		1	-
Single-Unit Trucks %	3.1%	0%	0%	0%		1.7%	0%	0.3%	0%	0%		0.3%	0%	0%	0%	0%		0%	0%	0.1%	0%	0%		0.1%	-
Buses	0	0	0	0		0	0	10	0	0		10	0	0	0	0		0	0	8	0	0		8	-
Buses %	0%	0%	0%	0%		0%	0%	1.4%	0%	0%		1.3%	0%	0%	0%	0%		0%	0%	0.8%	0%	0%		0.7%	-
Articulated Trucks	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	1	0	0		1	-
Articulated Trucks %	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0.1%	0%	0%		0.1%	-
Pedestrians	-	-	-	-	12	-	-	-	-	-	4	-	-	-	-	-	3	-	-	-	-	-	4	-	-
Pedestrians%	-	-	-	-	52.2%		-	-	-	-	17.4%		-	-	-	-	13%		-	-	-	-	17.4%		-
Bicycles on Road	0	0	0	0	0	-	0	1	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	-
Bicycles on Road%	-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-

Peak Hour: 08:00 AM - 09:00 AM Weather: Light Intensity Shower Rain (15.81 °C)



	Pedestrians
N	8
S	1
E	3
W	8

Peak Hour: 05:00 PM - 06:00 PM **Weather: Thunderstorm (19.19 °C)**



	Pedestrians
N	12
S	3
E	4
W	4

Turning Movement Count (3 . KINGSTON RD & STEEPLE HILL / EAST SITE ACCESS)

Start Time	N Approach						E Approach						S Approach						W Approach						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	5	1	13	0	0	19	7	150	8	3	2	168	3	1	0	0	0	4	0	66	0	0	0	66	257	
07:15:00	10	2	24	0	0	36	12	185	11	3	2	211	6	0	0	0	1	6	1	70	4	0	0	75	328	
07:30:00	14	2	23	0	0	39	6	204	6	2	2	218	3	0	0	0	3	3	1	92	3	0	0	96	356	
07:45:00	13	1	24	0	2	38	10	224	20	2	3	256	13	2	1	0	1	16	1	117	10	0	1	128	438	1379
08:00:00	6	0	34	0	3	40	13	211	11	4	0	239	4	0	3	0	0	7	0	103	7	0	0	110	396	1518
08:15:00	17	0	40	0	4	57	20	210	6	5	1	241	4	0	2	0	0	6	0	141	12	0	1	153	457	1647
08:30:00	18	1	43	0	1	62	12	246	7	2	0	267	4	0	1	0	0	5	1	208	14	0	1	223	557	1848
08:45:00	11	0	33	0	0	44	12	212	16	3	0	243	5	1	1	0	0	7	4	141	6	0	0	151	445	1855
BREAK																										
16:00:00	18	2	52	0	2	72	28	156	26	2	5	212	28	3	9	0	1	40	8	185	19	0	4	212	536	
16:15:00	12	4	53	0	4	69	31	183	19	4	2	237	35	2	9	0	0	46	4	205	25	0	7	234	586	
16:30:00	11	3	44	0	2	58	35	180	30	4	5	249	34	3	12	0	2	49	5	225	19	0	1	249	605	
16:45:00	9	5	55	0	2	69	35	162	17	4	2	218	27	4	11	0	1	42	4	220	26	0	2	250	579	2306
17:00:00	16	5	52	0	0	73	29	155	28	5	1	217	27	3	5	0	1	35	5	249	16	0	2	270	595	2365
17:15:00	19	4	64	0	2	87	32	190	25	0	6	247	26	5	11	0	0	42	3	214	28	0	2	245	621	2400
17:30:00	12	2	47	0	3	61	38	165	22	2	2	227	27	4	2	0	0	33	6	263	35	0	1	304	625	2420
17:45:00	24	1	57	0	4	82	30	182	19	5	1	236	19	2	8	0	1	29	3	219	27	0	0	249	596	2437
Grand Total	215	33	658	0	29	906	350	3015	271	50	34	3686	265	30	75	0	11	370	46	2718	251	0	22	3015	**7977**	-
Approach%	23.7%	3.6%	72.6%	0%		-	9.5%	81.8%	7.4%	1.4%		-	71.6%	8.1%	20.3%	0%		-	1.5%	90.1%	8.3%	0%		-	-	-
Totals %	2.7%	0.4%	8.2%	0%		11.4%	4.4%	37.8%	3.4%	0.6%		46.2%	3.3%	0.4%	0.9%	0%		4.6%	0.6%	34.1%	3.1%	0%		37.8%	-	-
Heavy	1	0	11	0		-	5	87	1	1		-	4	0	0	0		-	3	70	2	0		-	-	-
Heavy %	0.5%	0%	1.7%	0%		-	1.4%	2.9%	0.4%	2%		-	1.5%	0%	0%	0%		-	6.5%	2.6%	0.8%	0%		-	-	-
Bicycles	0	0	0	0		-	0	0	0	0		-	0	1	0	0		-	0	158	0	0		-	-	-
Bicycle %	0%	0%	0%	0%		-	0%	0%	0%	0%		-	0%	3.3%	0%	0%		-	0%	5.8%	0%	0%		-	-	-

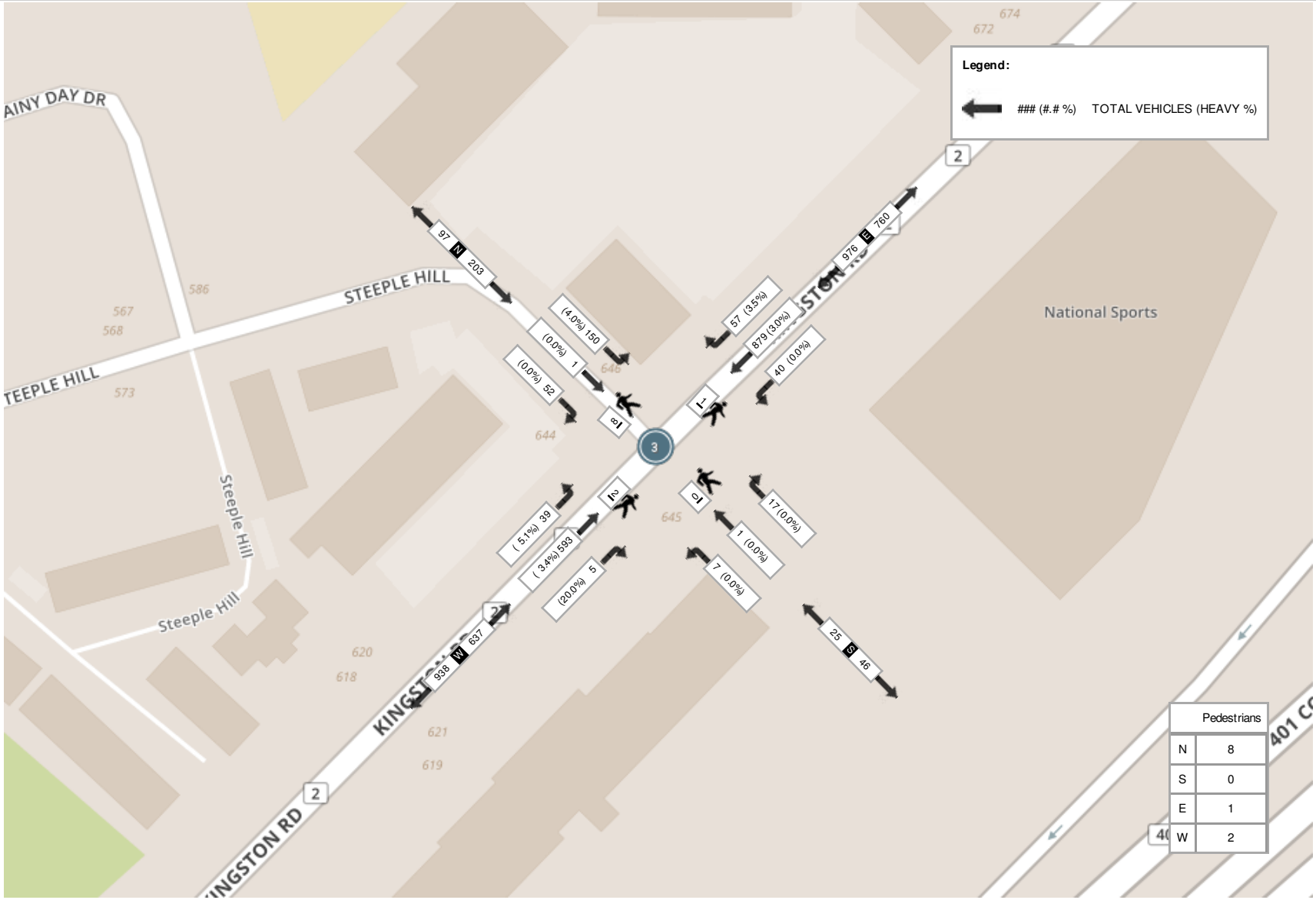
Peak Hour: 08:00 AM - 09:00 AM Weather: Light Intensity Shower Rain (15.81 °C)

Start Time	N Approach						E Approach						S Approach						W Approach						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	6	0	34	0	3	40	13	211	11	4	0	239	4	0	3	0	0	7	0	103	7	0	0	110	396
08:15:00	17	0	40	0	4	57	20	210	6	5	1	241	4	0	2	0	0	6	0	141	12	0	1	153	457
08:30:00	18	1	43	0	1	62	12	246	7	2	0	267	4	0	1	0	0	5	1	208	14	0	1	223	557
08:45:00	11	0	33	0	0	44	12	212	16	3	0	243	5	1	1	0	0	7	4	141	6	0	0	151	445
Grand Total	52	1	150	0	8	203	57	879	40	14	1	990	17	1	7	0	0	25	5	593	39	0	2	637	**1855**
Approach%	25.6%	0.5%	73.9%	0%		-	5.8%	88.8%	4%	1.4%		-	68%	4%	28%	0%		-	0.8%	93.1%	6.1%	0%		-	**-**
Totals %	2.8%	0.1%	8.1%	0%		10.9%	3.1%	47.4%	2.2%	0.8%		53.4%	0.9%	0.1%	0.4%	0%		1.3%	0.3%	32%	2.1%	0%		34.3%	**-**
PHF	0.72	0.25	0.87	0		0.82	0.71	0.89	0.63	0.7		0.93	0.85	0.25	0.58	0		0.89	0.31	0.71	0.7	0		0.71	**-**
Heavy	0	0	6	0		6	2	26	0	0		28	0	0	0	0		0	1	20	2	0		23	**-**
Heavy %	0%	0%	4%	0%		3%	3.5%	3%	0%	0%		2.8%	0%	0%	0%	0%		0%	20%	3.4%	5.1%	0%		3.6%	**-**
Lights	52	1	144	0		197	55	853	40	14		962	17	1	7	0		25	4	573	37	0		614	**-**
Lights %	100%	100%	96%	0%		97%	96.5%	97%	100%	100%		97.2%	100%	100%	100%	0%		100%	80%	96.6%	94.9%	0%		96.4%	**-**
Single-Unit Trucks	0	0	3	0		3	2	10	0	0		12	0	0	0	0		0	0	6	2	0		8	**-**
Single-Unit Trucks %	0%	0%	2%	0%		1.5%	3.5%	1.1%	0%	0%		1.2%	0%	0%	0%	0%		0%	0%	1%	5.1%	0%		1.3%	**-**
Buses	0	0	1	0		1	0	15	0	0		15	0	0	0	0		0	1	13	0	0		14	**-**
Buses %	0%	0%	0.7%	0%		0.5%	0%	1.7%	0%	0%		1.5%	0%	0%	0%	0%		0%	20%	2.2%	0%	0%		2.2%	**-**
Articulated Trucks	0	0	2	0		2	0	1	0	0		1	0	0	0	0		0	0	1	0	0		1	**-**
Articulated Trucks %	0%	0%	1.3%	0%		1%	0%	0.1%	0%	0%		0.1%	0%	0%	0%	0%		0%	0%	0.2%	0%	0%		0.2%	**-**
Pedestrians	-	-	-	-	8	-	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	2	-	**-**
Pedestrians%	-	-	-	-	72.7%		-	-	-	-	9.1%		-	-	-	-	0%		-	-	-	-	18.2%		**-**
Bicycles on Road	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	158	0	0	0	-	**-**
Bicycles on Road%	-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		**-**

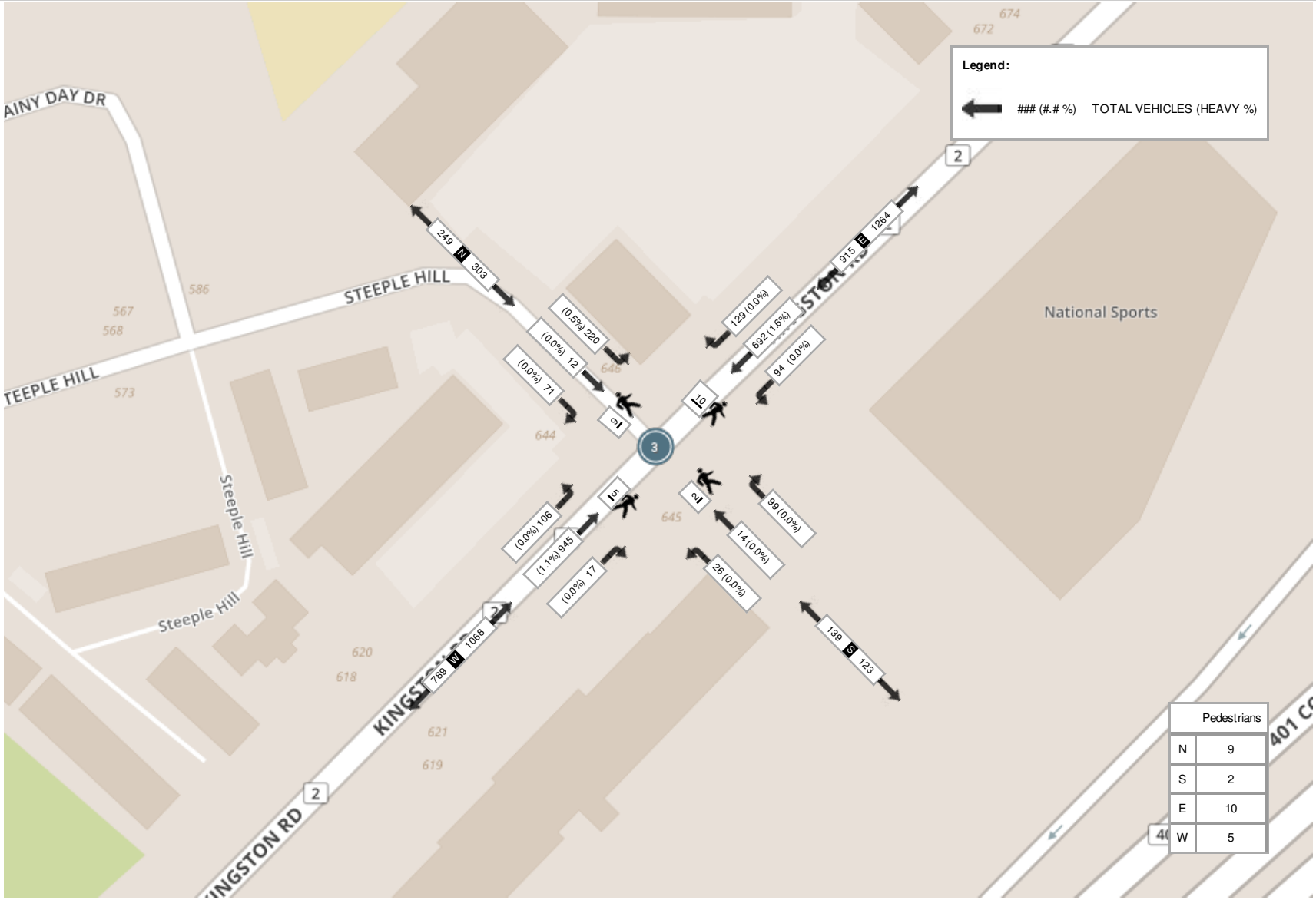
Peak Hour: 05:00 PM - 06:00 PM Weather: Thunderstorm (19.19 °C)

Start Time	N Approach						E Approach						S Approach						W Approach						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	
17:00:00	16	5	52	0	0	73	29	155	28	5	1	217	27	3	5	0	1	35	5	249	16	0	2	270	595
17:15:00	19	4	64	0	2	87	32	190	25	0	6	247	26	5	11	0	0	42	3	214	28	0	2	245	621
17:30:00	12	2	47	0	3	61	38	165	22	2	2	227	27	4	2	0	0	33	6	263	35	0	1	304	625
17:45:00	24	1	57	0	4	82	30	182	19	5	1	236	19	2	8	0	1	29	3	219	27	0	0	249	596
Grand Total	71	12	220	0	9	303	129	692	94	12	10	927	99	14	26	0	2	139	17	945	106	0	5	1068	**2437**
Approach%	23.4%	4%	72.6%	0%		-	13.9%	74.6%	10.1%	1.3%		-	71.2%	10.1%	18.7%	0%		-	1.6%	88.5%	9.9%	0%		-	-
Totals %	2.9%	0.5%	9%	0%		12.4%	5.3%	28.4%	3.9%	0.5%		38%	4.1%	0.6%	1.1%	0%		5.7%	0.7%	38.8%	4.3%	0%		43.8%	-
PHF	0.74	0.6	0.86	0		0.87	0.85	0.91	0.84	0.6		0.94	0.92	0.7	0.59	0		0.83	0.71	0.9	0.76	0		0.88	-
Heavy	0	0	1	0		1	0	11	0	0		11	0	0	0	0		0	0	10	0	0		10	-
Heavy %	0%	0%	0.5%	0%		0.3%	0%	1.6%	0%	0%		1.2%	0%	0%	0%	0%		0%	0%	1.1%	0%	0%		0.9%	-
Lights	71	12	219	0		302	129	681	94	12		916	99	14	26	0		139	17	935	106	0		1058	-
Lights %	100%	100%	99.5%	0%		99.7%	100%	98.4%	100%	100%		98.8%	100%	100%	100%	0%		100%	100%	98.9%	100%	0%		99.1%	-
Single-Unit Trucks	0	0	0	0		0	0	2	0	0		2	0	0	0	0		0	0	2	0	0		2	-
Single-Unit Trucks %	0%	0%	0%	0%		0%	0%	0.3%	0%	0%		0.2%	0%	0%	0%	0%		0%	0%	0.2%	0%	0%		0.2%	-
Buses	0	0	0	0		0	0	9	0	0		9	0	0	0	0		0	0	8	0	0		8	-
Buses %	0%	0%	0%	0%		0%	0%	1.3%	0%	0%		1%	0%	0%	0%	0%		0%	0%	0.8%	0%	0%		0.7%	-
Articulated Trucks	0	0	1	0		1	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	-
Articulated Trucks %	0%	0%	0.5%	0%		0.3%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	-
Pedestrians	-	-	-	-	9	-	-	-	-	-	10	-	-	-	-	-	2	-	-	-	-	-	5	-	-
Pedestrians%	-	-	-	-	34.6%		-	-	-	-	38.5%		-	-	-	-	7.7%		-	-	-	-	19.2%		-
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: Light Intensity Shower Rain (15.81 °C)**



Peak Hour: 05:00 PM - 06:00 PM Weather: Thunderstorm (19.19 °C)



Turning Movement Count (2 . KINGSTON RD & WEST SITE ACCESS)

Start Time	E Approach					S Approach					W Approach					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	159	0	0	0	159	1	3	0	0	4	0	64	0	0	64	227	
07:15:00	204	0	0	0	204	1	0	0	0	1	3	72	0	0	75	280	
07:30:00	224	0	0	0	224	0	3	0	0	3	2	101	0	0	103	330	
07:45:00	237	2	0	0	239	1	1	0	1	2	2	124	0	0	126	367	1204
08:00:00	222	0	0	0	222	0	0	0	0	0	1	113	0	0	114	336	1313
08:15:00	233	0	0	0	233	1	1	0	1	2	1	147	1	0	149	384	1417
08:30:00	281	1	0	0	282	1	1	0	1	2	2	220	0	0	222	506	1593
08:45:00	226	0	0	0	226	0	1	0	0	1	6	161	0	0	167	394	1620
BREAK																	
16:00:00	182	2	1	0	185	2	2	0	0	4	8	211	0	0	219	408	
16:15:00	198	0	0	0	198	3	4	0	0	7	6	240	0	0	246	451	
16:30:00	207	0	1	0	208	2	2	0	0	4	6	236	0	0	242	454	
16:45:00	174	0	2	0	176	2	1	0	0	3	2	246	0	0	248	427	1740
17:00:00	174	0	1	0	175	0	1	0	0	1	7	273	0	0	280	456	1788
17:15:00	224	2	0	0	226	1	1	0	0	2	3	250	0	0	253	481	1818
17:30:00	174	1	0	0	175	1	0	0	0	1	4	300	0	0	304	480	1844
17:45:00	211	5	0	0	216	1	2	0	0	3	2	250	0	0	252	471	1888
Grand Total	3330	13	5	0	3348	17	23	0	3	40	55	3008	1	0	3064	**6452**	-
Approach%	99.5%	0.4%	0.1%		-	42.5%	57.5%	0%		-	1.8%	98.2%	0%		-	-	-
Totals %	51.6%	0.2%	0.1%		51.9%	0.3%	0.4%	0%		0.6%	0.9%	46.6%	0%		47.5%	-	-
Heavy	93	0	0		-	0	1	0		-	0	72	0		-	-	-
Heavy %	2.8%	0%	0%		-	0%	4.3%	0%		-	0%	2.4%	0%		-	-	-
Bicycles	1	0	0		-	0	0	0		-	0	138	0		-	-	-
Bicycle %	0%	0%	0%		-	0%	0%	0%		-	0%	4.6%	0%		-	-	-

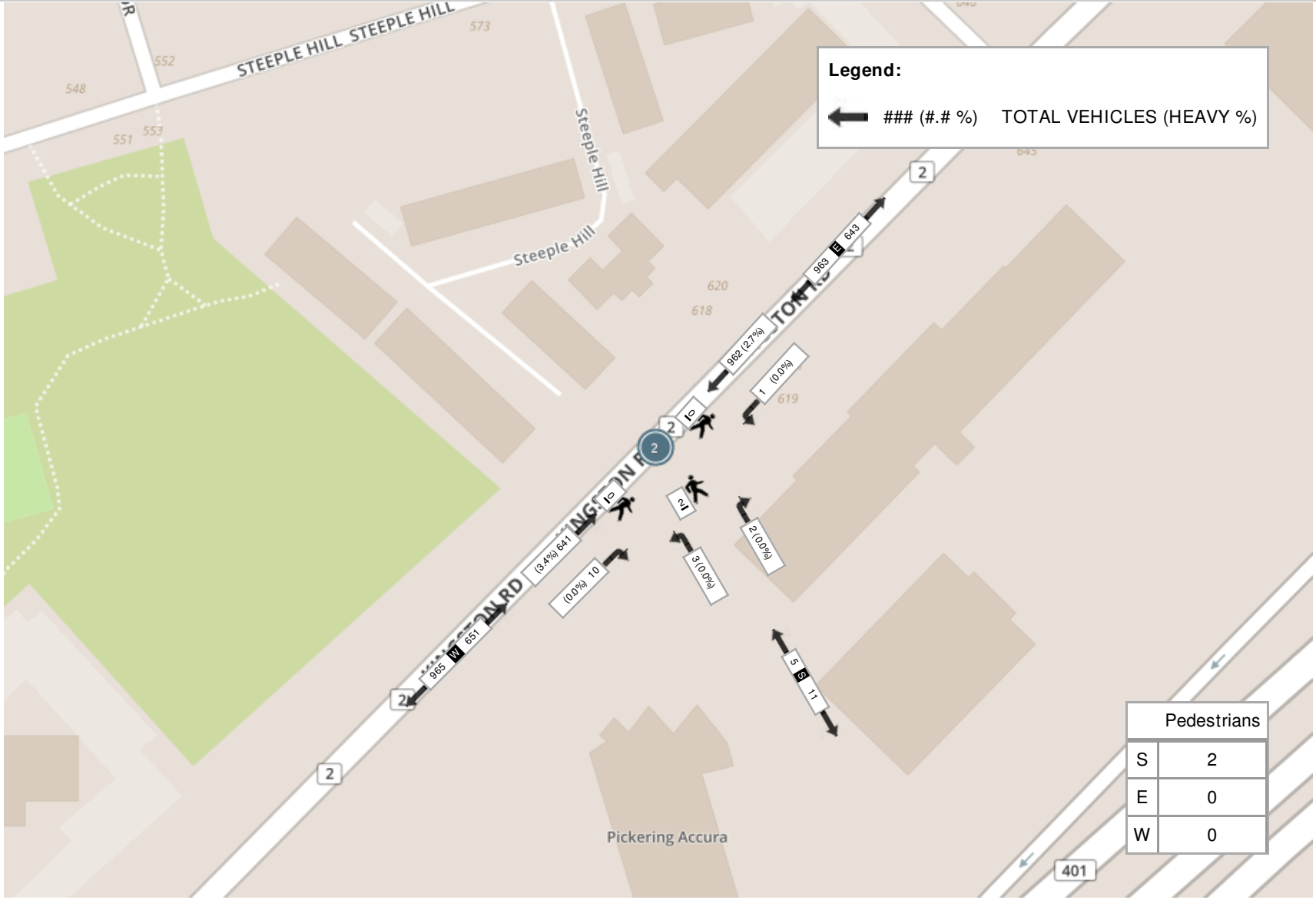
Peak Hour: 08:00 AM - 09:00 AM Weather: Light Intensity Shower Rain (15.81 °C)

Start Time	E Approach					S Approach					W Approach					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	222	0	0	0	222	0	0	0	0	0	1	113	0	0	114	336
08:15:00	233	0	0	0	233	1	1	0	1	2	1	147	1	0	149	384
08:30:00	281	1	0	0	282	1	1	0	1	2	2	220	0	0	222	506
08:45:00	226	0	0	0	226	0	1	0	0	1	6	161	0	0	167	394
Grand Total	962	1	0	0	963	2	3	0	2	5	10	641	1	0	652	**1620**
Approach%	99.9%	0.1%	0%		-	40%	60%	0%		-	1.5%	98.3%	0.2%		-	**-**
Totals %	59.4%	0.1%	0%		59.4%	0.1%	0.2%	0%		0.3%	0.6%	39.6%	0.1%		40.2%	**-**
PHF	0.86	0.25	0		0.85	0.5	0.75	0		0.63	0.42	0.73	0.25		0.73	**-**
Heavy	26	0	0		26	0	0	0		0	0	22	0		22	**-**
Heavy %	2.7%	0%	0%		2.7%	0%	0%	0%		0%	0%	3.4%	0%		3.4%	**-**
Lights	936	1	0		937	2	3	0		5	10	619	1		630	**-**
Lights %	97.3%	100%	0%		97.3%	100%	100%	0%		100%	100%	96.6%	100%		96.6%	**-**
Single-Unit Trucks	11	0	0		11	0	0	0		0	0	8	0		8	**-**
Single-Unit Trucks %	1.1%	0%	0%		1.1%	0%	0%	0%		0%	0%	1.2%	0%		1.2%	**-**
Buses	14	0	0		14	0	0	0		0	0	14	0		14	**-**
Buses %	1.5%	0%	0%		1.5%	0%	0%	0%		0%	0%	2.2%	0%		2.1%	**-**
Articulated Trucks	1	0	0		1	0	0	0		0	0	0	0		0	**-**
Articulated Trucks %	0.1%	0%	0%		0.1%	0%	0%	0%		0%	0%	0%	0%		0%	**-**
Pedestrians	-	-	-	0	-	-	-	-	2	-	-	-	-	0	-	**-**
Pedestrians%	-	-	-	0%		-	-	-	100%		-	-	-	0%		**-**
Bicycles on Road	1	0	0	0	-	0	0	0	0	-	0	138	0	0	-	**-**
Bicycles on Road%	-	-	-	0%		-	-	-	0%		-	-	-	0%		**-**

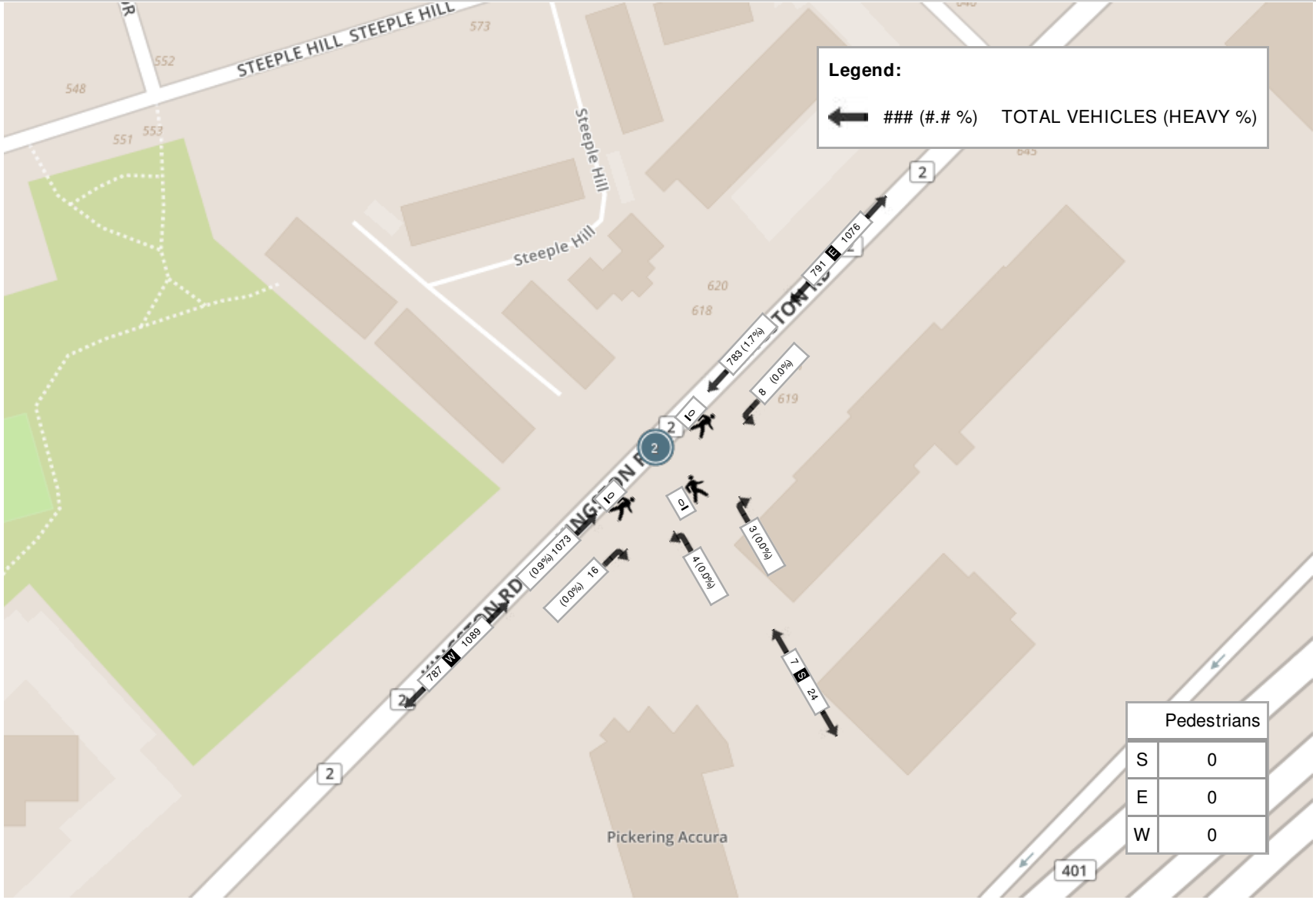
Peak Hour: 05:00 PM - 06:00 PM Weather: Thunderstorm (19.19 °C)

Start Time	E Approach					S Approach					W Approach					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	174	0	1	0	175	0	1	0	0	1	7	273	0	0	280	456
17:15:00	224	2	0	0	226	1	1	0	0	2	3	250	0	0	253	481
17:30:00	174	1	0	0	175	1	0	0	0	1	4	300	0	0	304	480
17:45:00	211	5	0	0	216	1	2	0	0	3	2	250	0	0	252	471
Grand Total	783	8	1	0	792	3	4	0	0	7	16	1073	0	0	1089	**1888**
Approach%	98.9%	1%	0.1%		-	42.9%	57.1%	0%		-	1.5%	98.5%	0%		-	**-**
Totals %	41.5%	0.4%	0.1%		41.9%	0.2%	0.2%	0%		0.4%	0.8%	56.8%	0%		57.7%	**-**
PHF	0.87	0.4	0.25		0.88	0.75	0.5	0		0.58	0.57	0.89	0		0.9	**-**
Heavy	13	0	0		13	0	0	0		0	0	10	0		10	**-**
Heavy %	1.7%	0%	0%		1.6%	0%	0%	0%		0%	0%	0.9%	0%		0.9%	**-**
Lights	770	8	1		779	3	4	0		7	16	1063	0		1079	**-**
Lights %	98.3%	100%	100%		98.4%	100%	100%	0%		100%	100%	99.1%	0%		99.1%	**-**
Single-Unit Trucks	4	0	0		4	0	0	0		0	0	2	0		2	**-**
Single-Unit Trucks %	0.5%	0%	0%		0.5%	0%	0%	0%		0%	0%	0.2%	0%		0.2%	**-**
Buses	9	0	0		9	0	0	0		0	0	8	0		8	**-**
Buses %	1.1%	0%	0%		1.1%	0%	0%	0%		0%	0%	0.7%	0%		0.7%	**-**
Articulated Trucks	0	0	0		0	0	0	0		0	0	0	0		0	**-**
Articulated Trucks %	0%	0%	0%		0%	0%	0%	0%		0%	0%	0%	0%		0%	**-**
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	**-**
Pedestrians%	-	-	-	0%		-	-	-	0%		-	-	-	0%		**-**
Bicycles on Road	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	**-**
Bicycles on Road%	-	-	-	0%		-	-	-	0%		-	-	-	0%		**-**

Peak Hour: 08:00 AM - 09:00 AM Weather: Light Intensity Shower Rain (15.81 °C)



Peak Hour: 05:00 PM - 06:00 PM Weather: Thunderstorm (19.19 °C)



Turning Movement Count (4 . KINGSTON RD & WHITES RD)

Start Time	N Approach						E Approach						S Approach						W Approach						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	9	218	16	0	4	243	39	131	53	0	3	223	37	67	32	0	2	136	46	62	6	0	1	114	716	
07:15:00	19	245	7	0	7	271	56	161	50	0	2	267	61	90	41	0	3	192	56	36	6	1	0	99	829	
07:30:00	15	280	7	0	7	302	58	159	62	0	13	279	58	102	39	0	1	199	83	34	3	0	0	120	900	
07:45:00	15	293	12	1	4	321	56	201	75	0	5	332	100	94	45	0	1	239	96	49	11	0	0	156	1048	3493
08:00:00	17	254	27	0	11	298	90	202	71	0	11	363	75	126	51	0	5	252	81	43	11	0	2	135	1048	3825
08:15:00	40	301	34	0	15	375	71	165	65	0	13	301	88	136	50	0	8	274	104	66	20	1	12	191	1141	4137
08:30:00	45	206	21	1	5	273	97	197	67	0	4	361	113	113	37	0	9	263	103	131	26	0	4	260	1157	4394
08:45:00	26	245	36	0	4	307	76	183	72	0	3	331	131	93	59	0	2	283	77	91	19	0	4	187	1108	4454
BREAK																										
16:00:00	19	117	33	0	6	169	91	154	60	0	2	305	198	203	57	0	7	458	56	169	27	0	7	252	1184	
16:15:00	37	99	39	0	13	175	123	190	47	0	7	360	183	236	72	0	5	491	60	192	26	1	0	279	1305	
16:30:00	26	108	41	0	7	175	122	185	60	0	3	367	187	248	61	0	1	496	52	194	43	0	1	289	1327	
16:45:00	34	138	46	0	10	218	152	177	46	0	12	375	181	248	51	0	0	480	80	189	41	0	1	310	1383	5199
17:00:00	24	150	33	0	4	207	130	171	63	0	0	364	182	233	61	0	6	476	84	199	34	0	4	317	1364	5379
17:15:00	23	134	39	0	8	196	122	173	65	0	0	360	188	249	69	0	1	506	51	193	39	1	2	284	1346	5420
17:30:00	25	161	43	0	6	229	113	155	44	0	0	312	199	229	76	0	5	504	82	227	34	0	0	343	1388	5481
17:45:00	31	148	33	0	7	212	122	167	72	0	6	361	198	221	71	0	6	490	78	201	32	0	3	311	1374	5472
Grand Total	405	3097	467	2	118	3971	1518	2771	972	0	84	5261	2179	2688	872	0	62	5739	1189	2076	378	4	41	3647	**18618**	-
Approach%	10.2%	78%	11.8%	0.1%		-	28.9%	52.7%	18.5%	0%		-	38%	46.8%	15.2%	0%		-	32.6%	56.9%	10.4%	0.1%		-	-	-
Totals %	2.2%	16.6%	2.5%	0%		21.3%	8.2%	14.9%	5.2%	0%		28.3%	11.7%	14.4%	4.7%	0%		30.8%	6.4%	11.2%	2%	0%		19.6%	-	-
Heavy	14	81	8	0		-	34	71	16	0		-	22	51	13	0		-	17	56	3	1		-	-	-
Heavy %	3.5%	2.6%	1.7%	0%		-	2.2%	2.6%	1.6%	0%		-	1%	1.9%	1.5%	0%		-	1.4%	2.7%	0.8%	25%		-	-	-
Bicycles	0	0	0	0		-	0	0	0	0		-	0	0	0	0		-	0	160	0	0		-	-	-
Bicycle %	0%	0%	0%	0%		-	0%	0%	0%	0%		-	0%	0%	0%	0%		-	0%	7.7%	0%	0%		-	-	-

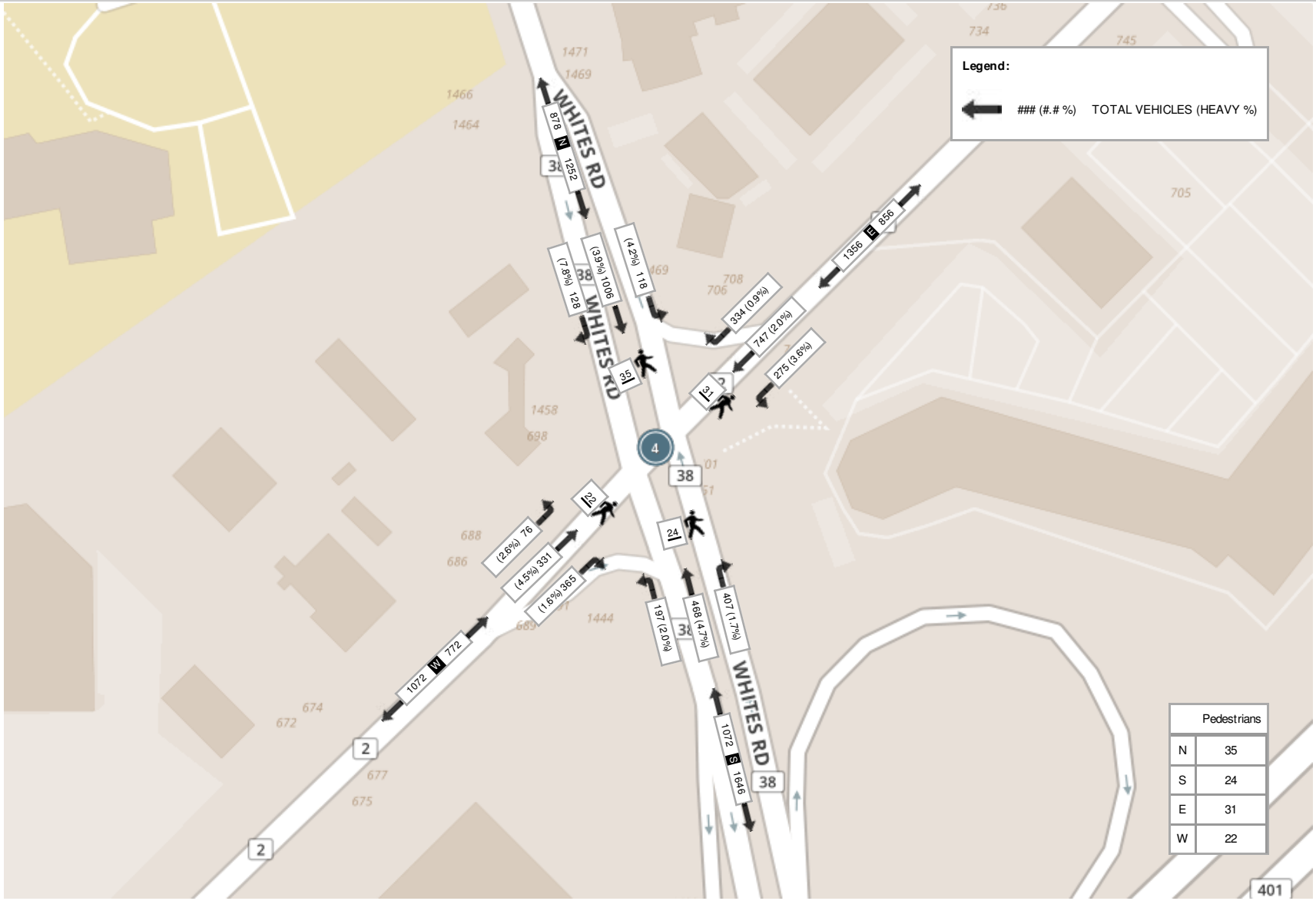
Peak Hour: 08:00 AM - 09:00 AM Weather: Light Intensity Shower Rain (15.81 °C)

Start Time	N Approach						E Approach						S Approach						W Approach						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	17	254	27	0	11	298	90	202	71	0	11	363	75	126	51	0	5	252	81	43	11	0	2	135	1048
08:15:00	40	301	34	0	15	375	71	165	65	0	13	301	88	136	50	0	8	274	104	66	20	1	12	191	1141
08:30:00	45	206	21	1	5	273	97	197	67	0	4	361	113	113	37	0	9	263	103	131	26	0	4	260	1157
08:45:00	26	245	36	0	4	307	76	183	72	0	3	331	131	93	59	0	2	283	77	91	19	0	4	187	1108
Grand Total	128	1006	118	1	35	1253	334	747	275	0	31	1356	407	468	197	0	24	1072	365	331	76	1	22	773	**4454**
Approach%	10.2%	80.3%	9.4%	0.1%		-	24.6%	55.1%	20.3%	0%		-	38%	43.7%	18.4%	0%		-	47.2%	42.8%	9.8%	0.1%		-	**-**
Totals %	2.9%	22.6%	2.6%	0%		28.1%	7.5%	16.8%	6.2%	0%		30.4%	9.1%	10.5%	4.4%	0%		24.1%	8.2%	7.4%	1.7%	0%		17.4%	**-**
PHF	0.71	0.84	0.82	0.25		0.84	0.86	0.92	0.95	0		0.93	0.78	0.86	0.83	0		0.95	0.88	0.63	0.73	0.25		0.74	**-**
Heavy	10	39	5	0		54	3	15	10	0		28	7	22	4	0		33	6	15	2	1		24	**-**
Heavy %	7.8%	3.9%	4.2%	0%		4.3%	0.9%	2%	3.6%	0%		2.1%	1.7%	4.7%	2%	0%		3.1%	1.6%	4.5%	2.6%	100%		3.1%	**-**
Lights	118	967	113	1		1199	331	732	265	0		1328	400	446	193	0		1039	359	316	74	0		749	**-**
Lights %	92.2%	96.1%	95.8%	100%		95.7%	99.1%	98%	96.4%	0%		97.9%	98.3%	95.3%	98%	0%		96.9%	98.4%	95.5%	97.4%	0%		96.9%	**-**
Single-Unit Trucks	10	10	5	0		25	1	5	6	0		12	4	6	3	0		13	3	7	2	1		13	**-**
Single-Unit Trucks %	7.8%	1%	4.2%	0%		2%	0.3%	0.7%	2.2%	0%		0.9%	1%	1.3%	1.5%	0%		1.2%	0.8%	2.1%	2.6%	100%		1.7%	**-**
Buses	0	27	0	0		27	1	10	3	0		14	3	13	1	0		17	1	8	0	0		9	**-**
Buses %	0%	2.7%	0%	0%		2.2%	0.3%	1.3%	1.1%	0%		1%	0.7%	2.8%	0.5%	0%		1.6%	0.3%	2.4%	0%	0%		1.2%	**-**
Articulated Trucks	0	2	0	0		2	1	0	1	0		2	0	3	0	0		3	2	0	0	0		2	**-**
Articulated Trucks %	0%	0.2%	0%	0%		0.2%	0.3%	0%	0.4%	0%		0.1%	0%	0.6%	0%	0%		0.3%	0.5%	0%	0%	0%		0.3%	**-**
Pedestrians	-	-	-	-	35	-	-	-	-	-	31	-	-	-	-	-	24	-	-	-	-	-	22	-	**-**
Pedestrians%	-	-	-	-	31.3%		-	-	-	-	27.7%		-	-	-	-	21.4%		-	-	-	-	19.6%		**-**
Bicycles on Road	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	160	0	0	0	-	**-**
Bicycles on Road%	-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		**-**

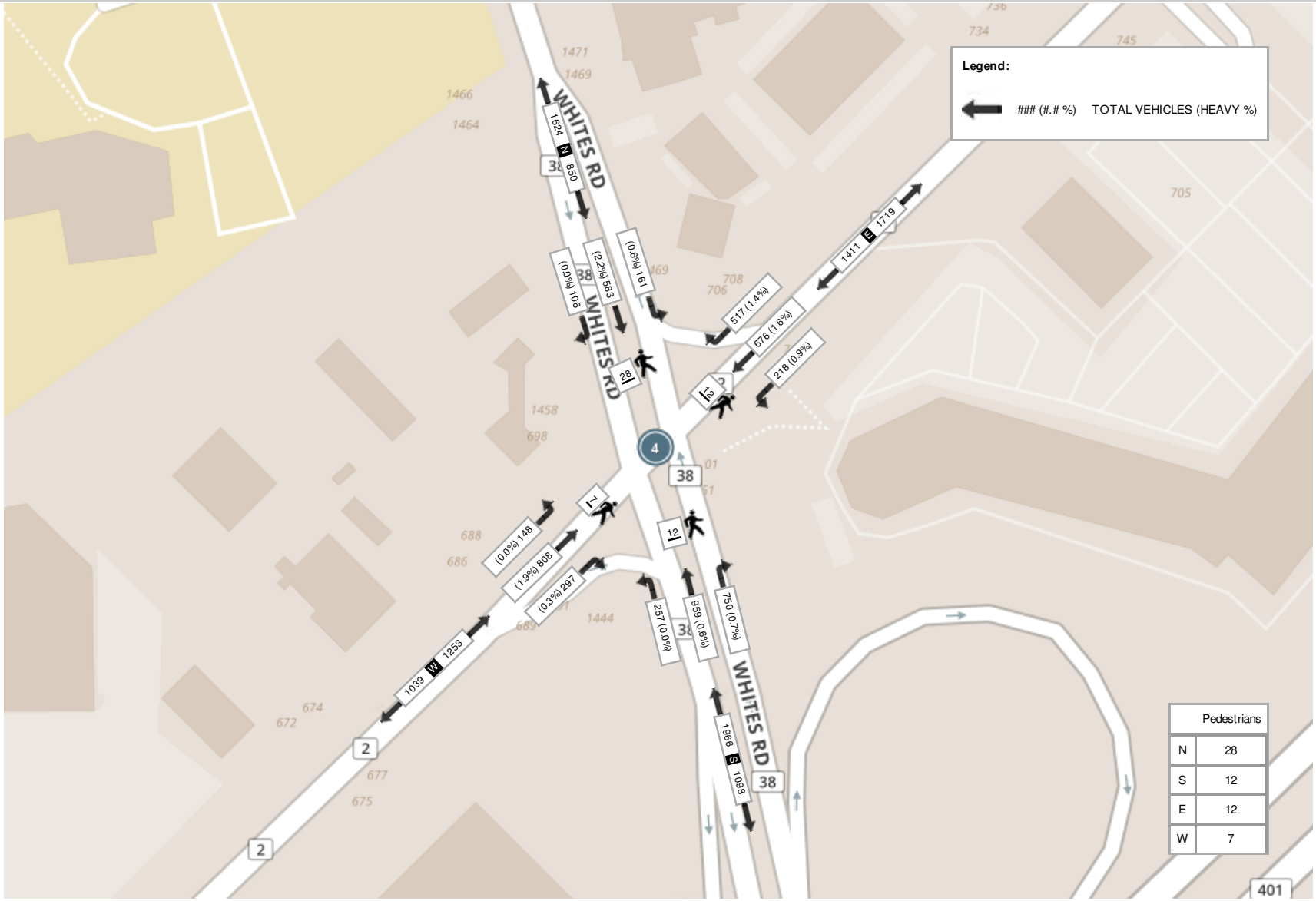
Peak Hour: 04:45 PM - 05:45 PM Weather: Thunderstorm (19.19 °C)

Start Time	N Approach						E Approach						S Approach						W Approach						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	
16:45:00	34	138	46	0	10	218	152	177	46	0	12	375	181	248	51	0	0	480	80	189	41	0	1	310	1383
17:00:00	24	150	33	0	4	207	130	171	63	0	0	364	182	233	61	0	6	476	84	199	34	0	4	317	1364
17:15:00	23	134	39	0	8	196	122	173	65	0	0	360	188	249	69	0	1	506	51	193	39	1	2	284	1346
17:30:00	25	161	43	0	6	229	113	155	44	0	0	312	199	229	76	0	5	504	82	227	34	0	0	343	1388
Grand Total	106	583	161	0	28	850	517	676	218	0	12	1411	750	959	257	0	12	1966	297	808	148	1	7	1254	**5481**
Approach%	12.5%	68.6%	18.9%	0%		-	36.6%	47.9%	15.5%	0%		-	38.1%	48.8%	13.1%	0%		-	23.7%	64.4%	11.8%	0.1%		-	-
Totals %	1.9%	10.6%	2.9%	0%		15.5%	9.4%	12.3%	4%	0%		25.7%	13.7%	17.5%	4.7%	0%		35.9%	5.4%	14.7%	2.7%	0%		22.9%	-
PHF	0.78	0.91	0.88	0		0.93	0.85	0.95	0.84	0		0.94	0.94	0.96	0.85	0		0.97	0.88	0.89	0.9	0.25		0.91	-
Heavy	0	13	1	0		14	7	11	2	0		20	5	6	0	0		11	1	15	0	0		16	-
Heavy %	0%	2.2%	0.6%	0%		1.6%	1.4%	1.6%	0.9%	0%		1.4%	0.7%	0.6%	0%	0%		0.6%	0.3%	1.9%	0%	0%		1.3%	-
Lights	106	570	160	0		836	510	665	216	0		1391	745	953	257	0		1955	296	793	148	1		1238	-
Lights %	100%	97.8%	99.4%	0%		98.4%	98.6%	98.4%	99.1%	0%		98.6%	99.3%	99.4%	100%	0%		99.4%	99.7%	98.1%	100%	100%		98.7%	-
Single-Unit Trucks	0	2	1	0		3	4	2	1	0		7	0	0	0	0		0	0	3	0	0		3	-
Single-Unit Trucks %	0%	0.3%	0.6%	0%		0.4%	0.8%	0.3%	0.5%	0%		0.5%	0%	0%	0%	0%		0%	0%	0.4%	0%	0%		0.2%	-
Buses	0	9	0	0		9	3	9	0	0		12	3	6	0	0		9	0	10	0	0		10	-
Buses %	0%	1.5%	0%	0%		1.1%	0.6%	1.3%	0%	0%		0.9%	0.4%	0.6%	0%	0%		0.5%	0%	1.2%	0%	0%		0.8%	-
Articulated Trucks	0	2	0	0		2	0	0	1	0		1	2	0	0	0		2	1	2	0	0		3	-
Articulated Trucks %	0%	0.3%	0%	0%		0.2%	0%	0%	0.5%	0%		0.1%	0.3%	0%	0%	0%		0.1%	0.3%	0.2%	0%	0%		0.2%	-
Pedestrians	-	-	-	-	28	-	-	-	-	-	12	-	-	-	-	-	12	-	-	-	-	-	7	-	-
Pedestrians%	-	-	-	-	47.5%		-	-	-	-	20.3%		-	-	-	-	20.3%		-	-	-	-	11.9%		-
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: Light Intensity Shower Rain (15.81 °C)



Peak Hour: 04:45 PM - 05:45 PM **Weather: Thunderstorm (19.19 °C)**



Turning Movement Count (8 . WHITES RD & BAYLY ST)

Start Time	N Approach					E Approach					S Approach					Int. Total (15 min)	Int. Total (1 hr)
	Thru N:S	Left N:E	UTurn N:N	Peds N:	Approach Total	Right E:N	Left E:S	UTurn E:E	Peds E:	Approach Total	Right S:E	Thru S:N	UTurn S:S	Peds S:	Approach Total		
07:00:00	71	120	0	0	191	66	20	0	1	86	21	93	0	0	114	391	
07:15:00	82	135	0	0	217	93	29	0	0	122	32	99	0	0	131	470	
07:30:00	106	123	0	0	229	90	41	0	4	131	34	142	0	0	176	536	
07:45:00	152	120	0	0	272	107	53	0	2	160	36	154	0	0	190	622	2019
08:00:00	85	125	0	0	210	91	70	0	7	161	32	172	0	0	204	575	2203
08:15:00	110	157	0	0	267	89	66	0	3	155	17	117	0	3	134	556	2289
08:30:00	144	136	0	0	280	71	64	0	3	135	39	140	0	1	179	594	2347
08:45:00	117	139	0	0	256	91	59	0	2	150	37	126	0	0	163	569	2294
BREAK																	
16:00:00	95	252	0	0	347	79	31	0	0	110	56	116	0	0	172	629	
16:15:00	113	256	0	0	369	56	46	0	0	102	50	94	0	0	144	615	
16:30:00	118	264	0	0	382	86	46	0	1	132	80	125	0	0	205	719	
16:45:00	125	258	0	0	383	63	42	0	1	105	63	95	0	0	158	646	2609
17:00:00	141	260	0	0	401	107	38	0	6	145	65	142	0	0	207	753	2733
17:15:00	126	235	0	0	361	106	38	1	2	145	47	117	0	0	164	670	2788
17:30:00	119	251	0	0	370	95	40	0	2	135	46	104	0	1	150	655	2724
17:45:00	119	230	0	0	349	102	37	0	4	139	40	92	0	0	132	620	2698
Grand Total	1823	3061	0	0	4884	1392	720	1	38	2113	695	1928	0	5	2623	**9620**	-
Approach%	37.3%	62.7%	0%		-	65.9%	34.1%	0%		-	26.5%	73.5%	0%		-	-	-
Totals %	19%	31.8%	0%		50.8%	14.5%	7.5%	0%		22%	7.2%	20%	0%		27.3%	-	-
Heavy	56	72	0		-	33	16	0		-	7	59	0		-	-	-
Heavy %	3.1%	2.4%	0%		-	2.4%	2.2%	0%		-	1%	3.1%	0%		-	-	-
Bicycles	1	0	0		-	2	0	0		-	0	4	0		-	-	-
Bicycle %	0.1%	0%	0%		-	0.1%	0%	0%		-	0%	0.2%	0%		-	-	-

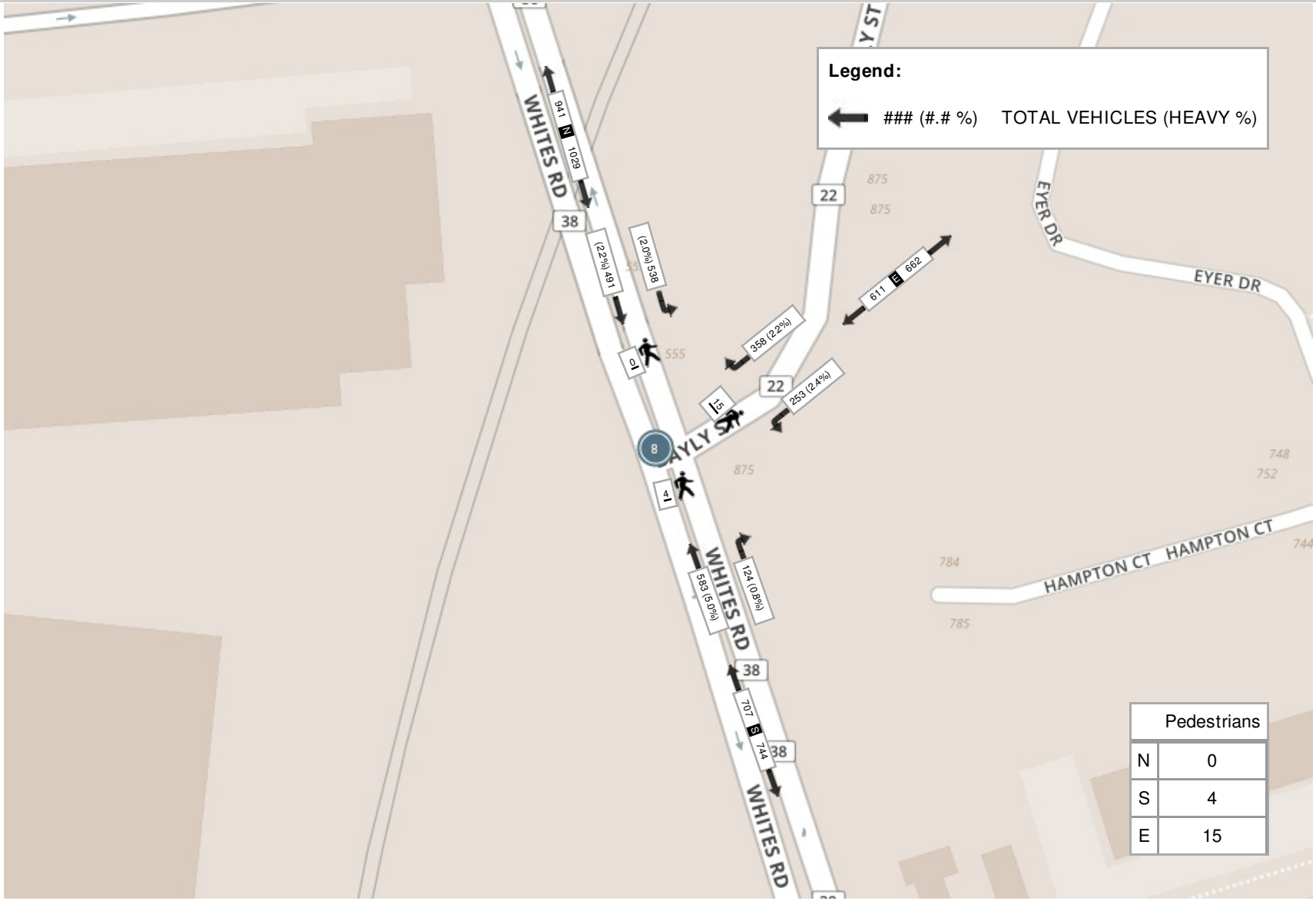
Peak Hour: 07:45 AM - 08:45 AM Weather: Light Intensity Shower Rain (15.81 °C)

Start Time	N Approach					E Approach					S Approach					Int. Total (15 min)
	Thru	Left	UTurn	Peds	Approach Total	Right	Left	UTurn	Peds	Approach Total	Right	Thru	UTurn	Peds	Approach Total	
07:45:00	152	120	0	0	272	107	53	0	2	160	36	154	0	0	190	622
08:00:00	85	125	0	0	210	91	70	0	7	161	32	172	0	0	204	575
08:15:00	110	157	0	0	267	89	66	0	3	155	17	117	0	3	134	556
08:30:00	144	136	0	0	280	71	64	0	3	135	39	140	0	1	179	594
Grand Total	491	538	0	0	1029	358	253	0	15	611	124	583	0	4	707	**2347**
Approach%	47.7%	52.3%	0%		-	58.6%	41.4%	0%		-	17.5%	82.5%	0%		-	**-**
Totals %	20.9%	22.9%	0%		43.8%	15.3%	10.8%	0%		26%	5.3%	24.8%	0%		30.1%	**-**
PHF	0.81	0.86	0		0.92	0.84	0.9	0		0.95	0.79	0.85	0		0.87	**-**
Heavy	11	11	0		22	8	6	0		14	1	29	0		30	**-**
Heavy %	2.2%	2%	0%		2.1%	2.2%	2.4%	0%		2.3%	0.8%	5%	0%		4.2%	**-**
Lights	480	527	0		1007	350	247	0		597	123	554	0		677	**-**
Lights %	97.8%	98%	0%		97.9%	97.8%	97.6%	0%		97.7%	99.2%	95%	0%		95.8%	**-**
Single-Unit Trucks	3	2	0		5	3	3	0		6	1	11	0		12	**-**
Single-Unit Trucks %	0.6%	0.4%	0%		0.5%	0.8%	1.2%	0%		1%	0.8%	1.9%	0%		1.7%	**-**
Buses	7	9	0		16	5	3	0		8	0	15	0		15	**-**
Buses %	1.4%	1.7%	0%		1.6%	1.4%	1.2%	0%		1.3%	0%	2.6%	0%		2.1%	**-**
Articulated Trucks	1	0	0		1	0	0	0		0	0	3	0		3	**-**
Articulated Trucks %	0.2%	0%	0%		0.1%	0%	0%	0%		0%	0%	0.5%	0%		0.4%	**-**
Pedestrians	-	-	-	0	-	-	-	-	15	-	-	-	-	4	-	**-**
Pedestrians%	-	-	-	0%		-	-	-	78.9%		-	-	-	21.1%		**-**
Bicycles on Road	0	0	0	0	-	0	0	0	0	-	0	1	0	0	-	**-**
Bicycles on Road%	-	-	-	0%		-	-	-	0%		-	-	-	0%		**-**

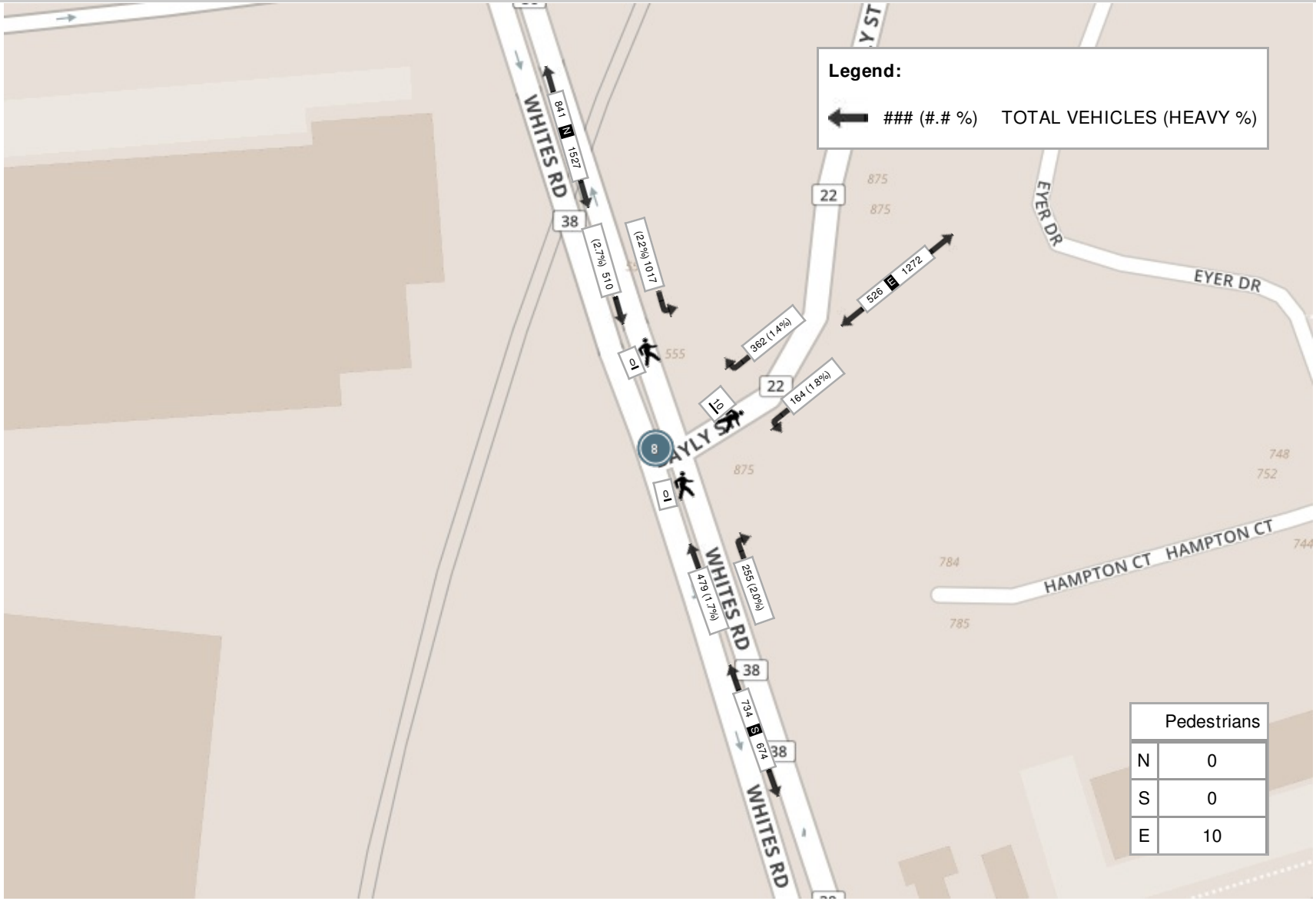
Peak Hour: 04:30 PM - 05:30 PM Weather: Thunderstorm (19.19 °C)

Start Time	N Approach					E Approach					S Approach					Int. Total (15 min)
	Thru	Left	UTurn	Peds	Approach Total	Right	Left	UTurn	Peds	Approach Total	Right	Thru	UTurn	Peds	Approach Total	
16:30:00	118	264	0	0	382	86	46	0	1	132	80	125	0	0	205	719
16:45:00	125	258	0	0	383	63	42	0	1	105	63	95	0	0	158	646
17:00:00	141	260	0	0	401	107	38	0	6	145	65	142	0	0	207	753
17:15:00	126	235	0	0	361	106	38	1	2	145	47	117	0	0	164	670
Grand Total	510	1017	0	0	1527	362	164	1	10	527	255	479	0	0	734	**2788**
Approach%	33.4%	66.6%	0%		-	68.7%	31.1%	0.2%		-	34.7%	65.3%	0%		-	**-**
Totals %	18.3%	36.5%	0%		54.8%	13%	5.9%	0%		18.9%	9.1%	17.2%	0%		26.3%	**-**
PHF	0.9	0.96	0		0.95	0.85	0.89	0.25		0.91	0.8	0.84	0		0.89	**-**
Heavy	14	22	0		36	5	3	0		8	5	8	0		13	**-**
Heavy %	2.7%	2.2%	0%		2.4%	1.4%	1.8%	0%		1.5%	2%	1.7%	0%		1.8%	**-**
Lights	496	995	0		1491	357	161	1		519	250	471	0		721	**-**
Lights %	97.3%	97.8%	0%		97.6%	98.6%	98.2%	100%		98.5%	98%	98.3%	0%		98.2%	**-**
Single-Unit Trucks	9	10	0		19	1	2	0		3	4	4	0		8	**-**
Single-Unit Trucks %	1.8%	1%	0%		1.2%	0.3%	1.2%	0%		0.6%	1.6%	0.8%	0%		1.1%	**-**
Buses	4	5	0		9	3	0	0		3	1	3	0		4	**-**
Buses %	0.8%	0.5%	0%		0.6%	0.8%	0%	0%		0.6%	0.4%	0.6%	0%		0.5%	**-**
Articulated Trucks	1	7	0		8	1	1	0		2	0	1	0		1	**-**
Articulated Trucks %	0.2%	0.7%	0%		0.5%	0.3%	0.6%	0%		0.4%	0%	0.2%	0%		0.1%	**-**
Pedestrians	-	-	-	0	-	-	-	-	10	-	-	-	-	0	-	**-**
Pedestrians%	-	-	-	0%		-	-	-	100%		-	-	-	0%		**-**
Bicycles on Road	0	0	0	0	-	0	0	0	0	-	0	1	0	0	-	**-**
Bicycles on Road%	-	-	-	0%		-	-	-	0%		-	-	-	0%		**-**

