CITY OF MISSISSAUGA

RATHBURN ROAD AND PONYTRAIL DRIVE INTERGRATED ROAD PROJECT

PRELIMINARY DESIGN REPORT

FEBRUARY 11, 2022

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PRELIMINARY DESIGN REPORT

CITY OF MISSISSAUGA

PROJECT NO.: OUR REF. NO. 19M-00836-03
CLIENT REF:
DATE: FEBUARY 11, 2022

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February 11, 2021

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Attention: Rory O'Sullivan, P. Eng., PMP Transportation Project Engineer

Subject.: Rathburn Road East – Ponytrail Drive Draft Preliminary Design Report

Dear Sir:

Enclosed, herewith, is the Preliminary Design Report for your review and comments.

Yours sincerely,

Don McLeod, C.E.T., PMP
Senior Project Manager

Encl.
WSP ref.: OUR REF. NO. 19M-00348

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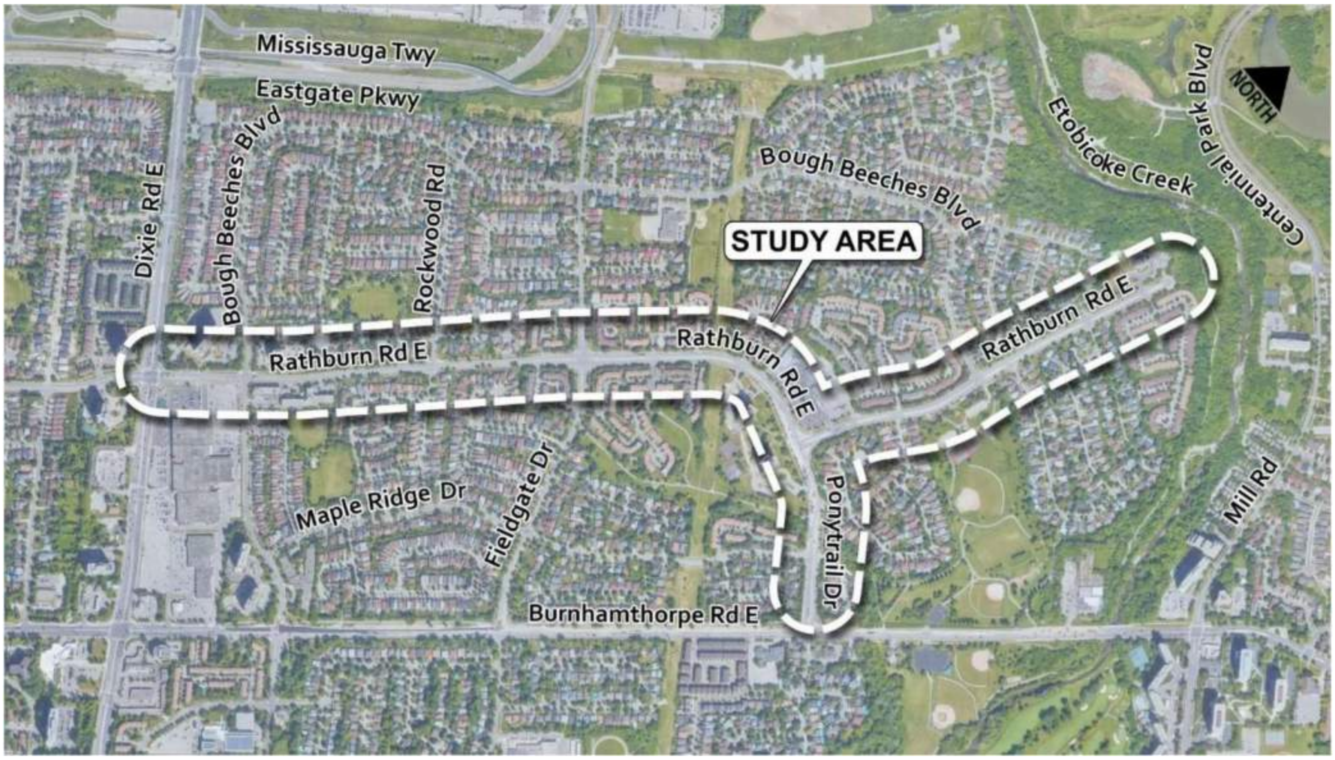
1 INTRODUCTION

The City of Mississauga is undertaking the Rathburn Road and Ponytrail Drive Integrated Road Project in accordance with the Schedule ‘A+’ Municipal Class Environmental Assessment (EA) process. The limits for the proposed road improvements are:

- Rathburn Road East from Dixie Road to Etobicoke Creek; and,
- Ponytrail Drive from Rathburn Road East to Burnhamthorpe Road East.