Peak Hour: 07:45 AM - 08:45 AM Weather: Light Intensity Shower Rain (15.81 °C)



Peak Hour: 04:30 PM - 05:30 PM Weather: Thunderstorm (19.19 °C)



Turning Movement Count (7 . WHITES RD & HWY 401 EB RAMPS)

Start Time	N Approach				S Approach				NW Approach			E Approach			W Approach				Int. Total (15 min)	Int. Total (1 hr)
	Right N:NW	Thru N:S	UTurn N:N	Approach Total	Right S:E	Thru S:N	UTurn S:S	Approach Total	UTurn NW:NW	Peds NW:	Approach Total	UTurn E:E	Peds E:	Approach Total	Right W:S	Left W:N	UTurn W:W	Approach Total		
07:00:00	74	110	0	184	23	136	0	159	0	9	0	0	0	0	79	80	0	159	502	
07:15:00	87	127	0	214	32	164	0	196	0	11	0	0	0	0	96	109	0	205	615	
07:30:00	124	147	0	271	37	199	0	236	0	1	0	0	0	0	89	92	0	181	688	
07:45:00	154	173	0	327	38	230	0	268	0	5	0	0	0	0	100	125	0	225	820	2625
08:00:00	135	119	0	254	35	239	0	274	0	0	0	0	0	0	92	123	0	215	743	2866
08:15:00	162	154	1	317	31	187	0	218	0	3	0	0	0	0	111	138	0	249	784	3035
08:30:00	129	160	0	289	43	176	0	219	0	1	0	0	0	0	122	180	0	302	810	3157
08:45:00	169	132	0	301	43	176	0	219	0	0	0	0	0	0	122	156	0	278	798	3135
BREAK																				
16:00:00	43	117	1	161	23	190	0	213	0	11	0	0	0	0	240	381	0	621	995	
16:15:00	36	116	0	152	18	164	0	182	0	1	0	0	0	0	259	391	0	650	984	
16:30:00	38	125	0	163	20	224	0	244	0	0	0	0	0	0	246	394	0	640	1047	
16:45:00	47	156	0	203	11	168	0	179	0	2	0	0	0	0	245	361	0	606	988	4014
17:00:00	52	158	0	210	45	203	0	248	0	2	0	0	0	0	240	329	0	569	1027	4046
17:15:00	40	143	0	183	30	216	0	246	0	0	0	0	0	0	214	355	0	569	998	4060
17:30:00	46	149	0	195	25	201	0	226	0	1	0	0	0	0	215	369	0	584	1005	4018
17:45:00	54	141	0	195	15	195	0	210	0	1	0	0	0	0	218	352	0	570	975	4005
Grand Total	1390	2227	2	3619	469	3068	0	3537	0	48	0	0	0	0	2688	3935	0	6623	**13779**	-
Approach%	38.4%	61.5%	0.1%	-	13.3%	86.7%	0%	-	0%		-	0%		-	40.6%	59.4%	0%	-	**-**	-
Totals %	10.1%	16.2%	0%	26.3%	3.4%	22.3%	0%	25.7%	0%		0%	0%		0%	19.5%	28.6%	0%	48.1%	**-**	-
Heavy	42	68	0	-	13	77	0	-	0		-	0		-	69	60	0	-	**-**	-
Heavy %	3%	3.1%	0%	-	2.8%	2.5%	0%	-	0%		-	0%		-	2.6%	1.5%	0%	-	**-**	-
Bicycles	0	2	0	-	0	1	0	-	0		-	0		-	0	0	0	-	**-**	-
Bicycle %	0%	0.1%	0%	-	0%	0%	0%	-	0%		-	0%		-	0%	0%	0%	-	**-**	-

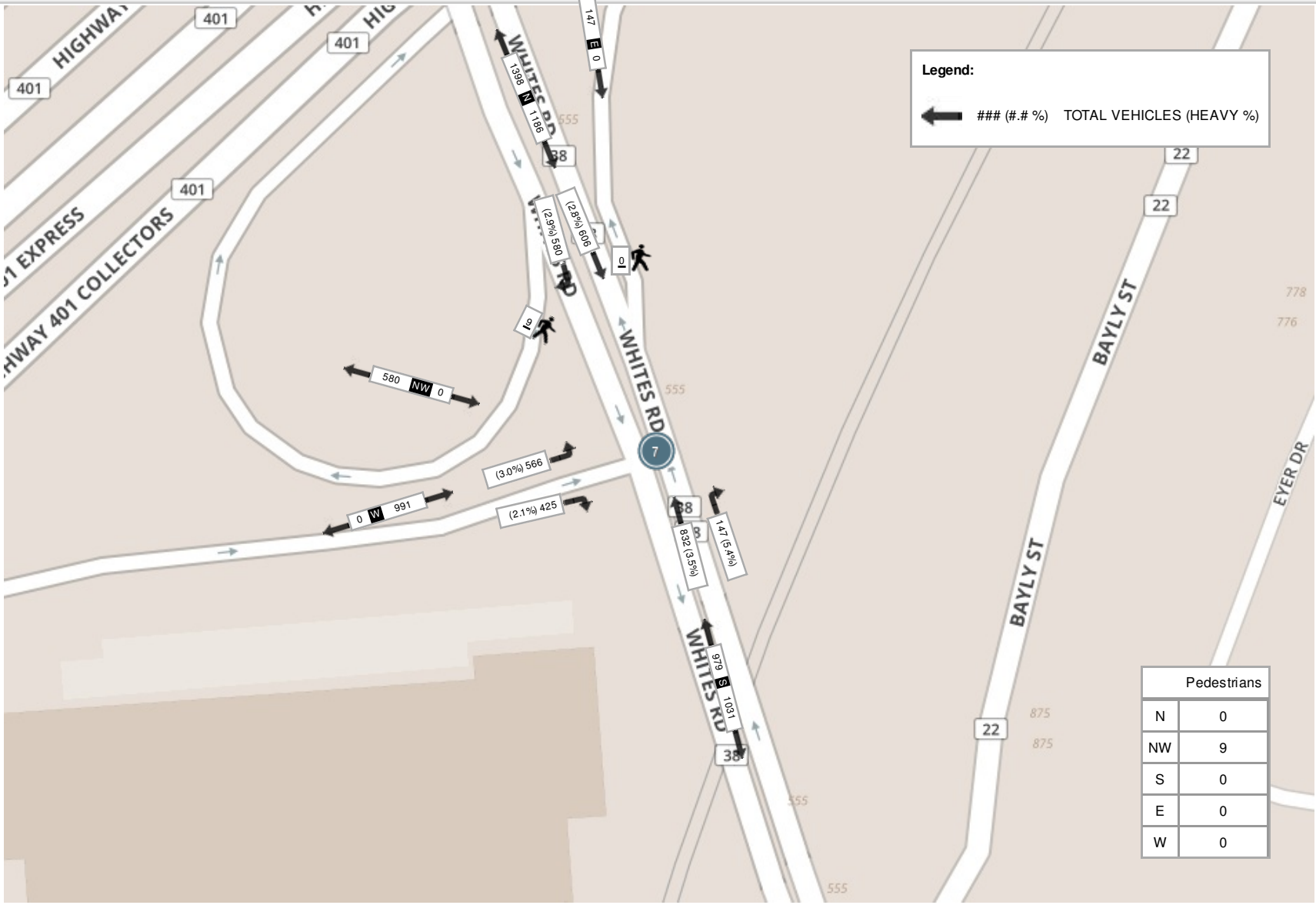
Peak Hour: 07:45 AM - 08:45 AM Weather: Light Intensity Shower Rain (15.81 °C)

Start Time	N Approach				S Approach				NW Approach			E Approach			W Approach				Int. Total (15 min)
	Right	Thru	UTurn	Approach Total	Right	Thru	UTurn	Approach Total	UTurn	Peds	Approach Total	UTurn	Peds	Approach Total	Right	Left	UTurn	Approach Total	
07:45:00	154	173	0	327	38	230	0	268	0	5	0	0	0	0	100	125	0	225	820
08:00:00	135	119	0	254	35	239	0	274	0	0	0	0	0	0	92	123	0	215	743
08:15:00	162	154	1	317	31	187	0	218	0	3	0	0	0	0	111	138	0	249	784
08:30:00	129	160	0	289	43	176	0	219	0	1	0	0	0	0	122	180	0	302	810
Grand Total	580	606	1	1187	147	832	0	979	0	9	0	0	0	0	425	566	0	991	**3157**
Approach%	48.9%	51.1%	0.1%	-	15%	85%	0%	-	0%		-	0%		-	42.9%	57.1%	0%	-	-
Totals %	18.4%	19.2%	0%	37.6%	4.7%	26.4%	0%	31%	0%		0%	0%		0%	13.5%	17.9%	0%	31.4%	-
PHF	0.9	0.88	0.25	0.91	0.85	0.87	0	0.89	0		0	0		0	0.87	0.79	0	0.82	-
Heavy	17	17	0	34	8	29	0	37	0		0	0		0	9	17	0	26	-
Heavy %	2.9%	2.8%	0%	2.9%	5.4%	3.5%	0%	3.8%	0%		0%	0%		0%	2.1%	3%	0%	2.6%	-
Lights	563	589	1	1153	139	803	0	942	0		0	0		0	416	549	0	965	-
Lights %	97.1%	97.2%	100%	97.1%	94.6%	96.5%	0%	96.2%	0%		0%	0%		0%	97.9%	97%	0%	97.4%	-
Single-Unit Trucks	12	3	0	15	7	7	0	14	0		0	0		0	6	11	0	17	-
Single-Unit Trucks %	2.1%	0.5%	0%	1.3%	4.8%	0.8%	0%	1.4%	0%		0%	0%		0%	1.4%	1.9%	0%	1.7%	-
Buses	4	14	0	18	1	19	0	20	0		0	0		0	2	2	0	4	-
Buses %	0.7%	2.3%	0%	1.5%	0.7%	2.3%	0%	2%	0%		0%	0%		0%	0.5%	0.4%	0%	0.4%	-
Articulated Trucks	1	0	0	1	0	3	0	3	0		0	0		0	1	4	0	5	-
Articulated Trucks %	0.2%	0%	0%	0.1%	0%	0.4%	0%	0.3%	0%		0%	0%		0%	0.2%	0.7%	0%	0.5%	-
Pedestrians	-	-	-	-	-	-	-	-	-	9	-	-	0	-	-	-	-	-	-
Pedestrians%	-	-	-		-	-	-		-	100%		-	0%		-	-	-		-
Bicycles on Road	0	0	0	-	0	0	0	-	0	0	-	0	0	-	0	0	0	-	-
Bicycles on Road%	-	-	-		-	-	-		-	0%		-	0%		-	-	-		-

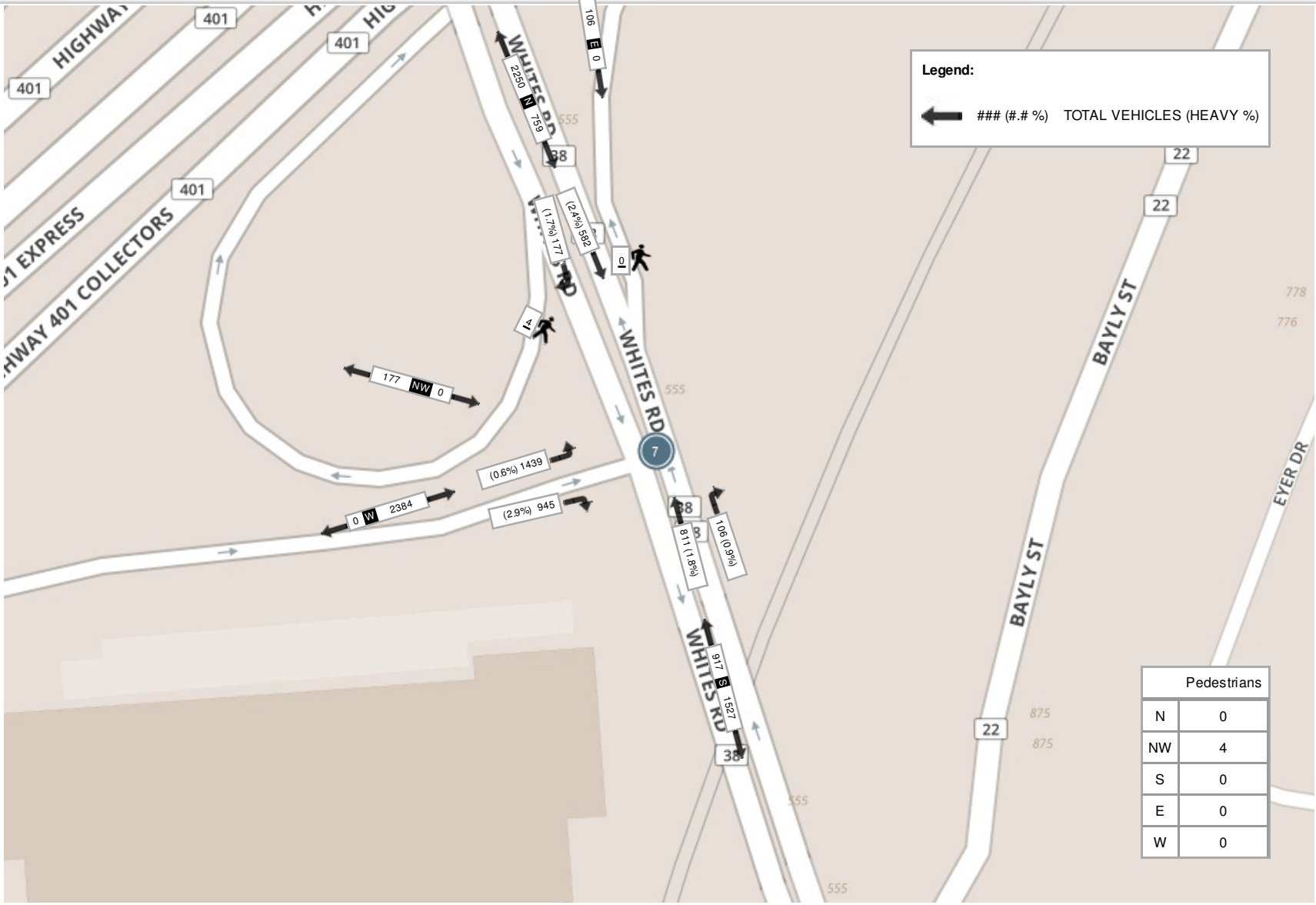
Peak Hour: 04:30 PM - 05:30 PM Weather: Thunderstorm (19.19 °C)

Start Time	N Approach				S Approach				NW Approach			E Approach			W Approach				Int. Total (15 min)
	Right	Thru	UTurn	Approach Total	Right	Thru	UTurn	Approach Total	UTurn	Peds	Approach Total	UTurn	Peds	Approach Total	Right	Left	UTurn	Approach Total	
16:30:00	38	125	0	163	20	224	0	244	0	0	0	0	0	0	246	394	0	640	1047
16:45:00	47	156	0	203	11	168	0	179	0	2	0	0	0	0	245	361	0	606	988
17:00:00	52	158	0	210	45	203	0	248	0	2	0	0	0	0	240	329	0	569	1027
17:15:00	40	143	0	183	30	216	0	246	0	0	0	0	0	0	214	355	0	569	998
Grand Total	177	582	0	759	106	811	0	917	0	4	0	0	0	0	945	1439	0	2384	**4060**
Approach%	23.3%	76.7%	0%	-	11.6%	88.4%	0%	-	0%		-	0%		-	39.6%	60.4%	0%	-	-
Totals %	4.4%	14.3%	0%	18.7%	2.6%	20%	0%	22.6%	0%		0%	0%		0%	23.3%	35.4%	0%	58.7%	-
PHF	0.85	0.92	0	0.9	0.59	0.91	0	0.92	0		0	0		0	0.96	0.91	0	0.93	-
Heavy	3	14	0	17	1	15	0	16	0		0	0		0	27	9	0	36	-
Heavy %	1.7%	2.4%	0%	2.2%	0.9%	1.8%	0%	1.7%	0%		0%	0%		0%	2.9%	0.6%	0%	1.5%	-
Lights	174	568	0	742	105	796	0	901	0		0	0		0	918	1430	0	2348	-
Lights %	98.3%	97.6%	0%	97.8%	99.1%	98.2%	0%	98.3%	0%		0%	0%		0%	97.1%	99.4%	0%	98.5%	-
Single-Unit Trucks	1	4	0	5	1	5	0	6	0		0	0		0	18	4	0	22	-
Single-Unit Trucks %	0.6%	0.7%	0%	0.7%	0.9%	0.6%	0%	0.7%	0%		0%	0%		0%	1.9%	0.3%	0%	0.9%	-
Buses	2	9	0	11	0	7	0	7	0		0	0		0	2	3	0	5	-
Buses %	1.1%	1.5%	0%	1.4%	0%	0.9%	0%	0.8%	0%		0%	0%		0%	0.2%	0.2%	0%	0.2%	-
Articulated Trucks	0	1	0	1	0	3	0	3	0		0	0		0	7	2	0	9	-
Articulated Trucks %	0%	0.2%	0%	0.1%	0%	0.4%	0%	0.3%	0%		0%	0%		0%	0.7%	0.1%	0%	0.4%	-
Pedestrians	-	-	-	-	-	-	-	-	-	4	-	-	0	-	-	-	-	-	-
Pedestrians%	-	-	-		-	-	-		-	100%		-	0%		-	-	-		-
Bicycles on Road	0	0	0	-	0	0	0	-	0	0	-	0	0	-	0	0	0	-	-
Bicycles on Road%	-	-	-		-	-	-		-	0%		-	0%		-	-	-		-

Peak Hour: 07:45 AM - 08:45 AM Weather: Light Intensity Shower Rain (15.81 °C)



Peak Hour: 04:30 PM - 05:30 PM Weather: Thunderstorm (19.19 °C)



	Pedestrians
N	0
NW	4
S	0
E	0
W	0

Turning Movement Count (6 . WHITES RD & HWY 401 WB RAMPS)

Start Time	N Approach					E Approach			S Approach					W Approach			Int. Total (15 min)	Int. Total (1 hr)
	Right N:W	Thru N:S	UTurn N:N	Peds N:	Approach Total	UTurn E:E	Peds E:	Approach Total	Right S:E	Thru S:N	UTurn S:S	Peds S:	Approach Total	UTurn W:W	Peds W:	Approach Total		
07:00:00	132	187	0	0	319	0	0	0	77	137	0	0	214	0	0	0	533	
07:15:00	145	209	0	0	354	0	0	0	73	196	0	0	269	0	0	0	623	
07:30:00	145	272	0	0	417	0	0	0	96	191	0	0	287	0	0	0	704	
07:45:00	143	330	0	0	473	0	0	0	100	255	0	0	355	0	0	0	828	2688
08:00:00	143	264	0	0	407	0	0	0	102	252	0	0	354	0	0	0	761	2916
08:15:00	155	309	0	0	464	0	0	0	76	262	0	0	338	0	0	0	802	3095
08:30:00	101	285	0	0	386	0	0	0	56	271	0	0	327	0	0	0	713	3104
08:45:00	106	296	0	0	402	0	0	0	67	279	0	0	346	0	0	0	748	3024
BREAK																		
16:00:00	66	163	0	0	229	0	0	0	48	471	0	0	519	0	0	0	748	
16:15:00	63	149	0	0	212	0	0	0	55	488	0	0	543	0	0	0	755	
16:30:00	73	156	0	0	229	0	0	0	57	494	0	0	551	0	0	0	780	
16:45:00	64	210	0	0	274	0	0	0	53	479	0	0	532	0	0	0	806	3089
17:00:00	96	205	0	0	301	0	0	0	62	467	0	0	529	0	0	0	830	3171
17:15:00	62	189	0	0	251	0	0	0	58	492	0	0	550	0	0	0	801	3217
17:30:00	78	207	0	0	285	0	0	0	50	494	0	0	544	0	0	0	829	3266
17:45:00	94	190	0	0	284	0	0	0	36	489	0	0	525	0	0	0	809	3269
Grand Total	1666	3621	0	0	5287	0	0	0	1066	5717	0	0	6783	0	0	0	**12070**	-
Approach%	31.5%	68.5%	0%		-	0%		-	15.7%	84.3%	0%		-	0%		-	**-**	-
Totals %	13.8%	30%	0%		43.8%	0%		0%	8.8%	47.4%	0%		56.2%	0%		0%	**-**	-
Heavy	21	110	0		-	0		-	22	109	0		-	0		-	**-**	-
Heavy %	1.3%	3%	0%		-	0%		-	2.1%	1.9%	0%		-	0%		-	**-**	-
Bicycles	0	2	0		-	0		-	0	3	0		-	0		-	**-**	-
Bicycle %	0%	0.1%	0%		-	0%		-	0%	0.1%	0%		-	0%		-	**-**	-

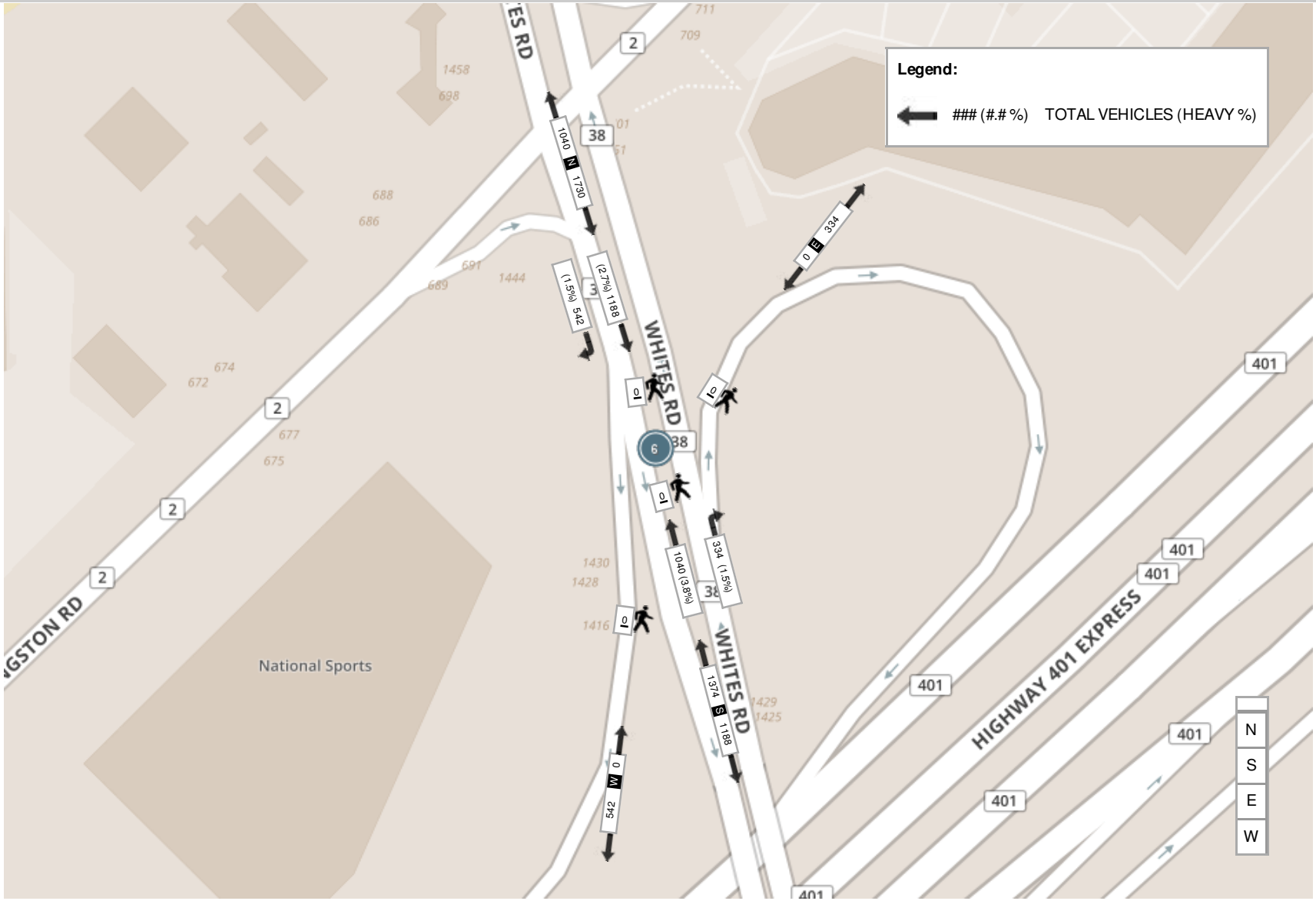
Peak Hour: 07:45 AM - 08:45 AM Weather: Light Intensity Shower Rain (15.81 °C)

Start Time	N Approach					E Approach			S Approach					W Approach			Int. Total (15 min)
	Right	Thru	UTurn	Peds	Approach Total	UTurn	Peds	Approach Total	Right	Thru	UTurn	Peds	Approach Total	UTurn	Peds	Approach Total	
07:45:00	143	330	0	0	473	0	0	0	100	255	0	0	355	0	0	0	828
08:00:00	143	264	0	0	407	0	0	0	102	252	0	0	354	0	0	0	761
08:15:00	155	309	0	0	464	0	0	0	76	262	0	0	338	0	0	0	802
08:30:00	101	285	0	0	386	0	0	0	56	271	0	0	327	0	0	0	713
Grand Total	542	1188	0	0	1730	0	0	0	334	1040	0	0	1374	0	0	0	**3104**
Approach%	31.3%	68.7%	0%		-	0%		-	24.3%	75.7%	0%		-	0%		-	**-**
Totals %	17.5%	38.3%	0%		55.7%	0%		0%	10.8%	33.5%	0%		44.3%	0%		0%	**-**
PHF	0.87	0.9	0		0.91	0		0	0.82	0.96	0		0.97	0		0	**-**
Heavy	8	32	0		40	0		0	5	39	0		44	0		0	**-**
Heavy %	1.5%	2.7%	0%		2.3%	0%		0%	1.5%	3.8%	0%		3.2%	0%		0%	**-**
Lights	534	1156	0		1690	0		0	329	1001	0		1330	0		0	**-**
Lights %	98.5%	97.3%	0%		97.7%	0%		0%	98.5%	96.3%	0%		96.8%	0%		0%	**-**
Single-Unit Trucks	6	12	0		18	0		0	2	16	0		18	0		0	**-**
Single-Unit Trucks %	1.1%	1%	0%		1%	0%		0%	0.6%	1.5%	0%		1.3%	0%		0%	**-**
Buses	0	19	0		19	0		0	1	19	0		20	0		0	**-**
Buses %	0%	1.6%	0%		1.1%	0%		0%	0.3%	1.8%	0%		1.5%	0%		0%	**-**
Articulated Trucks	2	1	0		3	0		0	2	4	0		6	0		0	**-**
Articulated Trucks %	0.4%	0.1%	0%		0.2%	0%		0%	0.6%	0.4%	0%		0.4%	0%		0%	**-**
Bicycles on Road	0	1	0	0	-	0	0	-	0	1	0	0	-	0	0	-	**-**
Bicycles on Road%	-	-	-	%		-	%		-	-	-	%		-	%		**-**

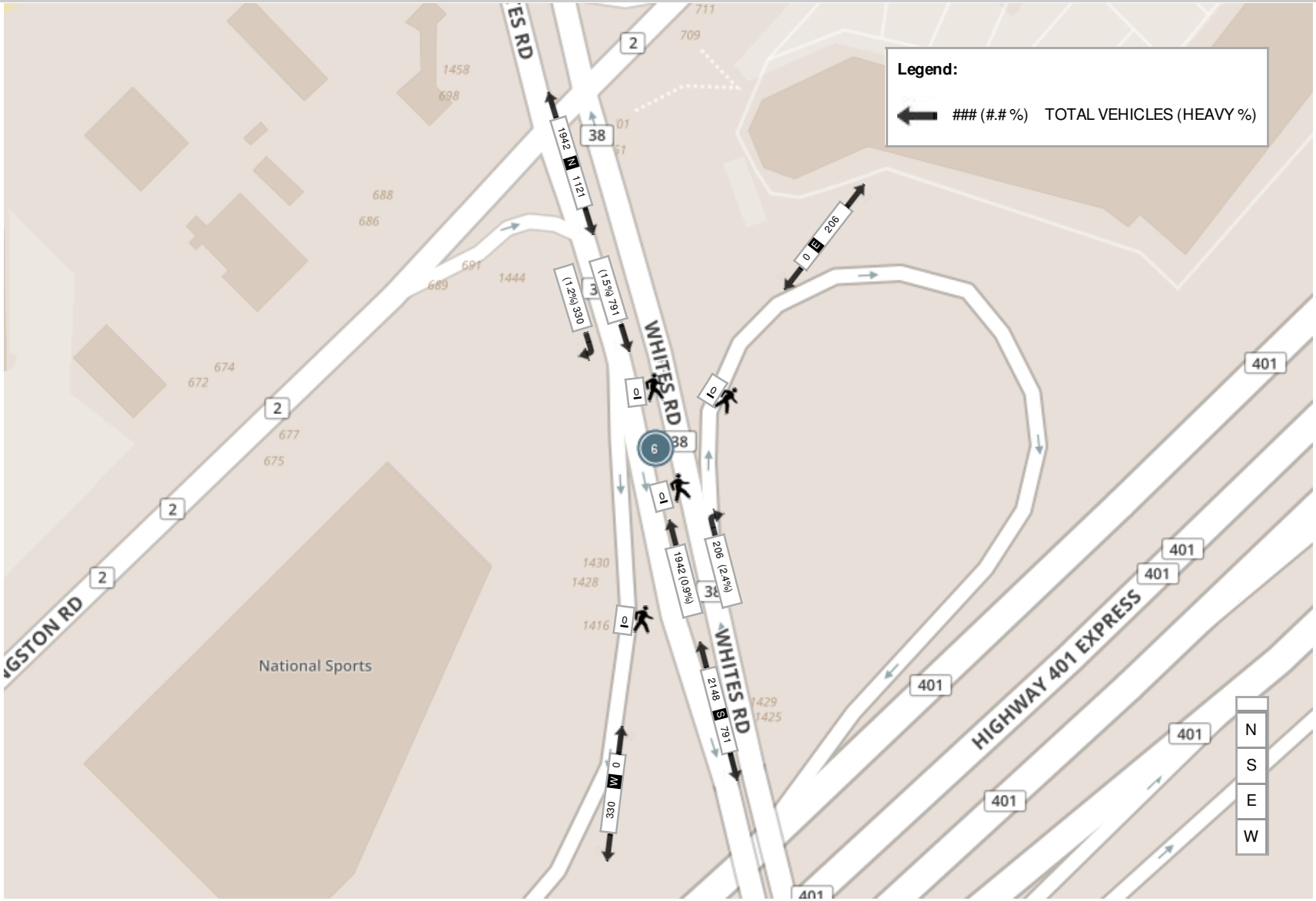
Peak Hour: 05:00 PM - 06:00 PM Weather: Thunderstorm (19.19 °C)

Start Time	N Approach					E Approach			S Approach					W Approach			Int. Total (15 min)
	Right	Thru	UTurn	Peds	Approach Total	UTurn	Peds	Approach Total	Right	Thru	UTurn	Peds	Approach Total	UTurn	Peds	Approach Total	
17:00:00	96	205	0	0	301	0	0	0	62	467	0	0	529	0	0	0	830
17:15:00	62	189	0	0	251	0	0	0	58	492	0	0	550	0	0	0	801
17:30:00	78	207	0	0	285	0	0	0	50	494	0	0	544	0	0	0	829
17:45:00	94	190	0	0	284	0	0	0	36	489	0	0	525	0	0	0	809
Grand Total	330	791	0	0	1121	0	0	0	206	1942	0	0	2148	0	0	0	**3269**
Approach%	29.4%	70.6%	0%		-	0%		-	9.6%	90.4%	0%		-	0%		-	**-**
Totals %	10.1%	24.2%	0%		34.3%	0%		0%	6.3%	59.4%	0%		65.7%	0%		0%	**-**
PHF	0.86	0.96	0		0.93	0		0	0.83	0.98	0		0.98	0		0	**-**
Heavy	4	12	0		16	0		0	5	18	0		23	0		0	**-**
Heavy %	1.2%	1.5%	0%		1.4%	0%		0%	2.4%	0.9%	0%		1.1%	0%		0%	**-**
Lights	326	779	0		1105	0		0	201	1924	0		2125	0		0	**-**
Lights %	98.8%	98.5%	0%		98.6%	0%		0%	97.6%	99.1%	0%		98.9%	0%		0%	**-**
Single-Unit Trucks	2	4	0		6	0		0	2	5	0		7	0		0	**-**
Single-Unit Trucks %	0.6%	0.5%	0%		0.5%	0%		0%	1%	0.3%	0%		0.3%	0%		0%	**-**
Buses	0	6	0		6	0		0	0	11	0		11	0		0	**-**
Buses %	0%	0.8%	0%		0.5%	0%		0%	0%	0.6%	0%		0.5%	0%		0%	**-**
Articulated Trucks	2	2	0		4	0		0	3	2	0		5	0		0	**-**
Articulated Trucks %	0.6%	0.3%	0%		0.4%	0%		0%	1.5%	0.1%	0%		0.2%	0%		0%	**-**
Bicycles on Road	0	0	0	0	-	0	0	-	0	0	0	0	-	0	0	-	**-**
Bicycles on Road%	-	-	-	%		-	%		-	-	-	%		-	%		**-**

Peak Hour: 07:45 AM - 08:45 AM Weather: Light Intensity Shower Rain (15.81 °C)



Peak Hour: 05:00 PM - 06:00 PM Weather: Thunderstorm (19.19 °C)



APPENDIX D:
Existing Signal Timing Plans

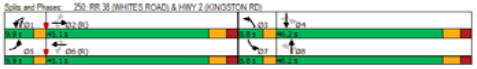
INTERSECTION SIGNAL TIMING REPORT

Location	Kingston Road (Hwy 2) and Whites Road (RR38)				
Date	11/7/2019	**C&E No.**	28579465	**Prepared by**	K.Patel
Prepared for	BA Group				

AM Peak 5:30-9:00

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	9.9	45.1	8.8	46.2
Maximum Split (%)	9.0%	41.0%	8.0%	42.0%	9.0%	41.0%	8.0%	42.0%
Minimum Split (s)	8	44	8	44.1	8	44	8	44.1
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								

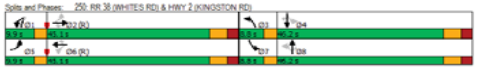
Splits and Phases: 250: RR 38 (WHITES ROAD) & HWY 2 (KINGSTON RD)



PM Peak 14:30-19:00

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	9.9	45.1	8.8	46.2
Maximum Split (%)	9.0%	41.0%	8.0%	42.0%	9.0%	41.0%	8.0%	42.0%
Minimum Split (s)	8	44	8	44.1	8	44	8	44.1
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								

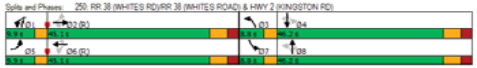
Splits and Phases: 250: RR 38 (WHITES RD) & HWY 2 (KINGSTON RD)



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	9.9	45.1	8.8	46.2
Maximum Split (%)	9.0%	41.0%	8.0%	42.0%	9.0%	41.0%	8.0%	42.0%
Minimum Split (s)	8	44	8	44.1	8	44	8	44.1
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.*

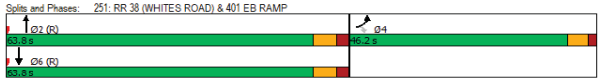
INTERSECTION SIGNAL TIMING REPORT

Location	Whites Rd. (RR 38) and Hwy. 401 EB Off-Ramp				
Date	11/7/2019	**C&E No.**	28579465	**Prepared by**	K.Patel
Prepared for	BA Group				

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)	29	29	29
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			

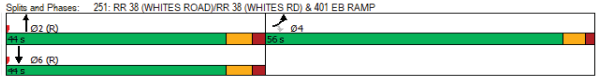
Splits and Phases: 251: RR 38 (WHITES ROAD) & 401 EB RAMP



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)	29	29	29
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			

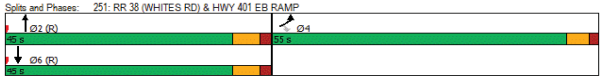
Splits and Phases: 251: RR 38 (WHITES ROAD)/RR 38 (WHITES RD) & 401 EB RAMP



Weekend Peak 08:00-21:00

Phase Number	2	4	6
Movement	NBT	EBL	SBT
Lead/Lag			
Lead-Lag Optimize			
Recall Mode	C-Max	None	C-Max
Maximum Split (s)	45	55	45
Maximum Split (%)	45.0%	55.0%	45.0%
Minimum Split (s)	29	29	29
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		60	
Offset: 22 (22%), Referenced to phase 2:NBT and 6:SBT, Start of Green			

Splits and Phases: 251: RR 38 (WHITES RD) & HWY 401 EB RAMP



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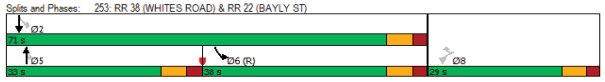
INTERSECTION SIGNAL TIMING REPORT

Location	Whites Rd. (RR 38) and Bayly St. (RR 22)				
Date	11/7/2019	**C&E No.**	28579465	**Prepared by**	K.Patel
Prepared for	BA Group				

AM Peak 06:30-09:00

Phase Number	2	5	6	8
Movement	SBTL	NBT	SBL	WBL
Lead/Lag		Lead	Lag	
Lead-Lag Optimize		Yes	Yes	
Recall Mode	Max	Max	C-Max	None
Maximum Split (s)	71	33	38	29
Maximum Split (%)	71.0%	33.0%	38.0%	29.0%
Minimum Split (s)	21	32	21	28
Yellow Time (s)	4.4	4.4	4.4	4.2
All-Red Time (s)	2.6	2.6	2.6	2.4
Minimum Initial (s)	12	12	12	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)	5	18	5	15
Flash Dont Walk (s)	5	6	5	5
Intersection Summary				
Cycle Length			100	
Control Type		Actuated-Coordinated		
Natural Cycle			85	
Offset: 16 (16%), Referenced to phase 6:SBL, Start of Green				

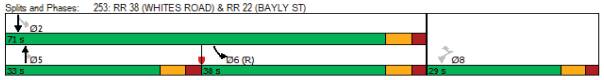
Splits and Phases: 253: RR 38 (WHITES ROAD) & RR 22 (BAYLY ST)



PM Peak 14:30-19:00

Phase Number	2	5	6	8
Movement	SBTL	NBT	SBL	WBL
Lead/Lag		Lead	Lag	
Lead-Lag Optimize		Yes	Yes	
Recall Mode	Max	Max	C-Max	None
Maximum Split (s)	71	33	38	29
Maximum Split (%)	71.0%	33.0%	38.0%	29.0%
Minimum Split (s)	21	32	21	28
Yellow Time (s)	4.4	4.4	4.4	4.2
All-Red Time (s)	2.6	2.6	2.6	2.4
Minimum Initial (s)	12	12	12	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)	5	18	5	15
Flash Dont Walk (s)	5	6	5	5
Intersection Summary				
Cycle Length			100	
Control Type		Actuated-Coordinated		
Natural Cycle			85	
Offset: 44 (44%), Referenced to phase 6:SBL, Start of Green				

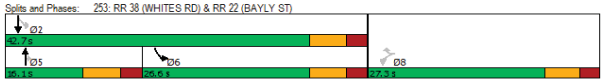
Splits and Phases: 253: RR 38 (WHITES ROAD) & RR 22 (BAYLY ST)



Weekend Peak 08:00-19:00

Phase Number	2	5	6	8
Movement	SBTL	NBT	SBL	WBL
Lead/Lag		Lead	Lag	
Lead-Lag Optimize		Yes	Yes	
Recall Mode	Max	Max	Max	None
Maximum Split (s)	42.7	16.1	26.6	27.3
Maximum Split (%)	61.0%	23.0%	38.0%	39.0%
Minimum Split (s)	21	32	21	28
Yellow Time (s)	4.4	4.4	4.4	4.2
All-Red Time (s)	2.6	2.6	2.6	2.4
Minimum Initial (s)	12	12	12	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)	5	18	5	15
Flash Dont Walk (s)	5	6	5	5
Intersection Summary				
Cycle Length			70	
Control Type		Semi Act-Uncoord		
Natural Cycle			85	

Splits and Phases: 253: RR 38 (WHITES RD) & RR 22 (BAYLY ST)



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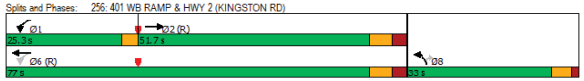
INTERSECTION SIGNAL TIMING REPORT

Location	Kingston Rd & Hwy 401 Ramp (E of Whites Rd.)				
Date	11/7/2019	**C&E No.**	28579465	**Prepared by**	K.Patel
Prepared for	BA Group				

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)	25.3	51.7	77	33
Maximum Split (%)	23.0%	47.0%	70.0%	30.0%
Minimum Split (s)	8	51	51	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			95	
Offset: 3.3 (3%), Referenced to phase 2:EBT and 6:WBTL, Start of Green				

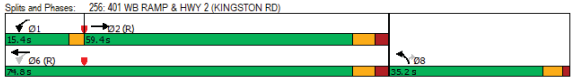
Splits and Phases: 256: 401 WB RAMP & HWY 2 (KINGSTON RD)



PM Peak 14:30-19:00

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)	15.4	59.4	74.8	35.2
Maximum Split (%)	14.0%	54.0%	68.0%	32.0%
Minimum Split (s)	8	51	51	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			95	
Offset: 22 (20%), Referenced to phase 2:EBT and 6:WBTL, Start of Green				

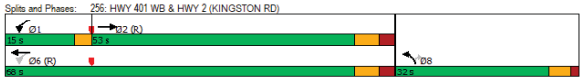
Splits and Phases: 256: 401 WB RAMP & HWY 2 (KINGSTON RD)



Weekend Peak 08:00-21:00

Phase Number	1	2	6	8
Movement	WBL	EBT	WBTL	NBL
Lead/Lag	Lead	Lag		
Lead-Lag Optimize	Yes	Yes		
Recall Mode	None	C-Max	C-Max	None
Maximum Split (s)	15	53	68	32
Maximum Split (%)	15.0%	53.0%	68.0%	32.0%
Minimum Split (s)	8	51	51	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			100	
Control Type		Actuated-Coordinated		
Natural Cycle			95	
Offset: 85 (85%), Referenced to phase 2:EBT and 6:WBTL, Start of Green				

Splits and Phases: 256: HWY 401 WB & HWY 2 (KINGSTON RD)



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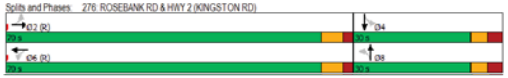
INTERSECTION SIGNAL TIMING REPORT

Location	Kingston Road (Hwy 2) and Rosebank Rd				
Date	11/7/2019	**C&E No.**	28579465	**Prepared by**	K. Patel
Prepared for	BA Group				

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				

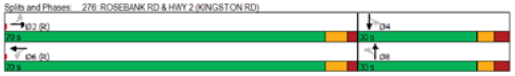
Splits and Phases: 276: ROSEBANK RD & HWY 2 (KINGSTON RD)



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				

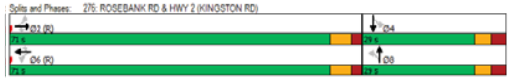
Splits and Phases: 276: ROSEBANK RD & HWY 2 (KINGSTON RD)



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)



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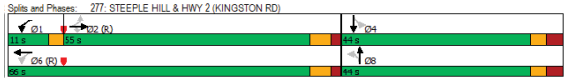
INTERSECTION SIGNAL TIMING REPORT

Location	Kingston Road (Hwy 2) and Steeple Hill				
Date	11/7/2019	**C&E No.**	28579465	**Prepared by**	K.Patel
Prepared for	BA Group				

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)	11	55	44	66	44
Maximum Split (%)	10.0%	50.0%	40.0%	60.0%	40.0%
Minimum Split (s)	8	28	38	28	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: 14.3 (13%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green					

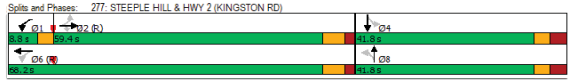
Splits and Phases: 277: STEEPLE HILL & HWY 2 (KINGSTON RD)



PM Peak 14:30-19:00

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)	8.8	59.4	41.8	68.2	41.8
Maximum Split (%)	8.0%	54.0%	38.0%	62.0%	38.0%
Minimum Split (s)	8	28	38	28	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: 92.4 (84%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green					

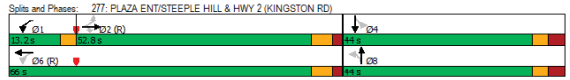
Splits and Phases: 277: STEEPLE HILL & HWY 2 (KINGSTON RD)



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	52.8	44	66	44
Maximum Split (%)	12.0%	48.0%	40.0%	60.0%	40.0%
Minimum Split (s)	8	28	38	28	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: 103.4 (94%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green					

Splits and Phases: 277: PLAZA ENT/STEEPLE HILL & HWY 2 (KINGSTON RD)



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APPENDIX E:
Synchro Reports

Queues
1: Kingston Road & Rosebank Road

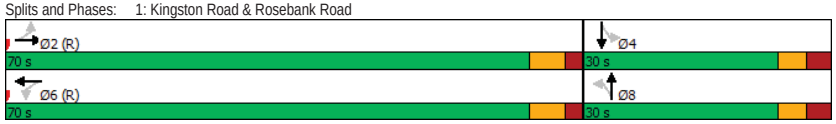
Existing AM Peak Hour

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	75	550	5	890	5	0	90	5
Future Volume (vph)	75	550	5	890	5	0	90	5
Lane Group Flow (vph)	91	683	6	1128	6	6	110	165
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		2		6		8		4
Permitted Phases	2		6		8		4	
Detector Phase	2	2	6	6	8	8	4	4
Switch Phase								
Minimum Initial (s)	20.0	20.0	20.0	20.0	8.0	8.0	8.0	8.0
Minimum Split (s)	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0
Total Split (s)	70.0	70.0	70.0	70.0	30.0	30.0	30.0	30.0
Total Split (%)	70.0%	70.0%	70.0%	70.0%	30.0%	30.0%	30.0%	30.0%
Yellow Time (s)	4.3	4.3	4.3	4.3	3.5	3.5	3.5	3.5
All-Red Time (s)	2.3	2.3	2.3	2.3	3.1	3.1	3.1	3.1
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	None	None	None
v/c Ratio	0.30	0.27	0.01	0.45	0.04	0.01	0.54	0.50
Control Delay	8.6	5.0	4.8	6.2	33.8	0.0	48.3	18.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.6	5.0	4.8	6.2	33.8	0.0	48.3	18.8
Queue Length 50th (m)	5.1	19.4	0.3	38.3	1.1	0.0	21.2	9.5
Queue Length 95th (m)	14.6	31.7	1.6	58.3	4.1	0.0	32.1	22.0
Internal Link Dist (m)		186.4		445.7		49.9		463.8
Turn Bay Length (m)	45.0		85.0		20.0		30.0	
Base Capacity (vph)	305	2495	526	2511	230	594	335	467
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.30	0.27	0.01	0.45	0.03	0.01	0.33	0.35

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 100
Offset: 57 (57%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Splits and Phases: 1: Kingston Road & Rosebank Road



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)	75	550	10	5	890	35	5	0	5	90	5	130
Future Volume (vph)	75	550	10	5	890	35	5	0	5	90	5	130
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	5.6	
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	0.97	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		0.99	1.00		0.99	1.00	
Frt	1.00	1.00		1.00	0.99		1.00	0.85		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1719	3372		1745	3391		1726	1567		1732	1567	
Flt Permitted	0.23	1.00		0.39	1.00		0.52	1.00		0.75	1.00	
Satd. Flow (perm)	412	3372		711	3391		946	1567		1375	1567	
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	91	671	12	6	1085	43	6	0	6	110	6	159
RTOR Reduction (vph)	0	1	0	0	2	0	0	5	0	0	96	0
Lane Group Flow (vph)	91	682	0	6	1126	0	6	1	0	110	69	0
Confl. Peds. (#/hr)	10					10	10		5	5		10
Confl. Bikes (#/hr)			150									
Heavy Vehicles (%)	1%	4%	0%	0%	3%	9%	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	7	7	0	6	6	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)	73.0	73.0		73.0	73.0		13.8	13.8		13.8	13.8	
Effective Green, g (s)	74.0	74.0		74.0	74.0		14.8	14.8		14.8	14.8	
Actuated g/C Ratio	0.74	0.74		0.74	0.74		0.15	0.15		0.15	0.15	
Clearance Time (s)	6.6	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	3.0	
Lane Grp Cap (vph)	304	2495		526	2509		140	231		203	231	
v/s Ratio Prot		0.20			c0.33			0.00			0.04	
v/s Ratio Perm	0.22			0.01			0.01			c0.08		
v/c Ratio	0.30	0.27		0.01	0.45		0.04	0.00		0.54	0.30	
Uniform Delay, d1	4.3	4.2		3.4	5.1		36.5	36.3		39.5	38.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.5	0.3		0.0	0.6		0.1	0.0		2.9	0.7	
Delay (s)	6.9	4.5		3.4	5.6		36.7	36.3		42.4	38.7	
Level of Service	A	A		A	A		D	D		D	D	
Approach Delay (s)		4.8			5.6			36.5			40.2	
Approach LOS		A			A			D			D	

Intersection Summary

HCM 2000 Control Delay	9.8	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.46			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	11.2	
Intersection Capacity Utilization	69.7%	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 AM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	640	10	0	960	5	0
Future Volume (Veh/h)	640	10	0	960	5	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	800	13	0	1200	6	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					0.86	
vC, conflicting volume			813		1400	400
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			813		1135	400
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		96	100
cM capacity (veh/h)			823		171	605

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1
Volume Total	400	400	13	0	600	600	6
Volume Left	0	0	0	0	0	0	6
Volume Right	0	0	13	0	0	0	0
cSH	1700	1700	1700	1700	1700	1700	171
Volume to Capacity	0.24	0.24	0.01	0.00	0.35	0.35	0.04
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0	0.9
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	26.8
Lane LOS							D
Approach Delay (s)	0.0			0.0			26.8
Approach LOS							D

Intersection Summary			
Average Delay		0.1	
Intersection Capacity Utilization		36.5%	ICU Level of Service A
Analysis Period (min)		15	

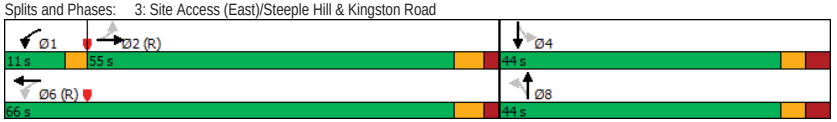
Queues
3: Site Access (East)/Steeple Hill & Kingston Road

Existing AM Peak Hour

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	40	595	40	880	5	0	150	0
Future Volume (vph)	40	595	40	880	5	0	150	0
Lane Group Flow (vph)	48	723	48	1126	6	18	181	60
Turn Type	Perm	NA	pm+pt	NA	Perm	NA	Perm	NA
Protected Phases		2	1	6		8		4
Permitted Phases	2		6		8		4	
Detector Phase	2	2	1	6	8	8	4	4
Switch Phase								
Minimum Initial (s)	20.0	20.0	5.0	20.0	8.0	8.0	8.0	8.0
Minimum Split (s)	28.0	28.0	8.0	28.0	38.0	38.0	38.0	38.0
Total Split (s)	55.0	55.0	11.0	66.0	44.0	44.0	44.0	44.0
Total Split (%)	50.0%	50.0%	10.0%	60.0%	40.0%	40.0%	40.0%	40.0%
Yellow Time (s)	4.2	4.2	3.0	4.2	3.3	3.3	3.3	3.3
All-Red Time (s)	2.1	2.1	0.0	2.1	3.4	3.4	3.4	3.4
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.3	5.3	2.0	5.3	5.7	5.7	5.7	5.7
Lead/Lag	Lag	Lag	Lead					
Lead-Lag Optimize?	Yes	Yes	Yes					
Recall Mode	C-Max	C-Max	None	C-Max	None	None	None	None
v/c Ratio	0.18	0.34	0.09	0.47	0.02	0.03	0.70	0.16
Control Delay	13.7	11.3	4.9	5.4	31.8	0.1	54.9	4.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.7	11.3	4.9	5.4	31.8	0.1	54.9	4.7
Queue Length 50th (m)	4.3	38.4	2.0	28.1	1.1	0.0	38.5	0.0
Queue Length 95th (m)	12.2	56.6	m4.1	m37.5	4.0	0.0	52.4	4.9
Internal Link Dist (m)		129.3		289.8		62.3		200.4
Turn Bay Length (m)	25.0		30.0				15.0	
Base Capacity (vph)	269	2157	545	2382	459	732	458	608
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.18	0.34	0.09	0.47	0.01	0.02	0.40	0.10

Intersection Summary
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 14.3 (13%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Site Access (East)/Steeple Hill & Kingston Road



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	595	5	40	880	55	5	0	15	150	0	50
Future Volume (vph)	40	595	5	40	880	55	5	0	15	150	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		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	1.00		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	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)	1653	3405		1745	3383		1745	1597		1678	1597	
Flt Permitted	0.24	1.00		0.34	1.00		0.72	1.00		0.75	1.00	
Satd. Flow (perm)	424	3405		618	3383		1319	1597		1317	1597	
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)	48	717	6	48	1060	66	6	0	18	181	0	60
RTOR Reduction (vph)	0	0	0	0	3	0	0	14	0	0	48	0
Lane Group Flow (vph)	48	723	0	48	1123	0	6	4	0	181	12	0
Confl. Peds. (#/hr)	10					10						
Confl. Bikes (#/hr)			160									
Heavy Vehicles (%)	5%	3%	20%	0%	3%	4%	0%	0%	0%	4%	0%	0%
Bus Blockages (#/hr)	0	7	7	0	6	6	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)	68.1	68.1		76.4	76.4		20.6	20.6		20.6	20.6	
Effective Green, g (s)	69.1	69.1		77.4	77.4		21.6	21.6		21.6	21.6	
Actuated g/C Ratio	0.63	0.63		0.70	0.70		0.20	0.20		0.20	0.20	
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)	266	2138		499	2380		259	313		258	313	
v/s Ratio Prot		0.21		0.01	c0.33			0.00			0.01	
v/s Ratio Perm	0.11			0.06			0.00			c0.14		
v/c Ratio	0.18	0.34		0.10	0.47		0.02	0.01		0.70	0.04	
Uniform Delay, d1	8.6	9.7		5.3	7.2		35.7	35.6		41.2	35.8	
Progression Factor	1.00	1.00		0.87	0.61		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.5	0.4		0.1	0.5		0.0	0.0		8.3	0.0	
Delay (s)	10.1	10.1		4.6	4.9		35.7	35.6		49.5	35.8	
Level of Service	B	B		A	A		D	D		D	D	
Approach Delay (s)		10.1			4.9			35.6			46.1	
Approach LOS		B			A			D			D	

Intersection Summary				
HCM 2000 Control Delay	11.5	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.53			
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	13.0	
Intersection Capacity Utilization	57.4%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

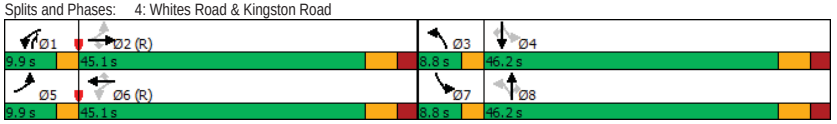
Queues
4: Whites Road & Kingston Road

Existing AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	75	320	365	275	745	335	195	470	405	120	1005	130
Future Volume (vph)	75	320	365	275	745	335	195	470	405	120	1005	130
Lane Group Flow (vph)	78	333	380	286	776	349	203	490	422	125	1047	135
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
Detector Phase	5	2	2	1	6	6	3	8	1	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	20.0	20.0	5.0	20.0	20.0	5.0	8.0	5.0	5.0	8.0	8.0
Minimum Split (s)	8.0	44.0	44.0	8.0	44.0	44.0	8.0	44.1	8.0	8.0	44.1	44.1
Total Split (s)	9.9	45.1	45.1	9.9	45.1	45.1	8.8	46.2	9.9	8.8	46.2	46.2
Total Split (%)	9.0%	41.0%	41.0%	9.0%	41.0%	41.0%	8.0%	42.0%	9.0%	8.0%	42.0%	42.0%
Yellow Time (s)	3.0	4.2	4.2	3.0	4.2	4.2	3.0	4.3	3.0	3.0	4.3	4.3
All-Red Time (s)	0.0	2.8	2.8	0.0	2.8	2.8	0.0	2.8	0.0	0.0	2.8	2.8
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
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
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	Max	None	None	Max	Max
v/c Ratio	0.27	0.28	0.65	0.61	0.59	0.50	0.99	0.40	0.50	0.32	0.84	0.24
Control Delay	15.8	23.6	18.8	18.9	23.2	6.6	84.0	24.7	4.7	18.5	39.2	9.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	15.8	23.6	18.8	18.9	23.2	6.6	84.0	24.7	4.7	18.5	39.2	9.1
Queue Length 50th (m)	7.3	23.0	23.8	37.6	69.1	20.9	22.3	31.6	1.6	15.3	112.5	5.3
Queue Length 95th (m)	15.7	38.8	60.8	51.2	75.0	33.8	#70.5	67.7	30.7	26.8	140.8	18.9
Internal Link Dist (m)		289.8			476.9			454.6			338.0	
Turn Bay Length (m)	100.0			80.0	35.0		35.0	50.0		45.0	85.0		15.0
Base Capacity (vph)	287	1208	585	470	1307	698	205	1239	852	389	1251	561
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.27	0.28	0.65	0.61	0.59	0.50	0.99	0.40	0.50	0.32	0.84	0.24

Intersection Summary
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 1.1 (1%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 105
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Whites Road & Kingston Road



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)	75	320	365	275	745	335	195	470	405	120	1005	130
Future Volume (vph)	75	320	365	275	745	335	195	470	405	120	1005	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	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.87	1.00	1.00	0.96	1.00	1.00	0.97	1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00	1.00	0.99	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)	1691	3400	1331	1667	3500	1479	1800	3400	1464	1670	3433	1369
Flt Permitted	0.24	1.00	1.00	0.51	1.00	1.00	0.13	1.00	1.00	0.41	1.00	1.00
Satd. Flow (perm)	425	3400	1331	894	3500	1479	236	3400	1464	716	3433	1369
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	78	333	380	286	776	349	203	490	422	125	1047	135
RTOR Reduction (vph)	0	0	112	0	0	147	0	0	171	0	0	63
Lane Group Flow (vph)	78	333	268	286	776	202	203	490	251	125	1047	72
Confl. Peds. (#/hr)	35		25	25		35	20		30	30		20
Confl. Bikes (#/hr)			160									
Heavy Vehicles (%)	3%	5%	2%	4%	2%	1%	2%	5%	2%	4%	4%	8%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	3	0	0	6
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)	43.6	38.1	38.1	46.4	39.5	39.5	44.9	39.1	46.0	44.9	39.1	39.1
Effective Green, g (s)	45.6	39.1	39.1	48.4	40.5	40.5	46.9	40.1	48.0	46.9	40.1	40.1
Actuated g/C Ratio	0.41	0.36	0.36	0.44	0.37	0.37	0.43	0.36	0.44	0.43	0.36	0.36
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)	250	1208	473	448	1288	544	197	1239	638	364	1251	499
v/s Ratio Prot	0.02	0.10		c0.05	c0.22		c0.06	0.14	0.03	0.02	c0.31	
v/s Ratio Perm	0.11		0.20	0.23		0.14	0.38		0.14	0.13		0.05
v/c Ratio	0.31	0.28	0.57	0.64	0.60	0.37	1.03	0.40	0.39	0.34	0.84	0.14
Uniform Delay, d1	20.6	25.3	28.6	22.3	28.2	25.4	21.7	26.0	21.1	19.7	32.0	23.4
Progression Factor	0.86	0.90	0.85	0.68	0.75	0.47	1.24	0.91	0.57	1.00	1.00	1.00
Incremental Delay, d2	0.7	0.5	4.6	2.7	1.9	1.8	69.0	0.9	0.4	0.6	6.8	0.6
Delay (s)	18.4	23.4	28.9	18.0	23.0	13.6	95.9	24.4	12.3	20.3	38.7	24.1
Level of Service	B	C	C	B	C	B	F	C	B	C	D	C
Approach Delay (s)		25.6			19.7			32.9			35.4	
Approach LOS		C			B			C			D	

Intersection Summary				
HCM 2000 Control Delay	28.3	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)	16.1	
Intersection Capacity Utilization	103.6%	ICU Level of Service	G	
Analysis Period (min)	15			
c Critical Lane Group				

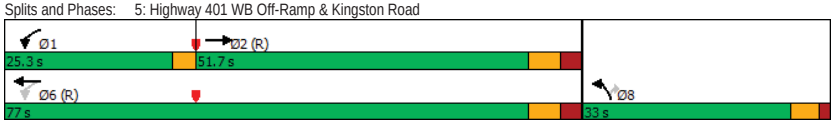
Queues
5: Highway 401 WB Off-Ramp & Kingston Road

Existing AM Peak Hour

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Configurations					
Traffic Volume (vph)	735	475	850	490	60
Future Volume (vph)	735	475	850	490	60
Lane Group Flow (vph)	793	505	904	521	64
Turn Type	NA	pm+pt	NA	Prot	Perm
Protected Phases	2	1	6	8	
Permitted Phases		6			8
Detector Phase	2	1	6	8	8
Switch Phase					
Minimum Initial (s)	20.0	3.5	20.0	8.0	8.0
Minimum Split (s)	51.0	8.0	51.0	32.0	32.0
Total Split (s)	51.7	25.3	77.0	33.0	33.0
Total Split (%)	47.0%	23.0%	70.0%	30.0%	30.0%
Yellow Time (s)	4.2	3.0	4.2	3.7	3.7
All-Red Time (s)	3.0	0.0	3.0	1.7	1.7
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	6.2	2.0	6.2	4.4	4.4
Lead/Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes			
Recall Mode	C-Max	None	C-Max	None	None
v/c Ratio	0.49	0.84	0.38	0.74	0.19
Control Delay	19.3	24.6	8.1	46.9	21.4
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	19.3	24.6	8.1	46.9	21.4
Queue Length 50th (m)	58.7	41.4	40.0	57.0	6.2
Queue Length 95th (m)	69.5	#108.5	60.0	71.3	17.0
Internal Link Dist (m)	476.9		318.1	85.1	
Turn Bay Length (m)		15.0			15.0
Base Capacity (vph)	1626	627	2395	862	416
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.49	0.81	0.38	0.60	0.15

Intersection Summary
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 3.3 (3%), Referenced to phase 2:EBT and 6:WBTL, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Highway 401 WB Off-Ramp & Kingston Road



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)	735	10	475	850	490	60
Future Volume (vph)	735	10	475	850	490	60
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
Frpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00	1.00	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		1728	3466	3319	1516
Flt Permitted	1.00		0.27	1.00	0.95	1.00
Satd. Flow (perm)	3421		483	3466	3319	1516
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	782	11	505	904	521	64
RTOR Reduction (vph)	1	0	0	0	0	24
Lane Group Flow (vph)	792	0	505	904	521	40
Confl. Bikes (#/hr)		150				
Heavy Vehicles (%)	4%	0%	1%	3%	2%	3%
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases			6			8
Actuated Green, G (s)	51.2		75.0	75.0	22.4	22.4
Effective Green, g (s)	52.2		76.0	76.0	23.4	23.4
Actuated g/C Ratio	0.47		0.69	0.69	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)	1623		580	2394	706	322
v/s Ratio Prot	c0.23		c0.17	0.26	c0.16	
v/s Ratio Perm			0.43			0.03
v/c Ratio	0.49		0.87	0.38	0.74	0.13
Uniform Delay, d1	19.8		12.1	7.1	40.4	35.0
Progression Factor	0.86		1.00	1.00	1.00	1.00
Incremental Delay, d2	1.0		13.4	0.5	4.0	0.2
Delay (s)	18.0		25.6	7.6	44.5	35.2
Level of Service	B		C	A	D	D
Approach Delay (s)	18.0			14.0	43.5	
Approach LOS	B			B	D	

Intersection Summary				
HCM 2000 Control Delay	21.3	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.63			
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.6	
Intersection Capacity Utilization	73.1%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

Queues
6: Whites Road & Bayly Street

Existing AM Peak Hour

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	255	360	620	125	540	490
Future Volume (vph)	255	360	620	125	540	490
Lane Group Flow (vph)	271	383	660	133	298	797
Turn Type	Perm	Perm	NA	Perm	pm+pt	NA
Protected Phases			5		6	2
Permitted Phases	8	8		5	2	
Detector Phase	8	8	5	5	6	2
Switch Phase						
Minimum Initial (s)	8.0	8.0	12.0	12.0	12.0	12.0
Minimum Split (s)	28.0	28.0	32.0	32.0	21.0	21.0
Total Split (s)	29.0	29.0	33.0	33.0	38.0	71.0
Total Split (%)	29.0%	29.0%	33.0%	33.0%	38.0%	71.0%
Yellow Time (s)	4.2	4.2	4.4	4.4	4.4	4.4
All-Red Time (s)	2.4	2.4	2.6	2.6	2.6	2.6
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.6	5.6	6.0	6.0	6.0	6.0
Lead/Lag			Lead	Lead	Lag	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None	None	Max	Max	C-Max	Max
v/c Ratio	0.78	0.62	0.65	0.26	0.45	0.46
Control Delay	53.0	8.4	34.8	10.5	16.9	10.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	53.0	8.4	34.8	10.5	16.9	10.8
Queue Length 50th (m)	51.6	0.0	62.8	4.6	24.8	35.4
Queue Length 95th (m)	79.4	24.4	85.1	19.4	40.8	48.5
Internal Link Dist (m)	323.4		152.5			150.1
Turn Bay Length (m)				35.0	30.0	
Base Capacity (vph)	397	648	1015	519	662	1728
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.68	0.59	0.65	0.26	0.45	0.46

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 16 (16%), Referenced to phase 6:SBL, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated

Splits and Phases: 6: Whites Road & Bayly Street

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)	255	360	620	125	540	490
Future Volume (vph)	255	360	620	125	540	490
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)	5.6	5.6	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	0.97	1.00	1.00
Flpb, ped/bikes	0.99	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	0.98
Satd. Flow (prot)	1698	1518	3400	1499	1554	3292
Flt Permitted	0.95	1.00	1.00	1.00	0.28	0.56
Satd. Flow (perm)	1698	1518	3400	1499	459	1880
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	271	383	660	133	574	521
RTOR Reduction (vph)	0	304	0	72	0	0
Lane Group Flow (vph)	271	79	660	61	298	797
Confl. Peds. (#/hr)	5			15	15	
Heavy Vehicles (%)	2%	2%	5%	1%	2%	2%
Bus Blockages (#/hr)	0	2	0	0	0	0
Turn Type	Perm	Perm	NA	Perm	pm+pt	NA
Protected Phases			5		6	2
Permitted Phases	8	8		5	2	
Actuated Green, G (s)	19.5	19.5	28.9	28.9	66.9	66.9
Effective Green, g (s)	20.5	20.5	29.9	29.9	67.9	67.9
Actuated g/C Ratio	0.20	0.20	0.30	0.30	0.68	0.68
Clearance Time (s)	6.6	6.6	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)	348	311	1016	448	662	1728
v/s Ratio Prot			c0.19		0.14	c0.15
v/s Ratio Perm	c0.16	0.05		0.04	0.16	0.17
v/c Ratio	0.78	0.25	0.65	0.14	0.45	0.46
Uniform Delay, d1	37.6	33.3	30.5	25.6	14.9	7.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	10.5	0.4	3.2	0.6	2.2	0.9
Delay (s)	48.1	33.8	33.7	26.3	17.1	8.4
Level of Service	D	C	C	C	B	A
Approach Delay (s)	39.7		32.5			10.8
Approach LOS	D		C			B

Intersection Summary				
HCM 2000 Control Delay	25.0	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.62			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.6	
Intersection Capacity Utilization	68.3%	ICU Level of Service	C	
Analysis Period (min)	15			

c Critical Lane Group

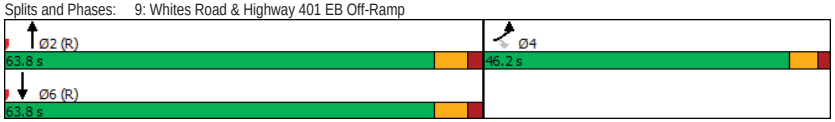
Queues
9: Whites Road & Highway 401 EB Off-Ramp

Existing AM Peak Hour

Lane Group	EBL	EBR	NBT	SBT
Lane Configurations				
Traffic Volume (vph)	565	425	980	605
Future Volume (vph)	565	425	980	605
Lane Group Flow (vph)	589	443	1021	630
Turn Type	Prot	Perm	NA	NA
Protected Phases	4		2	6
Permitted Phases		4		
Detector Phase	4	4	2	6
Switch Phase				
Minimum Initial (s)	8.0	8.0	20.0	20.0
Minimum Split (s)	29.0	29.0	29.0	29.0
Total Split (s)	46.2	46.2	63.8	63.8
Total Split (%)	42.0%	42.0%	58.0%	58.0%
Yellow Time (s)	3.7	3.7	4.5	4.5
All-Red Time (s)	1.8	1.8	2.2	2.2
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	4.5	4.5	5.7	5.7
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	None	None	C-Max	C-Max
v/c Ratio	0.69	0.79	0.46	0.28
Control Delay	40.2	28.7	11.7	8.6
Queue Delay	0.0	0.0	0.4	0.0
Total Delay	40.2	28.7	12.1	8.6
Queue Length 50th (m)	63.0	50.0	53.4	22.3
Queue Length 95th (m)	70.2	78.3	92.6	m43.4
Internal Link Dist (m)	465.0		150.1	454.6
Turn Bay Length (m)		220.0		
Base Capacity (vph)	1245	715	2217	2238
Starvation Cap Reductn	0	0	659	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.47	0.62	0.66	0.28

Intersection Summary
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 60 (55%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 9: Whites Road & Highway 401 EB Off-Ramp



HCM Signalized Intersection Capacity Analysis
9: Whites Road & Highway 401 EB Off-Ramp

Existing AM Peak Hour

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	565	425	0	980	605	0
Future Volume (vph)	565	425	0	980	605	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	1.00		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)	3286	1531		3433	3466	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	3286	1531		3433	3466	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	589	443	0	1021	630	0
RTOR Reduction (vph)	0	161	0	0	0	0
Lane Group Flow (vph)	589	282	0	1021	630	0
Confl. Peds. (#/hr)			10			10
Heavy Vehicles (%)	3%	2%	0%	4%	3%	0%
Turn Type	Prot	Perm		NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4				
Actuated Green, G (s)	27.7	27.7		70.1	70.1	
Effective Green, g (s)	28.7	28.7		71.1	71.1	
Actuated g/C Ratio	0.26	0.26		0.65	0.65	
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)	857	399		2218	2240	
v/s Ratio Prot	0.18			c0.30	0.18	
v/s Ratio Perm		c0.18				
v/c Ratio	0.69	0.71		0.46	0.28	
Uniform Delay, d1	36.6	36.8		9.8	8.4	
Progression Factor	1.00	1.00		1.00	0.89	
Incremental Delay, d2	2.3	5.6		0.7	0.2	
Delay (s)	38.9	42.5		10.5	7.6	
Level of Service	D	D		B	A	
Approach Delay (s)	40.4			10.5	7.6	
Approach LOS	D			B	A	

Intersection Summary				
HCM 2000 Control Delay	21.3	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.53			
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				

Queues
1: Kingston Road & Rosebank Road

Existing PM Peak Hour

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	120	990	710	5	0	50	5
Future Volume (vph)	120	990	710	5	0	50	5
Lane Group Flow (vph)	124	1021	794	5	10	52	72
Turn Type	Perm	NA	NA	Perm	NA	Perm	NA
Protected Phases		2	6		8		4
Permitted Phases	2			8		4	
Detector Phase	2	2	6	8	8	4	4
Switch Phase							
Minimum Initial (s)	20.0	20.0	20.0	8.0	8.0	8.0	8.0
Minimum Split (s)	28.0	28.0	28.0	28.0	28.0	28.0	28.0
Total Split (s)	70.0	70.0	70.0	30.0	30.0	30.0	30.0
Total Split (%)	70.0%	70.0%	70.0%	30.0%	30.0%	30.0%	30.0%
Yellow Time (s)	4.3	4.3	4.3	3.5	3.5	3.5	3.5
All-Red Time (s)	2.3	2.3	2.3	3.1	3.1	3.1	3.1
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.6	5.6	5.6	5.6	5.6	5.6	5.6
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	C-Max	C-Max	C-Max	None	None	None	None
v/c Ratio	0.24	0.36	0.29	0.03	0.03	0.31	0.29
Control Delay	5.8	4.5	4.0	35.0	0.2	42.7	13.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.8	4.5	4.0	35.0	0.2	42.7	13.2
Queue Length 50th (m)	5.3	26.0	18.1	1.0	0.0	10.1	1.0
Queue Length 95th (m)	19.2	58.4	41.8	3.9	0.0	19.3	12.3
Internal Link Dist (m)		186.4	445.7		49.9		463.8
Turn Bay Length (m)	45.0			20.0		30.0	
Base Capacity (vph)	508	2808	2746	316	482	334	427
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.24	0.36	0.29	0.02	0.02	0.16	0.17

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 83 (83%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Splits and Phases: 1: Kingston Road & Rosebank Road

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)	120	990	0	0	710	60	5	0	10	50	5	65
Future Volume (vph)	120	990	0	0	710	60	5	0	10	50	5	65
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			0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00			1.00		1.00	0.98		1.00	0.98	
Flpb, ped/bikes	0.99	1.00			1.00		0.99	1.00		0.99	1.00	
Frt	1.00	1.00			0.99		1.00	0.85		1.00	0.86	
Flt Protected	0.95	1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1728	3492			3410		1734	1567		1733	1545	
Flt Permitted	0.35	1.00			1.00		0.71	1.00		0.75	1.00	
Satd. Flow (perm)	631	3492			3410		1296	1567		1370	1545	
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)	124	1021	0	0	732	62	5	0	10	52	5	67
RTOR Reduction (vph)	0	0	0	0	4	0	0	9	0	0	60	0
Lane Group Flow (vph)	124	1021	0	0	790	0	5	1	0	52	12	0
Confl. Peds. (#/hr)	10		5	5		10	5		5	5		5
Heavy Vehicles (%)	0%	1%	0%	0%	2%	0%	0%	0%	0%	0%	0%	3%
Bus Blockages (#/hr)	0	6	6	0	6	6	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)	77.0	77.0			77.0		9.8	9.8		9.8	9.8	
Effective Green, g (s)	78.0	78.0			78.0		10.8	10.8		10.8	10.8	
Actuated g/C Ratio	0.78	0.78			0.78		0.11	0.11		0.11	0.11	
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)	492	2723			2659		139	169		147	166	
v/s Ratio Prot		c0.29			0.23			0.00			0.01	
v/s Ratio Perm	0.20						0.00			c0.04		
v/c Ratio	0.25	0.37			0.30		0.04	0.01		0.35	0.07	
Uniform Delay, d1	3.0	3.4			3.2		39.9	39.8		41.4	40.1	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.2	0.4			0.3		0.1	0.0		1.5	0.2	
Delay (s)	4.2	3.8			3.4		40.0	39.8		42.8	40.3	
Level of Service	A	A			A		D	D		D	D	
Approach Delay (s)		3.9			3.4			39.9			41.4	
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	0.37			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	11.2	
Intersection Capacity Utilization	68.7%	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)	1060	15	10	785	5	5
Future Volume (Veh/h)	1060	15	10	785	5	5
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	1082	15	10	801	5	5
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					0.91	
vC, conflicting volume			1097		1502	541
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1097		1354	541
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		96	99
cM capacity (veh/h)			644		128	491

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1
Volume Total	541	541	15	10	400	400	10
Volume Left	0	0	0	10	0	0	5
Volume Right	0	0	15	0	0	0	5
cSH	1700	1700	1700	644	1700	1700	204
Volume to Capacity	0.32	0.32	0.01	0.02	0.24	0.24	0.05
Queue Length 95th (m)	0.0	0.0	0.0	0.4	0.0	0.0	1.2
Control Delay (s)	0.0	0.0	0.0	10.7	0.0	0.0	23.6
Lane LOS				B			C
Approach Delay (s)	0.0			0.1			23.6
Approach LOS							C

Intersection Summary				
Average Delay	0.2			
Intersection Capacity Utilization	39.3%	ICU Level of Service		A
Analysis Period (min)	15			

Queues
3: Site Access (East)/Steeple Hill & Kingston Road

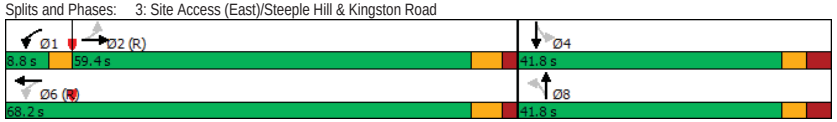
Existing PM Peak Hour

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	105	945	95	690	25	15	220	10
Future Volume (vph)	105	945	95	690	25	15	220	10
Lane Group Flow (vph)	108	989	98	845	26	118	227	82
Turn Type	Perm	NA	pm+pt	NA	Perm	NA	Perm	NA
Protected Phases		2	1	6		8		4
Permitted Phases	2		6		8		4	
Detector Phase	2	2	1	6	8	8	4	4
Switch Phase								
Minimum Initial (s)	20.0	20.0	5.0	20.0	8.0	8.0	8.0	8.0
Minimum Split (s)	28.0	28.0	8.0	28.0	38.0	38.0	38.0	38.0
Total Split (s)	59.4	59.4	8.8	68.2	41.8	41.8	41.8	41.8
Total Split (%)	54.0%	54.0%	8.0%	62.0%	38.0%	38.0%	38.0%	38.0%
Yellow Time (s)	4.2	4.2	3.0	4.2	3.3	3.3	3.3	3.3
All-Red Time (s)	2.1	2.1	0.0	2.1	3.4	3.4	3.4	3.4
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.3	5.3	2.0	5.3	5.7	5.7	5.7	5.7
Lead/Lag	Lag	Lag	Lead					
Lead-Lag Optimize?	Yes	Yes	Yes					
Recall Mode	C-Max	C-Max	None	C-Max	None	None	None	None
v/c Ratio	0.31	0.50	0.26	0.38	0.08	0.25	0.77	0.19
Control Delay	18.0	16.6	10.8	13.0	29.5	8.8	55.3	9.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.0	16.6	10.8	13.0	29.5	8.8	55.3	9.2
Queue Length 50th (m)	12.4	68.2	5.4	44.0	4.6	2.6	47.9	1.7
Queue Length 95th (m)	29.5	101.0	m17.6	70.7	10.7	15.3	69.1	12.4
Internal Link Dist (m)		129.3		289.8		62.3		200.4
Turn Bay Length (m)	25.0		30.0				15.0	
Base Capacity (vph)	345	1981	371	2222	422	594	400	575
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.31	0.50	0.26	0.38	0.06	0.20	0.57	0.14

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 110
Offset: 92.4 (84%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Site Access (East)/Steeple Hill & Kingston Road



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)	105	945	15	95	690	130	25	15	100	220	10	70
Future Volume (vph)	105	945	15	95	690	130	25	15	100	220	10	70
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	0.99		1.00	0.98		1.00	0.98	
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	0.87	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1730	3485		1745	3361		1737	1601		1712	1607	
Flt Permitted	0.33	1.00		0.22	1.00		0.70	1.00		0.68	1.00	
Satd. Flow (perm)	609	3485		400	3361		1286	1601		1220	1607	
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)	108	974	15	98	711	134	26	15	103	227	10	72
RTOR Reduction (vph)	0	1	0	0	11	0	0	78	0	0	55	0
Lane Group Flow (vph)	108	988	0	98	834	0	26	40	0	227	27	0
Confl. Peds. (#/hr)	10					10	5		10	10		5
Heavy Vehicles (%)	0%	1%	0%	0%	2%	0%	0%	0%	0%	1%	0%	0%
Bus Blockages (#/hr)	0	6	6	0	6	6	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)	61.5	61.5		71.4	71.4		25.6	25.6		25.6	25.6	
Effective Green, g (s)	62.5	62.5		72.4	72.4		26.6	26.6		26.6	26.6	
Actuated g/C Ratio	0.57	0.57		0.66	0.66		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)	346	1980		359	2212		310	387		295	388	
v/s Ratio Prot		c0.28		0.02	c0.25			0.02			0.02	
v/s Ratio Perm	0.18			0.16			0.02			c0.19		
v/c Ratio	0.31	0.50		0.27	0.38		0.08	0.10		0.77	0.07	
Uniform Delay, d1	12.5	14.3		8.2	8.5		32.3	32.4		38.8	32.2	
Progression Factor	1.00	1.00		1.32	1.36		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.3	0.9		0.3	0.4		0.1	0.1		11.4	0.1	
Delay (s)	14.8	15.2		11.2	12.1		32.4	32.5		50.3	32.2	
Level of Service	B	B		B	B		C	C		D	C	
Approach Delay (s)		15.2			12.0			32.5			45.5	
Approach LOS		B			B			C			D	

Intersection Summary

HCM 2000 Control Delay	18.7	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)	13.0	
Intersection Capacity Utilization	73.6%	ICU Level of Service	D	
Analysis Period (min)	15			

c Critical Lane Group

Queues
4: Whites Road & Kingston Road

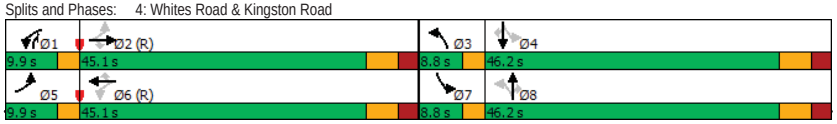
Existing PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	150	810	305	220	675	515	255	960	750	160	595	105
Future Volume (vph)	150	810	305	220	675	515	255	960	750	160	595	105
Lane Group Flow (vph)	152	818	308	222	682	520	258	970	758	162	601	106
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
Detector Phase	5	2	2	1	6	6	3	8	1	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	20.0	20.0	5.0	20.0	20.0	5.0	8.0	5.0	5.0	8.0	8.0
Minimum Split (s)	8.0	44.0	44.0	8.0	44.0	44.0	8.0	44.1	8.0	8.0	44.1	44.1
Total Split (s)	9.9	45.1	45.1	9.9	45.1	45.1	8.8	46.2	9.9	8.8	46.2	46.2
Total Split (%)	9.0%	41.0%	41.0%	9.0%	41.0%	41.0%	8.0%	42.0%	9.0%	8.0%	42.0%	42.0%
Yellow Time (s)	3.0	4.2	4.2	3.0	4.2	4.2	3.0	4.3	3.0	3.0	4.3	4.3
All-Red Time (s)	0.0	2.8	2.8	0.0	2.8	2.8	0.0	2.8	0.0	0.0	2.8	2.8
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
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
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	Max	None	None	Max	Max
v/c Ratio	0.47	0.66	0.44	0.83	0.55	0.80	0.74	0.75	0.94	0.79	0.47	0.17
Control Delay	16.2	24.5	4.1	45.5	25.1	24.5	33.9	35.1	39.5	45.2	28.3	6.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.2	24.5	4.1	45.5	25.1	24.5	33.9	35.1	39.5	45.2	28.3	6.2
Queue Length 50th (m)	11.9	86.1	3.0	22.6	44.1	34.1	34.4	99.8	117.8	20.3	54.2	1.0
Queue Length 95th (m)	19.7	55.7	8.3	m#45.3	56.4	#131.5	#57.4	125.3	#188.5	#47.3	71.2	12.6
Internal Link Dist (m)		289.8			476.9			454.6			338.0	
Turn Bay Length (m)	100.0		80.0	35.0		35.0	50.0		45.0	85.0		15.0
Base Capacity (vph)	321	1244	693	266	1244	652	351	1288	809	206	1275	611
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.47	0.66	0.44	0.83	0.55	0.80	0.74	0.75	0.94	0.79	0.47	0.17

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 110
Offset: 1.1 (1%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 105
Control Type: Actuated-Coordinated
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Whites Road & Kingston Road



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)	150	810	305	220	675	515	255	960	750	160	595	105
Future Volume (vph)	150	810	305	220	675	515	255	960	750	160	595	105
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	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.96	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)	1741	3500	1528	1727	3500	1486	1744	3535	1482	1727	3500	1505
Flt Permitted	0.28	1.00	1.00	0.20	1.00	1.00	0.33	1.00	1.00	0.14	1.00	1.00
Satd. Flow (perm)	505	3500	1528	364	3500	1486	609	3535	1482	248	3500	1505
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	152	818	308	222	682	520	258	970	758	162	601	106
RTOR Reduction (vph)	0	0	151	0	0	124	0	0	116	0	0	63
Lane Group Flow (vph)	152	818	157	222	682	396	258	970	642	162	601	43
Confl. Peds. (#/hr)	30		10	10		30	5		10	10		5
Heavy Vehicles (%)	0%	2%	0%	1%	2%	1%	0%	1%	1%	1%	2%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	6	0	0	5
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)	45.0	38.1	38.1	45.0	38.1	38.1	44.9	39.1	46.0	44.9	39.1	39.1
Effective Green, g (s)	47.0	39.1	39.1	47.0	39.1	39.1	46.9	40.1	48.0	46.9	40.1	40.1
Actuated g/C Ratio	0.43	0.36	0.36	0.43	0.36	0.36	0.43	0.36	0.44	0.43	0.36	0.36
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)	304	1244	543	253	1244	528	329	1288	646	197	1275	548
v/s Ratio Prot	0.04	0.23		0.06	0.19		0.05	0.27	c0.07	c0.05	0.17	
v/s Ratio Perm	0.18		0.10	0.31		c0.27	0.29		0.36	0.30		0.03
v/c Ratio	0.50	0.66	0.29	0.88	0.55	0.75	0.78	0.75	0.99	0.82	0.47	0.08
Uniform Delay, d1	20.6	29.8	25.5	24.9	28.4	31.1	25.5	30.6	30.9	23.0	26.8	22.9
Progression Factor	0.71	0.73	0.31	1.11	0.82	0.78	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.1	2.4	1.2	24.2	1.5	8.2	11.6	4.1	33.8	23.3	1.3	0.3
Delay (s)	15.8	24.3	9.2	51.8	24.9	32.3	37.0	34.7	64.7	46.3	28.1	23.1
Level of Service	B	C	A	D	C	C	D	C	E	D	C	C
Approach Delay (s)		19.6			31.8			46.5			30.9	
Approach LOS		B			C			D			C	

Intersection Summary

HCM 2000 Control Delay	34.1	HCM 2000 Level of Service		C	
HCM 2000 Volume to Capacity ratio	0.87				
Actuated Cycle Length (s)	110.0	Sum of lost time (s)		16.1	
Intersection Capacity Utilization	103.9%	ICU Level of Service		G	
Analysis Period (min)	15				

c Critical Lane Group

Queues
5: Highway 401 WB Off-Ramp & Kingston Road

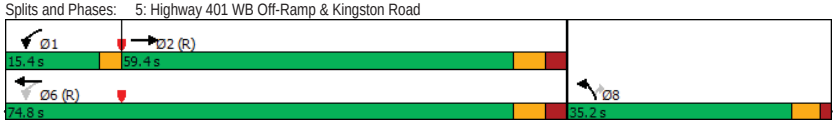
Existing PM Peak Hour

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Configurations					
Traffic Volume (vph)	1510	220	670	670	130
Future Volume (vph)	1510	220	670	670	130
Lane Group Flow (vph)	1600	232	705	705	137
Turn Type	NA	pm+pt	NA	Prot	Perm
Protected Phases	2	1	6	8	
Permitted Phases		6			8
Detector Phase	2	1	6	8	8
Switch Phase					
Minimum Initial (s)	20.0	3.5	20.0	8.0	8.0
Minimum Split (s)	51.0	8.0	51.0	32.0	32.0
Total Split (s)	59.4	15.4	74.8	35.2	35.2
Total Split (%)	54.0%	14.0%	68.0%	32.0%	32.0%
Yellow Time (s)	4.2	3.0	4.2	3.7	3.7
All-Red Time (s)	3.0	0.0	3.0	1.7	1.7
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	6.2	2.0	6.2	4.4	4.4
Lead/Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes			
Recall Mode	C-Max	None	C-Max	None	None
v/c Ratio	0.90	0.84	0.31	0.82	0.32
Control Delay	24.5	52.6	9.3	47.1	22.3
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	24.5	52.6	9.3	47.1	22.3
Queue Length 50th (m)	195.1	34.6	35.4	75.8	15.4
Queue Length 95th (m)	m#229.0	#78.6	47.2	97.1	32.1
Internal Link Dist (m)	476.9		318.1	85.1	
Turn Bay Length (m)		15.0			15.0
Base Capacity (vph)	1780	284	2265	938	468
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.90	0.82	0.31	0.75	0.29

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 110
Offset: 22 (20%), Referenced to phase 2:EBT and 6:WBTL, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Highway 401 WB Off-Ramp & Kingston Road



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)	1510	10	220	670	670	130
Future Volume (vph)	1510	10	220	670	670	130
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)	3495		1711	3500	3351	1546
Flt Permitted	1.00		0.07	1.00	0.95	1.00
Satd. Flow (perm)	3495		124	3500	3351	1546
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1589	11	232	705	705	137
RTOR Reduction (vph)	0	0	0	0	0	36
Lane Group Flow (vph)	1600	0	232	705	705	101
Heavy Vehicles (%)	2%	8%	2%	2%	1%	1%
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases			6			8
Actuated Green, G (s)	55.0		70.2	70.2	27.2	27.2
Effective Green, g (s)	56.0		71.2	71.2	28.2	28.2
Actuated g/C Ratio	0.51		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)	1779		270	2265	859	396
v/s Ratio Prot	c0.46		c0.10	0.20	c0.21	
v/s Ratio Perm			0.45			0.07
v/c Ratio	0.90		0.86	0.31	0.82	0.25
Uniform Delay, d1	24.4		32.6	8.6	38.5	32.5
Progression Factor	0.75		1.00	1.00	1.00	1.00
Incremental Delay, d2	4.8		22.8	0.4	6.3	0.3
Delay (s)	23.0		55.4	8.9	44.9	32.9
Level of Service	C		E	A	D	C
Approach Delay (s)	23.0			20.4	42.9	
Approach LOS	C			C	D	

Intersection Summary

HCM 2000 Control Delay	27.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.6
Intersection Capacity Utilization	85.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Queues
6: Whites Road & Bayly Street

Existing PM Peak Hour

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	165	360	555	255	1015	510
Future Volume (vph)	165	360	555	255	1015	510
Lane Group Flow (vph)	177	387	597	274	545	1094
Turn Type	Perm	Perm	NA	Perm	pm+pt	NA
Protected Phases			5		6	2
Permitted Phases	8	8		5	2	
Detector Phase	8	8	5	5	6	2
Switch Phase						
Minimum Initial (s)	8.0	8.0	12.0	12.0	12.0	12.0
Minimum Split (s)	28.0	28.0	32.0	32.0	21.0	21.0
Total Split (s)	29.0	29.0	33.0	33.0	38.0	71.0
Total Split (%)	29.0%	29.0%	33.0%	33.0%	38.0%	71.0%
Yellow Time (s)	4.2	4.2	4.4	4.4	4.4	4.4
All-Red Time (s)	2.4	2.4	2.6	2.6	2.6	2.6
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.6	5.6	6.0	6.0	6.0	6.0
Lead/Lag			Lead	Lead	Lag	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None	None	Max	Max	C-Max	Max
v/c Ratio	0.62	0.67	0.51	0.42	0.76	0.61
Control Delay	47.5	9.8	29.4	8.2	27.8	15.5
Queue Delay	0.0	0.0	0.0	0.0	53.1	0.0
Total Delay	47.5	9.8	29.4	8.2	80.9	15.5
Queue Length 50th (m)	34.0	0.0	50.7	5.9	46.8	54.0
Queue Length 95th (m)	52.1	24.7	75.0	28.5	m105.3	m68.5
Internal Link Dist (m)	323.4		152.5			150.1
Turn Bay Length (m)				35.0	30.0	
Base Capacity (vph)	400	655	1179	656	718	1782
Starvation Cap Reductn	0	0	0	0	256	32
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.44	0.59	0.51	0.42	1.18	0.63

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 100
Offset: 44 (44%), Referenced to phase 6:SBL, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: Whites Road & Bayly Street

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)	165	360	555	255	1015	510
Future Volume (vph)	165	360	555	255	1015	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)	5.6	5.6	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	0.98
Satd. Flow (prot)	1711	1533	3500	1493	1555	3251
Flt Permitted	0.95	1.00	1.00	1.00	0.34	0.56
Satd. Flow (perm)	1711	1533	3500	1493	557	1871
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	177	387	597	274	1091	548
RTOR Reduction (vph)	0	322	0	153	0	0
Lane Group Flow (vph)	177	65	597	121	545	1094
Confl. Peds. (#/hr)				10	10	
Heavy Vehicles (%)	2%	1%	2%	2%	2%	3%
Bus Blockages (#/hr)	0	2	0	0	0	0
Turn Type	Perm	Perm	NA	Perm	pm+pt	NA
Protected Phases			5		6	2
Permitted Phases	8	8		5	2	
Actuated Green, G (s)	15.7	15.7	32.7	32.7	70.7	70.7
Effective Green, g (s)	16.7	16.7	33.7	33.7	71.7	71.7
Actuated g/C Ratio	0.17	0.17	0.34	0.34	0.72	0.72
Clearance Time (s)	6.6	6.6	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)	285	256	1179	503	718	1783
v/s Ratio Prot			0.17		c0.24	0.20
v/s Ratio Perm	c0.10	0.04		0.08	c0.30	0.24
v/c Ratio	0.62	0.25	0.51	0.24	0.76	0.61
Uniform Delay, d1	38.7	36.2	26.5	23.9	14.5	7.1
Progression Factor	1.00	1.00	1.00	1.00	1.24	1.34
Incremental Delay, d2	4.2	0.5	1.6	1.1	4.8	1.0
Delay (s)	42.9	36.7	28.1	25.0	22.9	10.6
Level of Service	D	D	C	C	C	B
Approach Delay (s)	38.7		27.1			14.7
Approach LOS	D		C			B

Intersection Summary

HCM 2000 Control Delay	22.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.6
Intersection Capacity Utilization	72.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Queues
9: Whites Road & Highway 401 EB Off-Ramp

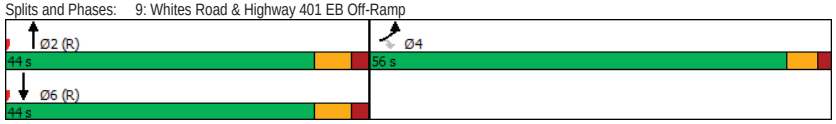
Existing PM Peak Hour

Lane Group	EBL	EBR	NBT	SBT
Lane Configurations				
Traffic Volume (vph)	1440	945	915	580
Future Volume (vph)	1440	945	915	580
Lane Group Flow (vph)	1690	769	943	598
Turn Type	Prot	Perm	NA	NA
Protected Phases	4		2	6
Permitted Phases		4		
Detector Phase	4	4	2	6
Switch Phase				
Minimum Initial (s)	8.0	8.0	20.0	20.0
Minimum Split (s)	29.0	29.0	29.0	29.0
Total Split (s)	56.0	56.0	44.0	44.0
Total Split (%)	56.0%	56.0%	44.0%	44.0%
Yellow Time (s)	3.7	3.7	4.5	4.5
All-Red Time (s)	1.8	1.8	2.2	2.2
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	4.5	4.5	5.7	5.7
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	None	None	C-Max	C-Max
v/c Ratio	0.98	0.99	0.70	0.45
Control Delay	42.8	52.0	12.9	24.3
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	42.8	52.0	12.9	24.3
Queue Length 50th (m)	165.5	144.6	30.1	47.0
Queue Length 95th (m)	#225.6	#244.3	41.4	62.7
Internal Link Dist (m)	465.0		150.1	454.6
Turn Bay Length (m)		220.0		
Base Capacity (vph)	1716	775	1340	1340
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.98	0.99	0.70	0.45

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 100
Offset: 8 (8%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 9: Whites Road & Highway 401 EB Off-Ramp



HCM Signalized Intersection Capacity Analysis
9: Whites Road & Highway 401 EB Off-Ramp

Existing PM Peak Hour

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	1440	945	0	915	580	0
Future Volume (vph)	1440	945	0	915	580	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	0.98	0.85		1.00	1.00	
Flt Protected	0.96	1.00		1.00	1.00	
Satd. Flow (prot)	3310	1379		3500	3500	
Flt Permitted	0.96	1.00		1.00	1.00	
Satd. Flow (perm)	3310	1379		3500	3500	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	1485	974	0	943	598	0
RTOR Reduction (vph)	11	65	0	0	0	0
Lane Group Flow (vph)	1679	704	0	943	598	0
Confl. Peds. (#/hr)			5			5
Heavy Vehicles (%)	1%	3%	0%	2%	2%	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)	1704	710		1340	1340	
v/s Ratio Prot	0.51			c0.27	0.17	
v/s Ratio Perm		c0.51				
v/c Ratio	0.99	0.99		0.70	0.45	
Uniform Delay, d1	23.9	24.0		26.1	23.0	
Progression Factor	1.00	1.00		0.39	1.00	
Incremental Delay, d2	18.2	31.5		2.7	1.1	
Delay (s)	42.1	55.6		12.8	24.0	
Level of Service	D	E		B	C	
Approach Delay (s)	46.3			12.8	24.0	
Approach LOS	D			B	C	

Intersection Summary

HCM 2000 Control Delay	35.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.2
Intersection Capacity Utilization	84.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Queues
1: Kingston Road & Rosebank Road

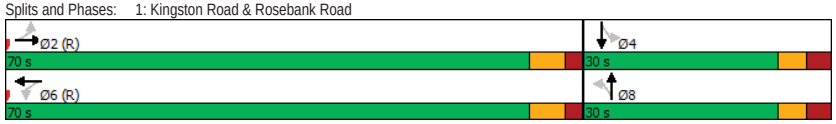
Future Background AM Peak Hour

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	75	575	5	940	5	0	90	5
Future Volume (vph)	75	575	5	940	5	0	90	5
Lane Group Flow (vph)	91	713	6	1189	6	6	110	165
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		2		6		8		4
Permitted Phases	2		6		8		4	
Detector Phase	2	2	6	6	8	8	4	4
Switch Phase								
Minimum Initial (s)	20.0	20.0	20.0	20.0	8.0	8.0	8.0	8.0
Minimum Split (s)	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0
Total Split (s)	70.0	70.0	70.0	70.0	30.0	30.0	30.0	30.0
Total Split (%)	70.0%	70.0%	70.0%	70.0%	30.0%	30.0%	30.0%	30.0%
Yellow Time (s)	4.3	4.3	4.3	4.3	3.5	3.5	3.5	3.5
All-Red Time (s)	2.3	2.3	2.3	2.3	3.1	3.1	3.1	3.1
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	None	None	None
v/c Ratio	0.32	0.29	0.01	0.47	0.04	0.01	0.54	0.52
Control Delay	9.4	5.1	4.8	6.5	33.8	0.0	48.3	22.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.4	5.1	4.8	6.5	33.8	0.0	48.3	22.1
Queue Length 50th (m)	5.2	20.5	0.3	41.4	1.1	0.0	21.2	12.2
Queue Length 95th (m)	15.3	33.3	1.6	62.8	4.1	0.0	32.1	24.9
Internal Link Dist (m)		186.4		445.7		49.9		463.8
Turn Bay Length (m)	45.0		85.0		20.0		30.0	
Base Capacity (vph)	282	2495	508	2514	230	581	335	456
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.32	0.29	0.01	0.47	0.03	0.01	0.33	0.36

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 100
Offset: 57 (57%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated

Splits and Phases: 1: Kingston Road & Rosebank Road



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)	75	575	10	5	940	35	5	0	5	90	5	130
Future Volume (vph)	75	575	10	5	940	35	5	0	5	90	5	130
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	5.6	
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	0.97	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		0.99	1.00		0.99	1.00	
Frt	1.00	1.00		1.00	0.99		1.00	0.85		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1720	3373		1745	3393		1726	1567		1732	1567	
Flt Permitted	0.21	1.00		0.37	1.00		0.52	1.00		0.75	1.00	
Satd. Flow (perm)	382	3373		687	3393		946	1567		1375	1567	
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	91	701	12	6	1146	43	6	0	6	110	6	159
RTOR Reduction (vph)	0	1	0	0	2	0	0	5	0	0	84	0
Lane Group Flow (vph)	91	712	0	6	1187	0	6	1	0	110	81	0
Confl. Peds. (#/hr)	10					10	10		5	5		10
Confl. Bikes (#/hr)			150									
Heavy Vehicles (%)	1%	4%	0%	0%	3%	9%	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	7	7	0	6	6	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)	73.0	73.0		73.0	73.0		13.8	13.8		13.8	13.8	
Effective Green, g (s)	74.0	74.0		74.0	74.0		14.8	14.8		14.8	14.8	
Actuated g/C Ratio	0.74	0.74		0.74	0.74		0.15	0.15		0.15	0.15	
Clearance Time (s)	6.6	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	3.0	
Lane Grp Cap (vph)	282	2496		508	2510		140	231		203	231	
v/s Ratio Prot		0.21			c0.35			0.00			0.05	
v/s Ratio Perm	0.24			0.01			0.01			c0.08		
v/c Ratio	0.32	0.29		0.01	0.47		0.04	0.00		0.54	0.35	
Uniform Delay, d1	4.4	4.3		3.4	5.2		36.5	36.3		39.5	38.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.0	0.3		0.0	0.6		0.1	0.0		2.9	0.9	
Delay (s)	7.5	4.6		3.5	5.8		36.7	36.3		42.4	39.2	
Level of Service	A	A		A	A		D	D		D	D	
Approach Delay (s)		4.9			5.8			36.5			40.5	
Approach LOS		A			A			D			D	

Intersection Summary

HCM 2000 Control Delay	9.8	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	71.1%	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 AM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	665	10	0	1010	5	0
Future Volume (Veh/h)	665	10	0	1010	5	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	831	13	0	1263	6	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					0.86	
vC, conflicting volume			844		1462	416
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			844		1214	416
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		96	100
cM capacity (veh/h)			801		152	592

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1
Volume Total	416	416	13	0	632	632	6
Volume Left	0	0	0	0	0	0	6
Volume Right	0	0	13	0	0	0	0
cSH	1700	1700	1700	1700	1700	1700	152
Volume to Capacity	0.24	0.24	0.01	0.00	0.37	0.37	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	29.6
Lane LOS							D
Approach Delay (s)	0.0			0.0			29.6
Approach LOS							D

Intersection Summary			
Average Delay		0.1	
Intersection Capacity Utilization		37.9%	ICU Level of Service A
Analysis Period (min)		15	

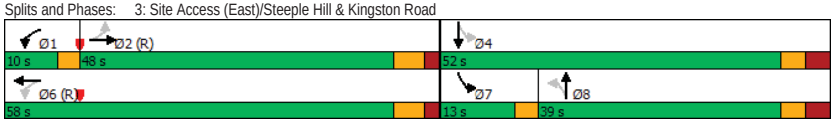
Queues
3: Site Access (East)/Steeple Hill & Kingston Road

Future Background AM Peak Hour

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	40	620	40	930	5	0	150	0
Future Volume (vph)	40	620	40	930	5	0	150	0
Lane Group Flow (vph)	48	753	48	1186	6	18	181	60
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	
Detector Phase	2	2	1	6	8	8	7	4
Switch Phase								
Minimum Initial (s)	20.0	20.0	5.0	20.0	8.0	8.0	5.0	8.0
Minimum Split (s)	28.0	28.0	8.0	28.0	38.0	38.0	8.0	38.0
Total Split (s)	48.0	48.0	10.0	58.0	39.0	39.0	13.0	52.0
Total Split (%)	43.6%	43.6%	9.1%	52.7%	35.5%	35.5%	11.8%	47.3%
Yellow Time (s)	4.2	4.2	3.0	4.2	3.3	3.3	3.0	3.3
All-Red Time (s)	2.1	2.1	0.0	2.1	3.4	3.4	0.0	3.4
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.3	5.3	2.0	5.3	5.7	5.7	2.0	5.7
Lead/Lag	Lag	Lag	Lead		Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes		Yes	Yes	Yes	
Recall Mode	C-Max	C-Max	None	C-Max	None	None	None	None
v/c Ratio	0.17	0.31	0.09	0.45	0.04	0.05	0.74	0.23
Control Delay	10.0	7.9	4.4	8.0	47.4	0.2	60.7	11.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.0	7.9	4.4	8.0	47.4	0.2	60.7	11.3
Queue Length 50th (m)	2.8	25.7	1.0	35.0	1.3	0.0	41.2	0.0
Queue Length 95th (m)	10.2	48.4	m4.8	78.0	5.1	0.0	52.5	9.0
Internal Link Dist (m)		129.3		289.8		62.3		200.4
Turn Bay Length (m)	25.0		30.0				15.0	
Base Capacity (vph)	283	2393	568	2611	529	681	244	708
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.17	0.31	0.08	0.45	0.01	0.03	0.74	0.08

Intersection Summary
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Site Access (East)/Steeple Hill & Kingston Road



HCM Signalized Intersection Capacity Analysis
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	620	5	40	930	55	5	0	15	150	0	50
Future Volume (vph)	40	620	5	40	930	55	5	0	15	150	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		2.0	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	1.00		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	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)	1653	3406		1745	3385		1745	1597		1678	1597	
Flt Permitted	0.23	1.00		0.33	1.00		0.95	1.00		0.65	1.00	
Satd. Flow (perm)	402	3406		607	3385		1749	1597		1139	1597	
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)	48	747	6	48	1120	66	6	0	18	181	0	60
RTOR Reduction (vph)	0	0	0	0	2	0	0	17	0	0	50	0
Lane Group Flow (vph)	48	753	0	48	1184	0	6	1	0	181	10	0
Confl. Peds. (#/hr)	10					10						
Confl. Bikes (#/hr)			160									
Heavy Vehicles (%)	5%	3%	20%	0%	3%	4%	0%	0%	0%	4%	0%	0%
Bus Blockages (#/hr)	0	7	7	0	6	6	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)	71.7	71.7		79.8	79.8		3.2	3.2		17.2	17.2	
Effective Green, g (s)	72.7	72.7		80.8	80.8		4.2	4.2		18.2	18.2	
Actuated g/C Ratio	0.66	0.66		0.73	0.73		0.04	0.04		0.17	0.17	
Clearance Time (s)	6.3	6.3		3.0	6.3		6.7	6.7		3.0	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)	265	2251		508	2486		66	60		247	264	
v/s Ratio Prot		0.22		0.01	c0.35			0.00		c0.08	0.01	
v/s Ratio Perm	0.12			0.06			0.00			0.04		
v/c Ratio	0.18	0.33		0.09	0.48		0.09	0.01		0.73	0.04	
Uniform Delay, d1	7.2	8.1		4.2	6.0		51.1	50.9		43.0	38.5	
Progression Factor	1.00	1.00		1.25	1.44		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.5	0.4		0.1	0.5		0.6	0.1		10.7	0.1	
Delay (s)	8.7	8.5		5.4	9.1		51.7	51.0		53.6	38.6	
Level of Service	A	A		A	A		D	D		D	D	
Approach Delay (s)		8.5			9.0			51.1			49.9	
Approach LOS		A			A			D			D	

Intersection Summary				
HCM 2000 Control Delay	13.5	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.53			
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	15.0	
Intersection Capacity Utilization	57.4%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

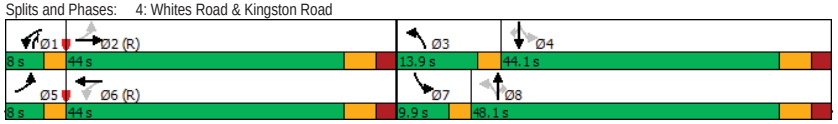
Queues
4: Whites Road & Kingston Road

Future Background AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	75	335	375	285	785	335	205	495	410	120	1055	130
Future Volume (vph)	75	335	375	285	785	335	205	495	410	120	1055	130
Lane Group Flow (vph)	78	349	391	297	818	349	214	516	427	125	1099	135
Turn Type	pm+pt	NA	Free	pm+pt	NA	Free	pm+pt	NA	pm+ov	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases	2		Free	6		Free	8		8	4		4
Detector Phase	5	2		1	6		3	8	1	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	20.0		5.0	20.0		5.0	8.0	5.0	5.0	8.0	8.0
Minimum Split (s)	8.0	44.0		8.0	44.0		8.0	44.1	8.0	8.0	44.1	44.1
Total Split (s)	8.0	44.0		8.0	44.0		13.9	48.1	8.0	9.9	44.1	44.1
Total Split (%)	7.3%	40.0%		7.3%	40.0%		12.6%	43.7%	7.3%	9.0%	40.1%	40.1%
Yellow Time (s)	3.0	4.2		3.0	4.2		3.0	4.3	3.0	3.0	4.3	4.3
All-Red Time (s)	0.0	2.8		0.0	2.8		0.0	2.8	0.0	0.0	2.8	2.8
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	2.0	6.0		2.0	6.0		2.0	6.1	2.0	2.0	6.1	6.1
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max		None	C-Max		None	Max	None	None	Max	Max
v/c Ratio	0.34	0.30	0.27	0.70	0.65	0.23	0.75	0.40	0.51	0.30	0.92	0.24
Control Delay	18.5	23.4	0.5	25.2	24.7	0.3	36.9	21.7	4.1	16.6	47.8	6.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.5	23.4	0.5	25.2	24.7	0.3	36.9	21.7	4.1	16.6	47.8	6.1
Queue Length 50th (m)	10.4	33.1	0.0	42.7	74.9	0.0	22.4	32.5	1.4	14.4	124.8	0.9
Queue Length 95th (m)	m12.2	m30.6	0.7	58.3	82.2	0.0	#57.2	60.7	15.4	25.2	#167.9	14.3
Internal Link Dist (m)		289.8			476.9			454.6			338.0	
Turn Bay Length (m)	100.0		80.0	35.0		35.0	50.0		45.0	85.0		15.0
Base Capacity (vph)	231	1174	1447	425	1260	1511	289	1298	845	412	1194	560
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.34	0.30	0.27	0.70	0.65	0.23	0.74	0.40	0.51	0.30	0.92	0.24

Intersection Summary
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 1.1 (1%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 105
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Whites Road & Kingston Road



HCM Signalized Intersection Capacity Analysis
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	335	375	285	785	335	205	495	410	120	1055	130
Future Volume (vph)	75	335	375	285	785	335	205	495	410	120	1055	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	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	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.95	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	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)	1692	3400	1447	1667	3500	1511	1800	3400	1462	1669	3433	1369
Flt Permitted	0.20	1.00	1.00	0.50	1.00	1.00	0.13	1.00	1.00	0.43	1.00	1.00
Satd. Flow (perm)	365	3400	1447	874	3500	1511	236	3400	1462	762	3433	1369
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	78	349	391	297	818	349	214	516	427	125	1099	135
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	165	0	0	84
Lane Group Flow (vph)	78	349	391	297	818	349	214	516	262	125	1099	51
Confl. Peds. (#/hr)	35		25	25		35	20		30	30		20
Confl. Bikes (#/hr)			160									
Heavy Vehicles (%)	3%	5%	2%	4%	2%	1%	2%	5%	2%	4%	4%	8%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	3	0	0	6
Turn Type	pm+pt	NA	Free	pm+pt	NA	Free	pm+pt	NA	pm+ov	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases	2		Free	6		Free	8		8	4		4
Actuated Green, G (s)	41.0	37.0	110.0	43.0	38.0	110.0	50.9	41.0	46.0	44.2	37.3	37.3
Effective Green, g (s)	43.0	38.0	110.0	45.0	39.0	110.0	51.9	42.0	48.0	46.2	38.3	38.3
Actuated g/C Ratio	0.39	0.35	1.00	0.41	0.35	1.00	0.47	0.38	0.44	0.42	0.35	0.35
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)	203	1174	1447	400	1240	1511	276	1298	637	385	1195	476
v/s Ratio Prot	0.02	0.10		c0.04	c0.23		c0.08	0.15	0.02	0.02	c0.32	
v/s Ratio Perm	0.13		0.27	0.26		0.23	0.28		0.16	0.11		0.04
v/c Ratio	0.38	0.30	0.27	0.74	0.66	0.23	0.78	0.40	0.41	0.32	0.92	0.11
Uniform Delay, d1	22.6	26.3	0.0	26.5	29.9	0.0	17.4	24.8	21.3	20.0	34.4	24.3
Progression Factor	0.85	0.86	1.00	0.71	0.74	1.00	1.17	0.83	0.39	1.00	1.00	1.00
Incremental Delay, d2	1.1	0.6	0.4	6.5	2.5	0.3	11.5	0.8	0.4	0.5	12.7	0.5
Delay (s)	20.3	23.2	0.4	25.4	24.6	0.3	31.8	21.5	8.6	20.5	47.1	24.7
Level of Service	C	C	A	C	C	A	C	C	A	C	D	C
Approach Delay (s)		12.1			19.0			18.7			42.5	
Approach LOS		B			B			B			D	

Intersection Summary				
HCM 2000 Control Delay	24.4	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.78			
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.1	
Intersection Capacity Utilization	104.7%	ICU Level of Service	G	
Analysis Period (min)	15			
c Critical Lane Group				

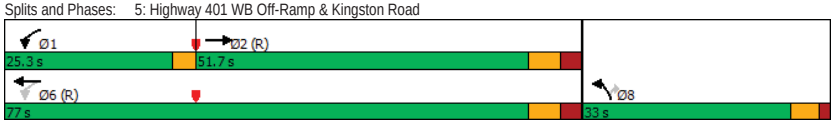
Queues
5: Highway 401 WB Off-Ramp & Kingston Road

Future Background AM Peak Hour

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Configurations					
Traffic Volume (vph)	760	500	870	515	65
Future Volume (vph)	760	500	870	515	65
Lane Group Flow (vph)	825	532	926	548	69
Turn Type	NA	pm+pt	NA	Prot	Perm
Protected Phases	2	1	6	8	
Permitted Phases		6			8
Detector Phase	2	1	6	8	8
Switch Phase					
Minimum Initial (s)	20.0	3.5	20.0	8.0	8.0
Minimum Split (s)	51.0	8.0	51.0	32.0	32.0
Total Split (s)	51.7	25.3	77.0	33.0	33.0
Total Split (%)	47.0%	23.0%	70.0%	30.0%	30.0%
Yellow Time (s)	4.2	3.0	4.2	3.7	3.7
All-Red Time (s)	3.0	0.0	3.0	1.7	1.7
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	6.2	2.0	6.2	4.4	4.4
Lead/Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes			
Recall Mode	C-Max	None	C-Max	None	None
v/c Ratio	0.54	0.88	0.39	0.76	0.19
Control Delay	17.2	32.0	8.4	47.1	21.6
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	17.2	32.0	8.4	47.1	21.6
Queue Length 50th (m)	50.3	58.3	42.7	59.9	6.9
Queue Length 95th (m)	65.5	#134.2	61.9	75.4	18.1
Internal Link Dist (m)	476.9		318.1	85.1	
Turn Bay Length (m)		15.0			15.0
Base Capacity (vph)	1517	611	2374	862	417
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.54	0.87	0.39	0.64	0.17

Intersection Summary
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 3.3 (3%), Referenced to phase 2:EBT and 6:WBTL, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Highway 401 WB Off-Ramp & Kingston Road



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)	760	15	500	870	515	65
Future Volume (vph)	760	15	500	870	515	65
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
Frpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00	1.00	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)	3416		1728	3466	3319	1516
Flt Permitted	1.00		0.24	1.00	0.95	1.00
Satd. Flow (perm)	3416		434	3466	3319	1516
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	809	16	532	926	548	69
RTOR Reduction (vph)	1	0	0	0	0	24
Lane Group Flow (vph)	824	0	532	926	548	45
Confl. Bikes (#/hr)		150				
Heavy Vehicles (%)	4%	0%	1%	3%	2%	3%
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases			6			8
Actuated Green, G (s)	47.9		74.4	74.4	23.0	23.0
Effective Green, g (s)	48.9		75.4	75.4	24.0	24.0
Actuated g/C Ratio	0.44		0.69	0.69	0.22	0.22
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)	1518		585	2375	724	330
v/s Ratio Prot	c0.24		c0.20	0.27	c0.17	
v/s Ratio Perm			0.42			0.03
v/c Ratio	0.54		0.91	0.39	0.76	0.14
Uniform Delay, d1	22.4		17.3	7.4	40.3	34.6
Progression Factor	0.68		1.00	1.00	1.00	1.00
Incremental Delay, d2	1.3		18.0	0.5	4.5	0.2
Delay (s)	16.5		35.3	7.9	44.8	34.8
Level of Service	B		D	A	D	C
Approach Delay (s)	16.5			17.9	43.7	
Approach LOS	B			B	D	

Intersection Summary				
HCM 2000 Control Delay	23.0	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.68			
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.6	
Intersection Capacity Utilization	76.0%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

Queues
6: Whites Road & Bayly Street

Future Background AM Peak Hour

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	255	360	650	125	540	515
Future Volume (vph)	255	360	650	125	540	515
Lane Group Flow (vph)	271	383	691	133	298	824
Turn Type	Perm	Perm	NA	Perm	pm+pt	NA
Protected Phases			5		6	2
Permitted Phases	8	8		5	2	
Detector Phase	8	8	5	5	6	2
Switch Phase						
Minimum Initial (s)	8.0	8.0	12.0	12.0	12.0	12.0
Minimum Split (s)	28.0	28.0	32.0	32.0	21.0	21.0
Total Split (s)	29.0	29.0	33.0	33.0	38.0	71.0
Total Split (%)	29.0%	29.0%	33.0%	33.0%	38.0%	71.0%
Yellow Time (s)	4.2	4.2	4.4	4.4	4.4	4.4
All-Red Time (s)	2.4	2.4	2.6	2.6	2.6	2.6
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.6	5.6	6.0	6.0	6.0	6.0
Lead/Lag			Lead	Lead	Lag	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None	None	Max	Max	C-Max	Max
v/c Ratio	0.78	0.62	0.68	0.26	0.46	0.48
Control Delay	53.0	8.4	35.7	11.2	17.7	11.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	53.0	8.4	35.7	11.2	17.7	11.3
Queue Length 50th (m)	51.6	0.0	66.5	5.4	24.8	36.9
Queue Length 95th (m)	79.4	24.4	89.5	20.4	40.8	50.5
Internal Link Dist (m)	323.4		152.5			150.1
Turn Bay Length (m)				35.0	30.0	
Base Capacity (vph)	397	648	1015	515	651	1720
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.68	0.59	0.68	0.26	0.46	0.48

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 16 (16%), Referenced to phase 6:SBL, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated

Splits and Phases: 6: Whites Road & Bayly Street

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)	255	360	650	125	540	515
Future Volume (vph)	255	360	650	125	540	515
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)	5.6	5.6	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	0.97	1.00	1.00
Flpb, ped/bikes	0.99	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	0.98
Satd. Flow (prot)	1698	1518	3400	1499	1555	3294
Flt Permitted	0.95	1.00	1.00	1.00	0.26	0.55
Satd. Flow (perm)	1698	1518	3400	1499	428	1855
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	271	383	691	133	574	548
RTOR Reduction (vph)	0	304	0	68	0	0
Lane Group Flow (vph)	271	79	691	65	298	824
Confl. Peds. (#/hr)	5			15	15	
Heavy Vehicles (%)	2%	2%	5%	1%	2%	2%
Bus Blockages (#/hr)	0	2	0	0	0	0
Turn Type	Perm	Perm	NA	Perm	pm+pt	NA
Protected Phases			5		6	2
Permitted Phases	8	8		5	2	
Actuated Green, G (s)	19.5	19.5	28.9	28.9	66.9	66.9
Effective Green, g (s)	20.5	20.5	29.9	29.9	67.9	67.9
Actuated g/C Ratio	0.20	0.20	0.30	0.30	0.68	0.68
Clearance Time (s)	6.6	6.6	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)	348	311	1016	448	651	1720
v/s Ratio Prot			c0.20		0.15	c0.15
v/s Ratio Perm	c0.16	0.05		0.04	0.16	0.17
v/c Ratio	0.78	0.25	0.68	0.15	0.46	0.48
Uniform Delay, d1	37.6	33.3	30.8	25.7	15.3	7.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	10.5	0.4	3.7	0.7	2.3	1.0
Delay (s)	48.1	33.8	34.5	26.4	17.7	8.6
Level of Service	D	C	C	C	B	A
Approach Delay (s)	39.7		33.2			11.0
Approach LOS	D		C			B

Intersection Summary				
HCM 2000 Control Delay	25.3	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.64			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.6	
Intersection Capacity Utilization	68.7%	ICU Level of Service	C	
Analysis Period (min)	15			

c Critical Lane Group

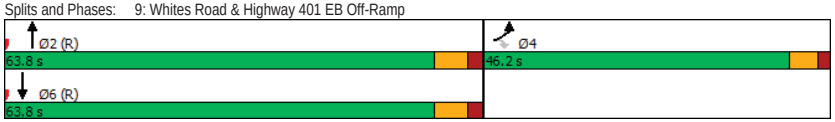
Queues
9: Whites Road & Highway 401 EB Off-Ramp

Future Background AM Peak Hour

Lane Group	EBL	EBR	NBT	SBT
Lane Configurations				
Traffic Volume (vph)	595	445	1010	610
Future Volume (vph)	595	445	1010	610
Lane Group Flow (vph)	620	464	1052	635
Turn Type	Prot	Perm	NA	NA
Protected Phases	4		2	6
Permitted Phases		4		
Detector Phase	4	4	2	6
Switch Phase				
Minimum Initial (s)	8.0	8.0	20.0	20.0
Minimum Split (s)	29.0	29.0	29.0	29.0
Total Split (s)	46.2	46.2	63.8	63.8
Total Split (%)	42.0%	42.0%	58.0%	58.0%
Yellow Time (s)	3.7	3.7	4.5	4.5
All-Red Time (s)	1.8	1.8	2.2	2.2
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	4.5	4.5	5.7	5.7
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	None	None	C-Max	C-Max
v/c Ratio	0.73	0.47	0.47	0.28
Control Delay	42.2	8.0	11.4	10.8
Queue Delay	0.0	0.0	0.5	0.0
Total Delay	42.2	8.0	11.8	10.8
Queue Length 50th (m)	66.3	8.4	57.5	31.5
Queue Length 95th (m)	78.7	20.8	88.2	m41.7
Internal Link Dist (m)	465.0		150.1	454.6
Turn Bay Length (m)		220.0		
Base Capacity (vph)	1245	1256	2227	2248
Starvation Cap Reductn	0	0	658	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.50	0.37	0.67	0.28

Intersection Summary
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 60 (55%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 9: Whites Road & Highway 401 EB Off-Ramp



HCM Signalized Intersection Capacity Analysis
9: Whites Road & Highway 401 EB Off-Ramp

Future Background AM Peak Hour

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	595	445	0	1010	610	0
Future Volume (vph)	595	445	0	1010	610	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)	3286	2694		3433	3466	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	3286	2694		3433	3466	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	620	464	0	1052	635	0
RTOR Reduction (vph)	0	281	0	0	0	0
Lane Group Flow (vph)	620	183	0	1052	635	0
Confl. Peds. (#/hr)			10			10
Heavy Vehicles (%)	3%	2%	0%	4%	3%	0%
Turn Type	Prot	Perm		NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4				
Actuated Green, G (s)	27.4	27.4		70.4	70.4	
Effective Green, g (s)	28.4	28.4		71.4	71.4	
Actuated g/C Ratio	0.26	0.26		0.65	0.65	
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)	848	695		2228	2249	
v/s Ratio Prot	c0.19			c0.31	0.18	
v/s Ratio Perm		0.07				
v/c Ratio	0.73	0.26		0.47	0.28	
Uniform Delay, d1	37.3	32.5		9.8	8.3	
Progression Factor	1.00	1.00		1.00	1.18	
Incremental Delay, d2	3.3	0.2		0.7	0.2	
Delay (s)	40.6	32.7		10.5	9.9	
Level of Service	D	C		B	A	
Approach Delay (s)	37.2			10.5	9.9	
Approach LOS	D			B	A	

Intersection Summary				
HCM 2000 Control Delay	20.8	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.55			
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	10.2	
Intersection Capacity Utilization	53.4%	ICU Level of Service	A	
Analysis Period (min)	15			
c Critical Lane Group				

Queues
1: Kingston Road & Rosebank Road

Future Background PM Peak Hour

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	120	1060	760	5	0	50	5
Future Volume (vph)	120	1060	760	5	0	50	5
Lane Group Flow (vph)	124	1093	846	5	10	52	72
Turn Type	Perm	NA	NA	Perm	NA	Perm	NA
Protected Phases		2	6		8		4
Permitted Phases	2			8		4	
Detector Phase	2	2	6	8	8	4	4
Switch Phase							
Minimum Initial (s)	20.0	20.0	20.0	8.0	8.0	8.0	8.0
Minimum Split (s)	28.0	28.0	28.0	28.0	28.0	28.0	28.0
Total Split (s)	70.0	70.0	70.0	30.0	30.0	30.0	30.0
Total Split (%)	70.0%	70.0%	70.0%	30.0%	30.0%	30.0%	30.0%
Yellow Time (s)	4.3	4.3	4.3	3.5	3.5	3.5	3.5
All-Red Time (s)	2.3	2.3	2.3	3.1	3.1	3.1	3.1
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.6	5.6	5.6	5.6	5.6	5.6	5.6
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	C-Max	C-Max	C-Max	None	None	None	None
v/c Ratio	0.26	0.39	0.31	0.03	0.03	0.31	0.29
Control Delay	6.0	4.7	4.1	35.0	0.2	42.7	13.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.0	4.7	4.1	35.0	0.2	42.7	13.2
Queue Length 50th (m)	5.4	28.6	19.8	1.0	0.0	10.1	1.0
Queue Length 95th (m)	19.7	64.1	45.4	3.9	0.0	19.3	12.3
Internal Link Dist (m)		186.4	445.7		49.9		463.8
Turn Bay Length (m)	45.0			20.0		30.0	
Base Capacity (vph)	479	2808	2748	316	467	334	427
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.26	0.39	0.31	0.02	0.02	0.16	0.17

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 83 (83%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Splits and Phases: 1: Kingston Road & Rosebank Road

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)	120	1060	0	0	760	60	5	0	10	50	5	65
Future Volume (vph)	120	1060	0	0	760	60	5	0	10	50	5	65
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			0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00			1.00		1.00	0.98		1.00	0.98	
Flpb, ped/bikes	0.99	1.00			1.00		0.99	1.00		0.99	1.00	
Frt	1.00	1.00			0.99		1.00	0.85		1.00	0.86	
Flt Protected	0.95	1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1730	3492			3413		1734	1567		1733	1545	
Flt Permitted	0.33	1.00			1.00		0.71	1.00		0.75	1.00	
Satd. Flow (perm)	595	3492			3413		1296	1567		1370	1545	
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)	124	1093	0	0	784	62	5	0	10	52	5	67
RTOR Reduction (vph)	0	0	0	0	4	0	0	9	0	0	60	0
Lane Group Flow (vph)	124	1093	0	0	842	0	5	1	0	52	12	0
Confl. Peds. (#/hr)	10		5	5		10	5		5	5		5
Heavy Vehicles (%)	0%	1%	0%	0%	2%	0%	0%	0%	0%	0%	0%	3%
Bus Blockages (#/hr)	0	6	6	0	6	6	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)	77.0	77.0			77.0		9.8	9.8		9.8	9.8	
Effective Green, g (s)	78.0	78.0			78.0		10.8	10.8		10.8	10.8	
Actuated g/C Ratio	0.78	0.78			0.78		0.11	0.11		0.11	0.11	
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)	464	2723			2662		139	169		147	166	
v/s Ratio Prot		c0.31			0.25			0.00			0.01	
v/s Ratio Perm	0.21						0.00			c0.04		
v/c Ratio	0.27	0.40			0.32		0.04	0.01		0.35	0.07	
Uniform Delay, d1	3.1	3.5			3.2		39.9	39.8		41.4	40.1	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.4	0.4			0.3		0.1	0.0		1.5	0.2	
Delay (s)	4.5	4.0			3.5		40.0	39.8		42.8	40.3	
Level of Service	A	A			A		D	D		D	D	
Approach Delay (s)		4.0			3.5			39.9			41.4	
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	0.40			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	11.2	
Intersection Capacity Utilization	70.6%	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)	1130	15	10	835	5	5
Future Volume (Veh/h)	1130	15	10	835	5	5
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	1153	15	10	852	5	5
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					0.91	
vC, conflicting volume			1168		1599	576
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1168		1458	576
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		95	99
cM capacity (veh/h)			605		110	465

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1
Volume Total	576	576	15	10	426	426	10
Volume Left	0	0	0	10	0	0	5
Volume Right	0	0	15	0	0	0	5
cSH	1700	1700	1700	605	1700	1700	177
Volume to Capacity	0.34	0.34	0.01	0.02	0.25	0.25	0.06
Queue Length 95th (m)	0.0	0.0	0.0	0.4	0.0	0.0	1.4
Control Delay (s)	0.0	0.0	0.0	11.0	0.0	0.0	26.5
Lane LOS				B			D
Approach Delay (s)	0.0			0.1			26.5
Approach LOS							D

Intersection Summary				
Average Delay	0.2			
Intersection Capacity Utilization	41.2%	ICU Level of Service		A
Analysis Period (min)	15			

Queues
3: Site Access (East)/Steeple Hill & Kingston Road

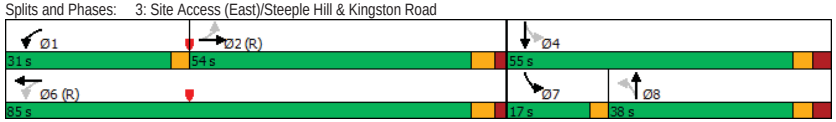
Future Background PM Peak Hour

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	105	1015	95	740	25	15	220	10
Future Volume (vph)	105	1015	95	740	25	15	220	10
Lane Group Flow (vph)	108	1061	98	897	26	118	227	82
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	
Detector Phase	2	2	1	6	8	8	7	4
Switch Phase								
Minimum Initial (s)	20.0	20.0	5.0	20.0	8.0	8.0	5.0	8.0
Minimum Split (s)	28.0	28.0	8.0	28.0	38.0	38.0	8.0	38.0
Total Split (s)	54.0	54.0	31.0	85.0	38.0	38.0	17.0	55.0
Total Split (%)	38.6%	38.6%	22.1%	60.7%	27.1%	27.1%	12.1%	39.3%
Yellow Time (s)	4.2	4.2	3.0	4.2	3.3	3.3	3.0	3.3
All-Red Time (s)	2.1	2.1	0.0	2.1	3.4	3.4	0.0	3.4
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.3	5.3	2.0	5.3	5.7	5.7	2.0	5.7
Lead/Lag	Lag	Lag	Lead		Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes		Yes	Yes	Yes	
Recall Mode	C-Max	C-Max	None	C-Max	None	None	None	None
v/c Ratio	0.30	0.49	0.27	0.38	0.20	0.47	0.75	0.20
Control Delay	18.5	17.2	7.7	6.7	57.6	18.7	61.0	11.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.5	17.2	7.7	6.7	57.6	18.7	61.0	11.2
Queue Length 50th (m)	12.3	74.3	5.7	30.0	7.4	4.2	60.5	2.4
Queue Length 95th (m)	38.9	147.6	m15.1	55.1	14.8	20.4	70.4	13.8
Internal Link Dist (m)		129.3		289.8		62.3		200.4
Turn Bay Length (m)	25.0		30.0				15.0	
Base Capacity (vph)	357	2163	557	2362	296	447	301	611
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.30	0.49	0.18	0.38	0.09	0.26	0.75	0.13

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Site Access (East)/Steeple Hill & Kingston Road



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)	105	1015	15	95	740	130	25	15	100	220	10	70
Future Volume (vph)	105	1015	15	95	740	130	25	15	100	220	10	70
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		2.0	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	0.99		1.00	0.98		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	0.98		1.00	0.87		1.00	0.87	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1727	3485		1745	3363		1734	1597		1720	1605	
Flt Permitted	0.32	1.00		0.21	1.00		0.70	1.00		0.46	1.00	
Satd. Flow (perm)	577	3485		380	3363		1285	1597		837	1605	
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)	108	1046	15	98	763	134	26	15	103	227	10	72
RTOR Reduction (vph)	0	0	0	0	7	0	0	93	0	0	56	0
Lane Group Flow (vph)	108	1061	0	98	890	0	26	25	0	227	26	0
Confl. Peds. (#/hr)	10					10	5		10	10		5
Heavy Vehicles (%)	0%	1%	0%	0%	2%	0%	0%	0%	0%	1%	0%	0%
Bus Blockages (#/hr)	0	6	6	0	6	6	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)	85.8	85.8		97.0	97.0		13.0	13.0		30.0	30.0	
Effective Green, g (s)	86.8	86.8		98.0	98.0		14.0	14.0		31.0	31.0	
Actuated g/C Ratio	0.62	0.62		0.70	0.70		0.10	0.10		0.22	0.22	
Clearance Time (s)	6.3	6.3		3.0	6.3		6.7	6.7		3.0	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)	357	2160		355	2354		128	159		279	355	
v/s Ratio Prot		c0.30		0.02	c0.26			0.02		c0.09	0.02	
v/s Ratio Perm	0.19			0.17			0.02			0.09		
v/c Ratio	0.30	0.49		0.28	0.38		0.20	0.16		0.81	0.07	
Uniform Delay, d1	12.4	14.5		8.6	8.6		57.9	57.6		49.5	43.1	
Progression Factor	1.00	1.00		0.87	0.67		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.2	0.8		0.4	0.4		0.8	0.5		16.4	0.1	
Delay (s)	14.6	15.3		7.8	6.1		58.7	58.1		65.9	43.2	
Level of Service	B	B		A	A		E	E		E	D	
Approach Delay (s)		15.3			6.3			58.2			59.9	
Approach LOS		B			A			E			E	

Intersection Summary

HCM 2000 Control Delay	19.5	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.51			
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	15.0	
Intersection Capacity Utilization	74.9%	ICU Level of Service	D	
Analysis Period (min)	15			

c Critical Lane Group

Queues
4: Whites Road & Kingston Road

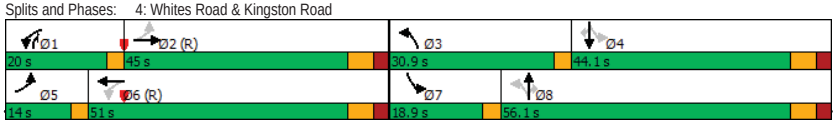
Future Background PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	150	855	330	225	710	515	270	1010	775	160	625	105
Future Volume (vph)	150	855	330	225	710	515	270	1010	775	160	625	105
Lane Group Flow (vph)	152	864	333	227	717	520	273	1020	783	162	631	106
Turn Type	pm+pt	NA	Free	pm+pt	NA	Free	pm+pt	NA	pm+ov	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases	2		Free	6		Free	8		8	4		4
Detector Phase	5	2		1	6		3	8	1	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	20.0		5.0	20.0		5.0	8.0	5.0	5.0	8.0	8.0
Minimum Split (s)	8.0	44.0		8.0	44.0		8.0	44.1	8.0	8.0	44.1	44.1
Total Split (s)	14.0	45.0		20.0	51.0		30.9	56.1	20.0	18.9	44.1	44.1
Total Split (%)	10.0%	32.1%		14.3%	36.4%		22.1%	40.1%	14.3%	13.5%	31.5%	31.5%
Yellow Time (s)	3.0	4.2		3.0	4.2		3.0	4.3	3.0	3.0	4.3	4.3
All-Red Time (s)	0.0	2.8		0.0	2.8		0.0	2.8	0.0	0.0	2.8	2.8
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	2.0	6.0		2.0	6.0		2.0	6.1	2.0	2.0	6.1	6.1
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max		None	C-Max		None	Max	None	None	Max	Max
v/c Ratio	0.53	0.87	0.22	0.85	0.63	0.34	0.63	0.75	0.87	0.64	0.53	0.18
Control Delay	27.5	51.6	0.3	53.1	28.5	0.5	26.2	42.3	30.5	32.9	39.8	4.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.5	51.6	0.3	53.1	28.5	0.5	26.2	42.3	30.5	32.9	39.8	4.4
Queue Length 50th (m)	17.3	130.7	0.0	39.4	86.8	0.0	43.9	135.0	136.5	24.2	77.4	0.0
Queue Length 95th (m)	m31.8	#142.8	0.0	m#82.0	102.3	0.0	63.7	168.9	#253.2	43.6	104.2	10.2
Internal Link Dist (m)		289.8			476.9			454.6			338.0	
Turn Bay Length (m)	100.0		80.0	35.0		35.0	50.0		45.0	85.0		15.0
Base Capacity (vph)	292	996	1538	277	1136	1514	518	1351	908	298	1195	595
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.52	0.87	0.22	0.82	0.63	0.34	0.53	0.75	0.86	0.54	0.53	0.18