Figure 1.1 Study Area Map



The purpose of the Rathburn Road East and Ponytrail Drive Integrated Road Project is to coordinate the planning, design and construction of various operational improvements along the Rathburn Road East and Ponytrail Drive road corridors including pavement rehabilitation, safety, drainage, noise wall, cycling and intersection improvements. The proposed improvements will create a safer, more comfortable and sustainable environment for all road users, including pedestrians, cyclists and transit users.

This Preliminary Design Report has been prepared to document the planning and preliminary design phases of the Rathburn Road East and Ponytrail Drive Integrated Road Project. The report will inform and provide a basis for the future phases of the project including detail design and construction.

2 PHASES. PLANNING / POLICY CONTEXT

The City of Mississauga has planned for road resurfacing of Rathburn Road East and Ponytrail Drive as part of the annual resurfacing program. This provides an opportunity to provide other road corridor improvements consistent with and supported by various City plans and policies.

2.1 MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT

The Integrated Road Project was carried out as a 'Schedule A+' project under the Municipal Class Environmental Assessment process (October 2000, as amended in 2007, 2011 & 2015), which is approved under the Ontario Environmental Assessment Act.

While Schedule A+ projects are preapproved, the public is to be advised prior to their implementation. For Schedule A+ projects, the manner in which the public is advised is to be determined by the proponent. The City has carried out a comprehensive engagement and consultation program for the proposed road improvements. The details of the consultation program can be found in **Section 7** of this document.

2.2 CYCLING MASTER PLAN

The City of Mississauga's 2018 Cycling Master Plan envisions a comfortable, connected and convenient cycling network that includes separated bike lanes, cycle tracks, multi-use trails, conventional bike lanes, and shared routes. The goals of the Cycling Master Plan are to improve safety for cycling, build a connected, convenient and comfortable bicycle network, increase the number of cycling trips in Mississauga, and foster a culture of cycling. The City's 2018 Cycling Master Plan supports the need for cycling improvements on Rathburn Road and Ponytrail Drive.

It is important to note that the proposed cycling improvements are not intended to replace but instead complement the existing trail facilities. They will serve residents in the area by providing direct access to a larger City wide cycling network that in the future will extend all the way to Creditview Road and include connections to other cycling facilities.

2.3 VISION ZERO

Another key policy consideration for the Project Team in developing the proposed improvements was the City's commitment to safety through the Vision Zero framework. City Council has previously asked staff to specifically consider Vision Zero in the delivery of projects and in, February 2018, the City of Mississauga passed a resolution to adopt Vision Zero on all City projects.

Vision Zero originated in Sweden in 1997. However, now it is well-known throughout North America and its key message is, "no loss of life caused by motor vehicle collisions is acceptable.”

The goal of Vision Zero is to eliminate serious injuries or deaths caused by motor vehicle collisions by prioritizing the safety and access of our most vulnerable road users such as cyclist, pedestrians and transit users.

3 EXISTING ROADWAY CONDITIONS

The project study area for the Rathburn Road East/Ponytrail Drive Integrated Study incorporates Rathburn Road East from Dixie Road to the Etobicoke Creek cul-de-sac, located east of Ponytrail Drive; and the segment of Ponytrail Drive between Rathburn Road East and Burnhamthorpe Road East. Within the study area, the posted speed limit on Rathburn Road East and Ponytrail Drive is 50 km/h, however operating speeds in excess of 60km/hr are typically observed.

Rathburn Road East is an east-west corridor, designated as a major collector in the City's Official Plan. It operates with a four-lane cross-section (two through lanes in each direction) within the study area with auxiliary left-turn and right-turn lanes throughout. There are channelized right-turn lanes at the Dixie Road / Rathburn Road intersection and the Rathburn Road / Ponytrail Drive intersection. Within the study area, Ponytrail Drive operates as a north-south major collector with a four-lane cross-section.