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 105
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Whites Road & Kingston Road



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)	150	855	330	225	710	515	270	1010	775	160	625	105
Future Volume (vph)	150	855	330	225	710	515	270	1010	775	160	625	105
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	0.95	1.00	1.00	0.95	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)	1741	3500	1538	1727	3500	1514	1744	3535	1482	1727	3500	1503
Flt Permitted	0.25	1.00	1.00	0.10	1.00	1.00	0.27	1.00	1.00	0.13	1.00	1.00
Satd. Flow (perm)	458	3500	1538	174	3500	1514	502	3535	1482	244	3500	1503
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	152	864	333	227	717	520	273	1020	783	162	631	106
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	116	0	0	70
Lane Group Flow (vph)	152	864	333	227	717	520	273	1020	667	162	631	36
Confl. Peds. (#/hr)	30		10	10		30	5		10	10		5
Heavy Vehicles (%)	0%	2%	0%	1%	2%	1%	0%	1%	1%	1%	2%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	6	0	0	5
Turn Type	pm+pt	NA	Free	pm+pt	NA	Free	pm+pt	NA	pm+ov	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases	2		Free	6		Free	8		8	4		4
Actuated Green, G (s)	49.5	38.9	140.0	58.0	44.4	140.0	67.9	52.5	68.6	59.2	46.8	46.8
Effective Green, g (s)	51.5	39.9	140.0	59.0	45.4	140.0	68.9	53.5	70.6	61.2	47.8	47.8
Actuated g/C Ratio	0.37	0.28	1.00	0.42	0.32	1.00	0.49	0.38	0.50	0.44	0.34	0.34
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)	274	997	1538	263	1135	1514	416	1350	747	248	1195	513
v/s Ratio Prot	0.05	c0.25		0.11	0.20		c0.09	0.29	c0.11	0.06	0.18	
v/s Ratio Perm	0.16		0.22	0.26		0.34	0.23		0.34	0.22		0.02
v/c Ratio	0.55	0.87	0.22	0.86	0.63	0.34	0.66	0.76	0.89	0.65	0.53	0.07
Uniform Delay, d1	31.5	47.5	0.0	38.5	40.2	0.0	23.0	37.6	31.3	27.7	37.0	31.1
Progression Factor	0.90	0.89	1.00	0.83	0.65	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.1	8.9	0.3	21.2	2.3	0.5	3.7	4.0	13.0	6.1	1.7	0.3
Delay (s)	30.4	51.0	0.3	53.2	28.2	0.5	26.7	41.5	44.2	33.8	38.7	31.4
Level of Service	C	D	A	D	C	A	C	D	D	C	D	C
Approach Delay (s)		36.1			22.3			40.6			37.0	
Approach LOS		D			C			D			D	

Intersection Summary

HCM 2000 Control Delay	34.4	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.86			
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.1	
Intersection Capacity Utilization	105.0%	ICU Level of Service	G	
Analysis Period (min)	15			

c Critical Lane Group

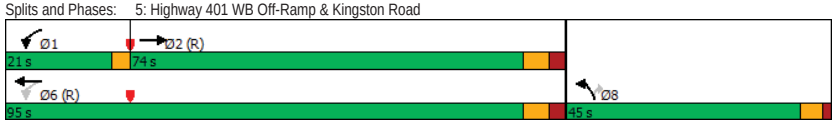
Queues
5: Highway 401 WB Off-Ramp & Kingston Road

Future Background PM Peak Hour

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Configurations					
Traffic Volume (vph)	1580	230	675	710	135
Future Volume (vph)	1580	230	675	710	135
Lane Group Flow (vph)	1674	242	711	747	142
Turn Type	NA	pm+pt	NA	Prot	Perm
Protected Phases	2	1	6	8	
Permitted Phases		6			8
Detector Phase	2	1	6	8	8
Switch Phase					
Minimum Initial (s)	20.0	3.5	20.0	8.0	8.0
Minimum Split (s)	51.0	8.0	51.0	32.0	32.0
Total Split (s)	74.0	21.0	95.0	45.0	45.0
Total Split (%)	52.9%	15.0%	67.9%	32.1%	32.1%
Yellow Time (s)	4.2	3.0	4.2	3.7	3.7
All-Red Time (s)	3.0	0.0	3.0	1.7	1.7
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	6.2	2.0	6.2	4.4	4.4
Lead/Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes			
Recall Mode	C-Max	None	C-Max	None	None
v/c Ratio	0.93	0.87	0.31	0.85	0.33
Control Delay	27.3	67.4	10.9	58.8	31.4
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	27.3	67.4	10.9	58.8	31.4
Queue Length 50th (m)	140.6	51.8	44.4	105.7	23.9
Queue Length 95th (m)	#302.0	#101.4	58.4	127.2	42.6
Internal Link Dist (m)	476.9		318.1	85.1	
Turn Bay Length (m)		15.0			15.0
Base Capacity (vph)	1803	292	2316	971	475
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.93	0.83	0.31	0.77	0.30

Intersection Summary
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBTL, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Highway 401 WB Off-Ramp & Kingston Road



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)	1580	10	230	675	710	135
Future Volume (vph)	1580	10	230	675	710	135
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)	3495		1711	3500	3351	1546
Flt Permitted	1.00		0.05	1.00	0.95	1.00
Satd. Flow (perm)	3495		97	3500	3351	1546
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1663	11	242	711	747	142
RTOR Reduction (vph)	0	0	0	0	0	28
Lane Group Flow (vph)	1674	0	242	711	747	114
Heavy Vehicles (%)	2%	8%	2%	2%	1%	1%
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases			6			8
Actuated Green, G (s)	71.2		91.6	91.6	35.8	35.8
Effective Green, g (s)	72.2		92.6	92.6	36.8	36.8
Actuated g/C Ratio	0.52		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)	1802		276	2315	880	406
v/s Ratio Prot	c0.48		c0.12	0.20	c0.22	
v/s Ratio Perm			0.46			0.07
v/c Ratio	0.93		0.88	0.31	0.85	0.28
Uniform Delay, d1	31.5		46.3	10.1	49.0	41.1
Progression Factor	0.63		1.00	1.00	1.00	1.00
Incremental Delay, d2	5.7		25.3	0.3	7.7	0.4
Delay (s)	25.7		71.5	10.4	56.6	41.4
Level of Service	C		E	B	E	D
Approach Delay (s)	25.7			25.9	54.2	
Approach LOS	C			C	D	

Intersection Summary			
HCM 2000 Control Delay	33.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.6
Intersection Capacity Utilization	89.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Queues
6: Whites Road & Bayly Street

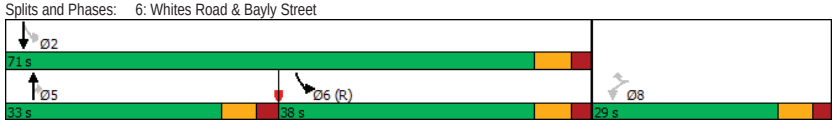
Future Background PM Peak Hour

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	165	360	585	255	1015	535
Future Volume (vph)	165	360	585	255	1015	535
Lane Group Flow (vph)	177	387	629	274	545	1121
Turn Type	Perm	Perm	NA	Perm	pm+pt	NA
Protected Phases			5		6	2
Permitted Phases	8	8		5	2	
Detector Phase	8	8	5	5	6	2
Switch Phase						
Minimum Initial (s)	8.0	8.0	12.0	12.0	12.0	12.0
Minimum Split (s)	28.0	28.0	32.0	32.0	21.0	21.0
Total Split (s)	29.0	29.0	33.0	33.0	38.0	71.0
Total Split (%)	29.0%	29.0%	33.0%	33.0%	38.0%	71.0%
Yellow Time (s)	4.2	4.2	4.4	4.4	4.4	4.4
All-Red Time (s)	2.4	2.4	2.6	2.6	2.6	2.6
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.6	5.6	6.0	6.0	6.0	6.0
Lead/Lag			Lead	Lead	Lag	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None	None	Max	Max	C-Max	Max
v/c Ratio	0.62	0.67	0.53	0.42	0.77	0.63
Control Delay	47.5	9.8	29.8	9.1	22.8	10.3
Queue Delay	0.0	0.0	0.0	0.0	52.6	0.0
Total Delay	47.5	9.8	29.8	9.1	75.5	10.3
Queue Length 50th (m)	34.0	0.0	54.0	7.6	45.3	28.4
Queue Length 95th (m)	52.1	24.7	79.5	31.0	#78.6	54.1
Internal Link Dist (m)	323.4		152.5			150.1
Turn Bay Length (m)				35.0	30.0	
Base Capacity (vph)	400	655	1179	648	705	1773
Starvation Cap Reductn	0	0	0	0	230	14
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.44	0.59	0.53	0.42	1.15	0.64

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 100
Offset: 44 (44%), Referenced to phase 6:SBL, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: Whites Road & Bayly Street



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)	165	360	585	255	1015	535
Future Volume (vph)	165	360	585	255	1015	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)	5.6	5.6	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	0.98
Satd. Flow (prot)	1711	1533	3500	1493	1555	3253
Flt Permitted	0.95	1.00	1.00	1.00	0.32	0.55
Satd. Flow (perm)	1711	1533	3500	1493	524	1845
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	177	387	629	274	1091	575
RTOR Reduction (vph)	0	322	0	145	0	0
Lane Group Flow (vph)	177	65	629	129	545	1121
Confl. Peds. (#/hr)				10	10	
Heavy Vehicles (%)	2%	1%	2%	2%	2%	3%
Bus Blockages (#/hr)	0	2	0	0	0	0
Turn Type	Perm	Perm	NA	Perm	pm+pt	NA
Protected Phases			5		6	2
Permitted Phases	8	8		5	2	
Actuated Green, G (s)	15.7	15.7	32.7	32.7	70.7	70.7
Effective Green, g (s)	16.7	16.7	33.7	33.7	71.7	71.7
Actuated g/C Ratio	0.17	0.17	0.34	0.34	0.72	0.72
Clearance Time (s)	6.6	6.6	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)	285	256	1179	503	705	1773
v/s Ratio Prot			0.18		c0.25	0.20
v/s Ratio Perm	c0.10	0.04		0.09	c0.31	0.25
v/c Ratio	0.62	0.25	0.53	0.26	0.77	0.63
Uniform Delay, d1	38.7	36.2	26.8	24.1	15.2	7.3
Progression Factor	1.00	1.00	1.00	1.00	0.81	0.78
Incremental Delay, d2	4.2	0.5	1.7	1.2	6.9	1.5
Delay (s)	42.9	36.7	28.5	25.3	19.1	7.2
Level of Service	D	D	C	C	B	A
Approach Delay (s)	38.7		27.5			11.1
Approach LOS	D		C			B

Intersection Summary

HCM 2000 Control Delay	20.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.6
Intersection Capacity Utilization	73.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Queues
9: Whites Road & Highway 401 EB Off-Ramp

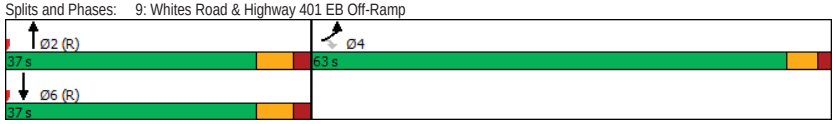
Future Background PM Peak Hour

Lane Group	EBL	EBR	NBT	SBT
Lane Configurations				
Traffic Volume (vph)	1520	945	945	605
Future Volume (vph)	1520	945	945	605
Lane Group Flow (vph)	1567	974	974	624
Turn Type	Prot	Perm	NA	NA
Protected Phases	4		2	6
Permitted Phases		4		
Detector Phase	4	4	2	6
Switch Phase				
Minimum Initial (s)	8.0	8.0	20.0	20.0
Minimum Split (s)	29.0	29.0	29.0	29.0
Total Split (s)	63.0	63.0	37.0	37.0
Total Split (%)	63.0%	63.0%	37.0%	37.0%
Yellow Time (s)	3.7	3.7	4.5	4.5
All-Red Time (s)	1.8	1.8	2.2	2.2
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	4.5	4.5	5.7	5.7
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	None	None	C-Max	C-Max
v/c Ratio	0.83	0.62	0.83	0.53
Control Delay	22.3	14.2	24.0	29.6
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	22.3	14.2	24.0	29.6
Queue Length 50th (m)	120.7	58.7	39.1	55.4
Queue Length 95th (m)	151.2	79.4	#77.8	74.1
Internal Link Dist (m)	465.0		150.1	454.6
Turn Bay Length (m)		220.0		
Base Capacity (vph)	1960	1613	1167	1167
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.80	0.60	0.83	0.53

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 100
Offset: 8 (8%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 9: Whites Road & Highway 401 EB Off-Ramp



HCM Signalized Intersection Capacity Analysis
9: Whites Road & Highway 401 EB Off-Ramp

Future Background PM Peak Hour

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	1520	945	0	945	605	0
Future Volume (vph)	1520	945	0	945	605	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)	3351	2668		3500	3500	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	3351	2668		3500	3500	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	1567	974	0	974	624	0
RTOR Reduction (vph)	0	56	0	0	0	0
Lane Group Flow (vph)	1567	918	0	974	624	0
Confl. Peds. (#/hr)			5			5
Heavy Vehicles (%)	1%	3%	0%	2%	2%	0%
Turn Type	Prot	Perm		NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4				
Actuated Green, G (s)	55.5	55.5		32.3	32.3	
Effective Green, g (s)	56.5	56.5		33.3	33.3	
Actuated g/C Ratio	0.56	0.56		0.33	0.33	
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)	1893	1507		1165	1165	
v/s Ratio Prot	c0.47			c0.28	0.18	
v/s Ratio Perm		0.34				
v/c Ratio	0.83	0.61		0.84	0.54	
Uniform Delay, d1	17.8	14.4		30.8	27.1	
Progression Factor	1.00	1.00		0.54	1.00	
Incremental Delay, d2	3.1	0.7		6.1	1.8	
Delay (s)	20.9	15.1		22.7	28.8	
Level of Service	C	B		C	C	
Approach Delay (s)	18.7			22.7	28.8	
Approach LOS	B			C	C	

Intersection Summary

HCM 2000 Control Delay	21.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.2
Intersection Capacity Utilization	78.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Queues
1: Kingston Road & Rosebank Road

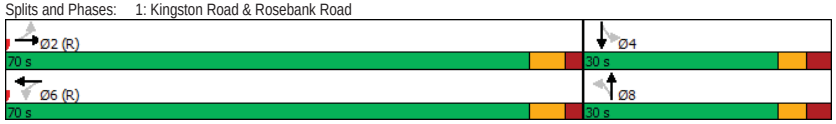
Future Total AM Peak Hour

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	75	615	5	1050	5	0	90	5
Future Volume (vph)	75	615	5	1050	5	0	90	5
Lane Group Flow (vph)	91	762	6	1323	6	6	110	165
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		2		6		8		4
Permitted Phases	2		6		8		4	
Detector Phase	2	2	6	6	8	8	4	4
Switch Phase								
Minimum Initial (s)	20.0	20.0	20.0	20.0	8.0	8.0	8.0	8.0
Minimum Split (s)	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0
Total Split (s)	70.0	70.0	70.0	70.0	30.0	30.0	30.0	30.0
Total Split (%)	70.0%	70.0%	70.0%	70.0%	30.0%	30.0%	30.0%	30.0%
Yellow Time (s)	4.3	4.3	4.3	4.3	3.5	3.5	3.5	3.5
All-Red Time (s)	2.3	2.3	2.3	2.3	3.1	3.1	3.1	3.1
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	None	None	None
v/c Ratio	0.38	0.31	0.01	0.53	0.04	0.01	0.54	0.56
Control Delay	11.8	5.2	5.0	7.0	33.8	0.0	48.3	28.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.8	5.2	5.0	7.0	33.8	0.0	48.3	28.4
Queue Length 50th (m)	5.5	22.4	0.3	49.1	1.1	0.0	21.2	17.1
Queue Length 95th (m)	17.5	35.9	1.6	73.3	4.1	0.0	32.1	30.0
Internal Link Dist (m)		186.4		445.7		49.9		463.8
Turn Bay Length (m)	45.0		85.0		20.0		30.0	
Base Capacity (vph)	237	2498	481	2514	230	563	335	438
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.38	0.31	0.01	0.53	0.03	0.01	0.33	0.38

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 100
Offset: 57 (57%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated

Splits and Phases: 1: Kingston Road & Rosebank Road



HCM Signalized Intersection Capacity Analysis
1: Kingston Road & Rosebank Road

Future Total AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	75	615	10	5	1050	35	5	0	5	90	5	130
Future Volume (vph)	75	615	10	5	1050	35	5	0	5	90	5	130
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	5.6	
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	0.97	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		0.99	1.00		0.99	1.00	
Frt	1.00	1.00		1.00	1.00		1.00	0.85		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1722	3374		1745	3396		1726	1567		1732	1567	
Flt Permitted	0.18	1.00		0.35	1.00		0.52	1.00		0.75	1.00	
Satd. Flow (perm)	321	3374		649	3396		946	1567		1375	1567	
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	91	750	12	6	1280	43	6	0	6	110	6	159
RTOR Reduction (vph)	0	1	0	0	2	0	0	5	0	0	63	0
Lane Group Flow (vph)	91	761	0	6	1321	0	6	1	0	110	102	0
Confl. Peds. (#/hr)	10					10	10		5	5		10
Confl. Bikes (#/hr)			150									
Heavy Vehicles (%)	1%	4%	0%	0%	3%	9%	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	7	7	0	6	6	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)	73.0	73.0		73.0	73.0		13.8	13.8		13.8	13.8	
Effective Green, g (s)	74.0	74.0		74.0	74.0		14.8	14.8		14.8	14.8	
Actuated g/C Ratio	0.74	0.74		0.74	0.74		0.15	0.15		0.15	0.15	
Clearance Time (s)	6.6	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	3.0	
Lane Grp Cap (vph)	237	2496		480	2513		140	231		203	231	
v/s Ratio Prot		0.23			c0.39			0.00			0.07	
v/s Ratio Perm	0.28			0.01			0.01			c0.08		
v/c Ratio	0.38	0.30		0.01	0.53		0.04	0.00		0.54	0.44	
Uniform Delay, d1	4.7	4.4		3.4	5.5		36.5	36.3		39.5	38.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	4.7	0.3		0.0	0.8		0.1	0.0		2.9	1.3	
Delay (s)	9.4	4.7		3.5	6.3		36.7	36.3		42.4	40.2	
Level of Service	A	A		A	A		D	D		D	D	
Approach Delay (s)		5.2			6.3			36.5			41.1	
Approach LOS		A			A			D			D	

Intersection Summary

HCM 2000 Control Delay	9.9	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.53			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	11.2	
Intersection Capacity Utilization	74.1%	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 AM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	690	25	0	1125	0	120
Future Volume (Veh/h)	690	25	0	1125	0	120
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	863	31	0	1406	0	150
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					0.77	
vC, conflicting volume			894		1566	432
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			894		1130	432
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	74
cM capacity (veh/h)			767		154	578

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1
Volume Total	432	432	31	0	703	703	150
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	31	0	0	0	150
cSH	1700	1700	1700	1700	1700	1700	578
Volume to Capacity	0.25	0.25	0.02	0.00	0.41	0.41	0.26
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0	8.3
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	13.4
Lane LOS							B
Approach Delay (s)	0.0			0.0			13.4
Approach LOS							B

Intersection Summary			
Average Delay		0.8	
Intersection Capacity Utilization		45.2%	ICU Level of Service A
Analysis Period (min)		15	

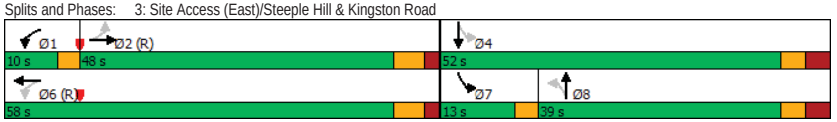
Queues
3: Site Access (East)/Steeple Hill & Kingston Road

Future Total AM Peak Hour

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	40	725	175	920	130	0	150	0
Future Volume (vph)	40	725	175	920	130	0	150	0
Lane Group Flow (vph)	48	927	211	1174	157	464	181	60
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	
Detector Phase	2	2	1	6	8	8	7	4
Switch Phase								
Minimum Initial (s)	20.0	20.0	5.0	20.0	8.0	8.0	5.0	8.0
Minimum Split (s)	28.0	28.0	8.0	28.0	38.0	38.0	8.0	38.0
Total Split (s)	48.0	48.0	10.0	58.0	39.0	39.0	13.0	52.0
Total Split (%)	43.6%	43.6%	9.1%	52.7%	35.5%	35.5%	11.8%	47.3%
Yellow Time (s)	4.2	4.2	3.0	4.2	3.3	3.3	3.0	3.3
All-Red Time (s)	2.1	2.1	0.0	2.1	3.4	3.4	0.0	3.4
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.3	5.3	2.0	5.3	5.7	5.7	2.0	5.7
Lead/Lag	Lag	Lag	Lead		Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes		Yes	Yes	Yes	
Recall Mode	C-Max	C-Max	None	C-Max	None	None	None	None
v/c Ratio	0.31	0.64	0.62	0.63	0.52	0.88	0.75	0.10
Control Delay	30.7	27.9	33.3	19.1	41.7	40.4	42.5	5.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.7	27.9	33.3	19.1	41.7	40.4	42.5	5.2
Queue Length 50th (m)	7.5	90.5	29.2	69.1	30.8	58.6	27.6	0.0
Queue Length 95th (m)	17.5	103.0	m45.8	m95.0	43.3	79.0	36.3	6.3
Internal Link Dist (m)		129.3		289.8		62.3		200.4
Turn Bay Length (m)	25.0		30.0				15.0	
Base Capacity (vph)	154	1449	338	1874	399	628	240	708
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.31	0.64	0.62	0.63	0.39	0.74	0.75	0.08

Intersection Summary
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Site Access (East)/Steeple Hill & Kingston Road



HCM Signalized Intersection Capacity Analysis
3: Site Access (East)/Steeple Hill & Kingston Road

Future Total AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	725	45	175	920	55	130	0	385	150	0	50
Future Volume (vph)	40	725	45	175	920	55	130	0	385	150	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		2.0	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	0.99		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		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)	1654	3325		1745	3385		1745	1597		1678	1597	
Flt Permitted	0.20	1.00		0.19	1.00		0.72	1.00		0.15	1.00	
Satd. Flow (perm)	354	3325		341	3385		1319	1597		260	1597	
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)	48	873	54	211	1108	66	157	0	464	181	0	60
RTOR Reduction (vph)	0	4	0	0	4	0	0	160	0	0	39	0
Lane Group Flow (vph)	48	923	0	211	1170	0	157	304	0	181	21	0
Confl. Peds. (#/hr)	10					10						
Confl. Bikes (#/hr)			160									
Heavy Vehicles (%)	5%	3%	20%	0%	3%	4%	0%	0%	0%	4%	0%	0%
Bus Blockages (#/hr)	0	7	7	0	6	6	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)	46.9	46.9		59.8	59.8		24.2	24.2		37.2	37.2	
Effective Green, g (s)	47.9	47.9		60.8	60.8		25.2	25.2		38.2	38.2	
Actuated g/C Ratio	0.44	0.44		0.55	0.55		0.23	0.23		0.35	0.35	
Clearance Time (s)	6.3	6.3		3.0	6.3		6.7	6.7		3.0	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)	154	1447		327	1870		302	365		232	554	
v/s Ratio Prot		0.28		c0.06	c0.35			c0.19		c0.08	0.01	
v/s Ratio Perm	0.14			0.29			0.12			0.19		
v/c Ratio	0.31	0.64		0.65	0.63		0.52	0.83		0.78	0.04	
Uniform Delay, d1	20.3	24.3		15.4	16.8		37.1	40.4		29.0	23.7	
Progression Factor	1.00	1.00		1.97	0.97		1.00	1.00		1.00	1.00	
Incremental Delay, d2	5.2	2.2		3.2	1.2		1.5	14.9		15.5	0.0	
Delay (s)	25.5	26.4		33.4	17.5		38.6	55.2		44.5	23.8	
Level of Service	C	C		C	B		D	E		D	C	
Approach Delay (s)		26.4			20.0			51.0			39.3	
Approach LOS		C			B			D			D	

Intersection Summary				
HCM 2000 Control Delay	29.3	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.71			
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	15.0	
Intersection Capacity Utilization	93.0%	ICU Level of Service	F	
Analysis Period (min)	15			
c Critical Lane Group				

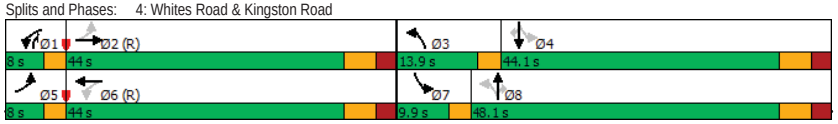
Queues
4: Whites Road & Kingston Road

Future Total AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	105	360	795	285	830	335	280	495	410	120	1055	135
Future Volume (vph)	105	360	795	285	830	335	280	495	410	120	1055	135
Lane Group Flow (vph)	109	375	828	297	865	349	280	516	427	125	1099	141
Turn Type	pm+pt	NA	Free	pm+pt	NA	Free	pm+pt	NA	pm+ov	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases	2		Free	6		Free	8		8	4		4
Detector Phase	5	2		1	6		3	8	1	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	20.0		5.0	20.0		5.0	8.0	5.0	5.0	8.0	8.0
Minimum Split (s)	8.0	44.0		8.0	44.0		8.0	44.1	8.0	8.0	44.1	44.1
Total Split (s)	8.0	44.0		8.0	44.0		13.9	48.1	8.0	9.9	44.1	44.1
Total Split (%)	7.3%	40.0%		7.3%	40.0%		12.6%	43.7%	7.3%	9.0%	40.1%	40.1%
Yellow Time (s)	3.0	4.2		3.0	4.2		3.0	4.3	3.0	3.0	4.3	4.3
All-Red Time (s)	0.0	2.8		0.0	2.8		0.0	2.8	0.0	0.0	2.8	2.8
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	2.0	6.0		2.0	6.0		2.0	6.1	2.0	2.0	6.1	6.1
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max		None	C-Max		None	Max	None	None	Max	Max
v/c Ratio	0.53	0.32	0.57	0.71	0.72	0.23	0.97	0.40	0.51	0.30	0.93	0.25
Control Delay	26.1	27.8	3.2	25.6	26.7	0.3	70.0	22.8	4.8	16.6	48.9	6.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.1	27.8	3.2	25.6	26.7	0.3	70.0	22.8	4.8	16.6	48.9	6.8
Queue Length 50th (m)	13.2	30.6	22.9	42.0	79.6	0.0	35.3	36.1	1.4	14.4	124.8	1.8
Queue Length 95th (m)	m21.1	m46.0	27.1	56.1	93.3	0.0	#93.5	62.0	30.5	25.2	#167.9	15.7
Internal Link Dist (m)		289.8			476.9			454.6			338.0	
Turn Bay Length (m)	100.0		80.0	35.0		35.0	50.0		45.0	85.0		15.0
Base Capacity (vph)	206	1174	1447	416	1209	1511	289	1298	835	412	1185	557
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.53	0.32	0.57	0.71	0.72	0.23	0.97	0.40	0.51	0.30	0.93	0.25

Intersection Summary
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 1.1 (1%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 105
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Whites Road & Kingston Road



HCM Signalized Intersection Capacity Analysis
4: Whites Road & Kingston Road

Future Total AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	105	360	795	285	830	335	280	495	410	120	1055	135
Future Volume (vph)	105	360	795	285	830	335	280	495	410	120	1055	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	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	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.95	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	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)	1692	3400	1447	1668	3500	1511	1800	3400	1462	1669	3433	1369
Flt Permitted	0.17	1.00	1.00	0.49	1.00	1.00	0.13	1.00	1.00	0.44	1.00	1.00
Satd. Flow (perm)	301	3400	1447	859	3500	1511	236	3400	1462	768	3433	1369
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	1.00	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	109	375	828	297	865	349	280	516	427	125	1099	141
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	154	0	0	84
Lane Group Flow (vph)	109	375	828	297	865	349	280	516	273	125	1099	57
Confl. Peds. (#/hr)	35		25	25		35	20		30	30		20
Confl. Bikes (#/hr)			160									
Heavy Vehicles (%)	3%	5%	2%	4%	2%	1%	2%	5%	2%	4%	4%	8%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	3	0	0	6
Turn Type	pm+pt	NA	Free	pm+pt	NA	Free	pm+pt	NA	pm+ov	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases	2		Free	6		Free	8		8	4		4
Actuated Green, G (s)	42.0	37.0	110.0	42.0	37.0	110.0	50.9	41.0	46.0	43.9	37.0	37.0
Effective Green, g (s)	44.0	38.0	110.0	44.0	38.0	110.0	51.9	42.0	48.0	45.9	38.0	38.0
Actuated g/C Ratio	0.40	0.35	1.00	0.40	0.35	1.00	0.47	0.38	0.44	0.42	0.35	0.35
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)	196	1174	1447	387	1209	1511	280	1298	637	385	1185	472
v/s Ratio Prot	0.03	0.11		0.04	c0.25		c0.11	0.15	0.02	0.02	c0.32	
v/s Ratio Perm	0.19		c0.57	0.26		0.23	0.36		0.16	0.11		0.04
v/c Ratio	0.56	0.32	0.57	0.77	0.72	0.23	1.00	0.40	0.43	0.32	0.93	0.12
Uniform Delay, d1	23.1	26.5	0.0	27.3	31.3	0.0	23.3	24.8	21.5	20.2	34.7	24.6
Progression Factor	1.05	1.02	1.00	0.70	0.74	1.00	1.22	0.88	0.44	1.00	1.00	1.00
Incremental Delay, d2	2.5	0.5	1.2	7.8	3.2	0.3	50.0	0.8	0.4	0.5	13.7	0.5
Delay (s)	26.7	27.6	1.2	26.9	26.4	0.3	78.4	22.6	9.9	20.7	48.4	25.1
Level of Service	C	C	A	C	C	A	E	C	A	C	D	C
Approach Delay (s)		10.9			20.5			31.0			43.4	
Approach LOS		B			C			C			D	

Intersection Summary				
HCM 2000 Control Delay	26.3	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.83			
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.1	
Intersection Capacity Utilization	108.9%	ICU Level of Service	G	
Analysis Period (min)	15			
c Critical Lane Group				

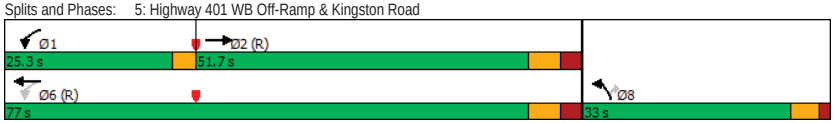
Queues
5: Highway 401 WB Off-Ramp & Kingston Road

Future Total AM Peak Hour

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Configurations					
Traffic Volume (vph)	785	500	880	550	65
Future Volume (vph)	785	500	880	550	65
Lane Group Flow (vph)	851	532	936	585	69
Turn Type	NA	pm+pt	NA	Prot	Perm
Protected Phases	2	1	6	8	
Permitted Phases		6			8
Detector Phase	2	1	6	8	8
Switch Phase					
Minimum Initial (s)	20.0	3.5	20.0	8.0	8.0
Minimum Split (s)	51.0	8.0	51.0	32.0	32.0
Total Split (s)	51.7	25.3	77.0	33.0	33.0
Total Split (%)	47.0%	23.0%	70.0%	30.0%	30.0%
Yellow Time (s)	4.2	3.0	4.2	3.7	3.7
All-Red Time (s)	3.0	0.0	3.0	1.7	1.7
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	6.2	2.0	6.2	4.4	4.4
Lead/Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes			
Recall Mode	C-Max	None	C-Max	None	None
v/c Ratio	0.58	0.90	0.40	0.78	0.19
Control Delay	21.0	37.2	8.8	47.4	22.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	21.0	37.2	8.8	47.4	22.0
Queue Length 50th (m)	57.8	65.8	45.1	63.8	7.2
Queue Length 95th (m)	72.5	#141.8	62.6	81.1	18.5
Internal Link Dist (m)	476.9		318.1	85.1	
Turn Bay Length (m)		15.0			15.0
Base Capacity (vph)	1474	590	2345	862	415
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.58	0.90	0.40	0.68	0.17

Intersection Summary
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 3.3 (3%), Referenced to phase 2:EBT and 6:WBTL, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Highway 401 WB Off-Ramp & Kingston Road



HCM Signalized Intersection Capacity Analysis
5: Highway 401 WB Off-Ramp & Kingston Road

Future Total AM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	785	15	500	880	550	65
Future Volume (vph)	785	15	500	880	550	65
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
Frpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00	1.00	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)	3416		1728	3466	3319	1516
Flt Permitted	1.00		0.22	1.00	0.95	1.00
Satd. Flow (perm)	3416		402	3466	3319	1516
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	835	16	532	936	585	69
RTOR Reduction (vph)	1	0	0	0	0	22
Lane Group Flow (vph)	850	0	532	936	585	47
Confl. Bikes (#/hr)		150				
Heavy Vehicles (%)	4%	0%	1%	3%	2%	3%
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases			6			8
Actuated Green, G (s)	46.4		73.4	73.4	24.0	24.0
Effective Green, g (s)	47.4		74.4	74.4	25.0	25.0
Actuated g/C Ratio	0.43		0.68	0.68	0.23	0.23
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)	1471		573	2344	754	344
v/s Ratio Prot	c0.25		c0.21	0.27	c0.18	
v/s Ratio Perm			0.42			0.03
v/c Ratio	0.58		0.93	0.40	0.78	0.14
Uniform Delay, d1	23.7		19.8	7.9	39.9	33.9
Progression Factor	0.80		1.00	1.00	1.00	1.00
Incremental Delay, d2	1.5		21.4	0.5	5.0	0.2
Delay (s)	20.5		41.2	8.4	44.9	34.1
Level of Service	C		D	A	D	C
Approach Delay (s)	20.5			20.3	43.8	
Approach LOS	C			C	D	

Intersection Summary				
HCM 2000 Control Delay	25.5	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.71			
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.6	
Intersection Capacity Utilization	77.7%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

Queues
6: Whites Road & Bayly Street

Future Total AM Peak Hour

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	255	365	645	125	570	505
Future Volume (vph)	255	365	645	125	570	505
Lane Group Flow (vph)	271	388	686	133	309	834
Turn Type	Perm	Perm	NA	Perm	pm+pt	NA
Protected Phases			5		6	2
Permitted Phases	8	8		5	2	
Detector Phase	8	8	5	5	6	2
Switch Phase						
Minimum Initial (s)	8.0	8.0	12.0	12.0	12.0	12.0
Minimum Split (s)	28.0	28.0	32.0	32.0	21.0	21.0
Total Split (s)	29.0	29.0	33.0	33.0	38.0	71.0
Total Split (%)	29.0%	29.0%	33.0%	33.0%	38.0%	71.0%
Yellow Time (s)	4.2	4.2	4.4	4.4	4.4	4.4
All-Red Time (s)	2.4	2.4	2.6	2.6	2.6	2.6
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.6	5.6	6.0	6.0	6.0	6.0
Lead/Lag			Lead	Lead	Lag	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None	None	Max	Max	C-Max	Max
v/c Ratio	0.78	0.63	0.68	0.26	0.47	0.49
Control Delay	53.0	8.4	35.5	11.0	18.1	11.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	53.0	8.4	35.5	11.0	18.1	11.5
Queue Length 50th (m)	51.6	0.0	65.8	5.2	26.0	37.6
Queue Length 95th (m)	79.4	24.7	88.9	20.1	42.8	51.3
Internal Link Dist (m)	323.4		152.5			150.1
Turn Bay Length (m)				35.0	30.0	
Base Capacity (vph)	397	652	1015	516	652	1716
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.68	0.60	0.68	0.26	0.47	0.49

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 16 (16%), Referenced to phase 6:SBL, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated

Splits and Phases: 6: Whites Road & Bayly Street

HCM Signalized Intersection Capacity Analysis
6: Whites Road & Bayly Street

Future Total AM Peak Hour

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	255	365	645	125	570	505
Future Volume (vph)	255	365	645	125	570	505
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)	5.6	5.6	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	0.97	1.00	1.00
Flpb, ped/bikes	0.99	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	0.98
Satd. Flow (prot)	1698	1518	3400	1499	1555	3290
Flt Permitted	0.95	1.00	1.00	1.00	0.26	0.55
Satd. Flow (perm)	1698	1518	3400	1499	433	1846
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	271	388	686	133	606	537
RTOR Reduction (vph)	0	308	0	69	0	0
Lane Group Flow (vph)	271	80	686	64	309	834
Confl. Peds. (#/hr)	5			15	15	
Heavy Vehicles (%)	2%	2%	5%	1%	2%	2%
Bus Blockages (#/hr)	0	2	0	0	0	0
Turn Type	Perm	Perm	NA	Perm	pm+pt	NA
Protected Phases			5		6	2
Permitted Phases	8	8		5	2	
Actuated Green, G (s)	19.5	19.5	28.9	28.9	66.9	66.9
Effective Green, g (s)	20.5	20.5	29.9	29.9	67.9	67.9
Actuated g/C Ratio	0.20	0.20	0.30	0.30	0.68	0.68
Clearance Time (s)	6.6	6.6	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)	348	311	1016	448	653	1715
v/s Ratio Prot			c0.20		0.15	c0.16
v/s Ratio Perm	c0.16	0.05		0.04	0.17	0.17
v/c Ratio	0.78	0.26	0.68	0.14	0.47	0.49
Uniform Delay, d1	37.6	33.3	30.8	25.7	15.4	7.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	10.5	0.4	3.6	0.7	2.5	1.0
Delay (s)	48.1	33.8	34.4	26.3	17.8	8.7
Level of Service	D	C	C	C	B	A
Approach Delay (s)	39.7		33.1			11.2
Approach LOS	D		C			B

Intersection Summary				
HCM 2000 Control Delay	25.2	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.64			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.6	
Intersection Capacity Utilization	69.1%	ICU Level of Service	C	
Analysis Period (min)	15			

c Critical Lane Group

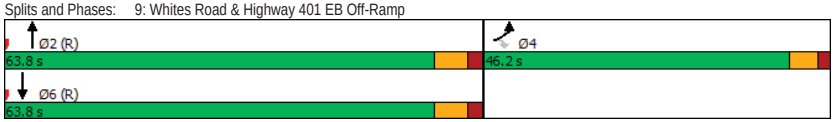
Queues
9: Whites Road & Highway 401 EB Off-Ramp

Future Total AM Peak Hour

Lane Group	EBL	EBR	NBT	SBT
Lane Configurations				
Traffic Volume (vph)	670	445	1010	630
Future Volume (vph)	670	445	1010	630
Lane Group Flow (vph)	698	464	1052	656
Turn Type	Prot	Perm	NA	NA
Protected Phases	4		2	6
Permitted Phases		4		
Detector Phase	4	4	2	6
Switch Phase				
Minimum Initial (s)	8.0	8.0	20.0	20.0
Minimum Split (s)	29.0	29.0	29.0	29.0
Total Split (s)	46.2	46.2	63.8	63.8
Total Split (%)	42.0%	42.0%	58.0%	58.0%
Yellow Time (s)	3.7	3.7	4.5	4.5
All-Red Time (s)	1.8	1.8	2.2	2.2
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	4.5	4.5	5.7	5.7
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	None	None	C-Max	C-Max
v/c Ratio	0.75	0.45	0.49	0.30
Control Delay	40.7	8.3	13.0	10.9
Queue Delay	0.0	0.0	0.5	0.0
Total Delay	40.7	8.3	13.5	10.9
Queue Length 50th (m)	73.5	9.8	63.5	28.6
Queue Length 95th (m)	86.5	22.1	94.2	m37.6
Internal Link Dist (m)	465.0		150.1	454.6
Turn Bay Length (m)		220.0		
Base Capacity (vph)	1245	1244	2137	2158
Starvation Cap Reductn	0	0	592	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.56	0.37	0.68	0.30

Intersection Summary
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 60 (55%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 9: Whites Road & Highway 401 EB Off-Ramp



HCM Signalized Intersection Capacity Analysis
9: Whites Road & Highway 401 EB Off-Ramp

Future Total AM Peak Hour

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	670	445	0	1010	630	0
Future Volume (vph)	670	445	0	1010	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)	3286	2694		3433	3466	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	3286	2694		3433	3466	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	698	464	0	1052	656	0
RTOR Reduction (vph)	0	258	0	0	0	0
Lane Group Flow (vph)	698	206	0	1052	656	0
Confl. Peds. (#/hr)			10			10
Heavy Vehicles (%)	3%	2%	0%	4%	3%	0%
Turn Type	Prot	Perm		NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4				
Actuated Green, G (s)	30.3	30.3		67.5	67.5	
Effective Green, g (s)	31.3	31.3		68.5	68.5	
Actuated g/C Ratio	0.28	0.28		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)	935	766		2137	2158	
v/s Ratio Prot	c0.21			c0.31	0.19	
v/s Ratio Perm		0.08				
v/c Ratio	0.75	0.27		0.49	0.30	
Uniform Delay, d1	35.7	30.5		11.3	9.7	
Progression Factor	1.00	1.00		1.00	1.02	
Incremental Delay, d2	3.3	0.2		0.8	0.2	
Delay (s)	39.0	30.7		12.1	10.1	
Level of Service	D	C		B	B	
Approach Delay (s)	35.7			12.1	10.1	
Approach LOS	D			B	B	

Intersection Summary				
HCM 2000 Control Delay	21.2	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)	10.2	
Intersection Capacity Utilization	55.5%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

Queues
1: Kingston Road & Rosebank Road

Future Total PM Peak Hour

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	120	1185	805	5	0	50	5
Future Volume (vph)	120	1185	805	5	0	50	5
Lane Group Flow (vph)	124	1222	892	5	10	52	72
Turn Type	Perm	NA	NA	Perm	NA	Perm	NA
Protected Phases		2	6		8		4
Permitted Phases	2			8		4	
Detector Phase	2	2	6	8	8	4	4
Switch Phase							
Minimum Initial (s)	20.0	20.0	20.0	8.0	8.0	8.0	8.0
Minimum Split (s)	28.0	28.0	28.0	28.0	28.0	28.0	28.0
Total Split (s)	70.0	70.0	70.0	30.0	30.0	30.0	30.0
Total Split (%)	70.0%	70.0%	70.0%	30.0%	30.0%	30.0%	30.0%
Yellow Time (s)	4.3	4.3	4.3	3.5	3.5	3.5	3.5
All-Red Time (s)	2.3	2.3	2.3	3.1	3.1	3.1	3.1
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.6	5.6	5.6	5.6	5.6	5.6	5.6
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	C-Max	C-Max	C-Max	None	None	None	None
v/c Ratio	0.27	0.44	0.32	0.03	0.04	0.31	0.29
Control Delay	6.3	5.0	4.2	35.0	0.3	42.7	13.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.3	5.0	4.2	35.0	0.3	42.7	13.2
Queue Length 50th (m)	5.5	33.9	21.2	1.0	0.0	10.1	1.0
Queue Length 95th (m)	20.4	75.3	48.5	3.9	0.0	19.3	12.3
Internal Link Dist (m)		186.4	445.7		49.9		463.8
Turn Bay Length (m)	45.0			20.0		30.0	
Base Capacity (vph)	454	2808	2750	316	447	334	427
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.27	0.44	0.32	0.02	0.02	0.16	0.17

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 83 (83%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Splits and Phases: 1: Kingston Road & Rosebank Road

HCM Signalized Intersection Capacity Analysis
1: Kingston Road & Rosebank Road

Future Total PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	120	1185	0	0	805	60	5	0	10	50	5	65
Future Volume (vph)	120	1185	0	0	805	60	5	0	10	50	5	65
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			0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00			1.00		1.00	0.98		1.00	0.98	
Flpb, ped/bikes	0.99	1.00			1.00		0.99	1.00		0.99	1.00	
Frt	1.00	1.00			0.99		1.00	0.85		1.00	0.86	
Flt Protected	0.95	1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1731	3492			3415		1734	1567		1733	1545	
Flt Permitted	0.31	1.00			1.00		0.71	1.00		0.75	1.00	
Satd. Flow (perm)	565	3492			3415		1296	1567		1370	1545	
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)	124	1222	0	0	830	62	5	0	10	52	5	67
RTOR Reduction (vph)	0	0	0	0	3	0	0	9	0	0	60	0
Lane Group Flow (vph)	124	1222	0	0	889	0	5	1	0	52	12	0
Confl. Peds. (#/hr)	10		5	5		10	5		5	5		5
Heavy Vehicles (%)	0%	1%	0%	0%	2%	0%	0%	0%	0%	0%	0%	3%
Bus Blockages (#/hr)	0	6	6	0	6	6	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)	77.0	77.0			77.0		9.8	9.8		9.8	9.8	
Effective Green, g (s)	78.0	78.0			78.0		10.8	10.8		10.8	10.8	
Actuated g/C Ratio	0.78	0.78			0.78		0.11	0.11		0.11	0.11	
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)	440	2723			2663		139	169		147	166	
v/s Ratio Prot		c0.35			0.26			0.00			0.01	
v/s Ratio Perm	0.22						0.00			c0.04		
v/c Ratio	0.28	0.45			0.33		0.04	0.01		0.35	0.07	
Uniform Delay, d1	3.1	3.7			3.3		39.9	39.8		41.4	40.1	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.6	0.5			0.3		0.1	0.0		1.5	0.2	
Delay (s)	4.7	4.3			3.6		40.0	39.8		42.8	40.3	
Level of Service	A	A			A		D	D		D	D	
Approach Delay (s)		4.3			3.6			39.9			41.4	
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	0.44			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	11.2	
Intersection Capacity Utilization	74.1%	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 PM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1190	80	0	885	0	70
Future Volume (Veh/h)	1190	80	0	885	0	70
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	1214	82	0	903	0	71
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					0.90	
vC, conflicting volume			1296		1666	607
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1296		1520	607
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	84
cM capacity (veh/h)			541		101	444

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1
Volume Total	607	607	82	0	452	452	71
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	82	0	0	0	71
cSH	1700	1700	1700	1700	1700	1700	444
Volume to Capacity	0.36	0.36	0.05	0.00	0.27	0.27	0.16
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0	4.5
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	14.6
Lane LOS							B
Approach Delay (s)	0.0			0.0			14.6
Approach LOS							B

Intersection Summary				
Average Delay	0.5			
Intersection Capacity Utilization	43.9%	ICU Level of Service		A
Analysis Period (min)	15			

Queues
3: Site Access (East)/Steeple Hill & Kingston Road

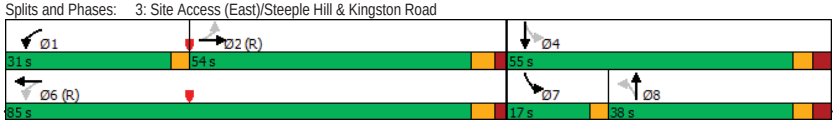
Future Total PM Peak Hour

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	100	1065	385	720	85	10	220	0
Future Volume (vph)	100	1065	385	720	85	10	220	0
Lane Group Flow (vph)	103	1196	397	871	88	294	227	72
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	
Detector Phase	2	2	1	6	8	8	7	4
Switch Phase								
Minimum Initial (s)	20.0	20.0	5.0	20.0	8.0	8.0	5.0	8.0
Minimum Split (s)	28.0	28.0	8.0	28.0	38.0	38.0	8.0	38.0
Total Split (s)	54.0	54.0	31.0	85.0	38.0	38.0	17.0	55.0
Total Split (%)	38.6%	38.6%	22.1%	60.7%	27.1%	27.1%	12.1%	39.3%
Yellow Time (s)	4.2	4.2	3.0	4.2	3.3	3.3	3.0	3.3
All-Red Time (s)	2.1	2.1	0.0	2.1	3.4	3.4	0.0	3.4
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.3	5.3	2.0	5.3	5.7	5.7	2.0	5.7
Lead/Lag	Lag	Lag	Lead		Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes		Yes	Yes	Yes	
Recall Mode	C-Max	C-Max	None	C-Max	None	None	None	None
v/c Ratio	0.41	0.81	0.84	0.38	0.54	0.66	0.92	0.14
Control Delay	37.5	41.3	57.2	9.2	67.0	13.7	83.1	0.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	37.5	41.3	57.2	9.2	67.0	13.7	83.1	0.5
Queue Length 50th (m)	20.9	160.6	100.7	42.5	24.8	2.7	56.6	0.0
Queue Length 95th (m)	44.8	#233.1	m#145.8	m70.6	38.2	28.0	#76.1	0.0
Internal Link Dist (m)		129.3		289.8		62.3		200.4
Turn Bay Length (m)	25.0		30.0				15.0	
Base Capacity (vph)	254	1483	481	2271	299	580	246	674
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.41	0.81	0.83	0.38	0.29	0.51	0.92	0.11

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 105
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Site Access (East)/Steeple Hill & Kingston Road



HCM Signalized Intersection Capacity Analysis
3: Site Access (East)/Steeple Hill & Kingston Road

Future Total PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	1065	95	385	720	125	85	10	275	220	0	70
Future Volume (vph)	100	1065	95	385	720	125	85	10	275	220	0	70
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		2.0	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	0.99		1.00	0.98		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	0.99		1.00	0.98		1.00	0.86		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)	1727	3452		1745	3364		1734	1567		1726	1567	
Flt Permitted	0.33	1.00		0.08	1.00		0.71	1.00		0.20	1.00	
Satd. Flow (perm)	592	3452		155	3364		1296	1567		367	1567	
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)	103	1098	98	397	742	129	88	10	284	227	0	72
RTOR Reduction (vph)	0	4	0	0	8	0	0	248	0	0	54	0
Lane Group Flow (vph)	103	1192	0	397	863	0	88	46	0	227	18	0
Confl. Peds. (#/hr)	10					10	5		10	10		5
Heavy Vehicles (%)	0%	1%	0%	0%	2%	0%	0%	0%	0%	1%	0%	0%
Bus Blockages (#/hr)	0	6	6	0	6	6	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)	58.9	58.9		93.2	93.2		16.8	16.8		33.8	33.8	
Effective Green, g (s)	59.9	59.9		94.2	94.2		17.8	17.8		34.8	34.8	
Actuated g/C Ratio	0.43	0.43		0.67	0.67		0.13	0.13		0.25	0.25	
Clearance Time (s)	6.3	6.3		3.0	6.3		6.7	6.7		3.0	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)	253	1476		471	2263		164	199		236	389	
v/s Ratio Prot		c0.35		c0.19	0.26			0.03		c0.10	0.01	
v/s Ratio Perm	0.17			0.37			c0.07			0.14		
v/c Ratio	0.41	0.81		0.84	0.38		0.54	0.23		0.96	0.05	
Uniform Delay, d1	27.7	35.0		39.0	10.1		57.2	55.0		47.3	40.0	
Progression Factor	1.00	1.00		1.34	0.82		1.00	1.00		1.00	1.00	
Incremental Delay, d2	4.8	4.8		8.9	0.3		3.4	0.6		47.7	0.0	
Delay (s)	32.5	39.9		61.2	8.6		60.6	55.5		95.0	40.0	
Level of Service	C	D		E	A		E	E		F	D	
Approach Delay (s)		39.3			25.0			56.7			81.8	
Approach LOS		D			C			E			F	

Intersection Summary

HCM 2000 Control Delay	39.7	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)	15.0
Intersection Capacity Utilization	102.4%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Queues
4: Whites Road & Kingston Road

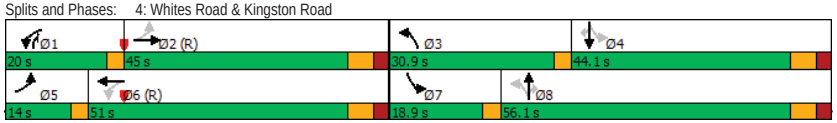
Future Total PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	160	810	590	225	775	515	455	1010	775	160	625	120
Future Volume (vph)	160	810	590	225	775	515	455	1010	775	160	625	120
Lane Group Flow (vph)	162	818	596	227	783	520	460	1020	783	162	631	121
Turn Type	pm+pt	NA	Free	pm+pt	NA	Free	pm+pt	NA	pm+ov	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases	2		Free	6		Free	8		8	4		4
Detector Phase	5	2		1	6		3	8	1	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	20.0		5.0	20.0		5.0	8.0	5.0	5.0	8.0	8.0
Minimum Split (s)	8.0	44.0		8.0	44.0		8.0	44.1	8.0	8.0	44.1	44.1
Total Split (s)	14.0	45.0		20.0	51.0		30.9	56.1	20.0	18.9	44.1	44.1
Total Split (%)	10.0%	32.1%		14.3%	36.4%		22.1%	40.1%	14.3%	13.5%	31.5%	31.5%
Yellow Time (s)	3.0	4.2		3.0	4.2		3.0	4.3	3.0	3.0	4.3	4.3
All-Red Time (s)	0.0	2.8		0.0	2.8		0.0	2.8	0.0	0.0	2.8	2.8
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	2.0	6.0		2.0	6.0		2.0	6.1	2.0	2.0	6.1	6.1
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max		None	C-Max		None	Max	None	None	Max	Max
v/c Ratio	0.62	0.82	0.39	0.81	0.69	0.34	0.95	0.76	0.87	0.63	0.66	0.24
Control Delay	39.1	53.5	0.5	44.6	30.2	0.5	58.0	42.7	31.5	32.4	49.1	7.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.1	53.5	0.5	44.6	30.2	0.5	58.0	42.7	31.5	32.4	49.1	7.1
Queue Length 50th (m)	25.2	83.9	0.0	35.9	93.5	0.0	92.4	135.2	138.2	24.2	86.4	0.0
Queue Length 95th (m)	m44.2	m117.0	m0.0	m#73.8	109.1	0.0	#161.9	168.9	#254.7	40.2	108.5	15.0
Internal Link Dist (m)		289.8			476.9			454.6			338.0	
Turn Bay Length (m)	100.0		80.0	35.0		35.0	50.0		45.0	85.0		15.0
Base Capacity (vph)	268	999	1538	291	1134	1514	486	1345	904	299	957	502
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.60	0.82	0.39	0.78	0.69	0.34	0.95	0.76	0.87	0.54	0.66	0.24

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 115
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Whites Road & Kingston Road



HCM Signalized Intersection Capacity Analysis
4: Whites Road & Kingston Road

Future Total PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	160	810	590	225	775	515	455	1010	775	160	625	120
Future Volume (vph)	160	810	590	225	775	515	455	1010	775	160	625	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	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	0.95	1.00	1.00	0.95	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)	1742	3500	1538	1727	3500	1514	1744	3535	1482	1727	3500	1503
Flt Permitted	0.21	1.00	1.00	0.12	1.00	1.00	0.22	1.00	1.00	0.17	1.00	1.00
Satd. Flow (perm)	380	3500	1538	216	3500	1514	402	3535	1482	301	3500	1503
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	162	818	596	227	783	520	460	1020	783	162	631	121
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	115	0	88
Lane Group Flow (vph)	162	818	596	227	783	520	460	1020	668	162	631	33
Confl. Peds. (#/hr)	30		10	10		30	5		10	10		5
Heavy Vehicles (%)	0%	2%	0%	1%	2%	1%	0%	1%	1%	1%	2%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	6	0	0	5
Turn Type	pm+pt	NA	Free	pm+pt	NA	Free	pm+pt	NA	pm+ov	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases	2		Free	6		Free	8		8	4		4
Actuated Green, G (s)	49.6	39.0	140.0	58.0	44.4	140.0	67.9	52.3	68.3	49.9	37.3	37.3
Effective Green, g (s)	51.6	40.0	140.0	59.0	45.4	140.0	68.9	53.3	70.3	51.9	38.3	38.3
Actuated g/C Ratio	0.37	0.29	1.00	0.42	0.32	1.00	0.49	0.38	0.50	0.37	0.27	0.27
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)	252	1000	1538	274	1135	1514	471	1345	744	250	957	411
v/s Ratio Prot	0.05	c0.23		0.10	0.22		c0.20	0.29	c0.11	0.06	0.18	
v/s Ratio Perm	0.18		0.39	0.25		0.34	0.28		0.34	0.18		0.02
v/c Ratio	0.64	0.82	0.39	0.83	0.69	0.34	0.98	0.76	0.90	0.65	0.66	0.08
Uniform Delay, d1	32.1	46.6	0.0	32.5	41.2	0.0	31.2	37.7	31.6	31.9	45.1	37.8
Progression Factor	1.34	1.03	1.00	0.85	0.65	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.4	4.7	0.5	15.8	2.9	0.5	35.1	4.0	13.6	5.7	3.6	0.4
Delay (s)	46.5	52.8	0.5	43.5	29.9	0.5	66.2	41.8	45.2	37.6	48.6	38.2
Level of Service	D	D	A	D	C	A	E	D	D	D	D	D
Approach Delay (s)		32.4			21.9			47.9			45.3	
Approach LOS		C			C			D			D	

Intersection Summary

HCM 2000 Control Delay	37.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.1
Intersection Capacity Utilization	115.3%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Queues
5: Highway 401 WB Off-Ramp & Kingston Road

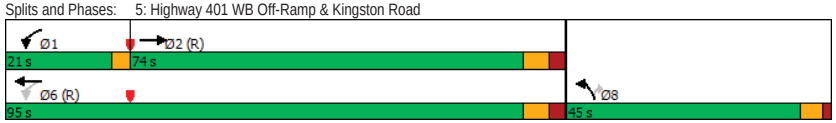
Future Total PM Peak Hour

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Configurations					
Traffic Volume (vph)	1535	230	735	715	135
Future Volume (vph)	1535	230	735	715	135
Lane Group Flow (vph)	1627	242	774	753	142
Turn Type	NA	pm+pt	NA	Prot	Perm
Protected Phases	2	1	6	8	
Permitted Phases		6			8
Detector Phase	2	1	6	8	8
Switch Phase					
Minimum Initial (s)	20.0	3.5	20.0	8.0	8.0
Minimum Split (s)	51.0	8.0	51.0	32.0	32.0
Total Split (s)	74.0	21.0	95.0	45.0	45.0
Total Split (%)	52.9%	15.0%	67.9%	32.1%	32.1%
Yellow Time (s)	4.2	3.0	4.2	3.7	3.7
All-Red Time (s)	3.0	0.0	3.0	1.7	1.7
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	6.2	2.0	6.2	4.4	4.4
Lead/Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes			
Recall Mode	C-Max	None	C-Max	None	None
v/c Ratio	0.90	0.87	0.33	0.85	0.33
Control Delay	26.4	67.7	11.2	59.0	31.3
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	26.4	67.7	11.2	59.0	31.3
Queue Length 50th (m)	144.3	51.9	49.7	106.6	23.8
Queue Length 95th (m)	#287.1	#101.4	64.5	128.5	42.6
Internal Link Dist (m)	476.9		318.1	85.1	
Turn Bay Length (m)		15.0			15.0
Base Capacity (vph)	1800	291	2312	971	475
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.90	0.83	0.33	0.78	0.30

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBTL, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Highway 401 WB Off-Ramp & Kingston Road



HCM Signalized Intersection Capacity Analysis
5: Highway 401 WB Off-Ramp & Kingston Road

Future Total PM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1535	10	230	735	715	135
Future Volume (vph)	1535	10	230	735	715	135
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)	3495		1711	3500	3351	1546
Flt Permitted	1.00		0.05	1.00	0.95	1.00
Satd. Flow (perm)	3495		97	3500	3351	1546
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1616	11	242	774	753	142
RTOR Reduction (vph)	0	0	0	0	0	28
Lane Group Flow (vph)	1627	0	242	774	753	114
Heavy Vehicles (%)	2%	8%	2%	2%	1%	1%
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases			6			8
Actuated Green, G (s)	71.1		91.5	91.5	35.9	35.9
Effective Green, g (s)	72.1		92.5	92.5	36.9	36.9
Actuated g/C Ratio	0.51		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)	1799		276	2312	883	407
v/s Ratio Prot	c0.47		c0.12	0.22	c0.22	
v/s Ratio Perm			0.46			0.07
v/c Ratio	0.90		0.88	0.33	0.85	0.28
Uniform Delay, d1	30.8		45.9	10.3	49.0	41.0
Progression Factor	0.66		1.00	1.00	1.00	1.00
Incremental Delay, d2	4.7		25.3	0.4	8.0	0.4
Delay (s)	25.0		71.2	10.7	57.0	41.4
Level of Service	C		E	B	E	D
Approach Delay (s)	25.0			25.1	54.5	
Approach LOS	C			C	D	

Intersection Summary

HCM 2000 Control Delay	32.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.6
Intersection Capacity Utilization	88.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Queues
6: Whites Road & Bayly Street

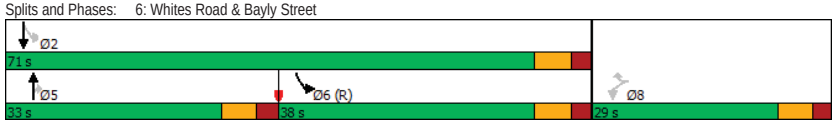
Future Total PM Peak Hour

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	165	360	560	255	1040	510
Future Volume (vph)	165	360	560	255	1040	510
Lane Group Flow (vph)	177	387	602	274	559	1107
Turn Type	Perm	Perm	NA	Perm	pm+pt	NA
Protected Phases			5		6	2
Permitted Phases	8	8		5	2	
Detector Phase	8	8	5	5	6	2
Switch Phase						
Minimum Initial (s)	8.0	8.0	12.0	12.0	12.0	12.0
Minimum Split (s)	28.0	28.0	32.0	32.0	21.0	21.0
Total Split (s)	29.0	29.0	33.0	33.0	38.0	71.0
Total Split (%)	29.0%	29.0%	33.0%	33.0%	38.0%	71.0%
Yellow Time (s)	4.2	4.2	4.4	4.4	4.4	4.4
All-Red Time (s)	2.4	2.4	2.6	2.6	2.6	2.6
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.6	5.6	6.0	6.0	6.0	6.0
Lead/Lag			Lead	Lead	Lag	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None	None	Max	Max	C-Max	Max
v/c Ratio	0.62	0.67	0.51	0.42	0.78	0.62
Control Delay	47.5	9.8	29.4	8.4	22.7	10.0
Queue Delay	0.0	0.0	0.0	0.0	52.3	0.0
Total Delay	47.5	9.8	29.4	8.4	75.0	10.0
Queue Length 50th (m)	34.0	0.0	51.2	6.2	45.1	27.8
Queue Length 95th (m)	52.1	24.7	75.6	28.9	#95.7	53.6
Internal Link Dist (m)	323.4		152.5			150.1
Turn Bay Length (m)				35.0	30.0	
Base Capacity (vph)	400	655	1179	654	716	1779
Starvation Cap Reductn	0	0	0	0	223	21
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.44	0.59	0.51	0.42	1.13	0.63

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 100
Offset: 44 (44%), Referenced to phase 6:SBL, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: Whites Road & Bayly Street



HCM Signalized Intersection Capacity Analysis
6: Whites Road & Bayly Street

Future Total PM Peak Hour

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	165	360	560	255	1040	510
Future Volume (vph)	165	360	560	255	1040	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)	5.6	5.6	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	0.98
Satd. Flow (prot)	1711	1533	3500	1493	1555	3250
Flt Permitted	0.95	1.00	1.00	1.00	0.34	0.56
Satd. Flow (perm)	1711	1533	3500	1493	552	1863
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	177	387	602	274	1118	548
RTOR Reduction (vph)	0	322	0	152	0	0
Lane Group Flow (vph)	177	65	602	122	559	1107
Confl. Peds. (#/hr)				10	10	
Heavy Vehicles (%)	2%	1%	2%	2%	2%	3%
Bus Blockages (#/hr)	0	2	0	0	0	0
Turn Type	Perm	Perm	NA	Perm	pm+pt	NA
Protected Phases			5		6	2
Permitted Phases	8	8		5	2	
Actuated Green, G (s)	15.7	15.7	32.7	32.7	70.7	70.7
Effective Green, g (s)	16.7	16.7	33.7	33.7	71.7	71.7
Actuated g/C Ratio	0.17	0.17	0.34	0.34	0.72	0.72
Clearance Time (s)	6.6	6.6	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)	285	256	1179	503	716	1779
v/s Ratio Prot			0.17		c0.25	0.20
v/s Ratio Perm	c0.10	0.04		0.08	c0.31	0.25
v/c Ratio	0.62	0.25	0.51	0.24	0.78	0.62
Uniform Delay, d1	38.7	36.2	26.5	23.9	14.9	7.2
Progression Factor	1.00	1.00	1.00	1.00	0.80	0.78
Incremental Delay, d2	4.2	0.5	1.6	1.1	7.0	1.4
Delay (s)	42.9	36.7	28.1	25.1	18.9	7.0
Level of Service	D	D	C	C	B	A
Approach Delay (s)	38.7		27.2			11.0
Approach LOS	D		C			B

Intersection Summary

HCM 2000 Control Delay	20.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.6
Intersection Capacity Utilization	73.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Queues
9: Whites Road & Highway 401 EB Off-Ramp

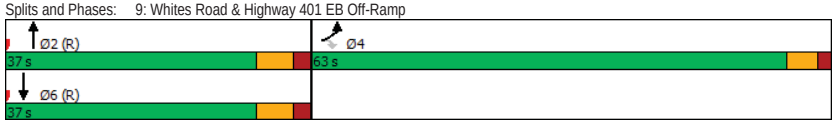
Future Total PM Peak Hour

Lane Group	EBL	EBR	NBT	SBT
Lane Configurations				
Traffic Volume (vph)	1730	945	920	605
Future Volume (vph)	1730	945	920	605
Lane Group Flow (vph)	1784	974	948	624
Turn Type	Prot	Perm	NA	NA
Protected Phases	4		2	6
Permitted Phases		4		
Detector Phase	4	4	2	6
Switch Phase				
Minimum Initial (s)	8.0	8.0	20.0	20.0
Minimum Split (s)	29.0	29.0	29.0	29.0
Total Split (s)	63.0	63.0	37.0	37.0
Total Split (%)	63.0%	63.0%	37.0%	37.0%
Yellow Time (s)	3.7	3.7	4.5	4.5
All-Red Time (s)	1.8	1.8	2.2	2.2
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	4.5	4.5	5.7	5.7
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	None	None	C-Max	C-Max
v/c Ratio	0.92	0.61	0.86	0.56
Control Delay	27.7	13.4	25.7	30.9
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	27.7	13.4	25.7	30.9
Queue Length 50th (m)	155.4	58.2	38.9	55.7
Queue Length 95th (m)	#202.5	79.4	#71.0	74.1
Internal Link Dist (m)	465.0		150.1	454.6
Turn Bay Length (m)		220.0		
Base Capacity (vph)	1960	1613	1108	1108
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.91	0.60	0.86	0.56

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 100
Offset: 8 (8%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 9: Whites Road & Highway 401 EB Off-Ramp



HCM Signalized Intersection Capacity Analysis
9: Whites Road & Highway 401 EB Off-Ramp

Future Total PM Peak Hour

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	1730	945	0	920	605	0
Future Volume (vph)	1730	945	0	920	605	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)	3351	2668		3500	3500	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	3351	2668		3500	3500	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	1784	974	0	948	624	0
RTOR Reduction (vph)	0	54	0	0	0	0
Lane Group Flow (vph)	1784	920	0	948	624	0
Confl. Peds. (#/hr)			5			5
Heavy Vehicles (%)	1%	3%	0%	2%	2%	0%
Turn Type	Prot	Perm		NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4				
Actuated Green, G (s)	57.1	57.1		30.7	30.7	
Effective Green, g (s)	58.1	58.1		31.7	31.7	
Actuated g/C Ratio	0.58	0.58		0.32	0.32	
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)	1946	1550		1109	1109	
v/s Ratio Prot	c0.53			c0.27	0.18	
v/s Ratio Perm		0.35				
v/c Ratio	0.92	0.59		0.85	0.56	
Uniform Delay, d1	18.8	13.4		32.0	28.4	
Progression Factor	1.00	1.00		0.55	1.00	
Incremental Delay, d2	7.3	0.6		7.3	2.1	
Delay (s)	26.1	14.0		24.8	30.5	
Level of Service	C	B		C	C	
Approach Delay (s)	21.8			24.8	30.5	
Approach LOS	C			C	C	

Intersection Summary

HCM 2000 Control Delay	23.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.2
Intersection Capacity Utilization	83.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Queues
1: Kingston Road & Rosebank Road

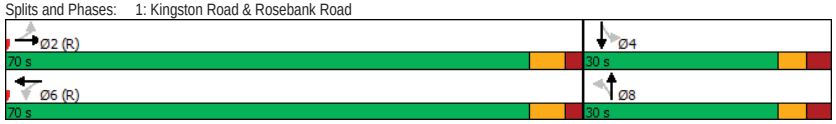
Future Total 2029 AM Peak Hour

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	75	625	5	1075	5	0	90	5
Future Volume (vph)	75	625	5	1075	5	0	90	5
Lane Group Flow (vph)	91	774	6	1354	6	6	110	165
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		2		6		8		4
Permitted Phases	2		6		8		4	
Detector Phase	2	2	6	6	8	8	4	4
Switch Phase								
Minimum Initial (s)	20.0	20.0	20.0	20.0	8.0	8.0	8.0	8.0
Minimum Split (s)	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0
Total Split (s)	70.0	70.0	70.0	70.0	30.0	30.0	30.0	30.0
Total Split (%)	70.0%	70.0%	70.0%	70.0%	30.0%	30.0%	30.0%	30.0%
Yellow Time (s)	4.3	4.3	4.3	4.3	3.5	3.5	3.5	3.5
All-Red Time (s)	2.3	2.3	2.3	2.3	3.1	3.1	3.1	3.1
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	None	None	None
v/c Ratio	0.40	0.31	0.01	0.54	0.04	0.01	0.54	0.57
Control Delay	12.5	5.2	5.0	7.2	33.8	0.0	48.3	29.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.5	5.2	5.0	7.2	33.8	0.0	48.3	29.7
Queue Length 50th (m)	5.6	22.7	0.3	51.2	1.1	0.0	21.2	18.1
Queue Length 95th (m)	18.1	36.6	1.6	76.2	4.1	0.0	32.1	31.0
Internal Link Dist (m)		186.4		445.7		49.9		463.8
Turn Bay Length (m)	45.0		85.0		20.0		30.0	
Base Capacity (vph)	228	2498	474	2515	230	558	335	434
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.40	0.31	0.01	0.54	0.03	0.01	0.33	0.38

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 100
Offset: 57 (57%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated

Splits and Phases: 1: Kingston Road & Rosebank Road



HCM Signalized Intersection Capacity Analysis
1: Kingston Road & Rosebank Road

Future Total 2029 AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	75	625	10	5	1075	35	5	0	5	90	5	130
Future Volume (vph)	75	625	10	5	1075	35	5	0	5	90	5	130
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	5.6	
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	0.97	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		0.99	1.00		0.99	1.00	
Frt	1.00	1.00		1.00	1.00		1.00	0.85		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1722	3374		1745	3396		1726	1567		1732	1567	
Flt Permitted	0.17	1.00		0.35	1.00		0.52	1.00		0.75	1.00	
Satd. Flow (perm)	308	3374		640	3396		946	1567		1375	1567	
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	91	762	12	6	1311	43	6	0	6	110	6	159
RTOR Reduction (vph)	0	1	0	0	2	0	0	5	0	0	59	0
Lane Group Flow (vph)	91	773	0	6	1352	0	6	1	0	110	106	0
Confl. Peds. (#/hr)	10					10	10		5	5		10
Confl. Bikes (#/hr)			150									
Heavy Vehicles (%)	1%	4%	0%	0%	3%	9%	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	7	7	0	6	6	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)	73.0	73.0		73.0	73.0		13.8	13.8		13.8	13.8	
Effective Green, g (s)	74.0	74.0		74.0	74.0		14.8	14.8		14.8	14.8	
Actuated g/C Ratio	0.74	0.74		0.74	0.74		0.15	0.15		0.15	0.15	
Clearance Time (s)	6.6	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	3.0	
Lane Grp Cap (vph)	227	2496		473	2513		140	231		203	231	
v/s Ratio Prot		0.23			c0.40			0.00			0.07	
v/s Ratio Perm	0.30			0.01			0.01			c0.08		
v/c Ratio	0.40	0.31		0.01	0.54		0.04	0.00		0.54	0.46	
Uniform Delay, d1	4.8	4.4		3.4	5.6		36.5	36.3		39.5	38.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	5.2	0.3		0.0	0.8		0.1	0.0		2.9	1.5	
Delay (s)	10.0	4.7		3.5	6.4		36.7	36.3		42.4	40.4	
Level of Service	B	A		A	A		D	D		D	D	
Approach Delay (s)		5.3			6.4			36.5			41.2	
Approach LOS		A			A			D			D	

Intersection Summary

HCM 2000 Control Delay	10.0	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.54			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	11.2	
Intersection Capacity Utilization	74.8%	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 2029 AM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	700	25	0	1150	0	120
Future Volume (Veh/h)	700	25	0	1150	0	120
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	875	31	0	1438	0	150
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					0.76	
vC, conflicting volume			906		1594	438
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			906		1139	438
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	74
cM capacity (veh/h)			759		149	573

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1
Volume Total	438	438	31	0	719	719	150
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	31	0	0	0	150
cSH	1700	1700	1700	1700	1700	1700	573
Volume to Capacity	0.26	0.26	0.02	0.00	0.42	0.42	0.26
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0	8.4
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	13.5
Lane LOS							B
Approach Delay (s)	0.0			0.0			13.5
Approach LOS							B

Intersection Summary			
Average Delay		0.8	
Intersection Capacity Utilization		45.9%	ICU Level of Service A
Analysis Period (min)		15	

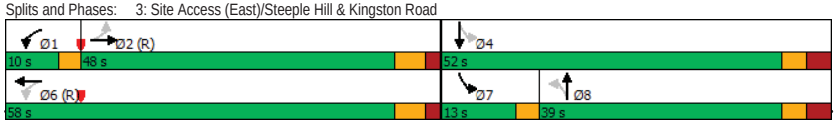
Queues
3: Site Access (East)/Steeple Hill & Kingston Road

Future Total 2029 AM Peak Hour

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	40	735	175	945	130	0	150	0
Future Volume (vph)	40	735	175	945	130	0	150	0
Lane Group Flow (vph)	48	940	211	1205	157	464	181	60
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	
Detector Phase	2	2	1	6	8	8	7	4
Switch Phase								
Minimum Initial (s)	20.0	20.0	5.0	20.0	8.0	8.0	5.0	8.0
Minimum Split (s)	28.0	28.0	8.0	28.0	38.0	38.0	8.0	38.0
Total Split (s)	48.0	48.0	10.0	58.0	39.0	39.0	13.0	52.0
Total Split (%)	43.6%	43.6%	9.1%	52.7%	35.5%	35.5%	11.8%	47.3%
Yellow Time (s)	4.2	4.2	3.0	4.2	3.3	3.3	3.0	3.3
All-Red Time (s)	2.1	2.1	0.0	2.1	3.4	3.4	0.0	3.4
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.3	5.3	2.0	5.3	5.7	5.7	2.0	5.7
Lead/Lag	Lag	Lag	Lead		Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes		Yes	Yes	Yes	
Recall Mode	C-Max	C-Max	None	C-Max	None	None	None	None
v/c Ratio	0.33	0.65	0.63	0.64	0.52	0.88	0.75	0.10
Control Delay	32.0	28.3	34.0	19.8	41.5	40.2	42.4	5.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.0	28.3	34.0	19.8	41.5	40.2	42.4	5.2
Queue Length 50th (m)	7.6	92.8	29.9	73.0	30.8	58.7	27.5	0.0
Queue Length 95th (m)	17.8	104.8	m#46.3	m98.7	43.3	79.3	36.3	6.3
Internal Link Dist (m)		129.3		289.8		62.3		200.4
Turn Bay Length (m)	25.0		30.0				15.0	
Base Capacity (vph)	145	1443	333	1870	399	627	241	708
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.33	0.65	0.63	0.64	0.39	0.74	0.75	0.08

Intersection Summary
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Site Access (East)/Steeple Hill & Kingston Road



HCM Signalized Intersection Capacity Analysis
3: Site Access (East)/Steeple Hill & Kingston Road

Future Total 2029 AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	735	45	175	945	55	130	0	385	150	0	50
Future Volume (vph)	40	735	45	175	945	55	130	0	385	150	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		2.0	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	0.99		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		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)	1655	3326		1745	3386		1745	1597		1678	1597	
Flt Permitted	0.19	1.00		0.18	1.00		0.72	1.00		0.15	1.00	
Satd. Flow (perm)	334	3326		330	3386		1319	1597		259	1597	
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)	48	886	54	211	1139	66	157	0	464	181	0	60
RTOR Reduction (vph)	0	4	0	0	3	0	0	159	0	0	39	0
Lane Group Flow (vph)	48	936	0	211	1202	0	157	305	0	181	21	0
Confl. Peds. (#/hr)	10					10						
Confl. Bikes (#/hr)			160									
Heavy Vehicles (%)	5%	3%	20%	0%	3%	4%	0%	0%	0%	4%	0%	0%
Bus Blockages (#/hr)	0	7	7	0	6	6	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)	46.7	46.7		59.7	59.7		24.3	24.3		37.3	37.3	
Effective Green, g (s)	47.7	47.7		60.7	60.7		25.3	25.3		38.3	38.3	
Actuated g/C Ratio	0.43	0.43		0.55	0.55		0.23	0.23		0.35	0.35	
Clearance Time (s)	6.3	6.3		3.0	6.3		6.7	6.7		3.0	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)	144	1442		323	1868		303	367		232	556	
v/s Ratio Prot		0.28		c0.07	c0.35			c0.19		c0.08	0.01	
v/s Ratio Perm	0.14			0.29			0.12			0.19		
v/c Ratio	0.33	0.65		0.65	0.64		0.52	0.83		0.78	0.04	
Uniform Delay, d1	20.6	24.6		15.6	17.1		37.0	40.3		28.9	23.7	
Progression Factor	1.00	1.00		2.01	0.99		1.00	1.00		1.00	1.00	
Incremental Delay, d2	6.1	2.3		3.4	1.2		1.5	14.6		15.5	0.0	
Delay (s)	26.7	26.8		34.7	18.2		38.5	54.9		44.5	23.7	
Level of Service	C	C		C	B		D	D		D	C	
Approach Delay (s)		26.8			20.7			50.8			39.3	
Approach LOS		C			C			D			D	

Intersection Summary				
HCM 2000 Control Delay	29.6	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.72			
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	15.0	
Intersection Capacity Utilization	93.7%	ICU Level of Service	F	
Analysis Period (min)	15			
c Critical Lane Group				

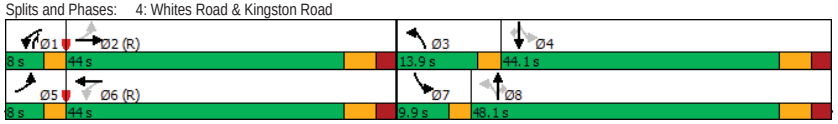
Queues
4: Whites Road & Kingston Road

Future Total 2029 AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	105	370	795	285	850	335	285	505	410	120	1080	135
Future Volume (vph)	105	370	795	285	850	335	285	505	410	120	1080	135
Lane Group Flow (vph)	109	385	828	297	885	349	285	526	427	125	1125	141
Turn Type	pm+pt	NA	Free	pm+pt	NA	Free	pm+pt	NA	pm+ov	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases	2		Free	6		Free	8		8	4		4
Detector Phase	5	2		1	6		3	8	1	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	20.0		5.0	20.0		5.0	8.0	5.0	5.0	8.0	8.0
Minimum Split (s)	8.0	44.0		8.0	44.0		8.0	44.1	8.0	8.0	44.1	44.1
Total Split (s)	8.0	44.0		8.0	44.0		13.9	48.1	8.0	9.9	44.1	44.1
Total Split (%)	7.3%	40.0%		7.3%	40.0%		12.6%	43.7%	7.3%	9.0%	40.1%	40.1%
Yellow Time (s)	3.0	4.2		3.0	4.2		3.0	4.3	3.0	3.0	4.3	4.3
All-Red Time (s)	0.0	2.8		0.0	2.8		0.0	2.8	0.0	0.0	2.8	2.8
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	2.0	6.0		2.0	6.0		2.0	6.1	2.0	2.0	6.1	6.1
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max		None	C-Max		None	Max	None	None	Max	Max
v/c Ratio	0.55	0.33	0.57	0.72	0.73	0.23	0.99	0.41	0.51	0.31	0.95	0.25
Control Delay	27.5	28.1	3.2	26.1	27.1	0.3	74.2	23.3	5.2	16.7	52.1	6.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.5	28.1	3.2	26.1	27.1	0.3	74.2	23.3	5.2	16.7	52.1	6.8
Queue Length 50th (m)	13.5	31.8	22.2	41.3	82.3	0.0	36.5	37.8	1.3	14.4	129.1	1.8
Queue Length 95th (m)	m21.2	47.5	26.2	#55.9	97.5	0.0	#96.9	64.0	34.7	25.2	#174.6	15.7
Internal Link Dist (m)		289.8			476.9			454.6			338.0	
Turn Bay Length (m)	100.0		80.0	35.0		35.0	50.0		45.0	85.0		15.0
Base Capacity (vph)	200	1174	1447	411	1209	1511	289	1298	831	407	1185	557
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.55	0.33	0.57	0.72	0.73	0.23	0.99	0.41	0.51	0.31	0.95	0.25

Intersection Summary
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 1.1 (1%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 105
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Whites Road & Kingston Road



HCM Signalized Intersection Capacity Analysis
4: Whites Road & Kingston Road

Future Total 2029 AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	105	370	795	285	850	335	285	505	410	120	1080	135
Future Volume (vph)	105	370	795	285	850	335	285	505	410	120	1080	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	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	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.95	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00	1.00	0.99	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)	1693	3400	1447	1668	3500	1511	1800	3400	1462	1669	3433	1369
Flt Permitted	0.16	1.00	1.00	0.48	1.00	1.00	0.13	1.00	1.00	0.43	1.00	1.00
Satd. Flow (perm)	284	3400	1447	844	3500	1511	236	3400	1462	755	3433	1369
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	1.00	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	109	385	828	297	885	349	285	526	427	125	1125	141
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	149	0	0	84
Lane Group Flow (vph)	109	385	828	297	885	349	285	526	278	125	1125	57
Confl. Peds. (#/hr)	35		25	25		35	20		30	30		20
Confl. Bikes (#/hr)			160									
Heavy Vehicles (%)	3%	5%	2%	4%	2%	1%	2%	5%	2%	4%	4%	8%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	3	0	0	6
Turn Type	pm+pt	NA	Free	pm+pt	NA	Free	pm+pt	NA	pm+ov	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases	2		Free	6		Free	8		8	4		4
Actuated Green, G (s)	42.0	37.0	110.0	42.0	37.0	110.0	50.9	41.0	46.0	43.9	37.0	37.0
Effective Green, g (s)	44.0	38.0	110.0	44.0	38.0	110.0	51.9	42.0	48.0	45.9	38.0	38.0
Actuated g/C Ratio	0.40	0.35	1.00	0.40	0.35	1.00	0.47	0.38	0.44	0.42	0.35	0.35
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)	190	1174	1447	382	1209	1511	280	1298	637	380	1185	472
v/s Ratio Prot	0.03	0.11		0.04	c0.25		c0.11	0.15	0.02	0.02	c0.33	
v/s Ratio Perm	0.20		c0.57	0.27		0.23	0.37		0.17	0.11		0.04
v/c Ratio	0.57	0.33	0.57	0.78	0.73	0.23	1.02	0.41	0.44	0.33	0.95	0.12
Uniform Delay, d1	23.2	26.6	0.0	27.5	31.5	0.0	23.3	24.9	21.6	20.2	35.1	24.6
Progression Factor	1.09	1.03	1.00	0.70	0.74	1.00	1.23	0.89	0.49	1.00	1.00	1.00
Incremental Delay, d2	3.0	0.5	1.2	8.4	3.4	0.3	54.4	0.8	0.4	0.5	16.5	0.5
Delay (s)	28.3	27.9	1.2	27.5	26.8	0.3	83.0	23.1	10.9	20.7	51.6	25.1
Level of Service	C	C	A	C	C	A	F	C	B	C	D	C
Approach Delay (s)		11.2			20.9			32.7			46.1	
Approach LOS		B			C			C			D	

Intersection Summary				
HCM 2000 Control Delay	27.6	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.85			
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.1	
Intersection Capacity Utilization	109.2%	ICU Level of Service	H	
Analysis Period (min)	15			
c Critical Lane Group				

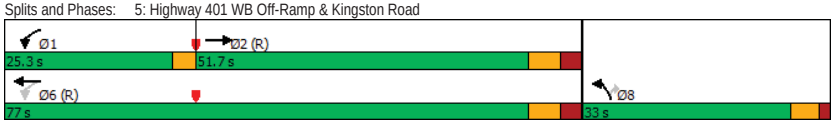
Queues
5: Highway 401 WB Off-Ramp & Kingston Road

Future Total 2029 AM Peak Hour

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Configurations					
Traffic Volume (vph)	795	510	890	560	65
Future Volume (vph)	795	510	890	560	65
Lane Group Flow (vph)	862	543	947	596	69
Turn Type	NA	pm+pt	NA	Prot	Perm
Protected Phases	2	1	6	8	
Permitted Phases		6			8
Detector Phase	2	1	6	8	8
Switch Phase					
Minimum Initial (s)	20.0	3.5	20.0	8.0	8.0
Minimum Split (s)	51.0	8.0	51.0	32.0	32.0
Total Split (s)	51.7	25.3	77.0	33.0	33.0
Total Split (%)	47.0%	23.0%	70.0%	30.0%	30.0%
Yellow Time (s)	4.2	3.0	4.2	3.7	3.7
All-Red Time (s)	3.0	0.0	3.0	1.7	1.7
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	6.2	2.0	6.2	4.4	4.4
Lead/Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes			
Recall Mode	C-Max	None	C-Max	None	None
v/c Ratio	0.60	0.92	0.41	0.78	0.19
Control Delay	21.9	40.9	9.0	47.5	21.9
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	21.9	40.9	9.0	47.5	21.9
Queue Length 50th (m)	57.5	72.8	46.3	65.1	7.1
Queue Length 95th (m)	74.6	#151.7	63.7	82.6	18.5
Internal Link Dist (m)	476.9		318.1	85.1	
Turn Bay Length (m)		15.0			15.0
Base Capacity (vph)	1437	590	2337	862	415
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.60	0.92	0.41	0.69	0.17

Intersection Summary
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 3.3 (3%), Referenced to phase 2:EBT and 6:WBTL, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Highway 401 WB Off-Ramp & Kingston Road



HCM Signalized Intersection Capacity Analysis
5: Highway 401 WB Off-Ramp & Kingston Road

Future Total 2029 AM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	795	15	510	890	560	65
Future Volume (vph)	795	15	510	890	560	65
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
Frpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00	1.00	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)	3416		1728	3466	3319	1516
Flt Permitted	1.00		0.21	1.00	0.95	1.00
Satd. Flow (perm)	3416		384	3466	3319	1516
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	846	16	543	947	596	69
RTOR Reduction (vph)	1	0	0	0	0	22
Lane Group Flow (vph)	861	0	543	947	596	47
Confl. Bikes (#/hr)		150				
Heavy Vehicles (%)	4%	0%	1%	3%	2%	3%
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases			6			8
Actuated Green, G (s)	45.3		73.2	73.2	24.2	24.2
Effective Green, g (s)	46.3		74.2	74.2	25.2	25.2
Actuated g/C Ratio	0.42		0.67	0.67	0.23	0.23
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)	1437		575	2337	760	347
v/s Ratio Prot	c0.25		c0.22	0.27	c0.18	
v/s Ratio Perm			0.41			0.03
v/c Ratio	0.60		0.94	0.41	0.78	0.13
Uniform Delay, d1	24.7		21.4	8.0	39.8	33.7
Progression Factor	0.80		1.00	1.00	1.00	1.00
Incremental Delay, d2	1.7		24.3	0.5	5.3	0.2
Delay (s)	21.5		45.8	8.5	45.2	33.9
Level of Service	C		D	A	D	C
Approach Delay (s)	21.5			22.1	44.0	
Approach LOS	C			C	D	

Intersection Summary				
HCM 2000 Control Delay	26.8	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)	12.6	
Intersection Capacity Utilization	78.9%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

Queues
6: Whites Road & Bayly Street

Future Total 2029 AM Peak Hour

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	255	365	660	125	570	515
Future Volume (vph)	255	365	660	125	570	515
Lane Group Flow (vph)	271	388	702	133	309	845
Turn Type	Perm	Perm	NA	Perm	pm+pt	NA
Protected Phases			5		6	2
Permitted Phases	8	8		5	2	
Detector Phase	8	8	5	5	6	2
Switch Phase						
Minimum Initial (s)	8.0	8.0	12.0	12.0	12.0	12.0
Minimum Split (s)	28.0	28.0	32.0	32.0	21.0	21.0
Total Split (s)	29.0	29.0	33.0	33.0	38.0	71.0
Total Split (%)	29.0%	29.0%	33.0%	33.0%	38.0%	71.0%
Yellow Time (s)	4.2	4.2	4.4	4.4	4.4	4.4
All-Red Time (s)	2.4	2.4	2.6	2.6	2.6	2.6
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.6	5.6	6.0	6.0	6.0	6.0
Lead/Lag			Lead	Lead	Lag	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None	None	Max	Max	C-Max	Max
v/c Ratio	0.78	0.63	0.69	0.26	0.48	0.49
Control Delay	53.0	8.4	36.0	11.4	18.5	11.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	53.0	8.4	36.0	11.4	18.5	11.7
Queue Length 50th (m)	51.6	0.0	67.9	5.5	26.0	38.2
Queue Length 95th (m)	79.4	24.7	91.4	20.6	44.6	52.1
Internal Link Dist (m)	323.4		152.5			150.1
Turn Bay Length (m)				35.0	30.0	
Base Capacity (vph)	397	652	1015	514	647	1711
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.68	0.60	0.69	0.26	0.48	0.49

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 16 (16%), Referenced to phase 6:SBL, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated

Splits and Phases: 6: Whites Road & Bayly Street

HCM Signalized Intersection Capacity Analysis
6: Whites Road & Bayly Street

Future Total 2029 AM Peak Hour

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	255	365	660	125	570	515
Future Volume (vph)	255	365	660	125	570	515
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)	5.6	5.6	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	0.97	1.00	1.00
Flpb, ped/bikes	0.99	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	0.98
Satd. Flow (prot)	1698	1518	3400	1499	1555	3291
Flt Permitted	0.95	1.00	1.00	1.00	0.25	0.55
Satd. Flow (perm)	1698	1518	3400	1499	417	1832
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	271	388	702	133	606	548
RTOR Reduction (vph)	0	308	0	67	0	0
Lane Group Flow (vph)	271	80	702	66	309	845
Confl. Peds. (#/hr)	5			15	15	
Heavy Vehicles (%)	2%	2%	5%	1%	2%	2%
Bus Blockages (#/hr)	0	2	0	0	0	0
Turn Type	Perm	Perm	NA	Perm	pm+pt	NA
Protected Phases			5		6	2
Permitted Phases	8	8		5	2	
Actuated Green, G (s)	19.5	19.5	28.9	28.9	66.9	66.9
Effective Green, g (s)	20.5	20.5	29.9	29.9	67.9	67.9
Actuated g/C Ratio	0.20	0.20	0.30	0.30	0.68	0.68
Clearance Time (s)	6.6	6.6	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)	348	311	1016	448	647	1710
v/s Ratio Prot			c0.21		0.15	c0.16
v/s Ratio Perm	c0.16	0.05		0.04	0.17	0.18
v/c Ratio	0.78	0.26	0.69	0.15	0.48	0.49
Uniform Delay, d1	37.6	33.3	31.0	25.7	15.6	7.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	10.5	0.4	3.9	0.7	2.5	1.0
Delay (s)	48.1	33.8	34.8	26.4	18.1	8.8
Level of Service	D	C	C	C	B	A
Approach Delay (s)	39.7		33.5			11.3
Approach LOS	D		C			B

Intersection Summary				
HCM 2000 Control Delay	25.3	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.65			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.6	
Intersection Capacity Utilization	69.3%	ICU Level of Service	C	
Analysis Period (min)	15			

c Critical Lane Group

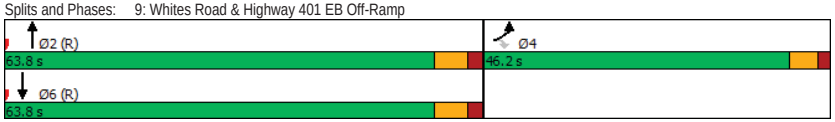
Queues
9: Whites Road & Highway 401 EB Off-Ramp

Future Total 2029 AM Peak Hour

Lane Group	EBL	EBR	NBT	SBT
Lane Configurations				
Traffic Volume (vph)	685	455	1025	630
Future Volume (vph)	685	455	1025	630
Lane Group Flow (vph)	714	474	1068	656
Turn Type	Prot	Perm	NA	NA
Protected Phases	4		2	6
Permitted Phases		4		
Detector Phase	4	4	2	6
Switch Phase				
Minimum Initial (s)	8.0	8.0	20.0	20.0
Minimum Split (s)	29.0	29.0	29.0	29.0
Total Split (s)	46.2	46.2	63.8	63.8
Total Split (%)	42.0%	42.0%	58.0%	58.0%
Yellow Time (s)	3.7	3.7	4.5	4.5
All-Red Time (s)	1.8	1.8	2.2	2.2
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	4.5	4.5	5.7	5.7
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	None	None	C-Max	C-Max
v/c Ratio	0.75	0.46	0.50	0.31
Control Delay	40.5	8.6	13.4	11.2
Queue Delay	0.0	0.0	0.5	0.0
Total Delay	40.5	8.6	14.0	11.2
Queue Length 50th (m)	75.2	10.8	65.8	29.3
Queue Length 95th (m)	88.2	23.2	97.5	m37.4
Internal Link Dist (m)	465.0		150.1	454.6
Turn Bay Length (m)		220.0		
Base Capacity (vph)	1245	1244	2121	2142
Starvation Cap Reductn	0	0	578	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.57	0.38	0.69	0.31

Intersection Summary
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 60 (55%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 9: Whites Road & Highway 401 EB Off-Ramp



HCM Signalized Intersection Capacity Analysis
9: Whites Road & Highway 401 EB Off-Ramp

Future Total 2029 AM Peak Hour

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	685	455	0	1025	630	0
Future Volume (vph)	685	455	0	1025	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)	3286	2694		3433	3466	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	3286	2694		3433	3466	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	714	474	0	1068	656	0
RTOR Reduction (vph)	0	256	0	0	0	0
Lane Group Flow (vph)	714	218	0	1068	656	0
Confl. Peds. (#/hr)			10			10
Heavy Vehicles (%)	3%	2%	0%	4%	3%	0%
Turn Type	Prot	Perm		NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4				
Actuated Green, G (s)	30.8	30.8		67.0	67.0	
Effective Green, g (s)	31.8	31.8		68.0	68.0	
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)	949	778		2122	2142	
v/s Ratio Prot	c0.22			c0.31	0.19	
v/s Ratio Perm		0.08				
v/c Ratio	0.75	0.28		0.50	0.31	
Uniform Delay, d1	35.5	30.2		11.6	9.9	
Progression Factor	1.00	1.00		1.00	1.02	
Incremental Delay, d2	3.4	0.2		0.9	0.2	
Delay (s)	38.9	30.4		12.5	10.4	
Level of Service	D	C		B	B	
Approach Delay (s)	35.5			12.5	10.4	
Approach LOS	D			B	B	

Intersection Summary				
HCM 2000 Control Delay	21.4	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.58			
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	10.2	
Intersection Capacity Utilization	56.4%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

Queues
1: Kingston Road & Rosebank Road

Future Total 2029 PM Peak Hour

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	120	1220	825	5	0	50	5
Future Volume (vph)	120	1220	825	5	0	50	5
Lane Group Flow (vph)	124	1258	913	5	10	52	72
Turn Type	Perm	NA	NA	Perm	NA	Perm	NA
Protected Phases		2	6		8		4
Permitted Phases	2			8		4	
Detector Phase	2	2	6	8	8	4	4
Switch Phase							
Minimum Initial (s)	20.0	20.0	20.0	8.0	8.0	8.0	8.0
Minimum Split (s)	28.0	28.0	28.0	28.0	28.0	28.0	28.0
Total Split (s)	70.0	70.0	70.0	30.0	30.0	30.0	30.0
Total Split (%)	70.0%	70.0%	70.0%	30.0%	30.0%	30.0%	30.0%
Yellow Time (s)	4.3	4.3	4.3	3.5	3.5	3.5	3.5
All-Red Time (s)	2.3	2.3	2.3	3.1	3.1	3.1	3.1
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.6	5.6	5.6	5.6	5.6	5.6	5.6
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	C-Max	C-Max	C-Max	None	None	None	None
v/c Ratio	0.28	0.45	0.33	0.03	0.04	0.31	0.29
Control Delay	6.5	5.1	4.3	35.0	0.3	42.7	13.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.5	5.1	4.3	35.0	0.3	42.7	13.2
Queue Length 50th (m)	5.5	35.5	21.8	1.0	0.0	10.1	1.0
Queue Length 95th (m)	20.7	78.6	50.1	3.9	0.0	19.3	12.3
Internal Link Dist (m)		186.4	445.7		49.9		463.8
Turn Bay Length (m)	45.0			20.0		30.0	
Base Capacity (vph)	444	2808	2751	316	442	334	427
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.28	0.45	0.33	0.02	0.02	0.16	0.17

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 83 (83%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Splits and Phases: 1: Kingston Road & Rosebank Road

HCM Signalized Intersection Capacity Analysis
1: Kingston Road & Rosebank Road

Future Total 2029 PM Peak Hour

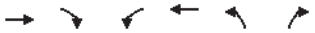
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	120	1220	0	0	825	60	5	0	10	50	5	65
Future Volume (vph)	120	1220	0	0	825	60	5	0	10	50	5	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	3.3	3.5	3.5	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			0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00			1.00		1.00	0.98		1.00	0.98	
Flpb, ped/bikes	0.99	1.00			1.00		0.99	1.00		0.99	1.00	
Frt	1.00	1.00			0.99		1.00	0.85		1.00	0.86	
Flt Protected	0.95	1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1731	3492			3416		1734	1567		1733	1545	
Flt Permitted	0.30	1.00			1.00		0.71	1.00		0.75	1.00	
Satd. Flow (perm)	552	3492			3416		1296	1567		1370	1545	
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)	124	1258	0	0	851	62	5	0	10	52	5	67
RTOR Reduction (vph)	0	0	0	0	3	0	0	9	0	0	60	0
Lane Group Flow (vph)	124	1258	0	0	910	0	5	1	0	52	12	0
Confl. Peds. (#/hr)	10		5	5		10	5		5	5		5
Heavy Vehicles (%)	0%	1%	0%	0%	2%	0%	0%	0%	0%	0%	0%	3%
Bus Blockages (#/hr)	0	6	6	0	6	6	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)	77.0	77.0			77.0		9.8	9.8		9.8	9.8	
Effective Green, g (s)	78.0	78.0			78.0		10.8	10.8		10.8	10.8	
Actuated g/C Ratio	0.78	0.78			0.78		0.11	0.11		0.11	0.11	
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)	430	2723			2664		139	169		147	166	
v/s Ratio Prot		c0.36			0.27			0.00			0.01	
v/s Ratio Perm	0.22						0.00			c0.04		
v/c Ratio	0.29	0.46			0.34		0.04	0.01		0.35	0.07	
Uniform Delay, d1	3.1	3.8			3.3		39.9	39.8		41.4	40.1	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.7	0.6			0.3		0.1	0.0		1.5	0.2	
Delay (s)	4.8	4.3			3.6		40.0	39.8		42.8	40.3	
Level of Service	A	A			A		D	D		D	D	
Approach Delay (s)		4.4			3.6			39.9			41.4	
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	0.45			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	11.2	
Intersection Capacity Utilization	75.1%	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 2029 PM Peak Hour



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1225	80	0	905	0	70
Future Volume (Veh/h)	1225	80	0	905	0	70
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	1250	82	0	923	0	71
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					0.90	
vC, conflicting volume			1332		1712	625
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1332		1565	625
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	84
cM capacity (veh/h)			525		94	433

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1
Volume Total	625	625	82	0	462	462	71
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	82	0	0	0	71
cSH	1700	1700	1700	1700	1700	1700	433
Volume to Capacity	0.37	0.37	0.05	0.00	0.27	0.27	0.16
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0	4.7
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	15.0
Lane LOS							B
Approach Delay (s)	0.0			0.0			15.0
Approach LOS							B

Intersection Summary				
Average Delay	0.5			
Intersection Capacity Utilization	44.9%	ICU Level of Service		A
Analysis Period (min)	15			

Queues
3: Site Access (East)/Steeple Hill & Kingston Road

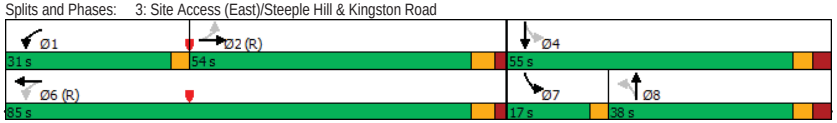
Future Total 2029 PM Peak Hour

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	100	1100	385	740	85	10	220	0
Future Volume (vph)	100	1100	385	740	85	10	220	0
Lane Group Flow (vph)	103	1232	397	892	88	294	227	72
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	
Detector Phase	2	2	1	6	8	8	7	4
Switch Phase								
Minimum Initial (s)	20.0	20.0	5.0	20.0	8.0	8.0	5.0	8.0
Minimum Split (s)	28.0	28.0	8.0	28.0	38.0	38.0	8.0	38.0
Total Split (s)	54.0	54.0	31.0	85.0	38.0	38.0	17.0	55.0
Total Split (%)	38.6%	38.6%	22.1%	60.7%	27.1%	27.1%	12.1%	39.3%
Yellow Time (s)	4.2	4.2	3.0	4.2	3.3	3.3	3.0	3.3
All-Red Time (s)	2.1	2.1	0.0	2.1	3.4	3.4	0.0	3.4
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.3	5.3	2.0	5.3	5.7	5.7	2.0	5.7
Lead/Lag	Lag	Lag	Lead		Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes		Yes	Yes	Yes	
Recall Mode	C-Max	C-Max	None	C-Max	None	None	None	None
v/c Ratio	0.42	0.83	0.85	0.39	0.54	0.66	0.92	0.14
Control Delay	38.0	42.5	59.1	9.5	67.0	13.7	83.1	0.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	38.0	42.5	59.1	9.5	67.0	13.7	83.1	0.5
Queue Length 50th (m)	21.0	168.1	102.9	45.4	24.8	2.7	56.6	0.0
Queue Length 95th (m)	45.2	#245.1	m#147.5	m73.4	38.2	28.0	#76.1	0.0
Internal Link Dist (m)		129.3		289.8		62.3		200.4
Turn Bay Length (m)	25.0		30.0				15.0	
Base Capacity (vph)	248	1483	473	2272	299	580	246	667
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.42	0.83	0.84	0.39	0.29	0.51	0.92	0.11

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 115
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Site Access (East)/Steeple Hill & Kingston Road



HCM Signalized Intersection Capacity Analysis
3: Site Access (East)/Steeple Hill & Kingston Road

Future Total 2029 PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	1100	95	385	740	125	85	10	275	220	0	70
Future Volume (vph)	100	1100	95	385	740	125	85	10	275	220	0	70
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		2.0	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	0.99		1.00	0.98		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	0.99		1.00	0.98		1.00	0.86		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)	1727	3453		1745	3366		1734	1567		1726	1567	
Flt Permitted	0.32	1.00		0.07	1.00		0.71	1.00		0.20	1.00	
Satd. Flow (perm)	580	3453		136	3366		1296	1567		367	1567	
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)	103	1134	98	397	763	129	88	10	284	227	0	72
RTOR Reduction (vph)	0	4	0	0	8	0	0	248	0	0	54	0
Lane Group Flow (vph)	103	1228	0	397	884	0	88	46	0	227	18	0
Confl. Peds. (#/hr)	10					10	5		10	10		5
Heavy Vehicles (%)	0%	1%	0%	0%	2%	0%	0%	0%	0%	1%	0%	0%
Bus Blockages (#/hr)	0	6	6	0	6	6	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)	58.9	58.9		93.2	93.2		16.8	16.8		33.8	33.8	
Effective Green, g (s)	59.9	59.9		94.2	94.2		17.8	17.8		34.8	34.8	
Actuated g/C Ratio	0.43	0.43		0.67	0.67		0.13	0.13		0.25	0.25	
Clearance Time (s)	6.3	6.3		3.0	6.3		6.7	6.7		3.0	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)	248	1477		462	2264		164	199		236	389	
v/s Ratio Prot		c0.36		c0.20	0.26			0.03		c0.10	0.01	
v/s Ratio Perm	0.18			0.38			c0.07			0.14		
v/c Ratio	0.42	0.83		0.86	0.39		0.54	0.23		0.96	0.05	
Uniform Delay, d1	27.9	35.6		40.9	10.2		57.2	55.0		47.3	40.0	
Progression Factor	1.00	1.00		1.29	0.84		1.00	1.00		1.00	1.00	
Incremental Delay, d2	5.1	5.6		10.0	0.3		3.4	0.6		47.7	0.0	
Delay (s)	32.9	41.2		62.9	8.8		60.6	55.5		95.0	40.0	
Level of Service	C	D		E	A		E	E		F	D	
Approach Delay (s)		40.5			25.5			56.7			81.8	
Approach LOS		D			C			E			F	

Intersection Summary

HCM 2000 Control Delay	40.3	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)	15.0
Intersection Capacity Utilization	103.4%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Queues
4: Whites Road & Kingston Road

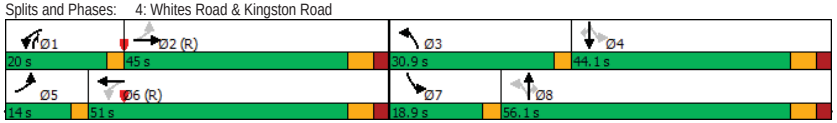
Future Total 2029 PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	160	830	605	225	790	515	460	1035	785	160	640	120
Future Volume (vph)	160	830	605	225	790	515	460	1035	785	160	640	120
Lane Group Flow (vph)	162	838	611	227	798	520	465	1045	793	162	646	121
Turn Type	pm+pt	NA	Free	pm+pt	NA	Free	pm+pt	NA	pm+ov	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases	2		Free	6		Free	8		8	4		4
Detector Phase	5	2		1	6		3	8	1	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	20.0		5.0	20.0		5.0	8.0	5.0	5.0	8.0	8.0
Minimum Split (s)	8.0	44.0		8.0	44.0		8.0	44.1	8.0	8.0	44.1	44.1
Total Split (s)	14.0	45.0		20.0	51.0		30.9	56.1	20.0	18.9	44.1	44.1
Total Split (%)	10.0%	32.1%		14.3%	36.4%		22.1%	40.1%	14.3%	13.5%	31.5%	31.5%
Yellow Time (s)	3.0	4.2		3.0	4.2		3.0	4.3	3.0	3.0	4.3	4.3
All-Red Time (s)	0.0	2.8		0.0	2.8		0.0	2.8	0.0	0.0	2.8	2.8
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	2.0	6.0		2.0	6.0		2.0	6.1	2.0	2.0	6.1	6.1
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max		None	C-Max		None	Max	None	None	Max	Max
v/c Ratio	0.63	0.84	0.40	0.83	0.70	0.34	0.97	0.78	0.89	0.64	0.68	0.24
Control Delay	40.4	54.7	0.7	48.5	30.3	0.5	63.6	43.8	33.0	34.3	49.9	7.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	40.4	54.7	0.7	48.5	30.3	0.5	63.6	43.8	33.0	34.3	49.9	7.1
Queue Length 50th (m)	25.6	89.8	0.0	37.5	95.5	0.0	97.4	140.8	144.2	24.2	88.9	0.0
Queue Length 95th (m)	m43.6	m122.0	m0.0	m#76.0	112.2	0.0	#169.9	175.0	#261.5	42.6	111.2	15.0
Internal Link Dist (m)		289.8			476.9			454.6			338.0	
Turn Bay Length (m)	100.0		80.0	35.0		35.0	50.0		45.0	85.0		15.0
Base Capacity (vph)	262	997	1538	285	1134	1514	479	1339	902	290	950	499
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.62	0.84	0.40	0.80	0.70	0.34	0.97	0.78	0.88	0.56	0.68	0.24

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 135
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Whites Road & Kingston Road



HCM Signalized Intersection Capacity Analysis
4: Whites Road & Kingston Road

Future Total 2029 PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	160	830	605	225	790	515	460	1035	785	160	640	120
Future Volume (vph)	160	830	605	225	790	515	460	1035	785	160	640	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	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	0.95	1.00	1.00	0.95	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)	1742	3500	1538	1727	3500	1514	1744	3535	1482	1727	3500	1503
Flt Permitted	0.20	1.00	1.00	0.11	1.00	1.00	0.21	1.00	1.00	0.15	1.00	1.00
Satd. Flow (perm)	364	3500	1538	196	3500	1514	380	3535	1482	275	3500	1503
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	162	838	611	227	798	520	465	1045	793	162	646	121
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	115	0	0	88
Lane Group Flow (vph)	162	838	611	227	798	520	465	1045	678	162	646	33
Confl. Peds. (#/hr)	30		10	10		30	5		10	10		5
Heavy Vehicles (%)	0%	2%	0%	1%	2%	1%	0%	1%	1%	1%	2%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	6	0	0	5
Turn Type	pm+pt	NA	Free	pm+pt	NA	Free	pm+pt	NA	pm+ov	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases	2		Free	6		Free	8		8	4		4
Actuated Green, G (s)	49.5	38.9	140.0	58.0	44.4	140.0	67.9	52.1	68.2	49.8	37.0	37.0
Effective Green, g (s)	51.5	39.9	140.0	59.0	45.4	140.0	68.9	53.1	70.2	51.8	38.0	38.0
Actuated g/C Ratio	0.37	0.28	1.00	0.42	0.32	1.00	0.49	0.38	0.50	0.37	0.27	0.27
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)	248	997	1538	269	1135	1514	468	1340	743	244	950	407
v/s Ratio Prot	0.05	c0.24		0.10	0.23		c0.20	0.30	c0.11	0.07	0.18	
v/s Ratio Perm	0.19		0.40	0.25		0.34	0.28		0.35	0.18		0.02
v/c Ratio	0.65	0.84	0.40	0.84	0.70	0.34	0.99	0.78	0.91	0.66	0.68	0.08
Uniform Delay, d1	32.3	47.1	0.0	35.4	41.4	0.0	33.1	38.3	32.1	32.2	45.6	38.0
Progression Factor	1.38	1.04	1.00	0.87	0.65	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.6	5.2	0.5	17.9	3.1	0.5	39.7	4.5	15.6	6.6	3.9	0.4
Delay (s)	48.2	54.2	0.5	48.8	30.0	0.5	72.8	42.8	47.7	38.8	49.5	38.4
Level of Service	D	D	A	D	C	A	E	D	D	D	D	D
Approach Delay (s)		33.2			22.8			50.6			46.2	
Approach LOS		C			C			D			D	

Intersection Summary

HCM 2000 Control Delay	38.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.1
Intersection Capacity Utilization	115.5%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

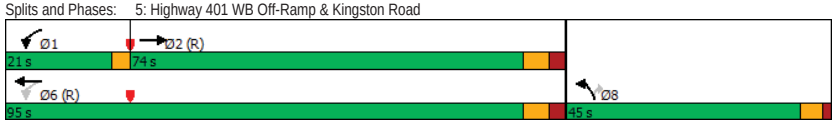
Queues
5: Highway 401 WB Off-Ramp & Kingston Road

Future Total 2029 PM Peak Hour

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Configurations					
Traffic Volume (vph)	1565	235	735	730	140
Future Volume (vph)	1565	235	735	730	140
Lane Group Flow (vph)	1658	247	774	768	147
Turn Type	NA	pm+pt	NA	Prot	Perm
Protected Phases	2	1	6	8	
Permitted Phases		6			8
Detector Phase	2	1	6	8	8
Switch Phase					
Minimum Initial (s)	20.0	3.5	20.0	8.0	8.0
Minimum Split (s)	51.0	8.0	51.0	32.0	32.0
Total Split (s)	74.0	21.0	95.0	45.0	45.0
Total Split (%)	52.9%	15.0%	67.9%	32.1%	32.1%
Yellow Time (s)	4.2	3.0	4.2	3.7	3.7
All-Red Time (s)	3.0	0.0	3.0	1.7	1.7
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	6.2	2.0	6.2	4.4	4.4
Lead/Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes			
Recall Mode	C-Max	None	C-Max	None	None
v/c Ratio	0.93	0.88	0.34	0.86	0.33
Control Delay	28.3	69.9	11.4	59.1	31.4
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	28.3	69.9	11.4	59.1	31.4
Queue Length 50th (m)	146.5	54.0	50.4	108.6	24.7
Queue Length 95th (m)	#296.9	#104.4	64.5	131.4	44.1
Internal Link Dist (m)	476.9		318.1	85.1	
Turn Bay Length (m)		15.0			15.0
Base Capacity (vph)	1783	291	2300	971	476
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.93	0.85	0.34	0.79	0.31

Intersection Summary
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBTL, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Highway 401 WB Off-Ramp & Kingston Road



HCM Signalized Intersection Capacity Analysis
5: Highway 401 WB Off-Ramp & Kingston Road

Future Total 2029 PM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1565	10	235	735	730	140
Future Volume (vph)	1565	10	235	735	730	140
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)	3495		1711	3500	3351	1546
Flt Permitted	1.00		0.05	1.00	0.95	1.00
Satd. Flow (perm)	3495		98	3500	3351	1546
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1647	11	247	774	768	147
RTOR Reduction (vph)	0	0	0	0	0	29
Lane Group Flow (vph)	1658	0	247	774	768	118
Heavy Vehicles (%)	2%	8%	2%	2%	1%	1%
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases			6			8
Actuated Green, G (s)	70.4		91.0	91.0	36.4	36.4
Effective Green, g (s)	71.4		92.0	92.0	37.4	37.4
Actuated g/C Ratio	0.51		0.66	0.66	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)	1782		278	2300	895	413
v/s Ratio Prot	c0.47		c0.12	0.22	c0.23	
v/s Ratio Perm			0.46			0.08
v/c Ratio	0.93		0.89	0.34	0.86	0.29
Uniform Delay, d1	32.0		46.4	10.6	48.8	40.7
Progression Factor	0.66		1.00	1.00	1.00	1.00
Incremental Delay, d2	5.9		27.1	0.4	8.2	0.4
Delay (s)	26.9		73.5	11.0	57.0	41.1
Level of Service	C		E	B	E	D
Approach Delay (s)	26.9			26.1	54.4	
Approach LOS	C			C	D	

Intersection Summary			
HCM 2000 Control Delay	33.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.6
Intersection Capacity Utilization	89.6%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Queues
6: Whites Road & Bayly Street

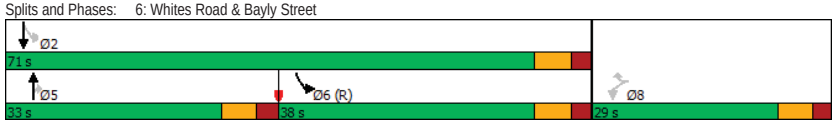
Future Total 2029 PM Peak Hour

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	165	360	575	255	1040	525
Future Volume (vph)	165	360	575	255	1040	525
Lane Group Flow (vph)	177	387	618	274	559	1124
Turn Type	Perm	Perm	NA	Perm	pm+pt	NA
Protected Phases			5		6	2
Permitted Phases	8	8		5	2	
Detector Phase	8	8	5	5	6	2
Switch Phase						
Minimum Initial (s)	8.0	8.0	12.0	12.0	12.0	12.0
Minimum Split (s)	28.0	28.0	32.0	32.0	21.0	21.0
Total Split (s)	29.0	29.0	33.0	33.0	38.0	71.0
Total Split (%)	29.0%	29.0%	33.0%	33.0%	38.0%	71.0%
Yellow Time (s)	4.2	4.2	4.4	4.4	4.4	4.4
All-Red Time (s)	2.4	2.4	2.6	2.6	2.6	2.6
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.6	5.6	6.0	6.0	6.0	6.0
Lead/Lag			Lead	Lead	Lag	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None	None	Max	Max	C-Max	Max
v/c Ratio	0.62	0.67	0.52	0.42	0.79	0.63
Control Delay	47.5	9.8	29.7	8.8	23.3	10.2
Queue Delay	0.0	0.0	0.0	0.0	52.3	0.0
Total Delay	47.5	9.8	29.7	8.8	75.6	10.2
Queue Length 50th (m)	34.0	0.0	52.7	7.1	46.9	28.3
Queue Length 95th (m)	52.1	24.7	77.9	30.2	#101.0	54.1
Internal Link Dist (m)	323.4		152.5			150.1
Turn Bay Length (m)				35.0	30.0	
Base Capacity (vph)	400	655	1179	650	710	1775
Starvation Cap Reductn	0	0	0	0	226	16
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.44	0.59	0.52	0.42	1.15	0.64

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 100
Offset: 44 (44%), Referenced to phase 6:SBL, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: Whites Road & Bayly Street



HCM Signalized Intersection Capacity Analysis
6: Whites Road & Bayly Street

Future Total 2029 PM Peak Hour

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	165	360	575	255	1040	525
Future Volume (vph)	165	360	575	255	1040	525
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)	5.6	5.6	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	0.98
Satd. Flow (prot)	1711	1533	3500	1493	1555	3251
Flt Permitted	0.95	1.00	1.00	1.00	0.33	0.56
Satd. Flow (perm)	1711	1533	3500	1493	535	1851
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	177	387	618	274	1118	565
RTOR Reduction (vph)	0	322	0	148	0	0
Lane Group Flow (vph)	177	65	618	126	559	1124
Confl. Peds. (#/hr)				10	10	
Heavy Vehicles (%)	2%	1%	2%	2%	2%	3%
Bus Blockages (#/hr)	0	2	0	0	0	0
Turn Type	Perm	Perm	NA	Perm	pm+pt	NA
Protected Phases			5		6	2
Permitted Phases	8	8		5	2	
Actuated Green, G (s)	15.7	15.7	32.7	32.7	70.7	70.7
Effective Green, g (s)	16.7	16.7	33.7	33.7	71.7	71.7
Actuated g/C Ratio	0.17	0.17	0.34	0.34	0.72	0.72
Clearance Time (s)	6.6	6.6	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)	285	256	1179	503	709	1775
v/s Ratio Prot			0.18		c0.25	0.20
v/s Ratio Perm	c0.10	0.04		0.08	c0.31	0.25
v/c Ratio	0.62	0.25	0.52	0.25	0.79	0.63
Uniform Delay, d1	38.7	36.2	26.7	24.0	15.2	7.3
Progression Factor	1.00	1.00	1.00	1.00	0.80	0.78
Incremental Delay, d2	4.2	0.5	1.7	1.2	7.3	1.4
Delay (s)	42.9	36.7	28.4	25.2	19.5	7.1
Level of Service	D	D	C	C	B	A
Approach Delay (s)	38.7		27.4			11.2
Approach LOS	D		C			B

Intersection Summary

HCM 2000 Control Delay	20.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.6
Intersection Capacity Utilization	73.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Queues
9: Whites Road & Highway 401 EB Off-Ramp

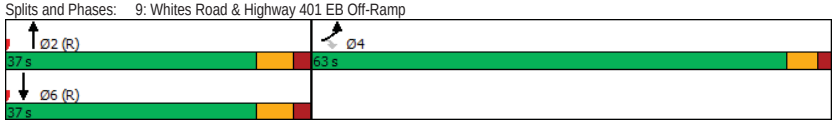
Future Total 2029 PM Peak Hour

Lane Group	EBL	EBR	NBT	SBT
Lane Configurations				
Traffic Volume (vph)	1765	945	935	620
Future Volume (vph)	1765	945	935	620
Lane Group Flow (vph)	1820	974	964	639
Turn Type	Prot	Perm	NA	NA
Protected Phases	4		2	6
Permitted Phases		4		
Detector Phase	4	4	2	6
Switch Phase				
Minimum Initial (s)	8.0	8.0	20.0	20.0
Minimum Split (s)	29.0	29.0	29.0	29.0
Total Split (s)	63.0	63.0	37.0	37.0
Total Split (%)	63.0%	63.0%	37.0%	37.0%
Yellow Time (s)	3.7	3.7	4.5	4.5
All-Red Time (s)	1.8	1.8	2.2	2.2
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	4.5	4.5	5.7	5.7
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	None	None	C-Max	C-Max
v/c Ratio	0.93	0.61	0.87	0.58
Control Delay	29.4	13.5	27.1	31.3
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	29.4	13.5	27.1	31.3
Queue Length 50th (m)	162.3	58.9	39.2	57.3
Queue Length 95th (m)	#228.1	80.2	#74.9	75.9
Internal Link Dist (m)	465.0		150.1	454.6
Turn Bay Length (m)		220.0		
Base Capacity (vph)	1960	1610	1103	1103
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.93	0.60	0.87	0.58

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 100
Offset: 8 (8%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 9: Whites Road & Highway 401 EB Off-Ramp



HCM Signalized Intersection Capacity Analysis
9: Whites Road & Highway 401 EB Off-Ramp

Future Total 2029 PM Peak Hour

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	1765	945	0	935	620	0
Future Volume (vph)	1765	945	0	935	620	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)	3351	2668		3500	3500	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	3351	2668		3500	3500	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	1820	974	0	964	639	0
RTOR Reduction (vph)	0	50	0	0	0	0
Lane Group Flow (vph)	1820	924	0	964	639	0
Confl. Peds. (#/hr)			5			5
Heavy Vehicles (%)	1%	3%	0%	2%	2%	0%
Turn Type	Prot	Perm		NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4				
Actuated Green, G (s)	57.3	57.3		30.5	30.5	
Effective Green, g (s)	58.3	58.3		31.5	31.5	
Actuated g/C Ratio	0.58	0.58		0.32	0.32	
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)	1953	1555		1102	1102	
v/s Ratio Prot	c0.54			c0.28	0.18	
v/s Ratio Perm		0.35				
v/c Ratio	0.93	0.59		0.87	0.58	
Uniform Delay, d1	19.0	13.3		32.4	28.7	
Progression Factor	1.00	1.00		0.55	1.00	
Incremental Delay, d2	8.7	0.6		8.4	2.2	
Delay (s)	27.8	13.9		26.1	30.9	
Level of Service	C	B		C	C	
Approach Delay (s)	22.9			26.1	30.9	
Approach LOS	C			C	C	

Intersection Summary

HCM 2000 Control Delay	24.8	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	84.7%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Queues
1: Kingston Road & Rosebank Road

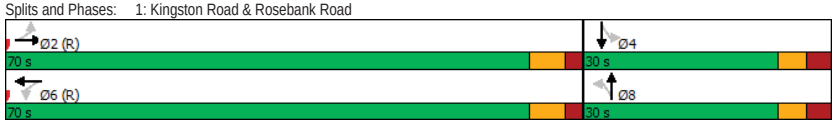
Future Total 2034 AM Peak Hour

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	75	650	5	1125	5	0	90	5
Future Volume (vph)	75	650	5	1125	5	0	90	5
Lane Group Flow (vph)	91	805	6	1415	6	6	110	165
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		2		6		8		4
Permitted Phases	2		6		8		4	
Detector Phase	2	2	6	6	8	8	4	4
Switch Phase								
Minimum Initial (s)	20.0	20.0	20.0	20.0	8.0	8.0	8.0	8.0
Minimum Split (s)	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0
Total Split (s)	70.0	70.0	70.0	70.0	30.0	30.0	30.0	30.0
Total Split (%)	70.0%	70.0%	70.0%	70.0%	30.0%	30.0%	30.0%	30.0%
Yellow Time (s)	4.3	4.3	4.3	4.3	3.5	3.5	3.5	3.5
All-Red Time (s)	2.3	2.3	2.3	2.3	3.1	3.1	3.1	3.1
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6
Lead/Lag								
Lead-Lag Optimize?								
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	None	None	None
v/c Ratio	0.43	0.32	0.01	0.56	0.04	0.01	0.54	0.58
Control Delay	14.4	5.3	5.0	7.5	33.8	0.0	48.3	32.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.4	5.3	5.0	7.5	33.8	0.0	48.3	32.2
Queue Length 50th (m)	5.8	24.0	0.3	55.1	1.1	0.0	21.2	19.7
Queue Length 95th (m)	19.8	38.3	1.6	81.5	4.1	0.0	32.1	32.6
Internal Link Dist (m)		186.4		445.7		49.9		463.8
Turn Bay Length (m)	45.0		85.0		20.0		30.0	
Base Capacity (vph)	210	2498	456	2515	230	547	335	428
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.43	0.32	0.01	0.56	0.03	0.01	0.33	0.39

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 100
Offset: 57 (57%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated

Splits and Phases: 1: Kingston Road & Rosebank Road



HCM Signalized Intersection Capacity Analysis
1: Kingston Road & Rosebank Road

Future Total 2034 AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	75	650	10	5	1125	35	5	0	5	90	5	130
Future Volume (vph)	75	650	10	5	1125	35	5	0	5	90	5	130
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	5.6	
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	0.97	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		0.99	1.00		0.99	1.00	
Frt	1.00	1.00		1.00	1.00		1.00	0.85		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1723	3374		1745	3398		1726	1567		1732	1567	
Flt Permitted	0.16	1.00		0.34	1.00		0.52	1.00		0.75	1.00	
Satd. Flow (perm)	284	3374		618	3398		946	1567		1375	1567	
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	91	793	12	6	1372	43	6	0	6	110	6	159
RTOR Reduction (vph)	0	1	0	0	2	0	0	5	0	0	52	0
Lane Group Flow (vph)	91	804	0	6	1413	0	6	1	0	110	113	0
Confl. Peds. (#/hr)	10					10	10		5	5		10
Confl. Bikes (#/hr)			150									
Heavy Vehicles (%)	1%	4%	0%	0%	3%	9%	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	7	7	0	6	6	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)	73.0	73.0		73.0	73.0		13.8	13.8		13.8	13.8	
Effective Green, g (s)	74.0	74.0		74.0	74.0		14.8	14.8		14.8	14.8	
Actuated g/C Ratio	0.74	0.74		0.74	0.74		0.15	0.15		0.15	0.15	
Clearance Time (s)	6.6	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	3.0	
Lane Grp Cap (vph)	210	2496		457	2514		140	231		203	231	
v/s Ratio Prot		0.24			c0.42			0.00			0.07	
v/s Ratio Perm	0.32			0.01			0.01			c0.08		
v/c Ratio	0.43	0.32		0.01	0.56		0.04	0.00		0.54	0.49	
Uniform Delay, d1	5.0	4.4		3.4	5.8		36.5	36.3		39.5	39.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	6.4	0.3		0.1	0.9		0.1	0.0		2.9	1.6	
Delay (s)	11.4	4.8		3.5	6.7		36.7	36.3		42.4	40.8	
Level of Service	B	A		A	A		D	D		D	D	
Approach Delay (s)		5.4			6.7			36.5			41.4	
Approach LOS		A			A			D			D	

Intersection Summary

HCM 2000 Control Delay	10.1	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.56			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	11.2	
Intersection Capacity Utilization	76.2%	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 2034 AM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	725	25	0	1200	0	120
Future Volume (Veh/h)	725	25	0	1200	0	120
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	906	31	0	1500	0	150
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					0.73	
vC, conflicting volume			937		1656	453
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			937		1167	453
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	73
cM capacity (veh/h)			739		139	559

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1
Volume Total	453	453	31	0	750	750	150
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	31	0	0	0	150
cSH	1700	1700	1700	1700	1700	1700	559
Volume to Capacity	0.27	0.27	0.02	0.00	0.44	0.44	0.27
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0	8.6
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	13.8
Lane LOS							B
Approach Delay (s)	0.0			0.0			13.8
Approach LOS							B

Intersection Summary			
Average Delay		0.8	
Intersection Capacity Utilization		47.3%	ICU Level of Service A
Analysis Period (min)		15	

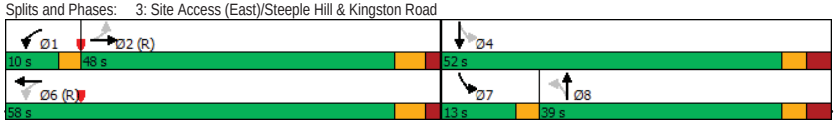
Queues
3: Site Access (East)/Steeple Hill & Kingston Road

Future Total 2034 AM Peak Hour

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	40	760	175	995	130	0	150	0
Future Volume (vph)	40	760	175	995	130	0	150	0
Lane Group Flow (vph)	48	970	211	1265	157	464	181	60
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	
Detector Phase	2	2	1	6	8	8	7	4
Switch Phase								
Minimum Initial (s)	20.0	20.0	5.0	20.0	8.0	8.0	5.0	8.0
Minimum Split (s)	28.0	28.0	8.0	28.0	38.0	38.0	8.0	38.0
Total Split (s)	48.0	48.0	10.0	58.0	39.0	39.0	13.0	52.0
Total Split (%)	43.6%	43.6%	9.1%	52.7%	35.5%	35.5%	11.8%	47.3%
Yellow Time (s)	4.2	4.2	3.0	4.2	3.3	3.3	3.0	3.3
All-Red Time (s)	2.1	2.1	0.0	2.1	3.4	3.4	0.0	3.4
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.3	5.3	2.0	5.3	5.7	5.7	2.0	5.7
Lead/Lag	Lag	Lag	Lead		Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes		Yes	Yes	Yes	
Recall Mode	C-Max	C-Max	None	C-Max	None	None	None	None
v/c Ratio	0.38	0.68	0.65	0.68	0.51	0.88	0.75	0.10
Control Delay	35.4	29.2	35.9	21.4	41.3	40.7	42.6	5.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	35.4	29.2	35.9	21.4	41.3	40.7	42.6	5.2
Queue Length 50th (m)	7.8	97.6	31.4	80.8	30.7	59.6	27.4	0.0
Queue Length 95th (m)	18.7	109.0	m#46.2	m105.2	43.3	80.3	36.3	6.3
Internal Link Dist (m)		129.3		289.8		62.3		200.4
Turn Bay Length (m)	25.0		30.0				15.0	
Base Capacity (vph)	127	1432	323	1864	399	625	240	708
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.38	0.68	0.65	0.68	0.39	0.74	0.75	0.08

Intersection Summary
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Site Access (East)/Steeple Hill & Kingston Road



HCM Signalized Intersection Capacity Analysis
3: Site Access (East)/Steeple Hill & Kingston Road

Future Total 2034 AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	760	45	175	995	55	130	0	385	150	0	50
Future Volume (vph)	40	760	45	175	995	55	130	0	385	150	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		2.0	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	0.99		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		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)	1656	3328		1745	3387		1745	1597		1678	1597	
Flt Permitted	0.17	1.00		0.17	1.00		0.72	1.00		0.15	1.00	
Satd. Flow (perm)	298	3328		306	3387		1319	1597		257	1597	
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)	48	916	54	211	1199	66	157	0	464	181	0	60
RTOR Reduction (vph)	0	3	0	0	3	0	0	156	0	0	39	0
Lane Group Flow (vph)	48	967	0	211	1262	0	157	308	0	181	21	0
Confl. Peds. (#/hr)	10					10						
Confl. Bikes (#/hr)			160									
Heavy Vehicles (%)	5%	3%	20%	0%	3%	4%	0%	0%	0%	4%	0%	0%
Bus Blockages (#/hr)	0	7	7	0	6	6	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)	46.3	46.3		59.5	59.5		24.5	24.5		37.5	37.5	
Effective Green, g (s)	47.3	47.3		60.5	60.5		25.5	25.5		38.5	38.5	
Actuated g/C Ratio	0.43	0.43		0.55	0.55		0.23	0.23		0.35	0.35	
Clearance Time (s)	6.3	6.3		3.0	6.3		6.7	6.7		3.0	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)	128	1431		314	1862		305	370		232	558	
v/s Ratio Prot		0.29		0.07	c0.37			c0.19		c0.08	0.01	
v/s Ratio Perm	0.16			0.30			0.12			0.20		
v/c Ratio	0.38	0.68		0.67	0.68		0.51	0.83		0.78	0.04	
Uniform Delay, d1	21.3	25.2		16.1	17.8		36.9	40.2		28.8	23.5	
Progression Factor	1.00	1.00		2.11	1.03		1.00	1.00		1.00	1.00	
Incremental Delay, d2	8.2	2.6		3.9	1.4		1.5	14.7		15.5	0.0	
Delay (s)	29.5	27.8		37.9	19.6		38.3	55.0		44.4	23.6	
Level of Service	C	C		D	B		D	D		D	C	
Approach Delay (s)		27.8			22.3			50.7			39.2	
Approach LOS		C			C			D			D	

Intersection Summary				
HCM 2000 Control Delay	30.4	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)	15.0	
Intersection Capacity Utilization	95.0%	ICU Level of Service	F	
Analysis Period (min)	15			
c Critical Lane Group				

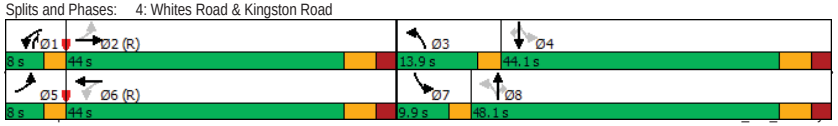
Queues
4: Whites Road & Kingston Road

Future Total 2034 AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	105	385	805	285	890	335	295	530	415	120	1130	135
Future Volume (vph)	105	385	805	285	890	335	295	530	415	120	1130	135
Lane Group Flow (vph)	109	401	839	297	927	349	295	552	432	125	1177	141
Turn Type	pm+pt	NA	Free	pm+pt	NA	Free	pm+pt	NA	pm+ov	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases	2		Free	6		Free	8		8	4		4
Detector Phase	5	2		1	6		3	8	1	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	20.0		5.0	20.0		5.0	8.0	5.0	5.0	8.0	8.0
Minimum Split (s)	8.0	44.0		8.0	44.0		8.0	44.1	8.0	8.0	44.1	44.1
Total Split (s)	8.0	44.0		8.0	44.0		13.9	48.1	8.0	9.9	44.1	44.1
Total Split (%)	7.3%	40.0%		7.3%	40.0%		12.6%	43.7%	7.3%	9.0%	40.1%	40.1%
Yellow Time (s)	3.0	4.2		3.0	4.2		3.0	4.3	3.0	3.0	4.3	4.3
All-Red Time (s)	0.0	2.8		0.0	2.8		0.0	2.8	0.0	0.0	2.8	2.8
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	2.0	6.0		2.0	6.0		2.0	6.1	2.0	2.0	6.1	6.1
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max		None	C-Max		None	Max	None	None	Max	Max
v/c Ratio	0.58	0.34	0.58	0.74	0.77	0.23	1.02	0.43	0.52	0.32	0.99	0.25
Control Delay	31.2	28.6	3.3	26.8	27.9	0.3	82.7	24.5	6.2	16.9	61.0	6.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	31.2	28.6	3.3	26.8	27.9	0.3	82.7	24.5	6.2	16.9	61.0	6.8
Queue Length 50th (m)	13.9	33.7	23.2	40.0	87.5	0.0	~42.0	42.1	1.3	14.4	138.2	1.8
Queue Length 95th (m)	m21.7	49.4	27.5	m#57.9	107.0	0.0	#102.2	68.4	43.7	25.2	#187.7	15.7
Internal Link Dist (m)		289.8			476.9			454.6			338.0	
Turn Bay Length (m)	100.0		80.0	35.0		35.0	50.0		45.0	85.0		15.0
Base Capacity (vph)	187	1174	1447	403	1209	1511	289	1298	824	394	1185	557
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.58	0.34	0.58	0.74	0.77	0.23	1.02	0.43	0.52	0.32	0.99	0.25