Rathburn Road East and Ponytrail Drive provide access to various residential properties, large multi-residential condominiums and a few commercial properties. The study area includes thirteen intersections and many property accesses/driveways. Currently, five intersections are signalized and other intersections are operating with 'two-way stop control with Rathburn Road/Ponytrail Drive operating in free-flow conditions.

On-street parking is not permitted on Rathburn Road East, except daytime parking east of Garnetwood Chase (East); no parking is permitted on Ponytrail Drive within the study area.

The MiWay route 20 services the proposed project area in both directions from Dixie Road to Burnhamthorpe Road East. The existing transit stops include concrete pedestrian pads (and shelters at some locations) located along the corridor.

There are currently sidewalks along both sides of the road and no cycling facilities along the roadways within the corridor. Signalized pedestrian crossings are located along Rathburn Road at the intersections at Dixie Road, Bough Beeches Boulevard, Fieldgate Drive, and Ponytrail Drive. Uncontrolled pedestrian crossing are provided at Rockwood Road and Garnetwood Chase intersections. Signalized pedestrian crossings are located along Ponytrail Drive at the Rathburn Road and Burnhamthorpe Road intersecti*ons.* An uncontrolled crossing is also provided where the Shaver Trail meets Ponytrail Drive

Existing active transportation facilities within the corridor include a multi-use trail along the west side of Dixie Road, along the hydro corridor (east of Fieldgate Drive), the Shaver Trail (west of Maple Ridge Drive), along the north side of Burnhamthorpe Road and at the end of the Rathburn Road cul-de-sac towards the Etobicoke Creek Trail. The only current crossride that legally allows cyclist to cross the Rathburn Road / Ponytrail Drive corridor within the study limits is on the north side of Burnhamthorpe Road.

4 DESIGN OBJECTIVES

The objective of the integrated road project is to improve the coordination of road projects, reduce construction costs, and construction nuisance/fatigue for local residents through the bundling of various road improvement projects.

For this project, the City has planned for road resurfacing within the limits of the study area as part of the annual resurfacing program. This provided an opportunity to bundle this work with other planned operational improvements, like safety, cycling and intersection improvements, into a single construction contract.

In assessing the possible design options, the following objectives were established:

<u>Separation of road users</u>:

- Dedicated cycling and pedestrian facilities
- Cycle track facilities adjacent to the road to be constructed flush with top of curb beyond a typical continuity buffer width of 0.6m behind the back of curb (BOC).
- Two-way cycle facilities to be separated by a grass boulevard

<u>Provide continuous active transportation facilities in both directions</u>:

- Uni-directional cycle facilities separate from pedestrian sidewalks.
- Two-way cycling facilities with connections to cross streets or existing trails
- Should space not permit, short stretches of asphalt multi-use trail will be considered instead

<u>Promote reduction in operating vehicular speeds</u>

- Reduce number of travel and auxiliary lanes were possible
- Provide minimum lane widths to promote lower speeds

<u>Well designed intersections:</u>

- Smart and safe designs which consider all vehicular, pedestrian, and cyclist movements through an intersection.
- Pavement marking per OTM Book 18, industry best practices and City of Mississauga Standard Drawings.
- Elimination of channelized right turn lanes

<u>Comfortable to use</u>:

- Provide a minimum of 0.6m separation between cyclists and pedestrians wherever ROW space is available.
- Provide a minimum 2.0m cycle facility with a 0.1m continuity strip

<u>Accessibility</u>:

Design considerations for MiWay stops including bus shelters and/or laybys <u>Pedestrian conflicts:</u>

- Providing lateral separation of 0.6m between the pedestrian and cyclist zones wherever space is available to convey that the cycle track is not an extension of the sidewalk; additional strategies such as alternative pavement markings can also be explored at detailed design stage of this project.

Landscaping

- Where feasible, minimise impacts to existing trees

Street Lighting

- Provide adequate luminance in accordance with RP8 for all road users

Drainage

- Where feasible, minimise additional runoff to existing storm sewer network

Maintenance

- Where feasible, provide clearway for snow clearing operations behind back of curb

4.1 DESIGN CRITERIA

The following summarizes the design criteria that was adapted for the project.