Intersection Summary
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 1.1 (1%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 105
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Whites Road & Kingston Road



HCM Signalized Intersection Capacity Analysis
4: Whites Road & Kingston Road

Future Total 2034 AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	105	385	805	285	890	335	295	530	415	120	1130	135
Future Volume (vph)	105	385	805	285	890	335	295	530	415	120	1130	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	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	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.95	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00	1.00	0.99	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)	1693	3400	1447	1669	3500	1511	1800	3400	1462	1670	3433	1369
Flt Permitted	0.14	1.00	1.00	0.47	1.00	1.00	0.13	1.00	1.00	0.41	1.00	1.00
Satd. Flow (perm)	249	3400	1447	821	3500	1511	236	3400	1462	722	3433	1369
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	1.00	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	109	401	839	297	927	349	295	552	432	125	1177	141
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	142	0	0	84
Lane Group Flow (vph)	109	401	839	297	927	349	295	552	290	125	1177	57
Confl. Peds. (#/hr)	35		25	25		35	20		30	30		20
Confl. Bikes (#/hr)			160									
Heavy Vehicles (%)	3%	5%	2%	4%	2%	1%	2%	5%	2%	4%	4%	8%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	3	0	0	6
Turn Type	pm+pt	NA	Free	pm+pt	NA	Free	pm+pt	NA	pm+ov	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases	2		Free	6		Free	8		8	4		4
Actuated Green, G (s)	42.0	37.0	110.0	42.0	37.0	110.0	50.9	41.0	46.0	43.9	37.0	37.0
Effective Green, g (s)	44.0	38.0	110.0	44.0	38.0	110.0	51.9	42.0	48.0	45.9	38.0	38.0
Actuated g/C Ratio	0.40	0.35	1.00	0.40	0.35	1.00	0.47	0.38	0.44	0.42	0.35	0.35
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)	178	1174	1447	374	1209	1511	280	1298	637	369	1185	472
v/s Ratio Prot	0.03	0.12		0.04	c0.26		c0.11	0.16	0.02	0.02	c0.34	
v/s Ratio Perm	0.21		c0.58	0.27		0.23	0.38		0.17	0.12		0.04
v/c Ratio	0.61	0.34	0.58	0.79	0.77	0.23	1.05	0.43	0.46	0.34	0.99	0.12
Uniform Delay, d1	23.6	26.7	0.0	27.8	32.1	0.0	23.3	25.1	21.8	20.2	35.9	24.6
Progression Factor	1.19	1.04	1.00	0.68	0.74	1.00	1.23	0.93	0.57	1.00	1.00	1.00
Incremental Delay, d2	4.3	0.6	1.2	9.6	4.0	0.3	64.1	0.9	0.4	0.5	24.6	0.5
Delay (s)	32.5	28.4	1.2	28.6	27.6	0.3	92.6	24.3	12.8	20.8	60.5	25.1
Level of Service	C	C	A	C	C	A	F	C	B	C	E	C
Approach Delay (s)		11.8			21.8			36.2			53.6	
Approach LOS		B			C			D			D	

Intersection Summary				
HCM 2000 Control Delay	30.8	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.89			
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.1	
Intersection Capacity Utilization	110.1%	ICU Level of Service	H	
Analysis Period (min)	15			
c Critical Lane Group				

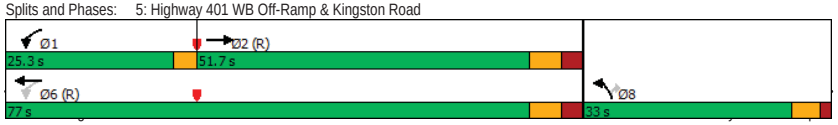
Queues
5: Highway 401 WB Off-Ramp & Kingston Road

Future Total 2034 AM Peak Hour

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Configurations					
Traffic Volume (vph)	815	535	905	585	70
Future Volume (vph)	815	535	905	585	70
Lane Group Flow (vph)	883	569	963	622	74
Turn Type	NA	pm+pt	NA	Prot	Perm
Protected Phases	2	1	6	8	
Permitted Phases		6			8
Detector Phase	2	1	6	8	8
Switch Phase					
Minimum Initial (s)	20.0	3.5	20.0	8.0	8.0
Minimum Split (s)	51.0	8.0	51.0	32.0	32.0
Total Split (s)	51.7	25.3	77.0	33.0	33.0
Total Split (%)	47.0%	23.0%	70.0%	30.0%	30.0%
Yellow Time (s)	4.2	3.0	4.2	3.7	3.7
All-Red Time (s)	3.0	0.0	3.0	1.7	1.7
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	6.2	2.0	6.2	4.4	4.4
Lead/Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes			
Recall Mode	C-Max	None	C-Max	None	None
v/c Ratio	0.62	0.98	0.42	0.80	0.20
Control Delay	22.7	55.6	9.3	48.0	22.4
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	22.7	55.6	9.3	48.0	22.4
Queue Length 50th (m)	57.7	~87.6	48.7	67.8	8.0
Queue Length 95th (m)	78.9	#170.6	65.1	86.7	20.1
Internal Link Dist (m)	476.9		318.1	85.1	
Turn Bay Length (m)		15.0			15.0
Base Capacity (vph)	1413	579	2319	862	415
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.62	0.98	0.42	0.72	0.18

Intersection Summary
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 3.3 (3%), Referenced to phase 2:EBT and 6:WBTL, Start of Green
Natural Cycle: 105
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Highway 401 WB Off-Ramp & Kingston Road



HCM Signalized Intersection Capacity Analysis
5: Highway 401 WB Off-Ramp & Kingston Road

Future Total 2034 AM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	815	15	535	905	585	70
Future Volume (vph)	815	15	535	905	585	70
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
Frpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00	1.00	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)	3416		1728	3466	3319	1516
Flt Permitted	1.00		0.20	1.00	0.95	1.00
Satd. Flow (perm)	3416		360	3466	3319	1516
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	867	16	569	963	622	74
RTOR Reduction (vph)	1	0	0	0	0	22
Lane Group Flow (vph)	882	0	569	963	622	52
Confl. Bikes (#/hr)		150				
Heavy Vehicles (%)	4%	0%	1%	3%	2%	3%
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases			6			8
Actuated Green, G (s)	44.5		72.6	72.6	24.8	24.8
Effective Green, g (s)	45.5		73.6	73.6	25.8	25.8
Actuated g/C Ratio	0.41		0.67	0.67	0.23	0.23
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)	1412		565	2319	778	355
v/s Ratio Prot	c0.26		c0.24	0.28	c0.19	
v/s Ratio Perm			0.43			0.03
v/c Ratio	0.62		1.01	0.42	0.80	0.15
Uniform Delay, d1	25.5		24.3	8.3	39.7	33.4
Progression Factor	0.81		1.00	1.00	1.00	1.00
Incremental Delay, d2	1.9		39.6	0.6	5.8	0.2
Delay (s)	22.5		63.9	8.9	45.4	33.6
Level of Service	C		E	A	D	C
Approach Delay (s)	22.5			29.3	44.2	
Approach LOS	C			C	D	

Intersection Summary				
HCM 2000 Control Delay	30.7	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)	12.6	
Intersection Capacity Utilization	81.5%	ICU Level of Service	D	
Analysis Period (min)	15			
c Critical Lane Group				

Queues
6: Whites Road & Bayly Street

Future Total 2034 AM Peak Hour

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	255	365	690	125	570	540
Future Volume (vph)	255	365	690	125	570	540
Lane Group Flow (vph)	271	388	734	133	309	871
Turn Type	Perm	Perm	NA	Perm	pm+pt	NA
Protected Phases			5		6	2
Permitted Phases	8	8		5	2	
Detector Phase	8	8	5	5	6	2
Switch Phase						
Minimum Initial (s)	8.0	8.0	12.0	12.0	12.0	12.0
Minimum Split (s)	28.0	28.0	32.0	32.0	21.0	21.0
Total Split (s)	29.0	29.0	33.0	33.0	38.0	71.0
Total Split (%)	29.0%	29.0%	33.0%	33.0%	38.0%	71.0%
Yellow Time (s)	4.2	4.2	4.4	4.4	4.4	4.4
All-Red Time (s)	2.4	2.4	2.6	2.6	2.6	2.6
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.6	5.6	6.0	6.0	6.0	6.0
Lead/Lag			Lead	Lead	Lag	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None	None	Max	Max	C-Max	Max
v/c Ratio	0.78	0.63	0.72	0.26	0.49	0.51
Control Delay	53.0	8.4	37.0	12.2	19.4	12.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	53.0	8.4	37.0	12.2	19.4	12.1
Queue Length 50th (m)	51.6	0.0	71.8	6.3	26.0	39.9
Queue Length 95th (m)	79.4	24.7	96.1	21.5	48.1	54.3
Internal Link Dist (m)	323.4		152.5			150.1
Turn Bay Length (m)				35.0	30.0	
Base Capacity (vph)	397	652	1015	511	636	1701
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.68	0.60	0.72	0.26	0.49	0.51

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 16 (16%), Referenced to phase 6:SBL, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated

Splits and Phases: 6: Whites Road & Bayly Street

HCM Signalized Intersection Capacity Analysis
6: Whites Road & Bayly Street

Future Total 2034 AM Peak Hour

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	255	365	690	125	570	540
Future Volume (vph)	255	365	690	125	570	540
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)	5.6	5.6	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	0.97	1.00	1.00
Flpb, ped/bikes	0.99	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	0.98
Satd. Flow (prot)	1698	1518	3400	1499	1555	3293
Flt Permitted	0.95	1.00	1.00	1.00	0.24	0.54
Satd. Flow (perm)	1698	1518	3400	1499	387	1807
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	271	388	734	133	606	574
RTOR Reduction (vph)	0	308	0	64	0	0
Lane Group Flow (vph)	271	80	734	69	309	871
Confl. Peds. (#/hr)	5			15	15	
Heavy Vehicles (%)	2%	2%	5%	1%	2%	2%
Bus Blockages (#/hr)	0	2	0	0	0	0
Turn Type	Perm	Perm	NA	Perm	pm+pt	NA
Protected Phases			5		6	2
Permitted Phases	8	8		5	2	
Actuated Green, G (s)	19.5	19.5	28.9	28.9	66.9	66.9
Effective Green, g (s)	20.5	20.5	29.9	29.9	67.9	67.9
Actuated g/C Ratio	0.20	0.20	0.30	0.30	0.68	0.68
Clearance Time (s)	6.6	6.6	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)	348	311	1016	448	636	1702
v/s Ratio Prot			c0.22		0.16	c0.16
v/s Ratio Perm	c0.16	0.05		0.05	0.17	0.18
v/c Ratio	0.78	0.26	0.72	0.15	0.49	0.51
Uniform Delay, d1	37.6	33.3	31.3	25.8	16.2	7.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	10.5	0.4	4.5	0.7	2.6	1.1
Delay (s)	48.1	33.8	35.8	26.5	18.8	9.0
Level of Service	D	C	D	C	B	A
Approach Delay (s)	39.7		34.4			11.6
Approach LOS	D		C			B

Intersection Summary				
HCM 2000 Control Delay	25.7	HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio	0.67			
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.6	
Intersection Capacity Utilization	69.8%	ICU Level of Service	C	
Analysis Period (min)	15			

c Critical Lane Group

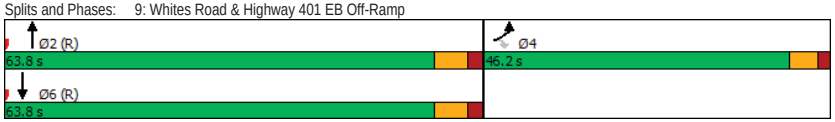
Queues
9: Whites Road & Highway 401 EB Off-Ramp

Future Total 2034 AM Peak Hour

Lane Group	EBL	EBR	NBT	SBT
Lane Configurations				
Traffic Volume (vph)	715	475	1055	635
Future Volume (vph)	715	475	1055	635
Lane Group Flow (vph)	745	495	1099	661
Turn Type	Prot	Perm	NA	NA
Protected Phases	4		2	6
Permitted Phases		4		
Detector Phase	4	4	2	6
Switch Phase				
Minimum Initial (s)	8.0	8.0	20.0	20.0
Minimum Split (s)	29.0	29.0	29.0	29.0
Total Split (s)	46.2	46.2	63.8	63.8
Total Split (%)	42.0%	42.0%	58.0%	58.0%
Yellow Time (s)	3.7	3.7	4.5	4.5
All-Red Time (s)	1.8	1.8	2.2	2.2
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	4.5	4.5	5.7	5.7
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	None	None	C-Max	C-Max
v/c Ratio	0.76	0.47	0.53	0.31
Control Delay	40.1	9.5	14.3	11.9
Queue Delay	0.0	0.0	0.6	0.0
Total Delay	40.1	9.5	14.9	11.9
Queue Length 50th (m)	78.2	13.2	70.5	31.0
Queue Length 95th (m)	91.4	26.1	103.7	m37.1
Internal Link Dist (m)	465.0		150.1	454.6
Turn Bay Length (m)		220.0		
Base Capacity (vph)	1245	1241	2090	2110
Starvation Cap Reductn	0	0	549	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.60	0.40	0.71	0.31

Intersection Summary
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 60 (55%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 9: Whites Road & Highway 401 EB Off-Ramp



HCM Signalized Intersection Capacity Analysis
9: Whites Road & Highway 401 EB Off-Ramp

Future Total 2034 AM Peak Hour

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	715	475	0	1055	635	0
Future Volume (vph)	715	475	0	1055	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)	3286	2694		3433	3466	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	3286	2694		3433	3466	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	745	495	0	1099	661	0
RTOR Reduction (vph)	0	249	0	0	0	0
Lane Group Flow (vph)	745	246	0	1099	661	0
Confl. Peds. (#/hr)			10			10
Heavy Vehicles (%)	3%	2%	0%	4%	3%	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)	979	803		2091	2111	
v/s Ratio Prot	c0.23			c0.32	0.19	
v/s Ratio Perm		0.09				
v/c Ratio	0.76	0.31		0.53	0.31	
Uniform Delay, d1	35.0	29.8		12.4	10.4	
Progression Factor	1.00	1.00		1.00	1.04	
Incremental Delay, d2	3.5	0.2		0.9	0.2	
Delay (s)	38.6	30.0		13.3	11.0	
Level of Service	D	C		B	B	
Approach Delay (s)	35.2			13.3	11.0	
Approach LOS	D			B	B	

Intersection Summary				
HCM 2000 Control Delay	21.8	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)	10.2	
Intersection Capacity Utilization	58.1%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				

Queues
1: Kingston Road & Rosebank Road

Future Total 2034 PM Peak Hour

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	120	1285	875	5	0	50	5
Future Volume (vph)	120	1285	875	5	0	50	5
Lane Group Flow (vph)	124	1325	964	5	10	52	72
Turn Type	Perm	NA	NA	Perm	NA	Perm	NA
Protected Phases		2	6		8		4
Permitted Phases	2			8		4	
Detector Phase	2	2	6	8	8	4	4
Switch Phase							
Minimum Initial (s)	20.0	20.0	20.0	8.0	8.0	8.0	8.0
Minimum Split (s)	28.0	28.0	28.0	28.0	28.0	28.0	28.0
Total Split (s)	70.0	70.0	70.0	30.0	30.0	30.0	30.0
Total Split (%)	70.0%	70.0%	70.0%	30.0%	30.0%	30.0%	30.0%
Yellow Time (s)	4.3	4.3	4.3	3.5	3.5	3.5	3.5
All-Red Time (s)	2.3	2.3	2.3	3.1	3.1	3.1	3.1
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.6	5.6	5.6	5.6	5.6	5.6	5.6
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	C-Max	C-Max	C-Max	None	None	None	None
v/c Ratio	0.30	0.47	0.35	0.03	0.04	0.31	0.29
Control Delay	6.9	5.3	4.4	35.0	0.3	42.7	13.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.9	5.3	4.4	35.0	0.3	42.7	13.2
Queue Length 50th (m)	5.6	38.5	23.7	1.0	0.0	10.1	1.0
Queue Length 95th (m)	21.5	85.3	53.7	3.9	0.0	19.3	12.3
Internal Link Dist (m)		186.4	445.7		49.9		463.8
Turn Bay Length (m)	45.0			20.0		30.0	
Base Capacity (vph)	418	2808	2751	316	434	334	427
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.30	0.47	0.35	0.02	0.02	0.16	0.17

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 83 (83%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Splits and Phases: 1: Kingston Road & Rosebank Road

HCM Signalized Intersection Capacity Analysis
1: Kingston Road & Rosebank Road

Future Total 2034 PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	120	1285	0	0	875	60	5	0	10	50	5	65
Future Volume (vph)	120	1285	0	0	875	60	5	0	10	50	5	65
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			0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00			1.00		1.00	0.98		1.00	0.98	
Flpb, ped/bikes	0.99	1.00			1.00		0.99	1.00		0.99	1.00	
Frt	1.00	1.00			0.99		1.00	0.85		1.00	0.86	
Flt Protected	0.95	1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1733	3492			3418		1734	1567		1733	1545	
Flt Permitted	0.29	1.00			1.00		0.71	1.00		0.75	1.00	
Satd. Flow (perm)	521	3492			3418		1296	1567		1370	1545	
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)	124	1325	0	0	902	62	5	0	10	52	5	67
RTOR Reduction (vph)	0	0	0	0	3	0	0	9	0	0	60	0
Lane Group Flow (vph)	124	1325	0	0	961	0	5	1	0	52	12	0
Confl. Peds. (#/hr)	10		5	5		10	5		5	5		5
Heavy Vehicles (%)	0%	1%	0%	0%	2%	0%	0%	0%	0%	0%	0%	3%
Bus Blockages (#/hr)	0	6	6	0	6	6	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)	77.0	77.0			77.0		9.8	9.8		9.8	9.8	
Effective Green, g (s)	78.0	78.0			78.0		10.8	10.8		10.8	10.8	
Actuated g/C Ratio	0.78	0.78			0.78		0.11	0.11		0.11	0.11	
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)	406	2723			2666		139	169		147	166	
v/s Ratio Prot		c0.38			0.28			0.00			0.01	
v/s Ratio Perm	0.24						0.00			c0.04		
v/c Ratio	0.31	0.49			0.36		0.04	0.01		0.35	0.07	
Uniform Delay, d1	3.2	3.9			3.4		39.9	39.8		41.4	40.1	
Progression Factor	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.9	0.6			0.4		0.1	0.0		1.5	0.2	
Delay (s)	5.1	4.5			3.7		40.0	39.8		42.8	40.3	
Level of Service	A	A			A		D	D		D	D	
Approach Delay (s)		4.6			3.7			39.9			41.4	
Approach LOS		A			A			D			D	

Intersection Summary				
HCM 2000 Control Delay	6.3	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	76.9%	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 2034 PM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1290	80	0	955	0	70
Future Volume (Veh/h)	1290	80	0	955	0	70
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	1316	82	0	974	0	71
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					0.89	
vC, conflicting volume			1398		1803	658
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1398		1651	658
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	83
cM capacity (veh/h)			495		81	412

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1
Volume Total	658	658	82	0	487	487	71
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	82	0	0	0	71
cSH	1700	1700	1700	1700	1700	1700	412
Volume to Capacity	0.39	0.39	0.05	0.00	0.29	0.29	0.17
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0	4.9
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	15.6
Lane LOS							C
Approach Delay (s)	0.0			0.0			15.6
Approach LOS							C

Intersection Summary				
Average Delay	0.5			
Intersection Capacity Utilization	46.7%	ICU Level of Service		A
Analysis Period (min)	15			

Queues
3: Site Access (East)/Steeple Hill & Kingston Road

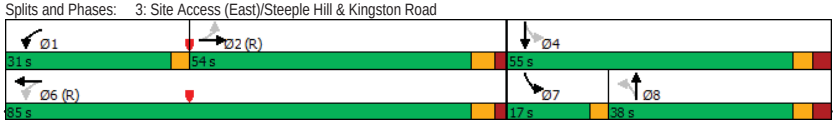
Future Total 2034 PM Peak Hour

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	100	1165	385	790	85	10	220	0
Future Volume (vph)	100	1165	385	790	85	10	220	0
Lane Group Flow (vph)	103	1299	397	943	88	294	227	72
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	
Detector Phase	2	2	1	6	8	8	7	4
Switch Phase								
Minimum Initial (s)	20.0	20.0	5.0	20.0	8.0	8.0	5.0	8.0
Minimum Split (s)	28.0	28.0	8.0	28.0	38.0	38.0	8.0	38.0
Total Split (s)	54.0	54.0	31.0	85.0	38.0	38.0	17.0	55.0
Total Split (%)	38.6%	38.6%	22.1%	60.7%	27.1%	27.1%	12.1%	39.3%
Yellow Time (s)	4.2	4.2	3.0	4.2	3.3	3.3	3.0	3.3
All-Red Time (s)	2.1	2.1	0.0	2.1	3.4	3.4	0.0	3.4
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.3	5.3	2.0	5.3	5.7	5.7	2.0	5.7
Lead/Lag	Lag	Lag	Lead		Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes		Yes	Yes	Yes	
Recall Mode	C-Max	C-Max	None	C-Max	None	None	None	None
v/c Ratio	0.44	0.88	0.87	0.41	0.54	0.66	0.92	0.14
Control Delay	39.3	45.2	60.4	10.3	67.0	13.7	83.1	0.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.3	45.2	60.4	10.3	67.0	13.7	83.1	0.6
Queue Length 50th (m)	21.3	182.7	105.3	51.9	24.8	2.7	56.6	0.0
Queue Length 95th (m)	46.2	#266.5	m#148.1	m79.8	38.2	28.0	#76.1	0.0
Internal Link Dist (m)		129.3		289.8		62.3		200.4
Turn Bay Length (m)	25.0		30.0				15.0	
Base Capacity (vph)	235	1484	465	2274	299	580	246	654
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.44	0.88	0.85	0.41	0.29	0.51	0.92	0.11

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 115
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Site Access (East)/Steeple Hill & Kingston Road



HCM Signalized Intersection Capacity Analysis
3: Site Access (East)/Steeple Hill & Kingston Road

Future Total 2034 PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	1165	95	385	790	125	85	10	275	220	0	70
Future Volume (vph)	100	1165	95	385	790	125	85	10	275	220	0	70
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		2.0	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	0.99		1.00	0.98		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	0.99		1.00	0.98		1.00	0.86		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)	1728	3455		1745	3371		1734	1567		1726	1567	
Flt Permitted	0.30	1.00		0.06	1.00		0.71	1.00		0.20	1.00	
Satd. Flow (perm)	552	3455		119	3371		1296	1567		367	1567	
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)	103	1201	98	397	814	129	88	10	284	227	0	72
RTOR Reduction (vph)	0	4	0	0	7	0	0	248	0	0	54	0
Lane Group Flow (vph)	103	1295	0	397	936	0	88	46	0	227	18	0
Confl. Peds. (#/hr)	10					10	5		10	10		5
Heavy Vehicles (%)	0%	1%	0%	0%	2%	0%	0%	0%	0%	1%	0%	0%
Bus Blockages (#/hr)	0	6	6	0	6	6	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)	58.9	58.9		93.2	93.2		16.8	16.8		33.8	33.8	
Effective Green, g (s)	59.9	59.9		94.2	94.2		17.8	17.8		34.8	34.8	
Actuated g/C Ratio	0.43	0.43		0.67	0.67		0.13	0.13		0.25	0.25	
Clearance Time (s)	6.3	6.3		3.0	6.3		6.7	6.7		3.0	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)	236	1478		455	2268		164	199		236	389	
v/s Ratio Prot		c0.37		c0.20	0.28			0.03		c0.10	0.01	
v/s Ratio Perm	0.19			0.39			c0.07			0.14		
v/c Ratio	0.44	0.88		0.87	0.41		0.54	0.23		0.96	0.05	
Uniform Delay, d1	28.2	36.7		42.7	10.4		57.2	55.0		47.3	40.0	
Progression Factor	1.00	1.00		1.25	0.89		1.00	1.00		1.00	1.00	
Incremental Delay, d2	5.8	7.6		10.6	0.3		3.4	0.6		47.7	0.0	
Delay (s)	34.0	44.2		64.0	9.6		60.6	55.5		95.0	40.0	
Level of Service	C	D		E	A		E	E		F	D	
Approach Delay (s)		43.5			25.7			56.7			81.8	
Approach LOS		D			C			E			F	

Intersection Summary

HCM 2000 Control Delay	41.3	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)	15.0
Intersection Capacity Utilization	105.2%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Queues
4: Whites Road & Kingston Road

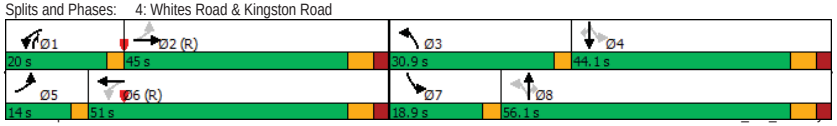
Future Total 2034 PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	160	870	630	225	825	515	475	1085	805	160	670	120
Future Volume (vph)	160	870	630	225	825	515	475	1085	805	160	670	120
Lane Group Flow (vph)	162	879	636	227	833	520	480	1096	813	162	677	121
Turn Type	pm+pt	NA	Free	pm+pt	NA	Free	pm+pt	NA	pm+ov	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases	2		Free	6		Free	8		8	4		4
Detector Phase	5	2		1	6		3	8	1	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	20.0		5.0	20.0		5.0	8.0	5.0	5.0	8.0	8.0
Minimum Split (s)	8.0	44.0		8.0	44.0		8.0	44.1	8.0	8.0	44.1	44.1
Total Split (s)	14.0	45.0		20.0	51.0		30.9	56.1	20.0	18.9	44.1	44.1
Total Split (%)	10.0%	32.1%		14.3%	36.4%		22.1%	40.1%	14.3%	13.5%	31.5%	31.5%
Yellow Time (s)	3.0	4.2		3.0	4.2		3.0	4.3	3.0	3.0	4.3	4.3
All-Red Time (s)	0.0	2.8		0.0	2.8		0.0	2.8	0.0	0.0	2.8	2.8
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	2.0	6.0		2.0	6.0		2.0	6.1	2.0	2.0	6.1	6.1
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max		None	C-Max		None	Max	None	None	Max	Max
v/c Ratio	0.66	0.89	0.41	0.84	0.73	0.34	1.03	0.82	0.91	0.68	0.71	0.24
Control Delay	43.7	57.5	0.9	52.5	30.7	0.5	79.6	45.9	35.9	40.4	51.0	7.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	43.7	57.5	0.9	52.5	30.7	0.5	79.6	45.9	35.9	40.4	51.0	7.1
Queue Length 50th (m)	26.9	102.4	0.0	38.6	100.5	0.0	~115.2	151.9	155.6	24.4	94.2	0.0
Queue Length 95th (m)	m43.3	m#143.2	m0.8	m#75.6	123.0	m0.0	#186.9	186.5	#213.0	48.6	117.3	15.0
Internal Link Dist (m)		289.8			476.9			454.6			338.0	
Turn Bay Length (m)	100.0		80.0	35.0		35.0	50.0		45.0	85.0		15.0
Base Capacity (vph)	250	992	1538	278	1134	1514	468	1334	900	275	950	499
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.65	0.89	0.41	0.82	0.73	0.34	1.03	0.82	0.90	0.59	0.71	0.24

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 125
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Whites Road & Kingston Road



HCM Signalized Intersection Capacity Analysis
4: Whites Road & Kingston Road

Future Total 2034 PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	160	870	630	225	825	515	475	1085	805	160	670	120
Future Volume (vph)	160	870	630	225	825	515	475	1085	805	160	670	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	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	0.95	1.00	1.00	0.95	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)	1743	3500	1538	1727	3500	1514	1744	3535	1482	1727	3500	1503
Flt Permitted	0.18	1.00	1.00	0.10	1.00	1.00	0.19	1.00	1.00	0.12	1.00	1.00
Satd. Flow (perm)	327	3500	1538	174	3500	1514	343	3535	1482	223	3500	1503
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	162	879	636	227	833	520	480	1096	813	162	677	121
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	115	0	0	88
Lane Group Flow (vph)	162	879	636	227	833	520	480	1096	698	162	677	33
Confl. Peds. (#/hr)	30		10	10		30	5		10	10		5
Heavy Vehicles (%)	0%	2%	0%	1%	2%	1%	0%	1%	1%	1%	2%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	6	0	0	5
Turn Type	pm+pt	NA	Free	pm+pt	NA	Free	pm+pt	NA	pm+ov	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases	2		Free	6		Free	8		8	4		4
Actuated Green, G (s)	49.3	38.7	140.0	58.0	44.4	140.0	67.9	51.9	68.2	50.0	37.0	37.0
Effective Green, g (s)	51.3	39.7	140.0	59.0	45.4	140.0	68.9	52.9	70.2	52.0	38.0	38.0
Actuated g/C Ratio	0.37	0.28	1.00	0.42	0.32	1.00	0.49	0.38	0.50	0.37	0.27	0.27
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)	237	992	1538	265	1135	1514	458	1335	743	233	950	407
v/s Ratio Prot	0.06	c0.25		0.11	0.24		c0.22	0.31	c0.12	0.07	0.19	
v/s Ratio Perm	0.19		0.41	0.25		0.34	0.30		0.36	0.19		0.02
v/c Ratio	0.68	0.89	0.41	0.86	0.73	0.34	1.05	0.82	0.94	0.70	0.71	0.08
Uniform Delay, d1	32.7	48.0	0.0	38.4	41.9	0.0	35.2	39.3	32.9	32.7	46.1	38.0
Progression Factor	1.48	1.05	1.00	0.89	0.64	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.4	6.8	0.4	19.3	3.5	0.5	55.2	5.8	19.5	8.7	4.5	0.4
Delay (s)	52.8	57.2	0.4	53.3	30.4	0.5	90.4	45.0	52.4	41.4	50.6	38.4
Level of Service	D	E	A	D	C	A	F	D	D	D	D	D
Approach Delay (s)		35.2			23.9			56.7			47.5	
Approach LOS		D			C			E			D	

Intersection Summary

HCM 2000 Control Delay	42.1	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	116.4%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Queues
5: Highway 401 WB Off-Ramp & Kingston Road

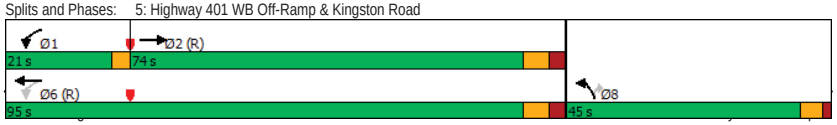
Future Total 2034 PM Peak Hour

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Configurations					
Traffic Volume (vph)	1625	245	735	765	145
Future Volume (vph)	1625	245	735	765	145
Lane Group Flow (vph)	1722	258	774	805	153
Turn Type	NA	pm+pt	NA	Prot	Perm
Protected Phases	2	1	6	8	
Permitted Phases		6			8
Detector Phase	2	1	6	8	8
Switch Phase					
Minimum Initial (s)	20.0	3.5	20.0	8.0	8.0
Minimum Split (s)	51.0	8.0	51.0	32.0	32.0
Total Split (s)	74.0	21.0	95.0	45.0	45.0
Total Split (%)	52.9%	15.0%	67.9%	32.1%	32.1%
Yellow Time (s)	4.2	3.0	4.2	3.7	3.7
All-Red Time (s)	3.0	0.0	3.0	1.7	1.7
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	6.2	2.0	6.2	4.4	4.4
Lead/Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes			
Recall Mode	C-Max	None	C-Max	None	None
v/c Ratio	0.98	0.91	0.34	0.88	0.34
Control Delay	35.0	74.0	11.8	60.2	31.9
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	35.0	74.0	11.8	60.2	31.9
Queue Length 50th (m)	~157.4	58.4	52.2	113.5	26.0
Queue Length 95th (m)	#316.9	#111.8	64.5	139.4	46.3
Internal Link Dist (m)	476.9		318.1	85.1	
Turn Bay Length (m)		15.0			15.0
Base Capacity (vph)	1751	292	2277	971	475
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.98	0.88	0.34	0.83	0.32

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBTL, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Highway 401 WB Off-Ramp & Kingston Road



HCM Signalized Intersection Capacity Analysis
5: Highway 401 WB Off-Ramp & Kingston Road

Future Total 2034 PM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1625	10	245	735	765	145
Future Volume (vph)	1625	10	245	735	765	145
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)	3495		1711	3500	3351	1546
Flt Permitted	1.00		0.06	1.00	0.95	1.00
Satd. Flow (perm)	3495		100	3500	3351	1546
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1711	11	258	774	805	153
RTOR Reduction (vph)	0	0	0	0	0	28
Lane Group Flow (vph)	1722	0	258	774	805	125
Heavy Vehicles (%)	2%	8%	2%	2%	1%	1%
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases			6			8
Actuated Green, G (s)	69.2		90.1	90.1	37.3	37.3
Effective Green, g (s)	70.2		91.1	91.1	38.3	38.3
Actuated g/C Ratio	0.50		0.65	0.65	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)	1752		282	2277	916	422
v/s Ratio Prot	c0.49		c0.12	0.22	c0.24	
v/s Ratio Perm			0.47			0.08
v/c Ratio	0.98		0.91	0.34	0.88	0.30
Uniform Delay, d1	34.3		47.6	11.0	48.6	40.2
Progression Factor	0.65		1.00	1.00	1.00	1.00
Incremental Delay, d2	11.2		32.0	0.4	9.6	0.4
Delay (s)	33.5		79.6	11.4	58.2	40.6
Level of Service	C		E	B	E	D
Approach Delay (s)	33.5			28.4	55.4	
Approach LOS	C			C	E	

Intersection Summary

HCM 2000 Control Delay	37.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.6
Intersection Capacity Utilization	92.8%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Queues
6: Whites Road & Bayly Street

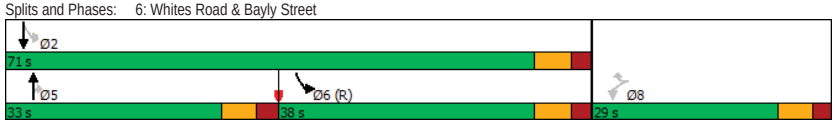
Future Total 2034 PM Peak Hour

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	165	360	605	255	1040	550
Future Volume (vph)	165	360	605	255	1040	550
Lane Group Flow (vph)	177	387	651	274	559	1150
Turn Type	Perm	Perm	NA	Perm	pm+pt	NA
Protected Phases			5		6	2
Permitted Phases	8	8		5	2	
Detector Phase	8	8	5	5	6	2
Switch Phase						
Minimum Initial (s)	8.0	8.0	12.0	12.0	12.0	12.0
Minimum Split (s)	28.0	28.0	32.0	32.0	21.0	21.0
Total Split (s)	29.0	29.0	33.0	33.0	38.0	71.0
Total Split (%)	29.0%	29.0%	33.0%	33.0%	38.0%	71.0%
Yellow Time (s)	4.2	4.2	4.4	4.4	4.4	4.4
All-Red Time (s)	2.4	2.4	2.6	2.6	2.6	2.6
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.6	5.6	6.0	6.0	6.0	6.0
Lead/Lag			Lead	Lead	Lag	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None	None	Max	Max	C-Max	Max
v/c Ratio	0.62	0.67	0.55	0.43	0.80	0.65
Control Delay	47.5	9.8	30.2	9.7	24.7	10.6
Queue Delay	0.0	0.0	0.0	0.0	52.3	0.0
Total Delay	47.5	9.8	30.2	9.7	77.0	10.6
Queue Length 50th (m)	34.0	0.0	56.3	8.7	50.3	29.1
Queue Length 95th (m)	52.1	24.7	82.5	32.6	#103.7	54.8
Internal Link Dist (m)	323.4		152.5			150.1
Turn Bay Length (m)				35.0	30.0	
Base Capacity (vph)	400	655	1179	643	697	1766
Starvation Cap Reductn	0	0	0	0	230	8
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.44	0.59	0.55	0.43	1.20	0.65

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 100
Offset: 44 (44%), Referenced to phase 6:SBL, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: Whites Road & Bayly Street



HCM Signalized Intersection Capacity Analysis
6: Whites Road & Bayly Street

Future Total 2034 PM Peak Hour

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	165	360	605	255	1040	550
Future Volume (vph)	165	360	605	255	1040	550
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)	5.6	5.6	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	0.98
Satd. Flow (prot)	1711	1533	3500	1493	1555	3253
Flt Permitted	0.95	1.00	1.00	1.00	0.31	0.55
Satd. Flow (perm)	1711	1533	3500	1493	502	1825
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	177	387	651	274	1118	591
RTOR Reduction (vph)	0	322	0	141	0	0
Lane Group Flow (vph)	177	65	651	133	559	1150
Confl. Peds. (#/hr)				10	10	
Heavy Vehicles (%)	2%	1%	2%	2%	2%	3%
Bus Blockages (#/hr)	0	2	0	0	0	0
Turn Type	Perm	Perm	NA	Perm	pm+pt	NA
Protected Phases			5		6	2
Permitted Phases	8	8		5	2	
Actuated Green, G (s)	15.7	15.7	32.7	32.7	70.7	70.7
Effective Green, g (s)	16.7	16.7	33.7	33.7	71.7	71.7
Actuated g/C Ratio	0.17	0.17	0.34	0.34	0.72	0.72
Clearance Time (s)	6.6	6.6	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)	285	256	1179	503	696	1765
v/s Ratio Prot			0.19		c0.26	0.21
v/s Ratio Perm	c0.10	0.04		0.09	c0.32	0.26
v/c Ratio	0.62	0.25	0.55	0.27	0.80	0.65
Uniform Delay, d1	38.7	36.2	27.0	24.1	16.0	7.5
Progression Factor	1.00	1.00	1.00	1.00	0.80	0.77
Incremental Delay, d2	4.2	0.5	1.9	1.3	7.9	1.5
Delay (s)	42.9	36.7	28.9	25.4	20.7	7.4
Level of Service	D	D	C	C	C	A
Approach Delay (s)	38.7		27.8			11.7
Approach LOS	D		C			B

Intersection Summary

HCM 2000 Control Delay	21.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.6
Intersection Capacity Utilization	74.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Queues
9: Whites Road & Highway 401 EB Off-Ramp

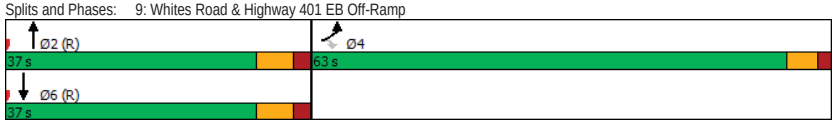
Future Total 2034 PM Peak Hour

Lane Group	EBL	EBR	NBT	SBT
Lane Configurations				
Traffic Volume (vph)	1840	945	965	645
Future Volume (vph)	1840	945	965	645
Lane Group Flow (vph)	1897	974	995	665
Turn Type	Prot	Perm	NA	NA
Protected Phases	4		2	6
Permitted Phases		4		
Detector Phase	4	4	2	6
Switch Phase				
Minimum Initial (s)	8.0	8.0	20.0	20.0
Minimum Split (s)	29.0	29.0	29.0	29.0
Total Split (s)	63.0	63.0	37.0	37.0
Total Split (%)	63.0%	63.0%	37.0%	37.0%
Yellow Time (s)	3.7	3.7	4.5	4.5
All-Red Time (s)	1.8	1.8	2.2	2.2
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	4.5	4.5	5.7	5.7
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	None	None	C-Max	C-Max
v/c Ratio	0.97	0.61	0.91	0.61
Control Delay	34.8	13.6	30.1	32.0
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	34.8	13.6	30.1	32.0
Queue Length 50th (m)	177.8	60.0	39.6	60.2
Queue Length 95th (m)	#245.1	81.3	#131.4	79.5
Internal Link Dist (m)	465.0		150.1	454.6
Turn Bay Length (m)		220.0		
Base Capacity (vph)	1960	1605	1095	1095
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.97	0.61	0.91	0.61

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 100
Offset: 8 (8%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 9: Whites Road & Highway 401 EB Off-Ramp



HCM Signalized Intersection Capacity Analysis
9: Whites Road & Highway 401 EB Off-Ramp

Future Total 2034 PM Peak Hour

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	1840	945	0	965	645	0
Future Volume (vph)	1840	945	0	965	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)	3351	2668		3500	3500	
Flt Permitted	0.95	1.00		1.00	1.00	
Satd. Flow (perm)	3351	2668		3500	3500	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	1897	974	0	995	665	0
RTOR Reduction (vph)	0	44	0	0	0	0
Lane Group Flow (vph)	1897	930	0	995	665	0
Confl. Peds. (#/hr)			5			5
Heavy Vehicles (%)	1%	3%	0%	2%	2%	0%
Turn Type	Prot	Perm		NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4				
Actuated Green, G (s)	57.5	57.5		30.3	30.3	
Effective Green, g (s)	58.5	58.5		31.3	31.3	
Actuated g/C Ratio	0.58	0.58		0.31	0.31	
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)	1960	1560		1095	1095	
v/s Ratio Prot	c0.57			c0.28	0.19	
v/s Ratio Perm		0.35				
v/c Ratio	0.97	0.60		0.91	0.61	
Uniform Delay, d1	19.9	13.2		33.0	29.1	
Progression Factor	1.00	1.00		0.55	1.00	
Incremental Delay, d2	13.4	0.6		10.8	2.5	
Delay (s)	33.3	13.8		29.0	31.6	
Level of Service	C	B		C	C	
Approach Delay (s)	26.7			29.0	31.6	
Approach LOS	C			C	C	

Intersection Summary

HCM 2000 Control Delay	27.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.2
Intersection Capacity Utilization	87.7%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Queues
1: Kingston Road & Rosebank Road

Future Total (with BRT) AM Peak Hour

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	75	615	5	1050	5	0	90	5
Future Volume (vph)	75	615	5	1050	5	0	90	5
Lane Group Flow (vph)	91	762	6	1323	6	6	110	165
Turn Type	Prot	NA	Prot	NA	Perm	NA	Perm	NA
Protected Phases	5	2	1	6		8		4
Permitted Phases					8		4	
Detector Phase	5	2	1	6	8	8	4	4
Switch Phase								
Minimum Initial (s)	5.0	20.0	5.0	20.0	8.0	8.0	8.0	8.0
Minimum Split (s)	11.0	28.0	11.0	28.0	28.0	28.0	28.0	28.0
Total Split (s)	19.0	97.0	11.0	89.0	32.0	32.0	32.0	32.0
Total Split (%)	13.6%	69.3%	7.9%	63.6%	22.9%	22.9%	22.9%	22.9%
Yellow Time (s)	3.0	4.3	3.0	4.3	3.5	3.5	3.5	3.5
All-Red Time (s)	3.0	2.3	3.0	2.3	3.1	3.1	3.1	3.1
Lost Time Adjust (s)	-4.0	-1.0	-4.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	2.0	5.6	2.0	5.6	5.6	5.6	5.6	5.6
Lead/Lag	Lead	Lag	Lead	Lag				
Lead-Lag Optimize?	Yes	Yes	Yes	Yes				
Recall Mode	None	C-Max	None	C-Max	None	None	None	None
v/c Ratio	0.46	0.29	0.05	0.59	0.07	0.01	0.64	0.52
Control Delay	64.7	5.8	59.4	9.9	52.2	0.0	74.6	18.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	64.7	5.8	59.4	9.9	52.2	0.0	74.6	18.3
Queue Length 50th (m)	25.1	26.1	1.7	65.6	1.6	0.0	31.0	6.6
Queue Length 95th (m)	38.9	53.1	m3.2	66.3	5.3	0.0	44.8	21.4
Internal Link Dist (m)		186.4		445.7		49.9		463.8
Turn Bay Length (m)	45.0		85.0		20.0		30.0	
Base Capacity (vph)	218	2619	125	2258	136	530	258	407
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.42	0.29	0.05	0.59	0.04	0.01	0.43	0.41

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Kingston Road & Rosebank Road

HCM Signalized Intersection Capacity Analysis
1: Kingston Road & Rosebank Road

Future Total (with BRT) AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	75	615	10	5	1050	35	5	0	5	90	5	130
Future Volume (vph)	75	615	10	5	1050	35	5	0	5	90	5	130
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)	2.0	5.6		2.0	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	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.98		1.00	0.97	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		0.99	1.00		0.99	1.00	
Frt	1.00	1.00		1.00	1.00		1.00	0.85		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1728	3374		1745	3395		1722	1562		1728	1558	
Flt Permitted	0.95	1.00		0.95	1.00		0.40	1.00		0.75	1.00	
Satd. Flow (perm)	1728	3374		1745	3395		726	1562		1371	1558	
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	91	750	12	6	1280	43	6	0	6	110	6	159
RTOR Reduction (vph)	0	1	0	0	1	0	0	5	0	0	123	0
Lane Group Flow (vph)	91	761	0	6	1322	0	6	1	0	110	43	0
Confl. Peds. (#/hr)	10					10	10		5	5		10
Confl. Bikes (#/hr)			150									
Heavy Vehicles (%)	1%	4%	0%	0%	3%	9%	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	7	7	0	6	6	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)	12.2	102.9		1.4	92.1		16.5	16.5		16.5	16.5	
Effective Green, g (s)	16.2	103.9		5.4	93.1		17.5	17.5		17.5	17.5	
Actuated g/C Ratio	0.12	0.74		0.04	0.66		0.12	0.12		0.12	0.12	
Clearance Time (s)	6.0	6.6		6.0	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	3.0	
Lane Grp Cap (vph)	199	2503		67	2257		90	195		171	194	
v/s Ratio Prot	c0.05	0.23		0.00	c0.39			0.00			0.03	
v/s Ratio Perm							0.01			c0.08		
v/c Ratio	0.46	0.30		0.09	0.59		0.07	0.00		0.64	0.22	
Uniform Delay, d1	57.8	6.0		64.9	12.9		54.0	53.6		58.3	55.1	
Progression Factor	1.00	1.00		0.98	0.64		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.7	0.3		0.5	0.9		0.3	0.0		8.0	0.6	
Delay (s)	59.5	6.3		63.8	9.1		54.4	53.6		66.3	55.7	
Level of Service	E	A		E	A		D	D		E	E	
Approach Delay (s)		12.0			9.4			54.0			59.9	
Approach LOS		B			A			D			E	

Intersection Summary

HCM 2000 Control Delay	16.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	13.2
Intersection Capacity Utilization	60.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Queues
3: Site Access (East)/Steeple Hill & Kingston Road

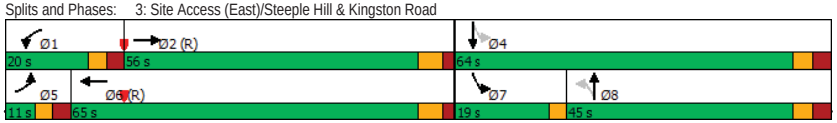
Future Total (with BRT) AM Peak Hour

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	40	725	175	920	130	0	150	0
Future Volume (vph)	40	725	175	920	130	0	150	0
Lane Group Flow (vph)	48	927	211	1174	157	464	181	60
Turn Type	Prot	NA	Prot	NA	Perm	NA	pm+pt	NA
Protected Phases	5	2	1	6		8	7	4
Permitted Phases					8		4	
Detector Phase	5	2	1	6	8	8	7	4
Switch Phase								
Minimum Initial (s)	5.0	20.0	5.0	20.0	8.0	8.0	5.0	8.0
Minimum Split (s)	11.0	28.0	11.0	28.0	38.0	38.0	8.0	38.0
Total Split (s)	11.0	56.0	20.0	65.0	45.0	45.0	19.0	64.0
Total Split (%)	7.9%	40.0%	14.3%	46.4%	32.1%	32.1%	13.6%	45.7%
Yellow Time (s)	3.0	4.2	3.0	4.2	3.3	3.3	3.0	3.3
All-Red Time (s)	3.0	2.1	3.0	2.1	3.4	3.4	0.0	3.4
Lost Time Adjust (s)	-4.0	-1.0	-4.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	2.0	5.3	2.0	5.3	5.7	5.7	2.0	5.7
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	C-Max	None	C-Max	None	None	None	None
v/c Ratio	0.38	0.71	0.77	0.71	0.53	0.90	0.72	0.09
Control Delay	72.7	36.6	85.0	20.8	53.0	50.3	46.9	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	72.7	36.6	85.0	20.8	53.0	50.3	46.9	0.3
Queue Length 50th (m)	13.4	128.2	63.8	65.6	40.1	79.3	35.4	0.0
Queue Length 95th (m)	26.1	113.4	m#94.2	90.1	54.7	101.3	49.1	0.0
Internal Link Dist (m)		129.3		289.8		62.3		200.4
Turn Bay Length (m)	25.0		30.0				15.0	
Base Capacity (vph)	126	1309	274	1665	370	593	259	736
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.38	0.71	0.77	0.71	0.42	0.78	0.70	0.08

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Site Access (East)/Steeple Hill & Kingston Road



HCM Signalized Intersection Capacity Analysis
3: Site Access (East)/Steeple Hill & Kingston Road

Future Total (with BRT) AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	725	45	175	920	55	130	0	385	150	0	50
Future Volume (vph)	40	725	45	175	920	55	130	0	385	150	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)	2.0	5.3		2.0	5.3		5.7	5.7		2.0	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	0.99		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		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)	1662	3322		1745	3383		1745	1597		1678	1597	
Flt Permitted	0.95	1.00		0.95	1.00		0.72	1.00		0.12	1.00	
Satd. Flow (perm)	1662	3322		1745	3383		1319	1597		212	1597	
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)	48	873	54	211	1108	66	157	0	464	181	0	60
RTOR Reduction (vph)	0	3	0	0	3	0	0	157	0	0	39	0
Lane Group Flow (vph)	48	924	0	211	1171	0	157	307	0	181	21	0
Confl. Peds. (#/hr)	10					10						
Confl. Bikes (#/hr)			160									
Heavy Vehicles (%)	5%	3%	20%	0%	3%	4%	0%	0%	0%	4%	0%	0%
Bus Blockages (#/hr)	0	7	7	0	6	6	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)	5.5	54.1		18.0	66.6		30.4	30.4		48.9	48.9	
Effective Green, g (s)	9.5	55.1		22.0	67.6		31.4	31.4		49.9	49.9	
Actuated g/C Ratio	0.07	0.39		0.16	0.48		0.22	0.22		0.36	0.36	
Clearance Time (s)	6.0	6.3		6.0	6.3		6.7	6.7		3.0	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)	112	1307		274	1633		295	358		248	569	
v/s Ratio Prot	0.03	0.28		c0.12	c0.35			c0.19		c0.09	0.01	
v/s Ratio Perm							0.12			0.17		
v/c Ratio	0.43	0.71		0.77	0.72		0.53	0.86		0.73	0.04	
Uniform Delay, d1	62.6	35.7		56.6	28.6		47.8	52.2		35.9	29.4	
Progression Factor	1.03	0.90		1.28	0.63		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.6	3.2		9.2	2.0		1.8	18.1		10.3	0.0	
Delay (s)	67.0	35.4		81.4	19.9		49.7	70.2		46.2	29.4	
Level of Service	E	D		F	B		D	E		D	C	
Approach Delay (s)		37.0			29.3			65.0			42.0	
Approach LOS		D			C			E			D	

Intersection Summary

HCM 2000 Control Delay	39.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	79.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Queues
4: Whites Road & Kingston Road

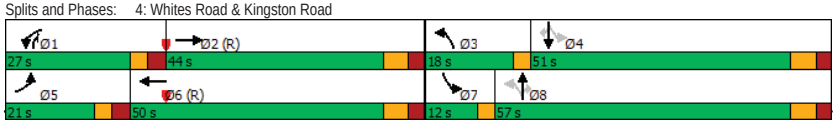
Future Total (with BRT) AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	105	360	795	285	830	335	280	495	410	120	1055	135
Future Volume (vph)	105	360	795	285	830	335	280	495	410	120	1055	135
Lane Group Flow (vph)	109	375	828	297	865	349	280	516	427	125	1099	141
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
Detector Phase	5	2		1	6		3	8	1	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	20.0		5.0	20.0		5.0	8.0	5.0	5.0	8.0	8.0
Minimum Split (s)	11.0	44.0		11.0	44.0		8.0	44.1	11.0	8.0	44.1	44.1
Total Split (s)	21.0	44.0		27.0	50.0		18.0	57.0	27.0	12.0	51.0	51.0
Total Split (%)	15.0%	31.4%		19.3%	35.7%		12.9%	40.7%	19.3%	8.6%	36.4%	36.4%
Yellow Time (s)	3.0	4.2		3.0	4.2		3.0	4.3	3.0	3.0	4.3	4.3
All-Red Time (s)	3.0	2.8		3.0	2.8		0.0	2.8	3.0	0.0	2.8	2.8
Lost Time Adjust (s)	-4.0	-1.0		-4.0	-1.0		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	2.0	6.0		2.0	6.0		2.0	6.1	5.0	2.0	6.1	6.1
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max		None	C-Max		None	Max	None	None	Max	Max
v/c Ratio	0.53	0.41	0.57	0.99	0.75	0.23	0.96	0.42	0.49	0.33	1.00	0.27
Control Delay	63.4	48.7	3.8	88.0	44.6	0.3	74.4	34.6	10.3	23.5	73.9	8.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	63.4	48.7	3.8	88.0	44.6	0.3	74.4	34.6	10.3	23.5	73.9	8.9
Queue Length 50th (m)	31.1	45.6	34.5	81.2	129.9	0.0	55.4	59.1	32.2	20.1	168.4	3.2
Queue Length 95th (m)	m42.8	m62.6	73.0	m#134.7	154.8	m0.0	#114.6	75.8	57.2	33.0	#218.7	19.5
Internal Link Dist (m)		289.8			476.9			454.6			338.0	
Turn Bay Length (m)	100.0		80.0	35.0		35.0	50.0		45.0	85.0		15.0
Base Capacity (vph)	229	922	1447	299	1149	1511	291	1242	877	378	1101	522
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.48	0.41	0.57	0.99	0.75	0.23	0.96	0.42	0.49	0.33	1.00	0.27

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 130
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Whites Road & Kingston Road



HCM Signalized Intersection Capacity Analysis
4: Whites Road & Kingston Road

Future Total (with BRT) AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	105	360	795	285	830	335	280	495	410	120	1055	135
Future Volume (vph)	105	360	795	285	830	335	280	495	410	120	1055	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	3.0	2.0	6.0	3.0	2.0	6.1	5.0	2.0	6.1	6.1
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.95	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	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)	1694	3400	1447	1678	3500	1511	1800	3400	1464	1667	3433	1363
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)	1694	3400	1447	1678	3500	1511	236	3400	1464	747	3433	1363
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	1.00	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	109	375	828	297	865	349	280	516	427	125	1099	141
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	103	0	0	85
Lane Group Flow (vph)	109	375	828	297	865	349	280	516	324	125	1099	56
Confl. Peds. (#/hr)	35		25	25		35	20		30	30		20
Confl. Bikes (#/hr)			160									
Heavy Vehicles (%)	3%	5%	2%	4%	2%	1%	2%	5%	2%	4%	4%	8%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	3	0	0	6
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)	13.0	37.0	140.0	21.0	45.0	140.0	61.9	50.1	71.1	52.7	43.9	43.9
Effective Green, g (s)	17.0	38.0	140.0	25.0	46.0	140.0	62.9	51.1	73.1	54.7	44.9	44.9
Actuated g/C Ratio	0.12	0.27	1.00	0.18	0.33	1.00	0.45	0.37	0.52	0.39	0.32	0.32
Clearance Time (s)	6.0	7.0		6.0	7.0		3.0	7.1	6.0	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)	205	922	1447	299	1150	1511	284	1241	764	356	1101	437
v/s Ratio Prot	0.06	0.11		c0.18	c0.25		c0.11	0.15	0.07	0.02	c0.32	
v/s Ratio Perm			0.57			0.23	0.33		0.15	0.11		0.04
v/c Ratio	0.53	0.41	0.57	0.99	0.75	0.23	0.99	0.42	0.42	0.35	1.00	0.13
Uniform Delay, d1	57.8	41.8	0.0	57.4	41.9	0.0	31.2	33.3	20.5	28.1	47.5	33.7
Progression Factor	0.99	1.14	1.00	0.71	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.8	0.9	1.1	45.5	3.8	0.3	49.1	1.0	0.4	0.6	26.7	0.6
Delay (s)	58.9	48.4	1.1	86.3	43.8	0.3	80.3	34.3	20.9	28.7	74.2	34.3
Level of Service	E	D	A	F	D	A	F	C	C	C	E	C
Approach Delay (s)		19.4			42.1			40.2			65.9	
Approach LOS		B			D			D			E	

Intersection Summary

HCM 2000 Control Delay	42.2	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)		19.1	
Intersection Capacity Utilization	108.9%	ICU Level of Service		G	
Analysis Period (min)	15				

c Critical Lane Group

Queues
5: Highway 401 WB Off-Ramp & Kingston Road

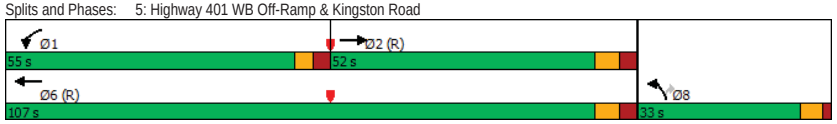
Future Total (with BRT) AM Peak Hour

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Configurations					
Traffic Volume (vph)	785	500	880	550	65
Future Volume (vph)	785	500	880	550	65
Lane Group Flow (vph)	851	532	936	585	69
Turn Type	NA	Prot	NA	Prot	Perm
Protected Phases	2	1	6	8	
Permitted Phases					8
Detector Phase	2	1	6	8	8
Switch Phase					
Minimum Initial (s)	20.0	3.5	20.0	8.0	8.0
Minimum Split (s)	51.0	9.5	51.0	32.0	32.0
Total Split (s)	52.0	55.0	107.0	33.0	33.0
Total Split (%)	37.1%	39.3%	76.4%	23.6%	23.6%
Yellow Time (s)	4.2	3.0	4.2	3.7	3.7
All-Red Time (s)	3.0	3.0	3.0	1.7	1.7
Lost Time Adjust (s)	-1.0	-4.0	-1.0	-1.0	-1.0
Total Lost Time (s)	6.2	2.0	6.2	4.4	4.4
Lead/Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes			
Recall Mode	C-Max	None	C-Max	None	None
v/c Ratio	0.70	0.87	0.37	0.89	0.22
Control Delay	42.0	57.8	7.8	70.6	34.8
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	42.0	57.8	7.8	70.6	34.8
Queue Length 50th (m)	93.8	139.6	49.8	85.7	11.6
Queue Length 95th (m)	124.5	188.6	60.3	#115.0	26.0
Internal Link Dist (m)	476.9		318.1	85.1	
Turn Bay Length (m)		15.0			15.0
Base Capacity (vph)	1219	654	2513	678	326
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.70	0.81	0.37	0.86	0.21

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 115
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Highway 401 WB Off-Ramp & Kingston Road



HCM Signalized Intersection Capacity Analysis
5: Highway 401 WB Off-Ramp & Kingston Road

Future Total (with BRT) AM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	785	15	500	880	550	65
Future Volume (vph)	785	15	500	880	550	65
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
Frpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00	1.00	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)	3414		1728	3466	3319	1516
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3414		1728	3466	3319	1516
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	835	16	532	936	585	69
RTOR Reduction (vph)	1	0	0	0	0	17
Lane Group Flow (vph)	850	0	532	936	585	52
Confl. Bikes (#/hr)		150				
Heavy Vehicles (%)	4%	0%	1%	3%	2%	3%
Turn Type	NA		Prot	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases						8
Actuated Green, G (s)	49.0		45.5	100.5	26.9	26.9
Effective Green, g (s)	50.0		49.5	101.5	27.9	27.9
Actuated g/C Ratio	0.36		0.35	0.72	0.20	0.20
Clearance Time (s)	7.2		6.0	7.2	5.4	5.4
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1219		610	2512	661	302
v/s Ratio Prot	c0.25		c0.31	0.27	c0.18	
v/s Ratio Perm						0.03
v/c Ratio	0.70		0.87	0.37	0.89	0.17
Uniform Delay, d1	38.5		42.3	7.3	54.5	46.5
Progression Factor	0.98		1.00	1.00	1.00	1.00
Incremental Delay, d2	3.1		13.0	0.4	13.4	0.3
Delay (s)	40.7		55.3	7.7	67.9	46.8
Level of Service	D		E	A	E	D
Approach Delay (s)	40.7			24.9	65.7	
Approach LOS	D			C	E	

Intersection Summary

HCM 2000 Control Delay	38.4	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)	12.6
Intersection Capacity Utilization	77.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Queues
1: Kingston Road & Rosebank Road

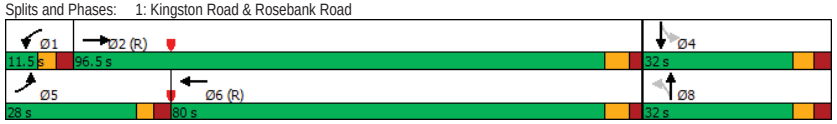
Future Total (with BRT) PM Peak Hour

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT	Ø1
Lane Configurations								
Traffic Volume (vph)	120	1185	805	5	0	50	5	
Future Volume (vph)	120	1185	805	5	0	50	5	
Lane Group Flow (vph)	124	1222	892	5	10	52	72	
Turn Type	Prot	NA	NA	Perm	NA	Perm	NA	
Protected Phases	5	2	6		8		4	1
Permitted Phases				8		4		
Detector Phase	5	2	6	8	8	4	4	
Switch Phase								
Minimum Initial (s)	5.0	20.0	20.0	8.0	8.0	8.0	8.0	5.0
Minimum Split (s)	11.0	28.0	28.0	28.0	28.0	28.0	28.0	11.5
Total Split (s)	28.0	96.5	80.0	32.0	32.0	32.0	32.0	11.5
Total Split (%)	20.0%	68.9%	57.1%	22.9%	22.9%	22.9%	22.9%	8%
Yellow Time (s)	3.0	4.3	4.3	3.5	3.5	3.5	3.5	3.0
All-Red Time (s)	3.0	2.3	2.3	3.1	3.1	3.1	3.1	3.0
Lost Time Adjust (s)	-4.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	2.0	5.6	5.6	5.6	5.6	5.6	5.6	
Lead/Lag	Lead	Lag	Lag					Lead
Lead-Lag Optimize?	Yes	Yes	Yes					Yes
Recall Mode	None	C-Max	C-Max	None	None	None	None	None
v/c Ratio	0.52	0.42	0.39	0.04	0.04	0.41	0.35	
Control Delay	63.1	4.1	16.7	54.4	0.2	67.3	18.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	63.1	4.1	16.7	54.4	0.2	67.3	18.6	
Queue Length 50th (m)	34.1	37.2	55.6	1.4	0.0	14.7	1.4	
Queue Length 95th (m)	53.2	71.2	85.2	5.6	0.0	27.1	16.1	
Internal Link Dist (m)		186.4	445.7		49.9		463.8	
Turn Bay Length (m)	45.0			20.0		30.0		
Base Capacity (vph)	324	2882	2303	243	415	257	344	
Starvation Cap Reductn	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.38	0.42	0.39	0.02	0.02	0.20	0.21	

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated

Splits and Phases: 1: Kingston Road & Rosebank Road



HCM Signalized Intersection Capacity Analysis
1: Kingston Road & Rosebank Road

Future Total (with BRT) PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	120	1185	0	0	805	60	5	0	10	50	5	65
Future Volume (vph)	120	1185	0	0	805	60	5	0	10	50	5	65
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)	2.0	5.6			5.6		5.6	5.6		5.6	5.6	
Lane Util. Factor	1.00	0.95			0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00			1.00		1.00	0.98		1.00	0.98	
Flpb, ped/bikes	1.00	1.00			1.00		0.99	1.00		0.99	1.00	
Frt	1.00	1.00			0.99		1.00	0.85		1.00	0.86	
Flt Protected	0.95	1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1745	3492			3412		1729	1562		1728	1541	
Flt Permitted	0.95	1.00			1.00		0.71	1.00		0.75	1.00	
Satd. Flow (perm)	1745	3492			3412		1292	1562		1366	1541	
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)	124	1222	0	0	830	62	5	0	10	52	5	67
RTOR Reduction (vph)	0	0	0	0	3	0	0	9	0	0	61	0
Lane Group Flow (vph)	124	1222	0	0	889	0	5	1	0	52	11	0
Confl. Peds. (#/hr)	10		5	5		10	5		5	5		5
Heavy Vehicles (%)	0%	1%	0%	0%	2%	0%	0%	0%	0%	0%	0%	3%
Bus Blockages (#/hr)	0	6	6	0	6	6	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)	15.2	114.6			93.4		12.2	12.2		12.2	12.2	
Effective Green, g (s)	19.2	115.6			94.4		13.2	13.2		13.2	13.2	
Actuated g/C Ratio	0.14	0.83			0.67		0.09	0.09		0.09	0.09	
Clearance Time (s)	6.0	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)	239	2883			2300		121	147		128	145	
v/s Ratio Prot	c0.07	c0.35			0.26			0.00			0.01	
v/s Ratio Perm							0.00			c0.04		
v/c Ratio	0.52	0.42			0.39		0.04	0.01		0.41	0.08	
Uniform Delay, d1	56.1	3.3			10.0		57.6	57.5		59.7	57.8	
Progression Factor	1.00	1.00			1.46		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.9	0.5			0.5		0.1	0.0		2.1	0.2	
Delay (s)	58.0	3.7			15.1		57.8	57.5		61.8	58.1	
Level of Service	E	A			B		E	E		E	E	
Approach Delay (s)		8.7			15.1			57.6			59.6	
Approach LOS		A			B			E			E	

Intersection Summary

HCM 2000 Control Delay	14.1	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.44			
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	13.2	
Intersection Capacity Utilization	60.3%	ICU Level of Service	B	
Analysis Period (min)	15			

c Critical Lane Group

Queues
3: Site Access (East)/Steeple Hill & Kingston Road

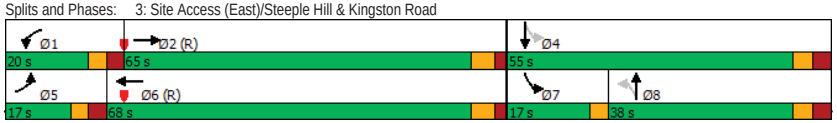
Future Total (with BRT) PM Peak Hour

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	100	1065	385	720	85	10	220	0
Future Volume (vph)	100	1065	385	720	85	10	220	0
Lane Group Flow (vph)	103	1196	397	871	88	294	227	72
Turn Type	Prot	NA	Prot	NA	Perm	NA	pm+pt	NA
Protected Phases	5	2	1	6		8	7	4
Permitted Phases					8		4	
Detector Phase	5	2	1	6	8	8	7	4
Switch Phase								
Minimum Initial (s)	5.0	20.0	5.0	20.0	8.0	8.0	5.0	8.0
Minimum Split (s)	11.0	28.0	11.0	28.0	38.0	38.0	8.0	38.0
Total Split (s)	17.0	65.0	20.0	68.0	38.0	38.0	17.0	55.0
Total Split (%)	12.1%	46.4%	14.3%	48.6%	27.1%	27.1%	12.1%	39.3%
Yellow Time (s)	3.0	4.2	3.0	4.2	3.3	3.3	3.0	3.3
All-Red Time (s)	3.0	2.1	3.0	2.1	3.4	3.4	0.0	3.4
Lost Time Adjust (s)	-4.0	-1.0	-4.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	2.0	5.3	2.0	5.3	5.7	5.7	2.0	5.7
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	C-Max	None	C-Max	None	None	None	None
v/c Ratio	0.52	0.81	0.99	0.48	0.53	0.79	0.92	0.12
Control Delay	71.0	36.8	93.5	16.4	66.0	34.2	82.9	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	71.0	36.8	93.5	16.4	66.0	34.2	82.9	0.4
Queue Length 50th (m)	28.8	160.1	120.3	50.4	24.8	28.5	56.6	0.0
Queue Length 95th (m)	51.0	190.2	m#225.4	m63.4	38.2	56.2	#76.9	0.0
Internal Link Dist (m)		129.3		289.8		62.3		200.4
Turn Bay Length (m)	25.0		30.0				15.0	
Base Capacity (vph)	206	1477	401	1831	299	512	246	726
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.50	0.81	0.99	0.48	0.29	0.57	0.92	0.10

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 115
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Site Access (East)/Steeple Hill & Kingston Road



HCM Signalized Intersection Capacity Analysis
3: Site Access (East)/Steeple Hill & Kingston Road

Future Total (with BRT) PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	1065	95	385	720	125	85	10	275	220	0	70
Future Volume (vph)	100	1065	95	385	720	125	85	10	275	220	0	70
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)	2.0	5.3		2.0	5.3		5.7	5.7		2.0	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	0.99		1.00	0.98		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	0.99		1.00	0.98		1.00	0.86		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	3452		1745	3364		1734	1567		1726	1567	
Flt Permitted	0.95	1.00		0.95	1.00		0.71	1.00		0.20	1.00	
Satd. Flow (perm)	1745	3452		1745	3364		1296	1567		362	1567	
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)	103	1098	98	397	742	129	88	10	284	227	0	72
RTOR Reduction (vph)	0	5	0	0	8	0	0	171	0	0	54	0
Lane Group Flow (vph)	103	1191	0	397	863	0	88	123	0	227	18	0
Confl. Peds. (#/hr)	10					10	5		10	10		5
Heavy Vehicles (%)	0%	1%	0%	0%	2%	0%	0%	0%	0%	1%	0%	0%
Bus Blockages (#/hr)	0	6	6	0	6	6	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)	12.0	58.7		28.2	74.9		17.1	17.1		34.1	34.1	
Effective Green, g (s)	16.0	59.7		32.2	75.9		18.1	18.1		35.1	35.1	
Actuated g/C Ratio	0.11	0.43		0.23	0.54		0.13	0.13		0.25	0.25	
Clearance Time (s)	6.0	6.3		6.0	6.3		6.7	6.7		3.0	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)	199	1472		401	1823		167	202		236	392	
v/s Ratio Prot	0.06	c0.35		c0.23	0.26			c0.08		c0.10	0.01	
v/s Ratio Perm							0.07			0.14		
v/c Ratio	0.52	0.81		0.99	0.47		0.53	0.61		0.96	0.05	
Uniform Delay, d1	58.4	35.2		53.7	19.7		56.9	57.6		47.1	39.8	
Progression Factor	1.07	0.91		1.21	0.76		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.1	4.6		31.9	0.5		3.0	5.4		47.7	0.0	
Delay (s)	64.3	36.7		97.0	15.4		59.9	63.0		94.7	39.8	
Level of Service	E	D		F	B		E	E		F	D	
Approach Delay (s)		38.8			41.0			62.3			81.5	
Approach LOS		D			D			E			F	

Intersection Summary

HCM 2000 Control Delay	46.4	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)	15.0
Intersection Capacity Utilization	102.4%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Queues
4: Whites Road & Kingston Road

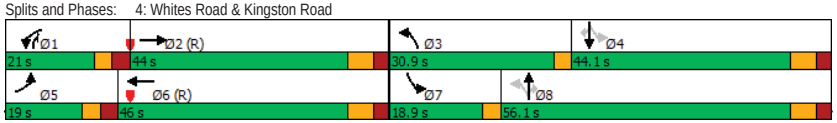
Future Total (with BRT) PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	160	810	590	225	775	515	455	1010	775	160	625	120
Future Volume (vph)	160	810	590	225	775	515	455	1010	775	160	625	120
Lane Group Flow (vph)	162	818	596	227	783	520	460	1020	783	162	631	121
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
Detector Phase	5	2		1	6		3	8	1	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	20.0		5.0	20.0		5.0	8.0	5.0	5.0	8.0	8.0
Minimum Split (s)	11.0	44.0		11.0	44.0		8.0	44.1	11.0	8.0	44.1	44.1
Total Split (s)	19.0	44.0		21.0	46.0		30.9	56.1	21.0	18.9	44.1	44.1
Total Split (%)	13.6%	31.4%		15.0%	32.9%		22.1%	40.1%	15.0%	13.5%	31.5%	31.5%
Yellow Time (s)	3.0	4.2		3.0	4.2		3.0	4.3	3.0	3.0	4.3	4.3
All-Red Time (s)	3.0	2.8		3.0	2.8		0.0	2.8	3.0	0.0	2.8	2.8
Lost Time Adjust (s)	-4.0	-1.0		-4.0	-1.0		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	2.0	6.0		2.0	6.0		2.0	6.1	5.0	2.0	6.1	6.1
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max		None	C-Max		None	Max	None	None	Max	Max
v/c Ratio	0.78	0.86	0.39	0.97	0.78	0.34	0.95	0.76	0.91	0.63	0.66	0.24
Control Delay	79.6	67.0	0.4	100.1	36.3	0.5	58.0	42.7	36.4	32.4	49.1	7.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	79.6	67.0	0.4	100.1	36.3	0.5	58.0	42.7	36.4	32.4	49.1	7.1
Queue Length 50th (m)	50.0	103.0	0.0	60.3	113.5	0.0	92.4	135.2	143.2	24.2	86.4	0.0
Queue Length 95th (m)	m62.9	m131.9	m0.0	m#97.0	m131.4	m0.0	#161.9	168.9	#211.5	40.2	108.5	15.0
Internal Link Dist (m)		289.8			476.9			454.6			338.0	
Turn Bay Length (m)	100.0		80.0	35.0		35.0	50.0		45.0	85.0		15.0
Base Capacity (vph)	211	950	1538	234	1003	1514	486	1345	859	299	957	502
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.77	0.86	0.39	0.97	0.78	0.34	0.95	0.76	0.91	0.54	0.66	0.24

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 140
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Whites Road & Kingston Road



HCM Signalized Intersection Capacity Analysis
4: Whites Road & Kingston Road

Future Total (with BRT) PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	160	810	590	225	775	515	455	1010	775	160	625	120
Future Volume (vph)	160	810	590	225	775	515	455	1010	775	160	625	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	3.0	2.0	6.0	3.0	2.0	6.1	5.0	2.0	6.1	6.1
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	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	3500	1538	1728	3500	1514	1744	3535	1482	1727	3500	1503
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.22	1.00	1.00	0.17	1.00	1.00
Satd. Flow (perm)	1745	3500	1538	1728	3500	1514	402	3535	1482	301	3500	1503
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	162	818	596	227	783	520	460	1020	783	162	631	121
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	116	0	0	88
Lane Group Flow (vph)	162	818	596	227	783	520	460	1020	667	162	631	33
Confl. Peds. (#/hr)	30		10	10		30	5		10	10		5
Heavy Vehicles (%)	0%	2%	0%	1%	2%	1%	0%	1%	1%	1%	2%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	6	0	0	5
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)	12.9	37.0	140.0	15.0	39.1	140.0	67.9	52.3	67.3	49.9	37.3	37.3
Effective Green, g (s)	16.9	38.0	140.0	19.0	40.1	140.0	68.9	53.3	69.3	51.9	38.3	38.3
Actuated g/C Ratio	0.12	0.27	1.00	0.14	0.29	1.00	0.49	0.38	0.49	0.37	0.27	0.27
Clearance Time (s)	6.0	7.0		6.0	7.0		3.0	7.1	6.0	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)	210	950	1538	234	1002	1514	471	1345	733	250	957	411
v/s Ratio Prot	0.09	c0.23		c0.13	0.22		c0.20	0.29	c0.10	0.06	0.18	
v/s Ratio Perm			0.39			0.34	0.28		0.35	0.18		0.02
v/c Ratio	0.77	0.86	0.39	0.97	0.78	0.34	0.98	0.76	0.91	0.65	0.66	0.08
Uniform Delay, d1	59.7	48.5	0.0	60.2	45.9	0.0	31.2	37.7	32.5	31.9	45.1	37.8
Progression Factor	1.08	1.25	1.00	0.92	0.68	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	10.0	6.3	0.4	43.7	4.8	0.5	35.1	4.0	15.1	5.7	3.6	0.4
Delay (s)	74.3	66.8	0.4	98.9	36.1	0.5	66.2	41.8	47.6	37.6	48.6	38.2
Level of Service	E	E	A	F	D	A	E	D	D	D	D	D
Approach Delay (s)		42.5			33.3			48.8			45.3	
Approach LOS		D			C			D			D	

Intersection Summary

HCM 2000 Control Delay	42.9	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)	19.1
Intersection Capacity Utilization	115.3%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Queues
5: Highway 401 WB Off-Ramp & Kingston Road

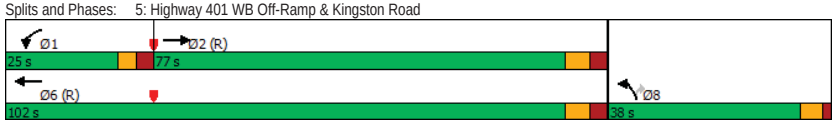
Future Total (with BRT) PM Peak Hour

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Configurations					
Traffic Volume (vph)	1535	230	735	715	135
Future Volume (vph)	1535	230	735	715	135
Lane Group Flow (vph)	1627	242	774	753	142
Turn Type	NA	Prot	NA	Prot	Perm
Protected Phases	2	1	6	8	
Permitted Phases					8
Detector Phase	2	1	6	8	8
Switch Phase					
Minimum Initial (s)	20.0	3.5	20.0	8.0	8.0
Minimum Split (s)	51.0	9.5	51.0	32.0	32.0
Total Split (s)	77.0	25.0	102.0	38.0	38.0
Total Split (%)	55.0%	17.9%	72.9%	27.1%	27.1%
Yellow Time (s)	4.2	3.0	4.2	3.7	3.7
All-Red Time (s)	3.0	3.0	3.0	1.7	1.7
Lost Time Adjust (s)	-1.0	-4.0	-1.0	-1.0	-1.0
Total Lost Time (s)	6.2	2.0	6.2	4.4	4.4
Lead/Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes			
Recall Mode	C-Max	None	C-Max	None	None
v/c Ratio	0.92	0.86	0.32	0.94	0.36
Control Delay	25.0	85.4	9.3	73.3	35.7
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	25.0	85.4	9.3	73.3	35.7
Queue Length 50th (m)	135.8	69.5	44.4	111.7	25.5
Queue Length 95th (m)	#157.1	#117.6	54.5	#150.2	46.4
Internal Link Dist (m)	476.9		318.1	85.1	
Turn Bay Length (m)		15.0			15.0
Base Capacity (vph)	1777	281	2402	804	398
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.92	0.86	0.32	0.94	0.36

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Highway 401 WB Off-Ramp & Kingston Road



HCM Signalized Intersection Capacity Analysis
5: Highway 401 WB Off-Ramp & Kingston Road

Future Total (with BRT) PM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1535	10	230	735	715	135
Future Volume (vph)	1535	10	230	735	715	135
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)	3495		1711	3500	3351	1546
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3495		1711	3500	3351	1546
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1616	11	242	774	753	142
RTOR Reduction (vph)	0	0	0	0	0	27
Lane Group Flow (vph)	1627	0	242	774	753	115
Heavy Vehicles (%)	2%	8%	2%	2%	1%	1%
Turn Type	NA		Prot	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases						8
Actuated Green, G (s)	70.2		18.9	95.1	32.3	32.3
Effective Green, g (s)	71.2		22.9	96.1	33.3	33.3
Actuated g/C Ratio	0.51		0.16	0.69	0.24	0.24
Clearance Time (s)	7.2		6.0	7.2	5.4	5.4
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1777		279	2402	797	367
v/s Ratio Prot	c0.47		c0.14	0.22	c0.22	
v/s Ratio Perm						0.07
v/c Ratio	0.92		0.87	0.32	0.94	0.31
Uniform Delay, d1	31.6		57.1	8.8	52.4	43.9
Progression Factor	0.62		1.00	1.00	1.00	1.00
Incremental Delay, d2	4.8		23.5	0.4	19.6	0.5
Delay (s)	24.3		80.6	9.2	72.0	44.4
Level of Service	C		F	A	E	D
Approach Delay (s)	24.3			26.2	67.6	
Approach LOS	C			C	E	

Intersection Summary

HCM 2000 Control Delay	35.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.6
Intersection Capacity Utilization	88.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Queues
1: Kingston Road & Rosebank Road

Future Total 2029 (with BRT) AM Peak Hour

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	75	625	5	1075	5	0	90	5
Future Volume (vph)	75	625	5	1075	5	0	90	5
Lane Group Flow (vph)	91	774	6	1354	6	6	110	165
Turn Type	Prot	NA	Prot	NA	Perm	NA	Perm	NA
Protected Phases	5	2	1	6		8		4
Permitted Phases					8		4	
Detector Phase	5	2	1	6	8	8	4	4
Switch Phase								
Minimum Initial (s)	5.0	20.0	5.0	20.0	8.0	8.0	8.0	8.0
Minimum Split (s)	11.0	28.0	11.0	28.0	28.0	28.0	28.0	28.0
Total Split (s)	19.0	97.0	11.0	89.0	32.0	32.0	32.0	32.0
Total Split (%)	13.6%	69.3%	7.9%	63.6%	22.9%	22.9%	22.9%	22.9%
Yellow Time (s)	3.0	4.3	3.0	4.3	3.5	3.5	3.5	3.5
All-Red Time (s)	3.0	2.3	3.0	2.3	3.1	3.1	3.1	3.1
Lost Time Adjust (s)	-4.0	-1.0	-4.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	2.0	5.6	2.0	5.6	5.6	5.6	5.6	5.6
Lead/Lag	Lead	Lag	Lead	Lag				
Lead-Lag Optimize?	Yes	Yes	Yes	Yes				
Recall Mode	None	C-Max	None	C-Max	None	None	None	None
v/c Ratio	0.46	0.30	0.05	0.60	0.07	0.01	0.64	0.53
Control Delay	64.7	5.8	59.2	10.1	52.2	0.0	74.6	19.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	64.7	5.8	59.2	10.1	52.2	0.0	74.6	19.3
Queue Length 50th (m)	25.1	26.5	1.7	68.6	1.6	0.0	31.0	7.7
Queue Length 95th (m)	38.9	54.2	m3.3	68.1	5.3	0.0	44.8	22.7
Internal Link Dist (m)		186.4		445.7		49.9		463.8
Turn Bay Length (m)	45.0		85.0		20.0		30.0	
Base Capacity (vph)	218	2619	125	2258	136	525	258	404
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.42	0.30	0.05	0.60	0.04	0.01	0.43	0.41

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Kingston Road & Rosebank Road

HCM Signalized Intersection Capacity Analysis
1: Kingston Road & Rosebank Road

Future Total 2029 (with BRT) AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	75	625	10	5	1075	35	5	0	5	90	5	130
Future Volume (vph)	75	625	10	5	1075	35	5	0	5	90	5	130
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)	2.0	5.6		2.0	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	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.98		1.00	0.97	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		0.99	1.00		0.99	1.00	
Frt	1.00	1.00		1.00	1.00		1.00	0.85		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1728	3374		1745	3395		1722	1562		1728	1558	
Flt Permitted	0.95	1.00		0.95	1.00		0.40	1.00		0.75	1.00	
Satd. Flow (perm)	1728	3374		1745	3395		726	1562		1371	1558	
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	91	762	12	6	1311	43	6	0	6	110	6	159
RTOR Reduction (vph)	0	1	0	0	1	0	0	5	0	0	119	0
Lane Group Flow (vph)	91	773	0	6	1353	0	6	1	0	110	46	0
Confl. Peds. (#/hr)	10					10	10		5	5		10
Confl. Bikes (#/hr)			150									
Heavy Vehicles (%)	1%	4%	0%	0%	3%	9%	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	7	7	0	6	6	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)	12.2	102.9		1.4	92.1		16.5	16.5		16.5	16.5	
Effective Green, g (s)	16.2	103.9		5.4	93.1		17.5	17.5		17.5	17.5	
Actuated g/C Ratio	0.12	0.74		0.04	0.66		0.12	0.12		0.12	0.12	
Clearance Time (s)	6.0	6.6		6.0	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	3.0	
Lane Grp Cap (vph)	199	2503		67	2257		90	195		171	194	
v/s Ratio Prot	c0.05	0.23		0.00	c0.40			0.00			0.03	
v/s Ratio Perm							0.01			c0.08		
v/c Ratio	0.46	0.31		0.09	0.60		0.07	0.00		0.64	0.24	
Uniform Delay, d1	57.8	6.0		64.9	13.1		54.0	53.6		58.3	55.2	
Progression Factor	1.00	1.00		0.97	0.64		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.7	0.3		0.5	0.9		0.3	0.0		8.0	0.6	
Delay (s)	59.5	6.4		63.6	9.3		54.4	53.6		66.3	55.9	
Level of Service	E	A		E	A		D	D		E	E	
Approach Delay (s)		11.9			9.6			54.0			60.0	
Approach LOS		B			A			D			E	

Intersection Summary

HCM 2000 Control Delay	16.1	HCM 2000 Level of Service		B	
HCM 2000 Volume to Capacity ratio	0.58				
Actuated Cycle Length (s)	140.0	Sum of lost time (s)		13.2	
Intersection Capacity Utilization	61.0%	ICU Level of Service		B	
Analysis Period (min)	15				

c Critical Lane Group

Queues
3: Site Access (East)/Steeple Hill & Kingston Road

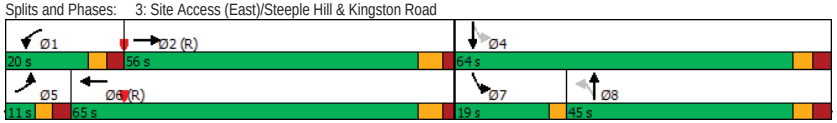
Future Total 2029 (with BRT) AM Peak Hour

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	40	735	175	945	130	0	150	0
Future Volume (vph)	40	735	175	945	130	0	150	0
Lane Group Flow (vph)	48	940	211	1205	157	464	181	60
Turn Type	Prot	NA	Prot	NA	Perm	NA	pm+pt	NA
Protected Phases	5	2	1	6		8	7	4
Permitted Phases					8		4	
Detector Phase	5	2	1	6	8	8	7	4
Switch Phase								
Minimum Initial (s)	5.0	20.0	5.0	20.0	8.0	8.0	5.0	8.0
Minimum Split (s)	11.0	28.0	11.0	28.0	38.0	38.0	8.0	38.0
Total Split (s)	11.0	56.0	20.0	65.0	45.0	45.0	19.0	64.0
Total Split (%)	7.9%	40.0%	14.3%	46.4%	32.1%	32.1%	13.6%	45.7%
Yellow Time (s)	3.0	4.2	3.0	4.2	3.3	3.3	3.0	3.3
All-Red Time (s)	3.0	2.1	3.0	2.1	3.4	3.4	0.0	3.4
Lost Time Adjust (s)	-4.0	-1.0	-4.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	2.0	5.3	2.0	5.3	5.7	5.7	2.0	5.7
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	C-Max	None	C-Max	None	None	None	None
v/c Ratio	0.38	0.72	0.77	0.72	0.53	0.90	0.72	0.09
Control Delay	73.0	37.1	84.8	21.6	52.9	50.3	47.1	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	73.0	37.1	84.8	21.6	52.9	50.3	47.1	0.3
Queue Length 50th (m)	13.6	130.9	64.0	67.4	40.1	79.6	35.4	0.0
Queue Length 95th (m)	26.1	115.5	m#92.3	m94.3	54.7	101.7	49.4	0.0
Internal Link Dist (m)		129.3		289.8		62.3		200.4
Turn Bay Length (m)	25.0		30.0				15.0	
Base Capacity (vph)	126	1309	273	1663	370	592	258	735
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.38	0.72	0.77	0.72	0.42	0.78	0.70	0.08

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Site Access (East)/Steeple Hill & Kingston Road



HCM Signalized Intersection Capacity Analysis
3: Site Access (East)/Steeple Hill & Kingston Road

Future Total 2029 (with BRT) AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	735	45	175	945	55	130	0	385	150	0	50
Future Volume (vph)	40	735	45	175	945	55	130	0	385	150	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)	2.0	5.3		2.0	5.3		5.7	5.7		2.0	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	0.99		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		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)	1662	3323		1745	3384		1745	1597		1678	1597	
Flt Permitted	0.95	1.00		0.95	1.00		0.72	1.00		0.12	1.00	
Satd. Flow (perm)	1662	3323		1745	3384		1319	1597		211	1597	
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)	48	886	54	211	1139	66	157	0	464	181	0	60
RTOR Reduction (vph)	0	3	0	0	3	0	0	156	0	0	39	0
Lane Group Flow (vph)	48	937	0	211	1202	0	157	308	0	181	21	0
Confl. Peds. (#/hr)	10					10						
Confl. Bikes (#/hr)			160									
Heavy Vehicles (%)	5%	3%	20%	0%	3%	4%	0%	0%	0%	4%	0%	0%
Bus Blockages (#/hr)	0	7	7	0	6	6	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)	5.5	54.1		17.9	66.5		30.5	30.5		49.0	49.0	
Effective Green, g (s)	9.5	55.1		21.9	67.5		31.5	31.5		50.0	50.0	
Actuated g/C Ratio	0.07	0.39		0.16	0.48		0.22	0.22		0.36	0.36	
Clearance Time (s)	6.0	6.3		6.0	6.3		6.7	6.7		3.0	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)	112	1307		272	1631		296	359		248	570	
v/s Ratio Prot	0.03	0.28		c0.12	c0.36			c0.19		c0.09	0.01	
v/s Ratio Perm							0.12			0.17		
v/c Ratio	0.43	0.72		0.78	0.74		0.53	0.86		0.73	0.04	
Uniform Delay, d1	62.6	35.9		56.7	29.1		47.7	52.1		35.9	29.3	
Progression Factor	1.03	0.91		1.28	0.64		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.6	3.3		9.3	2.1		1.8	18.0		10.3	0.0	
Delay (s)	67.3	35.8		81.6	20.7		49.6	70.1		46.2	29.3	
Level of Service	E	D		F	C		D	E		D	C	
Approach Delay (s)		37.4			29.8			64.9			42.0	
Approach LOS		D			C			E			D	

Intersection Summary

HCM 2000 Control Delay	39.7	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)	15.0
Intersection Capacity Utilization	80.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Queues
4: Whites Road & Kingston Road

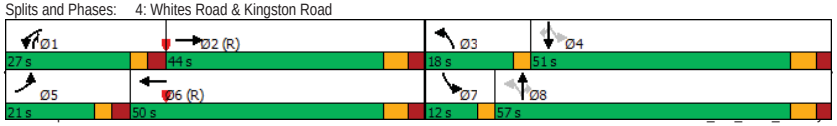
Future Total 2029 (with BRT) AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	105	370	795	285	850	335	285	505	410	120	1080	135
Future Volume (vph)	105	370	795	285	850	335	285	505	410	120	1080	135
Lane Group Flow (vph)	109	385	828	297	885	349	285	526	427	125	1125	141
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
Detector Phase	5	2		1	6		3	8	1	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	20.0		5.0	20.0		5.0	8.0	5.0	5.0	8.0	8.0
Minimum Split (s)	11.0	44.0		11.0	44.0		8.0	44.1	11.0	8.0	44.1	44.1
Total Split (s)	21.0	44.0		27.0	50.0		18.0	57.0	27.0	12.0	51.0	51.0
Total Split (%)	15.0%	31.4%		19.3%	35.7%		12.9%	40.7%	19.3%	8.6%	36.4%	36.4%
Yellow Time (s)	3.0	4.2		3.0	4.2		3.0	4.3	3.0	3.0	4.3	4.3
All-Red Time (s)	3.0	2.8		3.0	2.8		0.0	2.8	3.0	0.0	2.8	2.8
Lost Time Adjust (s)	-4.0	-1.0		-4.0	-1.0		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	2.0	6.0		2.0	6.0		2.0	6.1	5.0	2.0	6.1	6.1
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max		None	C-Max		None	Max	None	None	Max	Max
v/c Ratio	0.53	0.42	0.57	0.99	0.77	0.23	0.98	0.42	0.49	0.34	1.02	0.27
Control Delay	63.4	49.1	3.7	87.8	45.3	0.3	78.7	34.7	10.6	23.6	79.3	8.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	63.4	49.1	3.7	87.8	45.3	0.3	78.7	34.7	10.6	23.6	79.3	8.9
Queue Length 50th (m)	30.9	47.0	33.6	81.0	133.5	0.0	57.2	60.5	33.3	20.1	~182.8	3.2
Queue Length 95th (m)	m41.8	m64.1	71.9	m#133.5	m157.8	m0.0	#117.7	77.3	58.3	33.0	#227.3	19.5
Internal Link Dist (m)		289.8			476.9			454.6			338.0	
Turn Bay Length (m)	100.0		80.0	35.0		35.0	50.0		45.0	85.0		15.0
Base Capacity (vph)	229	922	1447	299	1149	1511	291	1242	874	374	1101	522
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.48	0.42	0.57	0.99	0.77	0.23	0.98	0.42	0.49	0.33	1.02	0.27

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 130
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Whites Road & Kingston Road



HCM Signalized Intersection Capacity Analysis
4: Whites Road & Kingston Road

Future Total 2029 (with BRT) AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	105	370	795	285	850	335	285	505	410	120	1080	135
Future Volume (vph)	105	370	795	285	850	335	285	505	410	120	1080	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	3.0	2.0	6.0	3.0	2.0	6.1	5.0	2.0	6.1	6.1
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.95	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	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)	1694	3400	1447	1678	3500	1511	1800	3400	1464	1668	3433	1363
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.13	1.00	1.00	0.42	1.00	1.00
Satd. Flow (perm)	1694	3400	1447	1678	3500	1511	236	3400	1464	733	3433	1363
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	1.00	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	109	385	828	297	885	349	285	526	427	125	1125	141
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	100	0	0	85
Lane Group Flow (vph)	109	385	828	297	885	349	285	526	327	125	1125	56
Confl. Peds. (#/hr)	35		25	25		35	20		30	30		20
Confl. Bikes (#/hr)			160									
Heavy Vehicles (%)	3%	5%	2%	4%	2%	1%	2%	5%	2%	4%	4%	8%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	3	0	0	6
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)	13.0	37.0	140.0	21.0	45.0	140.0	61.9	50.1	71.1	52.7	43.9	43.9
Effective Green, g (s)	17.0	38.0	140.0	25.0	46.0	140.0	62.9	51.1	73.1	54.7	44.9	44.9
Actuated g/C Ratio	0.12	0.27	1.00	0.18	0.33	1.00	0.45	0.37	0.52	0.39	0.32	0.32
Clearance Time (s)	6.0	7.0		6.0	7.0		3.0	7.1	6.0	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)	205	922	1447	299	1150	1511	284	1241	764	351	1101	437
v/s Ratio Prot	0.06	0.11		c0.18	c0.25		c0.11	0.15	0.07	0.02	c0.33	
v/s Ratio Perm			0.57			0.23	0.34		0.16	0.11		0.04
v/c Ratio	0.53	0.42	0.57	0.99	0.77	0.23	1.00	0.42	0.43	0.36	1.02	0.13
Uniform Delay, d1	57.8	41.9	0.0	57.4	42.2	0.0	31.8	33.4	20.6	28.2	47.6	33.7
Progression Factor	0.99	1.14	1.00	0.71	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.7	0.9	1.1	45.3	4.2	0.3	54.3	1.1	0.4	0.6	32.8	0.6
Delay (s)	59.0	48.8	1.1	86.0	44.4	0.3	86.1	34.5	21.0	28.8	80.3	34.3
Level of Service	E	D	A	F	D	A	F	C	C	C	F	C
Approach Delay (s)		19.8			42.4			41.7			71.0	
Approach LOS		B			D			D			E	

Intersection Summary

HCM 2000 Control Delay	44.1	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)	19.1
Intersection Capacity Utilization	109.2%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Queues
5: Highway 401 WB Off-Ramp & Kingston Road

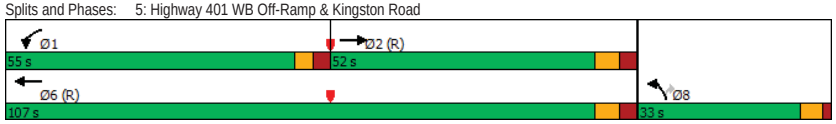
Future Total 2029 (with BRT) AM Peak Hour

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Configurations					
Traffic Volume (vph)	795	510	890	560	65
Future Volume (vph)	795	510	890	560	65
Lane Group Flow (vph)	862	543	947	596	69
Turn Type	NA	Prot	NA	Prot	Perm
Protected Phases	2	1	6	8	
Permitted Phases					8
Detector Phase	2	1	6	8	8
Switch Phase					
Minimum Initial (s)	20.0	3.5	20.0	8.0	8.0
Minimum Split (s)	51.0	9.5	51.0	32.0	32.0
Total Split (s)	52.0	55.0	107.0	33.0	33.0
Total Split (%)	37.1%	39.3%	76.4%	23.6%	23.6%
Yellow Time (s)	4.2	3.0	4.2	3.7	3.7
All-Red Time (s)	3.0	3.0	3.0	1.7	1.7
Lost Time Adjust (s)	-1.0	-4.0	-1.0	-1.0	-1.0
Total Lost Time (s)	6.2	2.0	6.2	4.4	4.4
Lead/Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes			
Recall Mode	C-Max	None	C-Max	None	None
v/c Ratio	0.72	0.88	0.38	0.90	0.22
Control Delay	43.2	58.3	7.9	72.1	34.8
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	43.2	58.3	7.9	72.1	34.8
Queue Length 50th (m)	96.5	142.6	50.6	87.6	11.6
Queue Length 95th (m)	126.4	#197.9	61.3	#118.7	26.0
Internal Link Dist (m)	476.9		318.1	85.1	
Turn Bay Length (m)		15.0			15.0
Base Capacity (vph)	1203	654	2511	678	326
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.72	0.83	0.38	0.88	0.21

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 125
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Highway 401 WB Off-Ramp & Kingston Road



HCM Signalized Intersection Capacity Analysis
5: Highway 401 WB Off-Ramp & Kingston Road

Future Total 2029 (with BRT) AM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	795	15	510	890	560	65
Future Volume (vph)	795	15	510	890	560	65
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
Frpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00	1.00	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)	3414		1728	3466	3319	1516
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3414		1728	3466	3319	1516
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	846	16	543	947	596	69
RTOR Reduction (vph)	1	0	0	0	0	17
Lane Group Flow (vph)	861	0	543	947	596	52
Confl. Bikes (#/hr)		150				
Heavy Vehicles (%)	4%	0%	1%	3%	2%	3%
Turn Type	NA		Prot	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases						8
Actuated Green, G (s)	48.3		46.1	100.4	27.0	27.0
Effective Green, g (s)	49.3		50.1	101.4	28.0	28.0
Actuated g/C Ratio	0.35		0.36	0.72	0.20	0.20
Clearance Time (s)	7.2		6.0	7.2	5.4	5.4
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1202		618	2510	663	303
v/s Ratio Prot	c0.25		c0.31	0.27	c0.18	
v/s Ratio Perm						0.03
v/c Ratio	0.72		0.88	0.38	0.90	0.17
Uniform Delay, d1	39.3		42.1	7.3	54.6	46.4
Progression Factor	0.98		1.00	1.00	1.00	1.00
Incremental Delay, d2	3.4		13.4	0.4	15.0	0.3
Delay (s)	42.0		55.5	7.8	69.6	46.7
Level of Service	D		E	A	E	D
Approach Delay (s)	42.0			25.2	67.2	
Approach LOS	D			C	E	

Intersection Summary

HCM 2000 Control Delay	39.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	12.6
Intersection Capacity Utilization	78.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Queues
1: Kingston Road & Rosebank Road

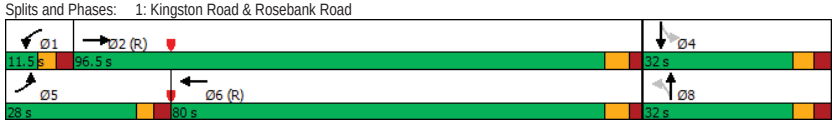
Future Total 2029 (with BRT) PM Peak Hour

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT	Ø1
Lane Configurations								
Traffic Volume (vph)	120	1220	825	5	0	50	5	
Future Volume (vph)	120	1220	825	5	0	50	5	
Lane Group Flow (vph)	124	1258	913	5	10	52	72	
Turn Type	Prot	NA	NA	Perm	NA	Perm	NA	
Protected Phases	5	2	6		8		4	1
Permitted Phases				8		4		
Detector Phase	5	2	6	8	8	4	4	
Switch Phase								
Minimum Initial (s)	5.0	20.0	20.0	8.0	8.0	8.0	8.0	5.0
Minimum Split (s)	11.0	28.0	28.0	28.0	28.0	28.0	28.0	11.5
Total Split (s)	28.0	96.5	80.0	32.0	32.0	32.0	32.0	11.5
Total Split (%)	20.0%	68.9%	57.1%	22.9%	22.9%	22.9%	22.9%	8%
Yellow Time (s)	3.0	4.3	4.3	3.5	3.5	3.5	3.5	3.0
All-Red Time (s)	3.0	2.3	2.3	3.1	3.1	3.1	3.1	3.0
Lost Time Adjust (s)	-4.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	2.0	5.6	5.6	5.6	5.6	5.6	5.6	
Lead/Lag	Lead	Lag	Lag					Lead
Lead-Lag Optimize?	Yes	Yes	Yes					Yes
Recall Mode	None	C-Max	C-Max	None	None	None	None	None
v/c Ratio	0.52	0.44	0.40	0.04	0.04	0.41	0.35	
Control Delay	63.1	4.2	17.0	54.4	0.2	67.3	18.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	63.1	4.2	17.0	54.4	0.2	67.3	18.6	
Queue Length 50th (m)	34.1	38.9	58.1	1.4	0.0	14.7	1.4	
Queue Length 95th (m)	53.2	74.3	87.5	5.6	0.0	27.1	16.1	
Internal Link Dist (m)		186.4	445.7		49.9		463.8	
Turn Bay Length (m)	45.0			20.0		30.0		
Base Capacity (vph)	324	2882	2303	243	410	257	344	
Starvation Cap Reductn	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.38	0.44	0.40	0.02	0.02	0.20	0.21	

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated

Splits and Phases: 1: Kingston Road & Rosebank Road



HCM Signalized Intersection Capacity Analysis
1: Kingston Road & Rosebank Road

Future Total 2029 (with BRT) PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	120	1220	0	0	825	60	5	0	10	50	5	65
Future Volume (vph)	120	1220	0	0	825	60	5	0	10	50	5	65
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)	2.0	5.6			5.6		5.6	5.6		5.6	5.6	
Lane Util. Factor	1.00	0.95			0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00			1.00		1.00	0.98		1.00	0.98	
Flpb, ped/bikes	1.00	1.00			1.00		0.99	1.00		0.99	1.00	
Frt	1.00	1.00			0.99		1.00	0.85		1.00	0.86	
Flt Protected	0.95	1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1745	3492			3413		1729	1562		1728	1541	
Flt Permitted	0.95	1.00			1.00		0.71	1.00		0.75	1.00	
Satd. Flow (perm)	1745	3492			3413		1292	1562		1366	1541	
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)	124	1258	0	0	851	62	5	0	10	52	5	67
RTOR Reduction (vph)	0	0	0	0	3	0	0	9	0	0	61	0
Lane Group Flow (vph)	124	1258	0	0	910	0	5	1	0	52	11	0
Confl. Peds. (#/hr)	10		5	5		10	5		5	5		5
Heavy Vehicles (%)	0%	1%	0%	0%	2%	0%	0%	0%	0%	0%	0%	3%
Bus Blockages (#/hr)	0	6	6	0	6	6	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)	15.2	114.6			93.4		12.2	12.2		12.2	12.2	
Effective Green, g (s)	19.2	115.6			94.4		13.2	13.2		13.2	13.2	
Actuated g/C Ratio	0.14	0.83			0.67		0.09	0.09		0.09	0.09	
Clearance Time (s)	6.0	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)	239	2883			2301		121	147		128	145	
v/s Ratio Prot	c0.07	c0.36			0.27			0.00			0.01	
v/s Ratio Perm							0.00			c0.04		
v/c Ratio	0.52	0.44			0.40		0.04	0.01		0.41	0.08	
Uniform Delay, d1	56.1	3.3			10.1		57.6	57.5		59.7	57.8	
Progression Factor	1.00	1.00			1.47		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.9	0.5			0.5		0.1	0.0		2.1	0.2	
Delay (s)	58.0	3.8			15.3		57.8	57.5		61.8	58.1	
Level of Service	E	A			B		E	E		E	E	
Approach Delay (s)		8.7			15.3			57.6			59.6	
Approach LOS		A			B			E			E	

Intersection Summary

HCM 2000 Control Delay	14.1	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.45			
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	13.2	
Intersection Capacity Utilization	61.2%	ICU Level of Service	B	
Analysis Period (min)	15			

c Critical Lane Group

Queues
3: Site Access (East)/Steeple Hill & Kingston Road

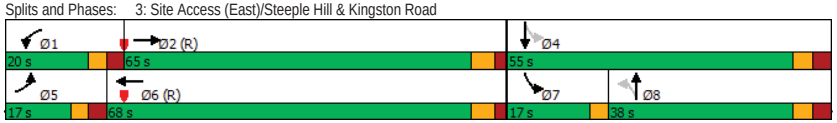
Future Total 2029 (with BRT) PM Peak Hour

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	100	1100	385	740	85	10	220	0
Future Volume (vph)	100	1100	385	740	85	10	220	0
Lane Group Flow (vph)	103	1232	397	892	88	294	227	72
Turn Type	Prot	NA	Prot	NA	Perm	NA	pm+pt	NA
Protected Phases	5	2	1	6		8	7	4
Permitted Phases					8		4	
Detector Phase	5	2	1	6	8	8	7	4
Switch Phase								
Minimum Initial (s)	5.0	20.0	5.0	20.0	8.0	8.0	5.0	8.0
Minimum Split (s)	11.0	28.0	11.0	28.0	38.0	38.0	8.0	38.0
Total Split (s)	17.0	65.0	20.0	68.0	38.0	38.0	17.0	55.0
Total Split (%)	12.1%	46.4%	14.3%	48.6%	27.1%	27.1%	12.1%	39.3%
Yellow Time (s)	3.0	4.2	3.0	4.2	3.3	3.3	3.0	3.3
All-Red Time (s)	3.0	2.1	3.0	2.1	3.4	3.4	0.0	3.4
Lost Time Adjust (s)	-4.0	-1.0	-4.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	2.0	5.3	2.0	5.3	5.7	5.7	2.0	5.7
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	C-Max	None	C-Max	None	None	None	None
v/c Ratio	0.52	0.83	0.99	0.49	0.52	0.79	0.92	0.12
Control Delay	71.0	38.1	93.3	16.5	65.8	34.7	82.9	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	71.0	38.1	93.3	16.5	65.8	34.7	82.9	0.4
Queue Length 50th (m)	28.8	167.3	120.7	51.7	24.8	29.1	56.6	0.0
Queue Length 95th (m)	50.6	198.8	m#220.4	m64.0	38.2	56.8	#77.2	0.0
Internal Link Dist (m)		129.3		289.8		62.3		200.4
Turn Bay Length (m)	25.0		30.0				15.0	
Base Capacity (vph)	206	1477	400	1830	299	510	246	722
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.50	0.83	0.99	0.49	0.29	0.58	0.92	0.10

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 115
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Site Access (East)/Steeple Hill & Kingston Road



HCM Signalized Intersection Capacity Analysis
3: Site Access (East)/Steeple Hill & Kingston Road

Future Total 2029 (with BRT) PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	1100	95	385	740	125	85	10	275	220	0	70
Future Volume (vph)	100	1100	95	385	740	125	85	10	275	220	0	70
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)	2.0	5.3		2.0	5.3		5.7	5.7		2.0	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	0.99		1.00	0.98		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	0.99		1.00	0.98		1.00	0.86		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	3453		1745	3366		1734	1567		1726	1567	
Flt Permitted	0.95	1.00		0.95	1.00		0.71	1.00		0.20	1.00	
Satd. Flow (perm)	1745	3453		1745	3366		1296	1567		360	1567	
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)	103	1134	98	397	763	129	88	10	284	227	0	72
RTOR Reduction (vph)	0	5	0	0	8	0	0	169	0	0	54	0
Lane Group Flow (vph)	103	1227	0	397	884	0	88	125	0	227	18	0
Confl. Peds. (#/hr)	10					10	5		10	10		5
Heavy Vehicles (%)	0%	1%	0%	0%	2%	0%	0%	0%	0%	1%	0%	0%
Bus Blockages (#/hr)	0	6	6	0	6	6	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)	12.0	58.7		28.1	74.8		17.2	17.2		34.2	34.2	
Effective Green, g (s)	16.0	59.7		32.1	75.8		18.2	18.2		35.2	35.2	
Actuated g/C Ratio	0.11	0.43		0.23	0.54		0.13	0.13		0.25	0.25	
Clearance Time (s)	6.0	6.3		6.0	6.3		6.7	6.7		3.0	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)	199	1472		400	1822		168	203		236	393	
v/s Ratio Prot	0.06	c0.36		c0.23	0.26			c0.08		c0.10	0.01	
v/s Ratio Perm							0.07			0.14		
v/c Ratio	0.52	0.83		0.99	0.49		0.52	0.62		0.96	0.05	
Uniform Delay, d1	58.4	35.7		53.8	20.0		56.9	57.6		47.0	39.7	
Progression Factor	1.07	0.91		1.21	0.75		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.1	5.4		31.8	0.5		2.9	5.5		47.7	0.0	
Delay (s)	64.3	37.9		97.1	15.6		59.8	63.1		94.7	39.7	
Level of Service	E	D		F	B		E	E		F	D	
Approach Delay (s)		39.9			40.7			62.3			81.4	
Approach LOS		D			D			E			F	

Intersection Summary

HCM 2000 Control Delay	46.6	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)	15.0
Intersection Capacity Utilization	103.4%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Queues
4: Whites Road & Kingston Road

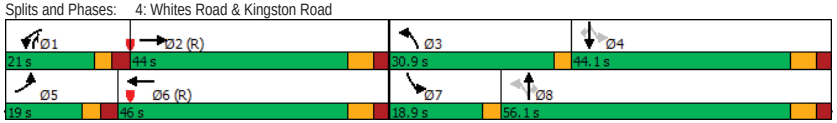
Future Total 2029 (with BRT) PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	160	830	605	225	790	515	460	1035	785	160	640	120
Future Volume (vph)	160	830	605	225	790	515	460	1035	785	160	640	120
Lane Group Flow (vph)	162	838	611	227	798	520	465	1045	793	162	646	121
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
Detector Phase	5	2		1	6		3	8	1	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	20.0		5.0	20.0		5.0	8.0	5.0	5.0	8.0	8.0
Minimum Split (s)	11.0	44.0		11.0	44.0		8.0	44.1	11.0	8.0	44.1	44.1
Total Split (s)	19.0	44.0		21.0	46.0		30.9	56.1	21.0	18.9	44.1	44.1
Total Split (%)	13.6%	31.4%		15.0%	32.9%		22.1%	40.1%	15.0%	13.5%	31.5%	31.5%
Yellow Time (s)	3.0	4.2		3.0	4.2		3.0	4.3	3.0	3.0	4.3	4.3
All-Red Time (s)	3.0	2.8		3.0	2.8		0.0	2.8	3.0	0.0	2.8	2.8
Lost Time Adjust (s)	-4.0	-1.0		-4.0	-1.0		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	2.0	6.0		2.0	6.0		2.0	6.1	5.0	2.0	6.1	6.1
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max		None	C-Max		None	Max	None	None	Max	Max
v/c Ratio	0.78	0.88	0.40	0.97	0.80	0.34	0.97	0.78	0.93	0.64	0.68	0.24
Control Delay	78.8	68.5	0.4	99.8	36.7	0.5	63.9	43.8	38.5	34.3	49.8	7.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	78.8	68.5	0.4	99.8	36.7	0.5	63.9	43.8	38.5	34.3	49.8	7.1
Queue Length 50th (m)	50.1	106.2	0.0	60.4	117.9	0.0	97.4	140.8	149.4	24.2	88.9	0.0
Queue Length 95th (m)	m61.3	m#142.0	m0.0	m#95.5	m133.6	m0.0	#169.9	175.0	#218.2	42.6	111.2	15.0
Internal Link Dist (m)		289.8			476.9			454.6			338.0	
Turn Bay Length (m)	100.0		80.0	35.0		35.0	50.0		45.0	85.0		15.0
Base Capacity (vph)	211	950	1538	234	1003	1514	479	1339	857	290	952	500
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.77	0.88	0.40	0.97	0.80	0.34	0.97	0.78	0.93	0.56	0.68	0.24

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 140
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Whites Road & Kingston Road



HCM Signalized Intersection Capacity Analysis
4: Whites Road & Kingston Road

Future Total 2029 (with BRT) PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	160	830	605	225	790	515	460	1035	785	160	640	120
Future Volume (vph)	160	830	605	225	790	515	460	1035	785	160	640	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	3.0	2.0	6.0	3.0	2.0	6.1	5.0	2.0	6.1	6.1
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	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	3500	1538	1728	3500	1514	1744	3535	1482	1727	3500	1503
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.21	1.00	1.00	0.15	1.00	1.00
Satd. Flow (perm)	1745	3500	1538	1728	3500	1514	381	3535	1482	274	3500	1503
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	162	838	611	227	798	520	465	1045	793	162	646	121
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	116	0	0	88
Lane Group Flow (vph)	162	838	611	227	798	520	465	1045	677	162	646	33
Confl. Peds. (#/hr)	30		10	10		30	5		10	10		5
Heavy Vehicles (%)	0%	2%	0%	1%	2%	1%	0%	1%	1%	1%	2%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	6	0	0	5
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)	12.9	37.0	140.0	15.0	39.1	140.0	67.9	52.1	67.1	49.9	37.1	37.1
Effective Green, g (s)	16.9	38.0	140.0	19.0	40.1	140.0	68.9	53.1	69.1	51.9	38.1	38.1
Actuated g/C Ratio	0.12	0.27	1.00	0.14	0.29	1.00	0.49	0.38	0.49	0.37	0.27	0.27
Clearance Time (s)	6.0	7.0		6.0	7.0		3.0	7.1	6.0	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)	210	950	1538	234	1002	1514	467	1340	731	244	952	409
v/s Ratio Prot	0.09	c0.24		c0.13	0.23		c0.20	0.30	c0.11	0.07	0.18	
v/s Ratio Perm			0.40			0.34	0.28		0.35	0.18		0.02
v/c Ratio	0.77	0.88	0.40	0.97	0.80	0.34	1.00	0.78	0.93	0.66	0.68	0.08
Uniform Delay, d1	59.7	48.9	0.0	60.2	46.2	0.0	33.0	38.3	33.0	32.1	45.5	37.9
Progression Factor	1.07	1.26	1.00	0.92	0.68	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	9.6	7.1	0.4	43.3	5.1	0.5	40.3	4.5	17.5	6.6	3.9	0.4
Delay (s)	73.7	68.5	0.4	98.6	36.5	0.5	73.3	42.8	50.6	38.8	49.4	38.3
Level of Service	E	E	A	F	D	A	E	D	D	D	D	D
Approach Delay (s)		43.2			33.5			51.7			46.1	
Approach LOS		D			C			D			D	

Intersection Summary

HCM 2000 Control Delay	44.3	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)	19.1
Intersection Capacity Utilization	115.5%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

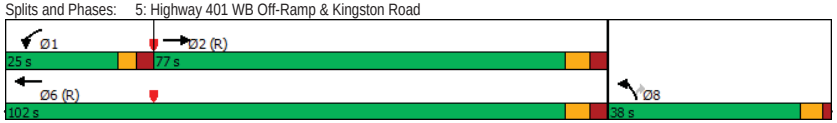
Queues
5: Highway 401 WB Off-Ramp & Kingston Road

Future Total 2029 (with BRT) PM Peak Hour

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Configurations					
Traffic Volume (vph)	1565	235	735	730	140
Future Volume (vph)	1565	235	735	730	140
Lane Group Flow (vph)	1658	247	774	768	147
Turn Type	NA	Prot	NA	Prot	Perm
Protected Phases	2	1	6	8	
Permitted Phases					8
Detector Phase	2	1	6	8	8
Switch Phase					
Minimum Initial (s)	20.0	3.5	20.0	8.0	8.0
Minimum Split (s)	51.0	9.5	51.0	32.0	32.0
Total Split (s)	77.0	25.0	102.0	38.0	38.0
Total Split (%)	55.0%	17.9%	72.9%	27.1%	27.1%
Yellow Time (s)	4.2	3.0	4.2	3.7	3.7
All-Red Time (s)	3.0	3.0	3.0	1.7	1.7
Lost Time Adjust (s)	-1.0	-4.0	-1.0	-1.0	-1.0
Total Lost Time (s)	6.2	2.0	6.2	4.4	4.4
Lead/Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes			
Recall Mode	C-Max	None	C-Max	None	None
v/c Ratio	0.94	0.88	0.32	0.96	0.37
Control Delay	26.4	87.2	9.4	74.9	36.2
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	26.4	87.2	9.4	74.9	36.2
Queue Length 50th (m)	138.2	71.2	44.4	114.5	26.9
Queue Length 95th (m)	m#163.6	#120.6	54.5	#154.8	48.2
Internal Link Dist (m)	476.9		318.1	85.1	
Turn Bay Length (m)		15.0			15.0
Base Capacity (vph)	1767	281	2395	804	398
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.94	0.88	0.32	0.96	0.37

Intersection Summary
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 105
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Highway 401 WB Off-Ramp & Kingston Road



HCM Signalized Intersection Capacity Analysis
5: Highway 401 WB Off-Ramp & Kingston Road

Future Total 2029 (with BRT) PM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1565	10	235	735	730	140
Future Volume (vph)	1565	10	235	735	730	140
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)	3495		1711	3500	3351	1546
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3495		1711	3500	3351	1546
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1647	11	247	774	768	147
RTOR Reduction (vph)	0	0	0	0	0	27
Lane Group Flow (vph)	1658	0	247	774	768	120
Heavy Vehicles (%)	2%	8%	2%	2%	1%	1%
Turn Type	NA		Prot	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases						8
Actuated Green, G (s)	69.8		19.0	94.8	32.6	32.6
Effective Green, g (s)	70.8		23.0	95.8	33.6	33.6
Actuated g/C Ratio	0.51		0.16	0.68	0.24	0.24
Clearance Time (s)	7.2		6.0	7.2	5.4	5.4
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1767		281	2395	804	371
v/s Ratio Prot	c0.47		c0.14	0.22	c0.23	
v/s Ratio Perm						0.08
v/c Ratio	0.94		0.88	0.32	0.96	0.32
Uniform Delay, d1	32.5		57.1	9.0	52.5	43.8
Progression Factor	0.61		1.00	1.00	1.00	1.00
Incremental Delay, d2	5.9		25.2	0.4	21.3	0.5
Delay (s)	25.7		82.3	9.3	73.8	44.3
Level of Service	C		F	A	E	D
Approach Delay (s)	25.7			27.0	69.1	
Approach LOS	C			C	E	

Intersection Summary			
HCM 2000 Control Delay	37.1	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	89.6%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Queues
1: Kingston Road & Rosebank Road

Future Total 2034 (with BRT) AM Peak Hour

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	75	650	5	1125	5	0	90	5
Future Volume (vph)	75	650	5	1125	5	0	90	5
Lane Group Flow (vph)	91	805	6	1415	6	6	110	165
Turn Type	Prot	NA	Prot	NA	Perm	NA	Perm	NA
Protected Phases	5	2	1	6		8		4
Permitted Phases					8		4	
Detector Phase	5	2	1	6	8	8	4	4
Switch Phase								
Minimum Initial (s)	5.0	20.0	5.0	20.0	8.0	8.0	8.0	8.0
Minimum Split (s)	11.0	28.0	11.0	28.0	28.0	28.0	28.0	28.0
Total Split (s)	19.0	97.0	11.0	89.0	32.0	32.0	32.0	32.0
Total Split (%)	13.6%	69.3%	7.9%	63.6%	22.9%	22.9%	22.9%	22.9%
Yellow Time (s)	3.0	4.3	3.0	4.3	3.5	3.5	3.5	3.5
All-Red Time (s)	3.0	2.3	3.0	2.3	3.1	3.1	3.1	3.1
Lost Time Adjust (s)	-4.0	-1.0	-4.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	2.0	5.6	2.0	5.6	5.6	5.6	5.6	5.6
Lead/Lag	Lead	Lag	Lead	Lag				
Lead-Lag Optimize?	Yes	Yes	Yes	Yes				
Recall Mode	None	C-Max	None	C-Max	None	None	None	None
v/c Ratio	0.46	0.31	0.05	0.63	0.07	0.01	0.64	0.54
Control Delay	64.7	5.9	58.8	10.5	52.2	0.0	74.6	21.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	64.7	5.9	58.8	10.5	52.2	0.0	74.6	21.3
Queue Length 50th (m)	25.1	28.0	1.7	72.6	1.6	0.0	31.0	9.6
Queue Length 95th (m)	38.9	56.8	m2.7	71.5	5.3	0.0	44.8	24.8
Internal Link Dist (m)		186.4		445.7		49.9		463.8
Turn Bay Length (m)	45.0		85.0		20.0		30.0	
Base Capacity (vph)	218	2619	125	2259	136	515	258	398
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.42	0.31	0.05	0.63	0.04	0.01	0.43	0.41

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Kingston Road & Rosebank Road

HCM Signalized Intersection Capacity Analysis
1: Kingston Road & Rosebank Road

Future Total 2034 (with BRT) AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	75	650	10	5	1125	35	5	0	5	90	5	130
Future Volume (vph)	75	650	10	5	1125	35	5	0	5	90	5	130
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)	2.0	5.6		2.0	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	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	0.98		1.00	0.97	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		0.99	1.00		0.99	1.00	
Frt	1.00	1.00		1.00	1.00		1.00	0.85		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1728	3374		1745	3396		1722	1562		1728	1558	
Flt Permitted	0.95	1.00		0.95	1.00		0.40	1.00		0.75	1.00	
Satd. Flow (perm)	1728	3374		1745	3396		726	1562		1371	1558	
Peak-hour factor, PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Adj. Flow (vph)	91	793	12	6	1372	43	6	0	6	110	6	159
RTOR Reduction (vph)	0	1	0	0	1	0	0	5	0	0	113	0
Lane Group Flow (vph)	91	804	0	6	1414	0	6	1	0	110	52	0
Confl. Peds. (#/hr)	10					10	10		5	5		10
Confl. Bikes (#/hr)			150									
Heavy Vehicles (%)	1%	4%	0%	0%	3%	9%	0%	0%	0%	0%	0%	0%
Bus Blockages (#/hr)	0	7	7	0	6	6	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)	12.2	102.9		1.4	92.1		16.5	16.5		16.5	16.5	
Effective Green, g (s)	16.2	103.9		5.4	93.1		17.5	17.5		17.5	17.5	
Actuated g/C Ratio	0.12	0.74		0.04	0.66		0.12	0.12		0.12	0.12	
Clearance Time (s)	6.0	6.6		6.0	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	3.0	
Lane Grp Cap (vph)	199	2503		67	2258		90	195		171	194	
v/s Ratio Prot	c0.05	0.24		0.00	c0.42			0.00			0.03	
v/s Ratio Perm							0.01			c0.08		
v/c Ratio	0.46	0.32		0.09	0.63		0.07	0.00		0.64	0.27	
Uniform Delay, d1	57.8	6.1		64.9	13.5		54.0	53.6		58.3	55.5	
Progression Factor	1.00	1.00		0.97	0.64		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.7	0.3		0.4	1.0		0.3	0.0		8.0	0.7	
Delay (s)	59.5	6.5		63.2	9.6		54.4	53.6		66.3	56.2	
Level of Service	E	A		E	A		D	D		E	E	
Approach Delay (s)		11.8			9.8			54.0			60.2	
Approach LOS		B			A			D			E	

Intersection Summary

HCM 2000 Control Delay	16.1	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.60			
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	13.2	
Intersection Capacity Utilization	62.4%	ICU Level of Service	B	
Analysis Period (min)	15			

c Critical Lane Group

Queues
3: Site Access (East)/Steeple Hill & Kingston Road

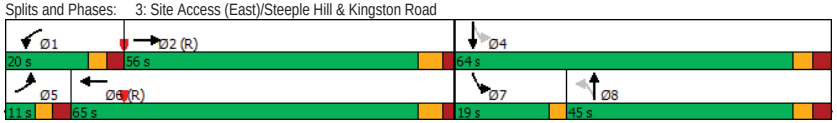
Future Total 2034 (with BRT) AM Peak Hour

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	40	760	175	995	130	0	150	0
Future Volume (vph)	40	760	175	995	130	0	150	0
Lane Group Flow (vph)	48	970	211	1265	157	464	181	60
Turn Type	Prot	NA	Prot	NA	Perm	NA	pm+pt	NA
Protected Phases	5	2	1	6		8	7	4
Permitted Phases					8		4	
Detector Phase	5	2	1	6	8	8	7	4
Switch Phase								
Minimum Initial (s)	5.0	20.0	5.0	20.0	8.0	8.0	5.0	8.0
Minimum Split (s)	11.0	28.0	11.0	28.0	38.0	38.0	8.0	38.0
Total Split (s)	11.0	56.0	20.0	65.0	45.0	45.0	19.0	64.0
Total Split (%)	7.9%	40.0%	14.3%	46.4%	32.1%	32.1%	13.6%	45.7%
Yellow Time (s)	3.0	4.2	3.0	4.2	3.3	3.3	3.0	3.3
All-Red Time (s)	3.0	2.1	3.0	2.1	3.4	3.4	0.0	3.4
Lost Time Adjust (s)	-4.0	-1.0	-4.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	2.0	5.3	2.0	5.3	5.7	5.7	2.0	5.7
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	C-Max	None	C-Max	None	None	None	None
v/c Ratio	0.38	0.74	0.78	0.76	0.53	0.90	0.72	0.09
Control Delay	72.7	38.3	83.9	23.4	52.6	50.7	46.9	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	72.7	38.3	83.9	23.4	52.6	50.7	46.9	0.3
Queue Length 50th (m)	13.3	136.3	63.9	73.6	39.9	80.3	35.2	0.0
Queue Length 95th (m)	26.0	120.3	m#86.2	m99.3	54.7	102.7	49.4	0.0
Internal Link Dist (m)		129.3		289.8		62.3		200.4
Turn Bay Length (m)	25.0		30.0				15.0	
Base Capacity (vph)	126	1308	272	1660	370	590	259	734
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.38	0.74	0.78	0.76	0.42	0.79	0.70	0.08

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Site Access (East)/Steeple Hill & Kingston Road



HCM Signalized Intersection Capacity Analysis
3: Site Access (East)/Steeple Hill & Kingston Road

Future Total 2034 (with BRT) AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	760	45	175	995	55	130	0	385	150	0	50
Future Volume (vph)	40	760	45	175	995	55	130	0	385	150	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)	2.0	5.3		2.0	5.3		5.7	5.7		2.0	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	0.99		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		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)	1662	3326		1745	3386		1745	1597		1678	1597	
Flt Permitted	0.95	1.00		0.95	1.00		0.72	1.00		0.12	1.00	
Satd. Flow (perm)	1662	3326		1745	3386		1319	1597		210	1597	
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)	48	916	54	211	1199	66	157	0	464	181	0	60
RTOR Reduction (vph)	0	3	0	0	3	0	0	153	0	0	38	0
Lane Group Flow (vph)	48	967	0	211	1262	0	157	311	0	181	22	0
Confl. Peds. (#/hr)	10					10						
Confl. Bikes (#/hr)			160									
Heavy Vehicles (%)	5%	3%	20%	0%	3%	4%	0%	0%	0%	4%	0%	0%
Bus Blockages (#/hr)	0	7	7	0	6	6	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)	5.5	54.0		17.8	66.3		30.7	30.7		49.2	49.2	
Effective Green, g (s)	9.5	55.0		21.8	67.3		31.7	31.7		50.2	50.2	
Actuated g/C Ratio	0.07	0.39		0.16	0.48		0.23	0.23		0.36	0.36	
Clearance Time (s)	6.0	6.3		6.0	6.3		6.7	6.7		3.0	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)	112	1306		271	1627		298	361		248	572	
v/s Ratio Prot	0.03	0.29		c0.12	c0.37			c0.19		c0.09	0.01	
v/s Ratio Perm							0.12			0.18		
v/c Ratio	0.43	0.74		0.78	0.78		0.53	0.86		0.73	0.04	
Uniform Delay, d1	62.6	36.4		56.8	30.1		47.6	52.0		35.8	29.2	
Progression Factor	1.03	0.91		1.27	0.66		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.6	3.7		8.8	2.4		1.7	18.5		10.3	0.0	
Delay (s)	66.8	37.0		80.9	22.3		49.2	70.5		46.1	29.2	
Level of Service	E	D		F	C		D	E		D	C	
Approach Delay (s)		38.4			30.7			65.2			41.9	
Approach LOS		D			C			E			D	

Intersection Summary

HCM 2000 Control Delay	40.2	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)	15.0	
Intersection Capacity Utilization	81.5%	ICU Level of Service	D	
Analysis Period (min)	15			

c Critical Lane Group

Queues
4: Whites Road & Kingston Road

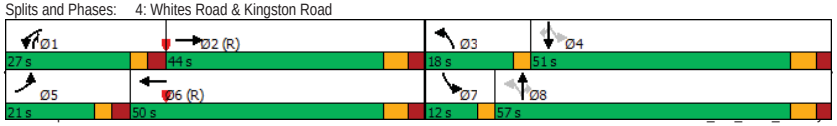
Future Total 2034 (with BRT) AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	105	385	805	285	890	335	295	530	415	120	1130	135
Future Volume (vph)	105	385	805	285	890	335	295	530	415	120	1130	135
Lane Group Flow (vph)	109	401	839	297	927	349	307	552	432	125	1177	141
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
Detector Phase	5	2		1	6		3	8	1	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	20.0		5.0	20.0		5.0	8.0	5.0	5.0	8.0	8.0
Minimum Split (s)	11.0	44.0		11.0	44.0		8.0	44.1	11.0	8.0	44.1	44.1
Total Split (s)	21.0	44.0		27.0	50.0		18.0	57.0	27.0	12.0	51.0	51.0
Total Split (%)	15.0%	31.4%		19.3%	35.7%		12.9%	40.7%	19.3%	8.6%	36.4%	36.4%
Yellow Time (s)	3.0	4.2		3.0	4.2		3.0	4.3	3.0	3.0	4.3	4.3
All-Red Time (s)	3.0	2.8		3.0	2.8		0.0	2.8	3.0	0.0	2.8	2.8
Lost Time Adjust (s)	-4.0	-1.0		-4.0	-1.0		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	2.0	6.0		2.0	6.0		2.0	6.1	5.0	2.0	6.1	6.1
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max		None	C-Max		None	Max	None	None	Max	Max
v/c Ratio	0.53	0.43	0.58	0.99	0.81	0.23	1.05	0.44	0.50	0.35	1.07	0.27
Control Delay	63.3	49.9	3.9	87.0	46.7	0.3	98.9	35.1	11.3	23.8	92.6	8.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	63.3	49.9	3.9	87.0	46.7	0.3	98.9	35.1	11.3	23.8	92.6	8.9
Queue Length 50th (m)	31.0	49.2	34.6	81.1	141.1	0.0	~71.0	64.0	36.4	20.1	~199.3	3.2
Queue Length 95th (m)	m40.9	66.7	72.2	m#130.0	m163.3	m0.0	#133.0	81.5	62.2	33.0	#243.9	19.5
Internal Link Dist (m)		289.8			476.9			454.6			338.0	
Turn Bay Length (m)	100.0		80.0	35.0		35.0	50.0		45.0	85.0		15.0
Base Capacity (vph)	229	922	1447	299	1149	1511	291	1242	869	362	1101	522
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.48	0.43	0.58	0.99	0.81	0.23	1.05	0.44	0.50	0.35	1.07	0.27

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Whites Road & Kingston Road



HCM Signalized Intersection Capacity Analysis
4: Whites Road & Kingston Road

Future Total 2034 (with BRT) AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	105	385	805	285	890	335	295	530	415	120	1130	135
Future Volume (vph)	105	385	805	285	890	335	295	530	415	120	1130	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	3.0	2.0	6.0	3.0	2.0	6.1	5.0	2.0	6.1	6.1
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.95	1.00	1.00	0.98	1.00	1.00	0.97	1.00	1.00	0.97
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	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)	1694	3400	1447	1678	3500	1511	1800	3400	1464	1669	3433	1363
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.13	1.00	1.00	0.40	1.00	1.00
Satd. Flow (perm)	1694	3400	1447	1678	3500	1511	236	3400	1464	699	3433	1363
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	109	401	839	297	927	349	307	552	432	125	1177	141
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	95	0	0	85
Lane Group Flow (vph)	109	401	839	297	927	349	307	552	337	125	1177	56
Confl. Peds. (#/hr)	35		25	25		35	20		30	30		20
Confl. Bikes (#/hr)			160									
Heavy Vehicles (%)	3%	5%	2%	4%	2%	1%	2%	5%	2%	4%	4%	8%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	3	0	0	6
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)	13.0	37.0	140.0	21.0	45.0	140.0	61.9	50.1	71.1	52.7	43.9	43.9
Effective Green, g (s)	17.0	38.0	140.0	25.0	46.0	140.0	62.9	51.1	73.1	54.7	44.9	44.9
Actuated g/C Ratio	0.12	0.27	1.00	0.18	0.33	1.00	0.45	0.37	0.52	0.39	0.32	0.32
Clearance Time (s)	6.0	7.0		6.0	7.0		3.0	7.1	6.0	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)	205	922	1447	299	1150	1511	284	1241	764	341	1101	437
v/s Ratio Prot	0.06	0.12		c0.18	c0.26		c0.12	0.16	0.07	0.03	c0.34	
v/s Ratio Perm			0.58			0.23	0.36		0.16	0.12		0.04
v/c Ratio	0.53	0.43	0.58	0.99	0.81	0.23	1.08	0.44	0.44	0.37	1.07	0.13
Uniform Delay, d1	57.8	42.1	0.0	57.4	42.9	0.0	31.8	33.7	20.8	28.2	47.6	33.7
Progression Factor	0.99	1.15	1.00	0.70	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.7	1.0	1.1	44.8	5.0	0.3	76.7	1.2	0.4	0.7	47.6	0.6
Delay (s)	59.0	49.6	1.1	85.2	45.9	0.3	108.4	34.9	21.2	28.9	95.1	34.3
Level of Service	E	D	A	F	D	A	F	C	C	C	F	C
Approach Delay (s)		20.2			43.2			47.8			83.5	
Approach LOS		C			D			D			F	

Intersection Summary

HCM 2000 Control Delay	49.0	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)	19.1
Intersection Capacity Utilization	110.1%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

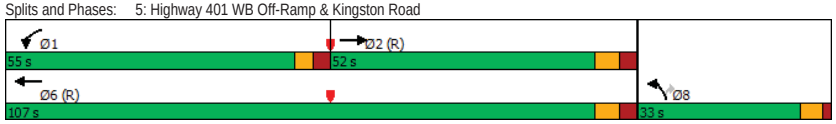
Queues
5: Highway 401 WB Off-Ramp & Kingston Road

Future Total 2034 (with BRT) AM Peak Hour

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Configurations					
Traffic Volume (vph)	815	535	905	585	70
Future Volume (vph)	815	535	905	585	70
Lane Group Flow (vph)	883	569	963	622	74
Turn Type	NA	Prot	NA	Prot	Perm
Protected Phases	2	1	6	8	
Permitted Phases					8
Detector Phase	2	1	6	8	8
Switch Phase					
Minimum Initial (s)	20.0	3.5	20.0	8.0	8.0
Minimum Split (s)	51.0	9.5	51.0	32.0	32.0
Total Split (s)	52.0	55.0	107.0	33.0	33.0
Total Split (%)	37.1%	39.3%	76.4%	23.6%	23.6%
Yellow Time (s)	4.2	3.0	4.2	3.7	3.7
All-Red Time (s)	3.0	3.0	3.0	1.7	1.7
Lost Time Adjust (s)	-1.0	-4.0	-1.0	-1.0	-1.0
Total Lost Time (s)	6.2	2.0	6.2	4.4	4.4
Lead/Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes			
Recall Mode	C-Max	None	C-Max	None	None
v/c Ratio	0.75	0.90	0.38	0.93	0.23
Control Delay	45.4	61.1	8.0	75.6	35.6
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	45.4	61.1	8.0	75.6	35.6
Queue Length 50th (m)	100.2	152.8	51.7	92.3	12.9
Queue Length 95th (m)	130.5	#220.1	62.5	#127.1	27.9
Internal Link Dist (m)	476.9		318.1	85.1	
Turn Bay Length (m)		15.0			15.0
Base Capacity (vph)	1173	654	2502	678	326
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.75	0.87	0.38	0.92	0.23

Intersection Summary
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 125
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Highway 401 WB Off-Ramp & Kingston Road



HCM Signalized Intersection Capacity Analysis
5: Highway 401 WB Off-Ramp & Kingston Road

Future Total 2034 (with BRT) AM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	815	15	535	905	585	70
Future Volume (vph)	815	15	535	905	585	70
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
Frpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00	1.00	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)	3414		1728	3466	3319	1516
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3414		1728	3466	3319	1516
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	867	16	569	963	622	74
RTOR Reduction (vph)	1	0	0	0	0	17
Lane Group Flow (vph)	882	0	569	963	622	57
Confl. Bikes (#/hr)		150				
Heavy Vehicles (%)	4%	0%	1%	3%	2%	3%
Turn Type	NA		Prot	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases						8
Actuated Green, G (s)	47.1		47.0	100.1	27.3	27.3
Effective Green, g (s)	48.1		51.0	101.1	28.3	28.3
Actuated g/C Ratio	0.34		0.36	0.72	0.20	0.20
Clearance Time (s)	7.2		6.0	7.2	5.4	5.4
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1172		629	2502	670	306
v/s Ratio Prot	c0.26		c0.33	0.28	c0.19	
v/s Ratio Perm						0.04
v/c Ratio	0.75		0.90	0.38	0.93	0.19
Uniform Delay, d1	40.7		42.2	7.5	54.9	46.3
Progression Factor	0.99		1.00	1.00	1.00	1.00
Incremental Delay, d2	4.1		16.5	0.4	19.1	0.3
Delay (s)	44.5		58.7	7.9	73.9	46.6
Level of Service	D		E	A	E	D
Approach Delay (s)	44.5			26.8	71.0	
Approach LOS	D			C	E	

Intersection Summary			
HCM 2000 Control Delay	41.7	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)	12.6
Intersection Capacity Utilization	81.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Queues
1: Kingston Road & Rosebank Road

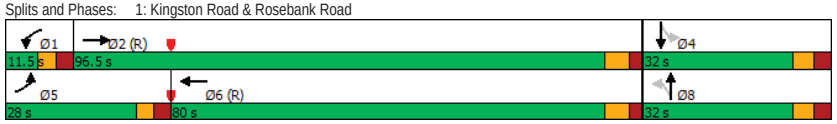
Future Total 2034 (with BRT) PM Peak Hour

Lane Group	EBL	EBT	WBT	NBL	NBT	SBL	SBT	Ø1
Lane Configurations								
Traffic Volume (vph)	120	1285	875	5	0	50	5	
Future Volume (vph)	120	1285	875	5	0	50	5	
Lane Group Flow (vph)	124	1325	964	5	10	52	72	
Turn Type	Prot	NA	NA	Perm	NA	Perm	NA	
Protected Phases	5	2	6		8		4	1
Permitted Phases				8		4		
Detector Phase	5	2	6	8	8	4	4	
Switch Phase								
Minimum Initial (s)	5.0	20.0	20.0	8.0	8.0	8.0	8.0	5.0
Minimum Split (s)	11.0	28.0	28.0	28.0	28.0	28.0	28.0	11.5
Total Split (s)	28.0	96.5	80.0	32.0	32.0	32.0	32.0	11.5
Total Split (%)	20.0%	68.9%	57.1%	22.9%	22.9%	22.9%	22.9%	8%
Yellow Time (s)	3.0	4.3	4.3	3.5	3.5	3.5	3.5	3.0
All-Red Time (s)	3.0	2.3	2.3	3.1	3.1	3.1	3.1	3.0
Lost Time Adjust (s)	-4.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	2.0	5.6	5.6	5.6	5.6	5.6	5.6	
Lead/Lag	Lead	Lag	Lag					Lead
Lead-Lag Optimize?	Yes	Yes	Yes					Yes
Recall Mode	None	C-Max	C-Max	None	None	None	None	None
v/c Ratio	0.52	0.46	0.42	0.04	0.04	0.41	0.35	
Control Delay	63.1	4.4	17.4	54.4	0.3	67.3	18.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	63.1	4.4	17.4	54.4	0.3	67.3	18.6	
Queue Length 50th (m)	34.1	42.3	65.8	1.4	0.0	14.7	1.4	
Queue Length 95th (m)	53.2	80.5	90.6	5.6	0.0	27.1	16.1	
Internal Link Dist (m)		186.4	445.7		49.9		463.8	
Turn Bay Length (m)	45.0			20.0		30.0		
Base Capacity (vph)	324	2882	2303	243	402	257	344	
Starvation Cap Reductn	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.38	0.46	0.42	0.02	0.02	0.20	0.21	

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated

Splits and Phases: 1: Kingston Road & Rosebank Road



HCM Signalized Intersection Capacity Analysis
1: Kingston Road & Rosebank Road

Future Total 2034 (with BRT) PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	120	1285	0	0	875	60	5	0	10	50	5	65
Future Volume (vph)	120	1285	0	0	875	60	5	0	10	50	5	65
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)	2.0	5.6			5.6		5.6	5.6		5.6	5.6	
Lane Util. Factor	1.00	0.95			0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00			1.00		1.00	0.98		1.00	0.98	
Flpb, ped/bikes	1.00	1.00			1.00		0.99	1.00		0.99	1.00	
Frt	1.00	1.00			0.99		1.00	0.85		1.00	0.86	
Flt Protected	0.95	1.00			1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1745	3492			3416		1729	1562		1728	1541	
Flt Permitted	0.95	1.00			1.00		0.71	1.00		0.75	1.00	
Satd. Flow (perm)	1745	3492			3416		1292	1562		1366	1541	
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)	124	1325	0	0	902	62	5	0	10	52	5	67
RTOR Reduction (vph)	0	0	0	0	3	0	0	9	0	0	61	0
Lane Group Flow (vph)	124	1325	0	0	961	0	5	1	0	52	11	0
Confl. Peds. (#/hr)	10		5	5		10	5		5	5		5
Heavy Vehicles (%)	0%	1%	0%	0%	2%	0%	0%	0%	0%	0%	0%	3%
Bus Blockages (#/hr)	0	6	6	0	6	6	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)	15.2	114.6			93.4		12.2	12.2		12.2	12.2	
Effective Green, g (s)	19.2	115.6			94.4		13.2	13.2		13.2	13.2	
Actuated g/C Ratio	0.14	0.83			0.67		0.09	0.09		0.09	0.09	
Clearance Time (s)	6.0	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)	239	2883			2303		121	147		128	145	
v/s Ratio Prot	c0.07	c0.38			0.28			0.00			0.01	
v/s Ratio Perm							0.00			c0.04		
v/c Ratio	0.52	0.46			0.42		0.04	0.01		0.41	0.08	
Uniform Delay, d1	56.1	3.4			10.3		57.6	57.5		59.7	57.8	
Progression Factor	1.00	1.00			1.47		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.9	0.5			0.5		0.1	0.0		2.1	0.2	
Delay (s)	58.0	4.0			15.7		57.8	57.5		61.8	58.1	
Level of Service	E	A			B		E	E		E	E	
Approach Delay (s)		8.6			15.7			57.6			59.6	
Approach LOS		A			B			E			E	

Intersection Summary

HCM 2000 Control Delay	14.0	HCM 2000 Level of Service	B		
HCM 2000 Volume to Capacity ratio	0.47				
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	13.2		
Intersection Capacity Utilization	63.0%	ICU Level of Service	B		
Analysis Period (min)	15				

c Critical Lane Group

Queues
3: Site Access (East)/Steeple Hill & Kingston Road

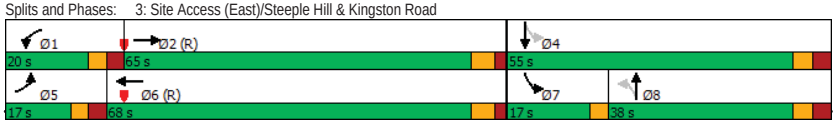
Future Total 2034 (with BRT) PM Peak Hour

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	100	1165	385	790	85	10	220	0
Future Volume (vph)	100	1165	385	790	85	10	220	0
Lane Group Flow (vph)	103	1299	397	943	88	294	227	72
Turn Type	Prot	NA	Prot	NA	Perm	NA	pm+pt	NA
Protected Phases	5	2	1	6		8	7	4
Permitted Phases					8		4	
Detector Phase	5	2	1	6	8	8	7	4
Switch Phase								
Minimum Initial (s)	5.0	20.0	5.0	20.0	8.0	8.0	5.0	8.0
Minimum Split (s)	11.0	28.0	11.0	28.0	38.0	38.0	8.0	38.0
Total Split (s)	17.0	65.0	20.0	68.0	38.0	38.0	17.0	55.0
Total Split (%)	12.1%	46.4%	14.3%	48.6%	27.1%	27.1%	12.1%	39.3%
Yellow Time (s)	3.0	4.2	3.0	4.2	3.3	3.3	3.0	3.3
All-Red Time (s)	3.0	2.1	3.0	2.1	3.4	3.4	0.0	3.4
Lost Time Adjust (s)	-4.0	-1.0	-4.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	2.0	5.3	2.0	5.3	5.7	5.7	2.0	5.7
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	C-Max	None	C-Max	None	None	None	None
v/c Ratio	0.52	0.88	0.99	0.52	0.52	0.80	0.92	0.12
Control Delay	70.8	41.0	92.6	17.0	65.4	36.1	82.8	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	70.8	41.0	92.6	17.0	65.4	36.1	82.8	0.4
Queue Length 50th (m)	29.1	181.9	121.2	55.3	24.7	30.7	56.4	0.0
Queue Length 95th (m)	51.0	215.0 m	#208.8	m67.5	38.2	58.4	#77.5	0.0
Internal Link Dist (m)		129.3		289.8		62.3		200.4
Turn Bay Length (m)	25.0		30.0				15.0	
Base Capacity (vph)	206	1477	399	1827	299	506	246	713
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.50	0.88	0.99	0.52	0.29	0.58	0.92	0.10

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 125
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Site Access (East)/Steeple Hill & Kingston Road



HCM Signalized Intersection Capacity Analysis
3: Site Access (East)/Steeple Hill & Kingston Road

Future Total 2034 (with BRT) PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	1165	95	385	790	125	85	10	275	220	0	70
Future Volume (vph)	100	1165	95	385	790	125	85	10	275	220	0	70
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)	2.0	5.3		2.0	5.3		5.7	5.7		2.0	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	0.99		1.00	0.98		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	0.99		1.00	0.98		1.00	0.86		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	3455		1745	3371		1734	1567		1726	1567	
Flt Permitted	0.95	1.00		0.95	1.00		0.71	1.00		0.20	1.00	
Satd. Flow (perm)	1745	3455		1745	3371		1296	1567		358	1567	
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)	103	1201	98	397	814	129	88	10	284	227	0	72
RTOR Reduction (vph)	0	4	0	0	7	0	0	164	0	0	54	0
Lane Group Flow (vph)	103	1295	0	397	936	0	88	130	0	227	18	0
Confl. Peds. (#/hr)	10					10	5		10	10		5
Heavy Vehicles (%)	0%	1%	0%	0%	2%	0%	0%	0%	0%	1%	0%	0%
Bus Blockages (#/hr)	0	6	6	0	6	6	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)	12.0	58.7		28.0	74.7		17.3	17.3		34.3	34.3	
Effective Green, g (s)	16.0	59.7		32.0	75.7		18.3	18.3		35.3	35.3	
Actuated g/C Ratio	0.11	0.43		0.23	0.54		0.13	0.13		0.25	0.25	
Clearance Time (s)	6.0	6.3		6.0	6.3		6.7	6.7		3.0	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)	199	1473		398	1822		169	204		236	395	
v/s Ratio Prot	0.06	c0.37		c0.23	0.28			c0.08		c0.10	0.01	
v/s Ratio Perm							0.07			0.14		
v/c Ratio	0.52	0.88		1.00	0.51		0.52	0.64		0.96	0.05	
Uniform Delay, d1	58.4	36.8		54.0	20.4		56.8	57.7		46.9	39.6	
Progression Factor	1.06	0.91		1.21	0.75		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.1	7.3		31.2	0.5		2.9	6.3		47.7	0.0	
Delay (s)	64.2	40.8		96.6	16.0		59.6	64.0		94.6	39.7	
Level of Service	E	D		F	B		E	E		F	D	
Approach Delay (s)		42.5			39.8			63.0			81.4	
Approach LOS		D			D			E			F	

Intersection Summary

HCM 2000 Control Delay	47.1	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)	15.0
Intersection Capacity Utilization	105.2%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Queues
4: Whites Road & Kingston Road

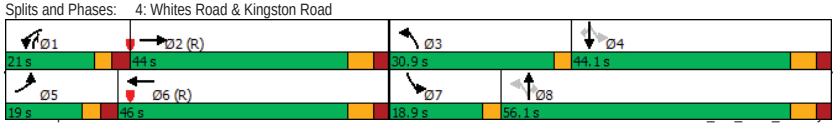
Future Total 2034 (with BRT) PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	160	870	630	225	825	515	475	1085	805	160	670	120
Future Volume (vph)	160	870	630	225	825	515	475	1085	805	160	670	120
Lane Group Flow (vph)	162	879	636	227	833	520	480	1096	813	162	677	121
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
Detector Phase	5	2		1	6		3	8	1	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	20.0		5.0	20.0		5.0	8.0	5.0	5.0	8.0	8.0
Minimum Split (s)	11.0	44.0		11.0	44.0		8.0	44.1	11.0	8.0	44.1	44.1
Total Split (s)	19.0	44.0		21.0	46.0		30.9	56.1	21.0	18.9	44.1	44.1
Total Split (%)	13.6%	31.4%		15.0%	32.9%		22.1%	40.1%	15.0%	13.5%	31.5%	31.5%
Yellow Time (s)	3.0	4.2		3.0	4.2		3.0	4.3	3.0	3.0	4.3	4.3
All-Red Time (s)	3.0	2.8		3.0	2.8		0.0	2.8	3.0	0.0	2.8	2.8
Lost Time Adjust (s)	-4.0	-1.0		-4.0	-1.0		-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	2.0	6.0		2.0	6.0		2.0	6.1	5.0	2.0	6.1	6.1
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max		None	C-Max		None	Max	None	None	Max	Max
v/c Ratio	0.78	0.93	0.41	0.97	0.83	0.34	1.03	0.82	0.95	0.68	0.71	0.24
Control Delay	77.4	72.1	0.4	99.0	38.0	0.5	79.6	45.9	43.1	40.4	51.0	7.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	77.4	72.1	0.4	99.0	38.0	0.5	79.6	45.9	43.1	40.4	51.0	7.1
Queue Length 50th (m)	50.0	112.6	0.0	60.7	129.5	0.0	~115.2	151.9	161.3	24.4	94.2	0.0
Queue Length 95th (m)	m58.7	m#162.9	m0.0	m#90.6	m138.8	m0.0	#186.9	186.5	#231.1	48.6	117.3	15.0
Internal Link Dist (m)		289.8			476.9			454.6			338.0	
Turn Bay Length (m)	100.0		80.0	35.0		35.0	50.0		45.0	85.0		15.0
Base Capacity (vph)	211	950	1538	234	1003	1514	468	1334	855	275	950	499
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.77	0.93	0.41	0.97	0.83	0.34	1.03	0.82	0.95	0.59	0.71	0.24

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 140
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Whites Road & Kingston Road



HCM Signalized Intersection Capacity Analysis
4: Whites Road & Kingston Road

Future Total 2034 (with BRT) PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	160	870	630	225	825	515	475	1085	805	160	670	120
Future Volume (vph)	160	870	630	225	825	515	475	1085	805	160	670	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	3.0	2.0	6.0	3.0	2.0	6.1	5.0	2.0	6.1	6.1
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	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	3500	1538	1728	3500	1514	1744	3535	1482	1727	3500	1503
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.19	1.00	1.00	0.12	1.00	1.00
Satd. Flow (perm)	1745	3500	1538	1728	3500	1514	343	3535	1482	223	3500	1503
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	162	879	636	227	833	520	480	1096	813	162	677	121
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	117	0	0	88
Lane Group Flow (vph)	162	879	636	227	833	520	480	1096	696	162	677	33
Confl. Peds. (#/hr)	30		10	10		30	5		10	10		5
Heavy Vehicles (%)	0%	2%	0%	1%	2%	1%	0%	1%	1%	1%	2%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	6	0	0	5
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)	12.9	37.0	140.0	15.0	39.1	140.0	67.9	51.9	66.9	50.0	37.0	37.0
Effective Green, g (s)	16.9	38.0	140.0	19.0	40.1	140.0	68.9	52.9	68.9	52.0	38.0	38.0
Actuated g/C Ratio	0.12	0.27	1.00	0.14	0.29	1.00	0.49	0.38	0.49	0.37	0.27	0.27
Clearance Time (s)	6.0	7.0		6.0	7.0		3.0	7.1	6.0	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)	210	950	1538	234	1002	1514	458	1335	729	233	950	407
v/s Ratio Prot	0.09	c0.25		c0.13	0.24		c0.22	0.31	c0.11	0.07	0.19	
v/s Ratio Perm			0.41			0.34	0.30		0.36	0.19		0.02
v/c Ratio	0.77	0.93	0.41	0.97	0.83	0.34	1.05	0.82	0.95	0.70	0.71	0.08
Uniform Delay, d1	59.7	49.6	0.0	60.2	46.8	0.0	35.2	39.3	34.1	32.7	46.1	38.0
Progression Factor	1.07	1.27	1.00	0.92	0.68	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	8.9	9.5	0.4	42.2	6.0	0.5	55.2	5.8	22.7	8.7	4.5	0.4
Delay (s)	72.7	72.5	0.4	97.9	37.7	0.5	90.4	45.0	56.8	41.4	50.6	38.4
Level of Service	E	E	A	F	D	A	F	D	E	D	D	D
Approach Delay (s)		45.2			34.1			58.2			47.5	
Approach LOS		D			C			E			D	

Intersection Summary

HCM 2000 Control Delay	47.6	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)	19.1
Intersection Capacity Utilization	116.4%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Queues
5: Highway 401 WB Off-Ramp & Kingston Road

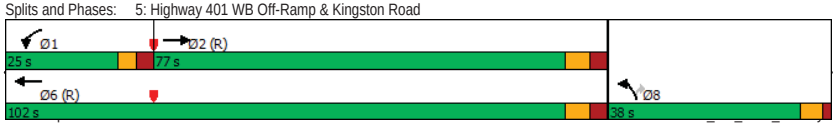
Future Total 2034 (with BRT) PM Peak Hour

Lane Group	EBT	WBL	WBT	NBL	NBR
Lane Configurations					
Traffic Volume (vph)	1625	245	735	765	145
Future Volume (vph)	1625	245	735	765	145
Lane Group Flow (vph)	1722	258	774	805	153
Turn Type	NA	Prot	NA	Prot	Perm
Protected Phases	2	1	6	8	
Permitted Phases					8
Detector Phase	2	1	6	8	8
Switch Phase					
Minimum Initial (s)	20.0	3.5	20.0	8.0	8.0
Minimum Split (s)	51.0	9.5	51.0	32.0	32.0
Total Split (s)	77.0	25.0	102.0	38.0	38.0
Total Split (%)	55.0%	17.9%	72.9%	27.1%	27.1%
Yellow Time (s)	4.2	3.0	4.2	3.7	3.7
All-Red Time (s)	3.0	3.0	3.0	1.7	1.7
Lost Time Adjust (s)	-1.0	-4.0	-1.0	-1.0	-1.0
Total Lost Time (s)	6.2	2.0	6.2	4.4	4.4
Lead/Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes			
Recall Mode	C-Max	None	C-Max	None	None
v/c Ratio	0.97	0.92	0.32	1.00	0.38
Control Delay	30.0	93.6	9.4	84.8	37.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	30.0	93.6	9.4	84.8	37.0
Queue Length 50th (m)	142.7	75.0	44.4	~122.0	28.4
Queue Length 95th (m)	m#297.8	#128.5	54.5	#167.0	50.3
Internal Link Dist (m)	476.9		318.1	85.1	
Turn Bay Length (m)		15.0			15.0
Base Capacity (vph)	1767	281	2395	804	398
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.97	0.92	0.32	1.00	0.38

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 115
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: Highway 401 WB Off-Ramp & Kingston Road



HCM Signalized Intersection Capacity Analysis
5: Highway 401 WB Off-Ramp & Kingston Road

Future Total 2034 (with BRT) PM Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1625	10	245	735	765	145
Future Volume (vph)	1625	10	245	735	765	145
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)	3495		1711	3500	3351	1546
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3495		1711	3500	3351	1546
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1711	11	258	774	805	153
RTOR Reduction (vph)	0	0	0	0	0	27
Lane Group Flow (vph)	1722	0	258	774	805	126
Heavy Vehicles (%)	2%	8%	2%	2%	1%	1%
Turn Type	NA		Prot	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases						8
Actuated Green, G (s)	69.8		19.0	94.8	32.6	32.6
Effective Green, g (s)	70.8		23.0	95.8	33.6	33.6
Actuated g/C Ratio	0.51		0.16	0.68	0.24	0.24
Clearance Time (s)	7.2		6.0	7.2	5.4	5.4
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1767		281	2395	804	371
v/s Ratio Prot	c0.49		c0.15	0.22	c0.24	
v/s Ratio Perm						0.08
v/c Ratio	0.97		0.92	0.32	1.00	0.34
Uniform Delay, d1	33.7		57.6	9.0	53.2	44.0
Progression Factor	0.60		1.00	1.00	1.00	1.00
Incremental Delay, d2	8.8		32.6	0.4	32.0	0.5
Delay (s)	29.1		90.2	9.3	85.2	44.6
Level of Service	C		F	A	F	D
Approach Delay (s)	29.1			29.5	78.7	
Approach LOS	C			C	E	

Intersection Summary

HCM 2000 Control Delay	42.0	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)	12.6
Intersection Capacity Utilization	92.8%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

APPENDIX F:
Vissim Model

MOVEMENT
IN URBAN
ENVIRONMENTS

BAGROUP.COM

BA Group

603-643 & 645-699 Kingston Road

Mixed-Use Development

City of Pickering

Microsimulation Model Calibration and Analysis

Prepared For: Director Industrial Holdings Limited

April 2020

45 St. Clair Avenue West, Suite 300
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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, a *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.

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:

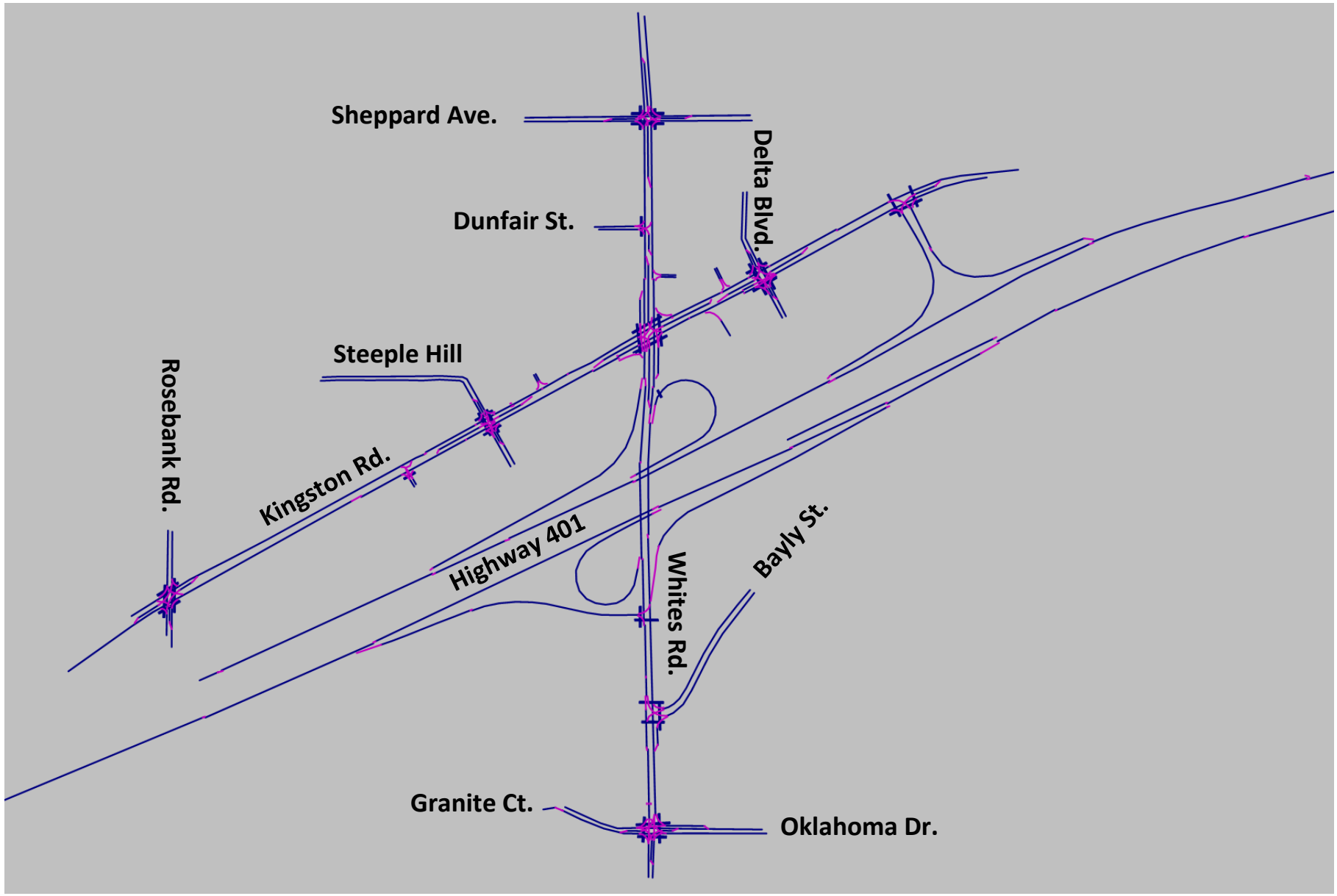
- All signalized intersections on the Kingston Road and Whites Road corridors located within the study area;
- Significant unsignalized access driveways on Kingston Road and Whites Road within the study area, notably including the west site access; and
- Existing transit facilities (bus stops) and transit 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 where 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. Lane configurations were informed by a combination of these Bing Maps aerial photographs, as well as Google Street View imagery of the study area.

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 through 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**, while signal timing plans are included in **Appendix D**.

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. The Google Maps Distance Matrix API provides a range of measured travel times, as well as an average or most likely travel time along road segments for specific times and days of the week.

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:

- *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 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 calibration *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 two network metrics which were used as targets during the calibration exercise were:

1) **Traffic volumes**, which were collected via turning movement counts conducted by Spectrum on behalf of BA Group at all signalized intersections and some unsignalized intersections located throughout the study area.

2) **Vehicle travel times**, which were 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.

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	7 (3)	0 (2)	4 (10)	88 (49)	4 (4)	132 (64)	73 (121)	550 (988)	10 (2)	4 (1)	891 (710)	34 (62)
Vissim Output	6 (3)	0 (1)	3 (10)	87 (54)	4 (4)	135 (63)	72 (115)	549 (1015)	10 (2)	3 (1)	898 (717)	38 (59)
GEH	0.4 (0)	0 (0.8)	0.5 (0)	0.1 (0.7)	0 (0)	0.3 (0.1)	0.1 (0.6)	0 (0.9)	0 (0)	0.5 (0)	0.2 (0.3)	0.7 (0.4)
Kingston Road & West Site Access												
Field Data	3 (4)	--	2 (3)	--	--	--	--	641 (1073)	10 (16)	1 (8)	962 (783)	--
Vissim Output	3 (5)	--	2 (2)	--	--	--	--	629 (1065)	11 (15)	1 (7)	940 (756)	--
GEH	0 (0.5)	--	0 (0.6)	--	--	--	--	0.5 (0.2)	0.3 (0.3)	0 (0.4)	0.7 (1)	--
Kingston Road & Steeple Hill/East Site Access												
Field Data	7 (26)	1 (14)	17 (99)	150 (220)	1 (12)	52 (71)	39 (106)	593 (945)	5 (17)	40 (94)	879 (692)	57 (129)
Vissim Output	9 (29)	1 (13)	16 (90)	151 (221)	1 (12)	52 (72)	39 (108)	590 (931)	6 (18)	41 (88)	877 (667)	59 (126)
GEH	0.7 (0.6)	0 (0.3)	0.2 (0.9)	0.1 (0.1)	0 (0)	0 (0.1)	0 (0.2)	0.1 (0.5)	0.4 (0.2)	0.2 (0.6)	0.1 (1)	0.3 (0.3)
Kingston Road & Whites Road												
Field Data	197 (257)	468 (959)	407 (750)	118 (161)	1006 (583)	128 (106)	76 (148)	331 (808)	365 (297)	275 (218)	747 (676)	334 (517)
Vissim Output	172 (260)	457 (939)	404 (748)	130 (152)	1077 (615)	138 (118)	76 (146)	324 (820)	351 (296)	282 (229)	758 (653)	342 (501)
GEH	1.8 (0.2)	0.5 (0.6)	0.1 (0.1)	1.1 (0.7)	2.2 (1.3)	0.9 (1.1)	0 (0.2)	0.4 (0.4)	0.7 (0.1)	0.4 (0.7)	0.4 (0.9)	0.4 (0.7)
Kingston Road & Delta Boulevard												
Field Data	33 (169)	4 (7)	24 (116)	51 (88)	7 (10)	164 (122)	96 (93)	663 (1316)	29 (28)	56 (79)	1090 (1167)	140 (97)
Vissim Output	33 (167)	5 (7)	29 (114)	47 (86)	7 (9)	162 (125)	93 (96)	668 (1315)	31 (28)	61 (76)	1186 (1173)	158 (91)
GEH	0 (0.2)	0.5 (0)	1 (0.2)	0.6 (0.2)	0 (0.3)	0.2 (0.3)	0.3 (0.3)	0.2 (0)	0.4 (0)	0.7 (0.3)	2.8 (0.2)	1.5 (0.6)
Kingston Road & Highway 401 Ramps												
Field Data	490 (671)	--	61 (132)	--	--	--	--	735 (1508)	12 (12)	476 (220)	852 (672)	--
Vissim Output	498 (655)	--	64 (133)	--	--	--	--	738 (1504)	12 (12)	436 (224)	905 (670)	--
GEH	0.4 (0.6)	--	0.4 (0.1)	--	--	--	--	0.1 (0.1)	0 (0)	1.9 (0.3)	1.8 (0.1)	--

	Turning Movement											
	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Whites Road & Sheppard Avenue												
Field Data	137 (170)	657 (1576)	21 (138)	45 (45)	1168 (699)	92 (32)	59 (125)	51 (171)	250 (162)	32 (24)	70 (97)	49 (44)
Vissim Output	130 (156)	643 (1514)	21 (128)	45 (41)	1185 (711)	90 (34)	53 (126)	51 (179)	254 (165)	29 (26)	67 (100)	47 (46)
GEH	0.6 (1.1)	0.5 (1.6)	0 (0.9)	0 (0.6)	0.5 (0.5)	0.2 (0.3)	0.8 (0.1)	0 (0.6)	0.3 (0.2)	0.5 (0.4)	0.4 (0.3)	0.3 (0.3)
Whites Road & Dunfair Street												
Field Data	78 (5)	796 (1819)	--	--	1387 (881)	--	5 (9)	--	65 (12)	--	--	--
Vissim Output	76 (5)	793 (1781)	--	--	1472 (895)	--	4 (8)	--	66 (11)	--	--	--
GEH	0.2 (0)	0.1 (0.9)	--	--	2.2 (0.5)	--	0.5 (0.3)	--	0.1 (0.3)	--	--	--
Highway 401 Ramps North of Highway 401 & Whites Road Overpass												
Field Data	--	832 (811)	147 (106)	--	606 (582)	580 (177)	566 (1439)	--	425 (945)	--	--	--
Vissim Output	--	801 (769)	142 (96)	--	601 (616)	575 (192)	575 (1407)	--	424 (936)	--	--	--
GEH	--	1.1 (1.5)	0.4 (1)	--	0.2 (1.4)	0.2 (1.1)	0.4 (0.8)	--	0 (0.3)	--	--	--
Highway 401 Ramps South of Highway 401 & Whites Road Overpass												
Field Data	--	583 (479)	124 (255)	538 (1017)	491 (510)	--	--	--	--	253 (164)	--	358 (362)
Vissim Output	--	592 (516)	132 (233)	532 (1034)	491 (515)	--	--	--	--	248 (164)	--	356 (350)
GEH	--	0.4 (1.7)	0.7 (1.4)	0.3 (0.5)	0 (0.2)	--	--	--	--	0.3 (0)	--	0.1 (0.6)
Whites Road & Bayly Street												
Field Data	11 (9)	133 (76)	15 (8)	201 (292)	35 (134)	468 (201)	213 (488)	60 (95)	7 (25)	10 (10)	60 (40)	378 (171)
Vissim Output	9 (10)	131 (81)	16 (8)	222 (321)	35 (138)	484 (221)	215 (493)	62 (95)	6 (23)	10 (10)	64 (43)	376 (176)
GEH	0.6 (0.3)	0.2 (0.6)	0.3 (0)	1.4 (1.7)	0 (0.3)	0.7 (1.4)	0.1 (0.2)	0.3 (0)	0.4 (0.4)	0 (0)	0.5 (0.5)	0.1 (0.4)
Whites Road & Oklahoma Drive/Granite Court												
Field Data	--	1040 (1942)	334 (206)	--	1188 (791)	542 (330)	--	--	--	--	--	--
Vissim Output	--	1022 (1960)	333 (208)	--	1181 (802)	524 (335)	--	--	--	--	--	--
GEH	--	0.6 (0.4)	0.1 (0.1)	--	0.2 (0.4)	0.8 (0.3)	--	--	--	--	--	--

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 data extracted from 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 and peak afternoon 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]
Kingston Road (Rosebank Road to the Highway 401 ramps east of Delta Boulevard)	Weekday Morning (AM) Peak Hour	Eastbound	95 – 240	147	91 – 212	138
		Westbound	88 – 280	146	90 – 196	149
	Weekday Afternoon (PM) Peak Hour	Eastbound	137 – 341	212	162 – 259	208
		Westbound	95 – 302	171	105 - 282	160
Whites Road (Sheppard Avenue to Oklahoma Drive/Granite Court)	Weekday Morning (AM) Peak Hour	Northbound	106 – 284	164	101 – 236	167
		Southbound	102 – 273	160	78 – 205	129
	Weekday Afternoon (PM) Peak Hour	Northbound	152 – 356	218	142 – 279	213
		Southbound	107 – 293	170	98 - 243	162
Highway 401 eastbound off-ramp at Whites Road	Weekday Morning (AM) Peak Hour	Eastbound	31 – 63	41	24 – 97	57
	Weekday Afternoon (PM) Peak Hour	Eastbound	48 – 116	66	27 - 115	67

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)

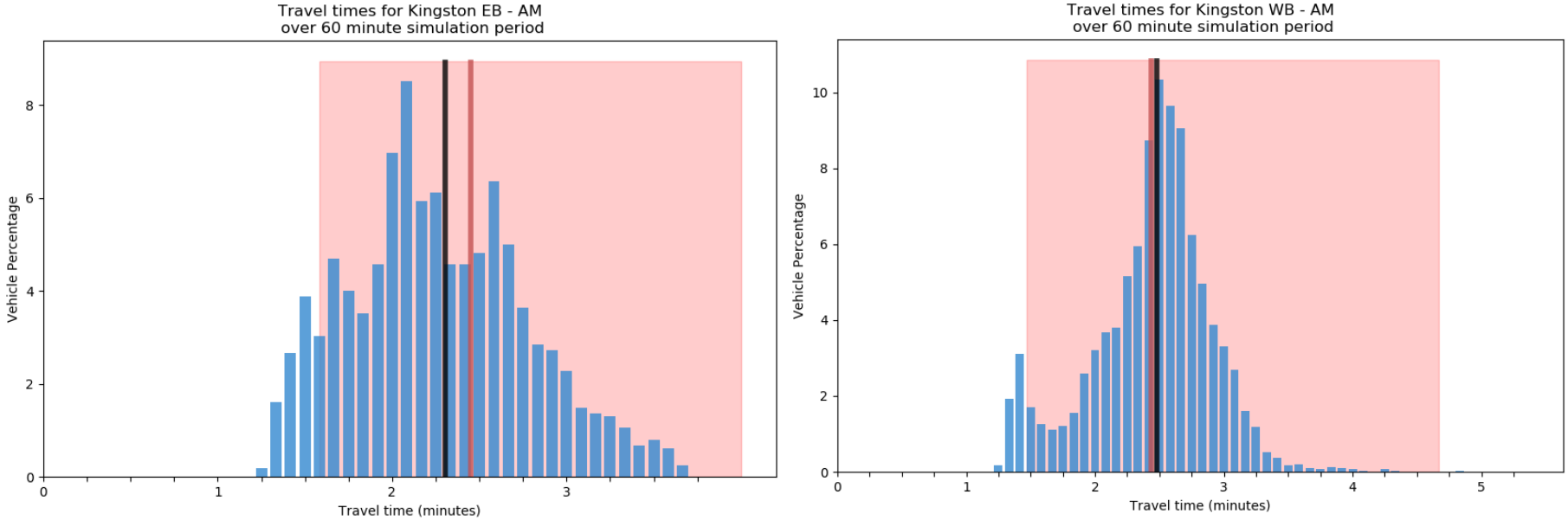


FIGURE 4: WHITES ROAD - EXISTING MODEL CALIBRATION TRAVEL TIMES (AM)

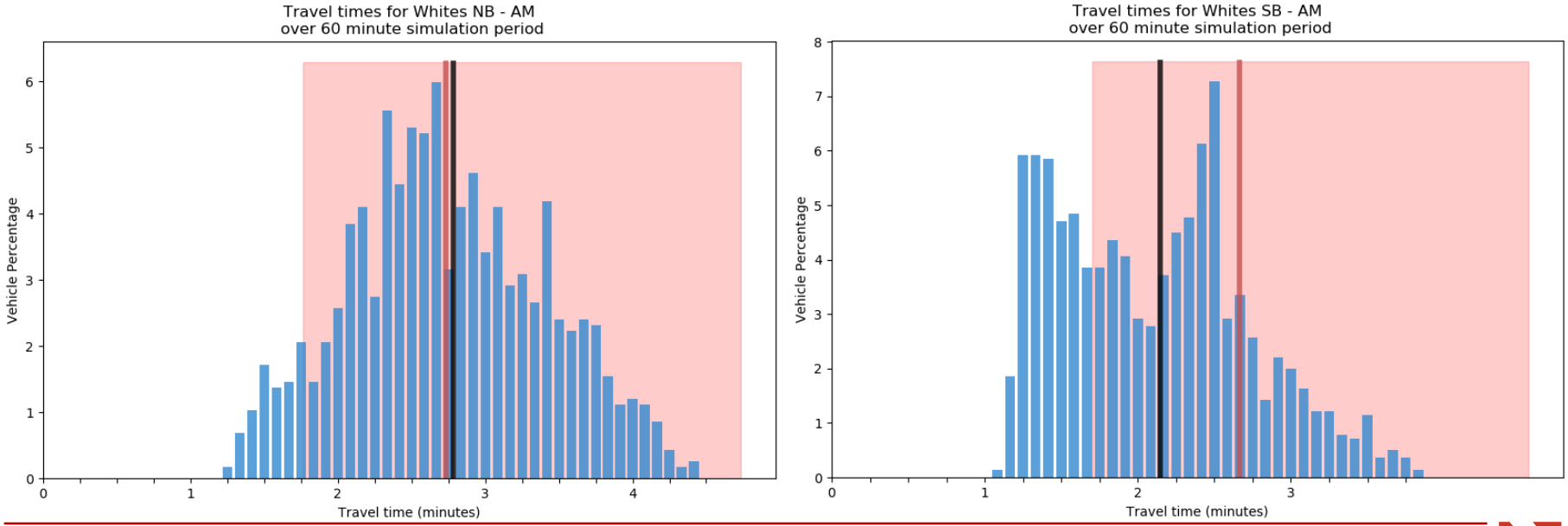


FIGURE 5: HWY 401 EB OFF-RAMP - EXISTING MODEL CALIBRATION TRAVEL TIMES (AM)

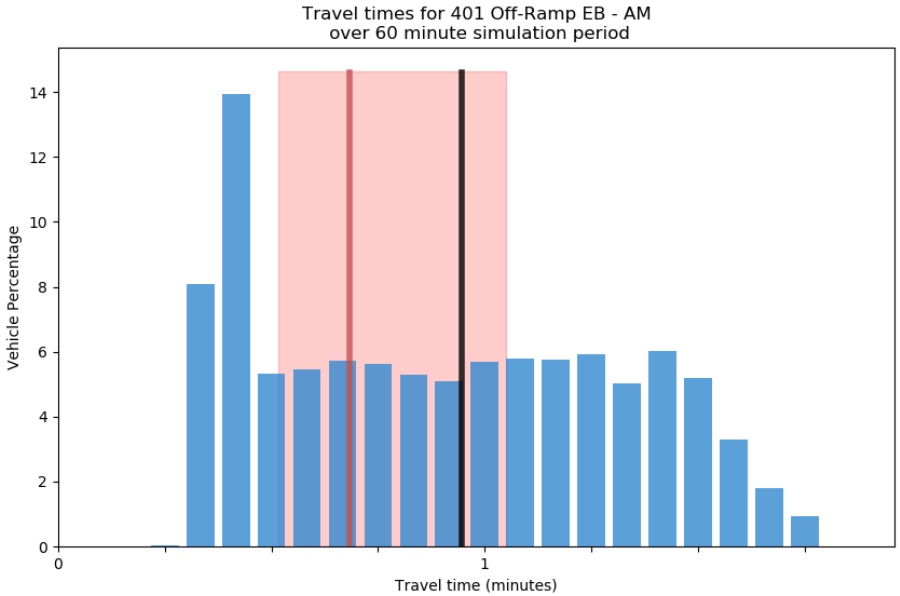
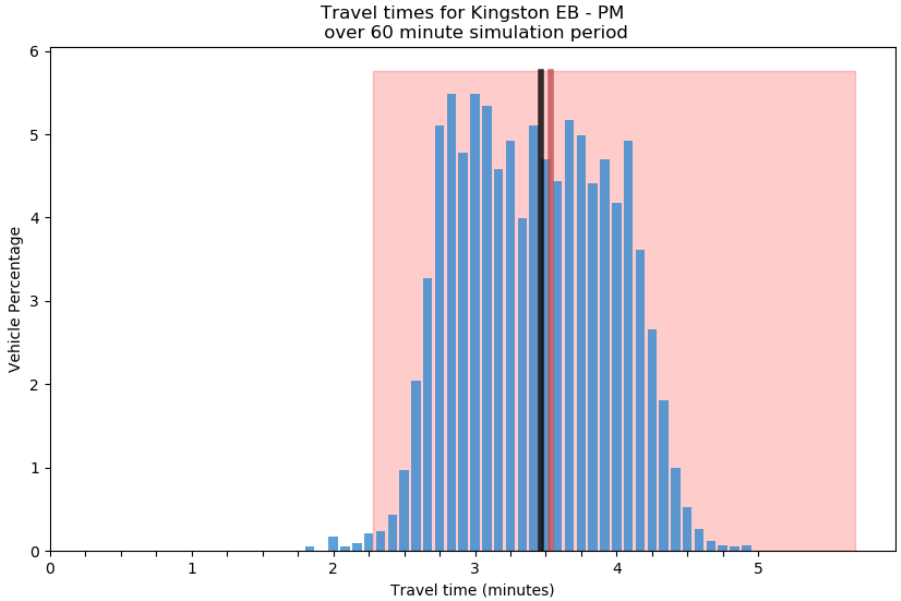


FIGURE 6: KINGSTON ROAD - EXISTING MODEL CALIBRATION TRAVEL TIMES (PM)



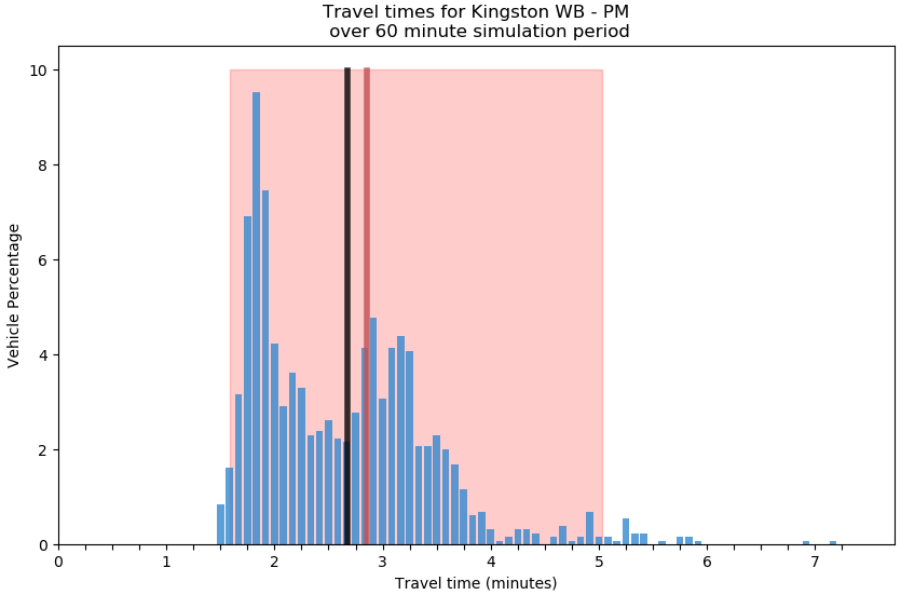


FIGURE 7: WHITES ROAD - EXISTING MODEL CALIBRATION TRAVEL TIMES (PM)

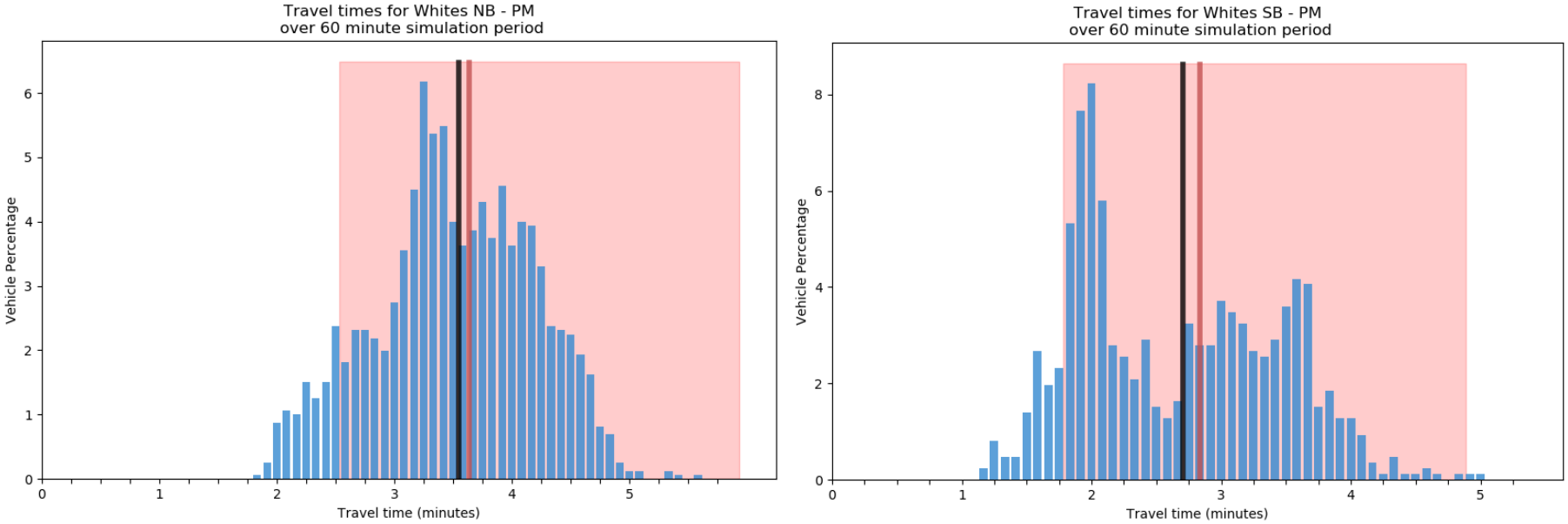
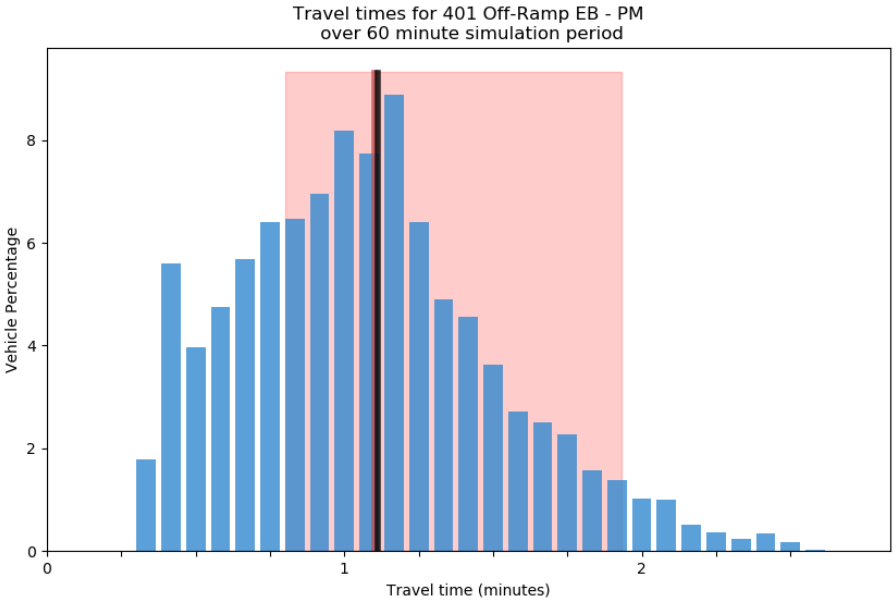


FIGURE 8: HWY 401 EB OFF-RAMP - EXISTING MODEL CALIBRATION TRAVEL TIMES (PM)



As shown in **Table 2** and **Figure 3** through **Figure 8**, calibrated existing conditions *Vissim* model travel time outputs fall within the average travel time ranges from the Google Maps Distance Matrix API during both the weekday morning (AM) and weekday afternoon (PM) peak hours along all corridors.

The above results indicate 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 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.

As discussed previously, the future conditions *Vissim* model includes planned infrastructure improvements, most notably the Durham-Scarborough BRT corridor, which operates through the study area in a 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 model are provided in **Figure 9**.

As detailed in the *"603-643 & 645-699 Kingston Road Mixed-Use Development, 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 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.

The proposed network modifications have been incorporated into the future conditions *Vissim* model and are consistent with the provided Highway Capacity Manual methodology analysis.

FIGURE 9: DURHAM-SCARBOROUGH BRT AT KINGSTON ROAD AND WHITES ROAD

3.1 KEY PERFORMANCE METRIC

The projected impact of the 603-643 & 645-699 Kingston Road redevelopment were primarily assessed through this modelling exercise using vehicle travel times throughout the surrounding road network to ensure that the traffic impacts associated with the site redevelopment would not result in excessive travel time increases.

Vehicle travel time analysis is provided with a comparison of projected future corridor travel times and existing conditions corridor travel times. This provides a clear representation of the future transportation conditions throughout the area road network and the impact of the 603 Kingston Road redevelopment, 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 *"603-643 & 645-699 Kingston Road Mixed-Use Development, Urban Transportation Considerations"* report and, taken together with the travel time analysis discussed below, offer a full picture of the performance of the future road network.

3.2 ANALYSIS RESULTS

3.2.1 Vehicle Travel Times

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.

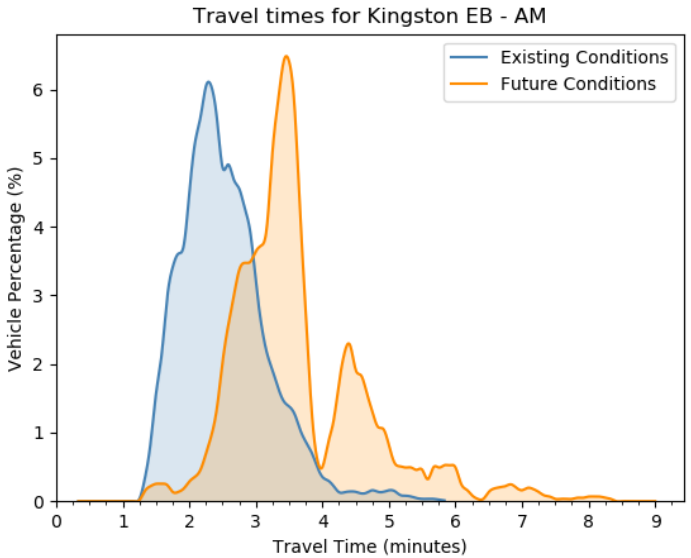
The future conditions *Vissim* model travel time results, along with a comparison to existing conditions travel time outputs are provided in **Table 3**. Furthermore, travel time plots comparing the projected future conditions and existing conditions travel times are provided in **Figure 10** through **Figure 15**.

TABLE 3 FUTURE MODEL ANALYSIS PROJECTED TRAVEL TIME RESULTS

Corridor Segment	Analysis Period	Direction	Existing Range[1,2]	Existing Average[1]	Projected Range[1,2]	Projected Average[1]
Kingston Road (Rosebank Road to the Highway 401 ramps east of Delta Boulevard)	Weekday Morning (AM) Peak Hour	Eastbound	91 – 212	138	138 – 338	210
		Westbound	90 – 196	149	138 – 261	191
	Weekday Afternoon (PM) Peak Hour	Eastbound	162 – 259	208	162 – 321	233
		Westbound	105 - 282	160	131 – 286	191
Whites Road (Sheppard Avenue to Oklahoma Drive/Granite Court)	Weekday Morning (AM) Peak Hour	Northbound	101 – 236	167	95 – 253	170
		Southbound	78 – 205	129	108 – 261	182
	Weekday Afternoon (PM) Peak Hour	Northbound	142 – 279	213	140 – 276	209
		Southbound	98 - 243	162	128 – 284	204
Highway 401 eastbound off-ramp at Whites Road	Weekday Morning (AM) Peak Hour	Eastbound	24 – 97	57	25 – 93	54
	Weekday Afternoon (PM) Peak Hour	Eastbound	27 - 115	67	25 – 72	47

Notes:
[1]Units in seconds
[2]90% of the vehicle travel time distribution from 10 *Vissim* simulations falls within this range

FIGURE 10: KINGSTON ROAD - TRAVEL TIME COMPARISON PLOTS (AM)



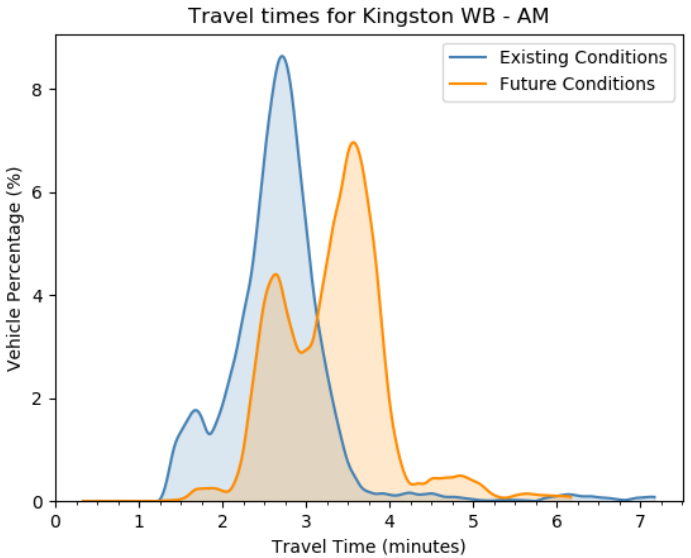
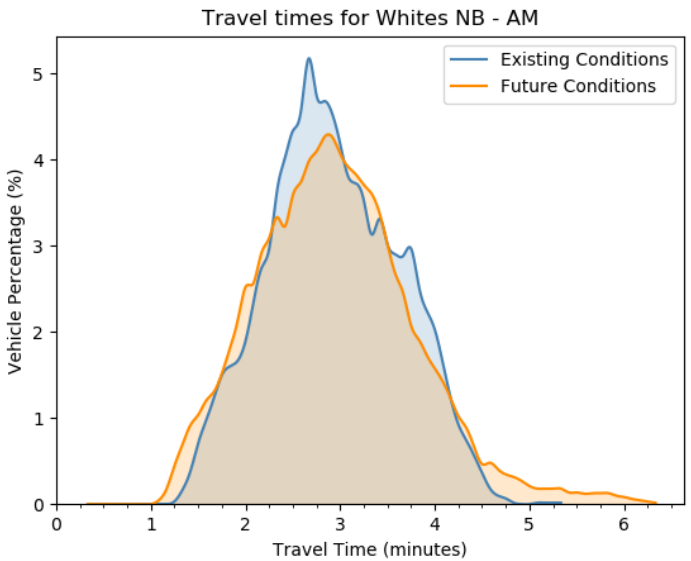


FIGURE 11: WHITES ROAD - TRAVEL TIME COMPARISON PLOTS (AM)



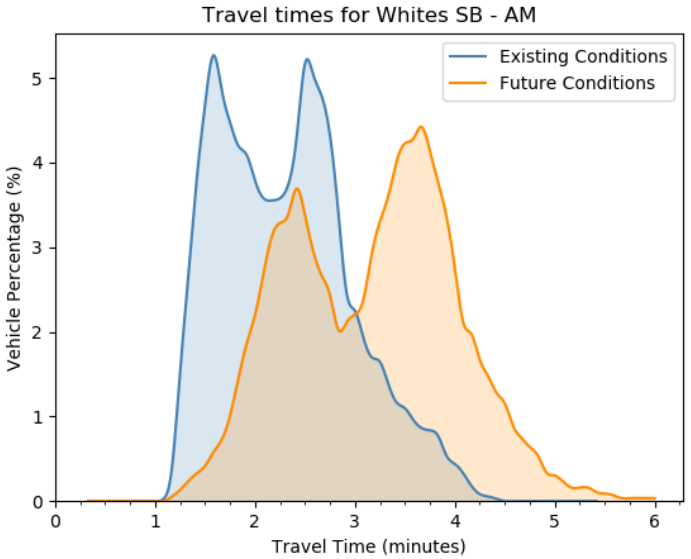


FIGURE 12: HWY 401 EB OFF-RAMP - TRAVEL TIME COMPARISON PLOTS (AM)

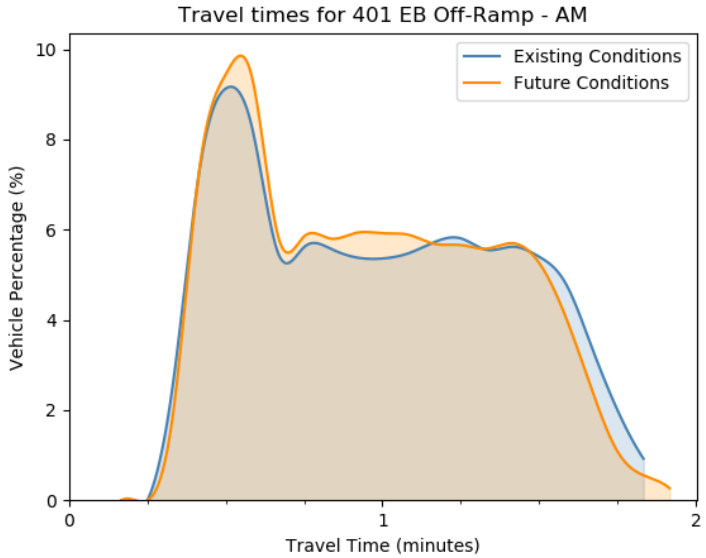
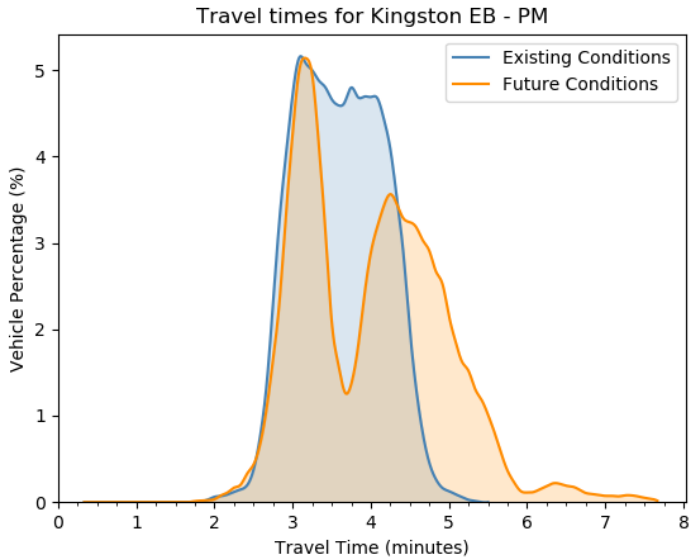


FIGURE 13: KINGSTON ROAD - TRAVEL TIME COMPARISON PLOTS (PM)



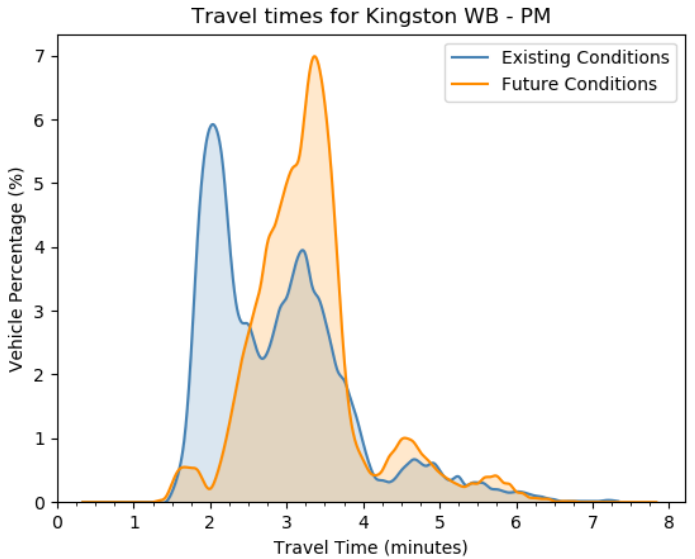
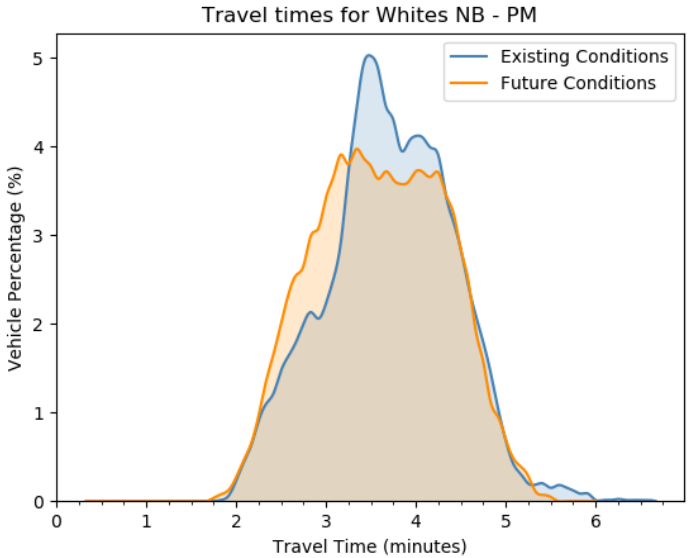


FIGURE 14: WHITES ROAD - TRAVEL TIME COMPARISON PLOTS (PM)



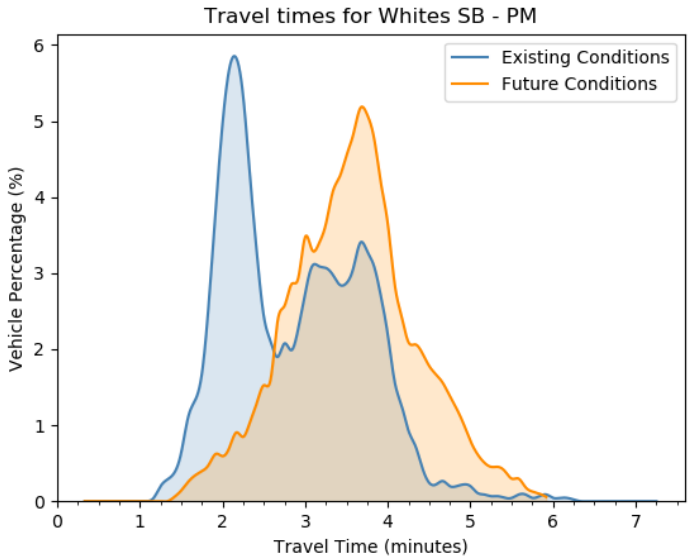
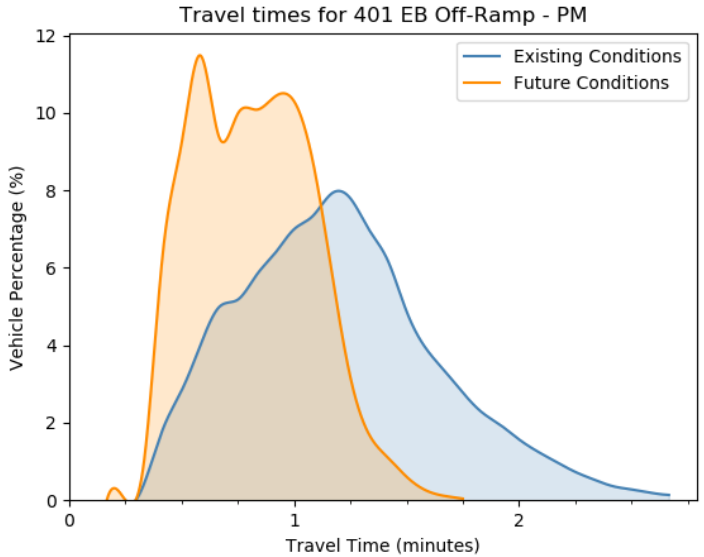


FIGURE 15: HWY 401 EB OFF-RAMP - TRAVEL TIME COMPARISON PLOTS (PM)



As presented in **Table 3**, 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.

Average travel times are projected to increase along Kingston Road, in both the morning (AM) and afternoon (PM) peak hours in the order of 25 to 72 seconds in the eastbound direction and 31 to 42 seconds in the westbound direction and with projected travel time distributions shifting or increasing similarly.

Along Whites Road, in both the morning (AM) and afternoon (PM) peak hours, southbound average travel times are projected to increase by approximately 50 seconds with projected travel time distributions shifting or increasing similarly, and average travel times are projected to remain relatively the same in the northbound direction.

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

Highway 401 eastbound off-ramp traffic volumes are projected to increase by 150 to 400 vehicles, however future average travel times and travel time distributions are projected to decrease slightly as a result of the proposed additional eastbound turn lane and signal timing adjustments at the intersection.

Overall, future conditions model analysis results provided, especially the travel time comparison plots, demonstrate that corridor travel times throughout the study area are not projected to increase significantly and therefore, the projected impacts of the proposed 603-643 & 645-699 Kingston Road redevelopment can be appropriately accommodated by the future road network.

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 the proposed redevelopment and 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.

Kingston Road Corridor – Travel Times

- Vehicle travel times are projected to increase, eastbound in the order of 25 to 72 seconds and westbound in the order of 31 to 42 seconds.

Whites Road Corridor – Travel Times

- Vehicle travel times are projected to increase southbound by approximately 50 seconds.

Highway 401 Eastbound Off-Ramp at Whites Road – Travel Times

- Vehicle travel times are projected to decrease slightly.

The Vissim microsimulation future conditions model results, project that vehicular travel times will not increase significantly along Kingston Road, Whites Road and the Highway 401 eastbound off-ramp in the weekday morning (AM) and afternoon (PM) peak hours due to the proposed redevelopment. Thus the projected impacts of the proposed 603-643 & 645-699 Kingston Road redevelopment can be appropriately accommodated by the future road network.