Table 4.1 Design Criteria

Element	Minimum (m)	Desired (m)	Proposed (m)	Source
General				
Posted Speed Design Speed Design Vehicle Minimum Horizontal Radius – Normal Crown Reverse Crown Curb (Road) Curb (Centre Median)	50 km/h	 1500 185	50 km/h 60 km/h Mississauga Platform Aerial 180 185	 City of Mississauga – Capital Works TAC Table 3.2.8 TAC Table 3.2.8 Existing of Ponytrail Existing on Rathburn OPSD 600.040 OPSD 600.080
Pedestrian and Cycling Facility Widths				
Multi-use path (bidirectional)	3.0	3.5	3.0	City of Mississauga Std Dwg 2240.080 OTM Book 18 Table 4.5 (2020)

Element	Minimum (m)	Desired (m)	Proposed (m)	Source
Multi-use path (unidirectional)	2.4	3.0	n/a	OTM Book 18 Table 4.5 (2020)
One-way cycle track	1.5	2.0 2.0	2.0	City of Mississauga Std Dwg 2240.081 OTM Book 18 Table 4.4 (2020)
Two-way Cycle Track	3.0	3.5	3.5	OTM Book 18 Table 4.4 (2020)
Buffer from back of curb	0.1 0.3	 1.0	0.1	City of Mississauga Std Dwg 2240.081 OTM Book 18 Table 4.6 (2020), 50 km/h posted speed
Sidewalk	1.5	1.8	1.5 2.0	City of Mississauga Std Dwg Adjacent to curb
Separation between cycle track and sidewalk for accessibility	0	0.6	0.3 m	OTM Book 18 (2020)
Lateral clearance from hazards/barriers Obstruction height <50mm 50-750mm >750mm	 0 0.2 0.3	 0 0.2 0.5	 0 0.2 0.3 min	OTM Book 18 Table 7.2 (2020)
Bicycle Lane	1.5	1.8	 2.0	OTM Book 18 Table 4.7 (2020) Direction from City
Transit Facilities Shelter Landing Pad Sidewalk Connection		 2m x 4m 2m x 15m 1.5m	 2m x 4m 2m x 15m 1.5m	 MiWay Std. Dwgs 2250.010 and 2250.030 MiWay Std. Dwgs 2250.010 and 2250.030 Parallel to curb

Element	Minimum (m)	Desired (m)	Proposed (m)	Source
Road Facilities **Rathburn Road / Ponytrail Drive (Dixie Road to Burnhamthorpe Road)**				
Through Lane	3.0 3.25	3.35	3.35	City of Mississauga guidance based on future Changing Lane Study TAC 2017 Chapter 4
Left Turn Lanes	3.0 3.25	3.0	3.0	City of Mississauga guidance based on future Changing Lane Study 3.5m to be provided where utilized by transit TAC 2017 Chapter 4
Right Turn Lanes	3.25 3.3	3.5 3.5	 3.5	TAC 2017 Chapter 4 MiWay Requirement
Curb lanes	3.5	 3.5	 3.5	City of Mississauga guidance based on future Changing Lane Study MiWay Requirement
Curb Radii	12.0		 9.0	City Standard 2211.160 City of Mississauga guidance based on future Changing Lane Study
Centre Median	• Maintain wide medians for planting opportunities and pedestrian refuge island • Reduce median if required to prevent requirements for property acquisition • Minimum 1.4m where traffic signal poles are required			Direction from City
Road Facilities **Rathburn Road (Ponytrail Drive to Etobicoke Creek)**				
Through Lane	3.0 3.25	3.35	3.50	City of Mississauga guidance based on future Changing Lane Study TAC 2017 Chapter 4
Shared Left Turn Lane	3.5	 3.3	3.5	TAC Chapter 8 section 8.6 Direction from City

Element	Minimum (m)	Desired (m)	Proposed (m)	Source
Parking Lane	2.4	2.4	2.6	TAC Section 4.3.2.4 Direction from City
Curb Radii	12.0		9.0	City Standard 2211.160 City of Mississauga guidance based on future Changing Lane Study
Lanes operated by Transit		3.5	3.5	MiWay Requirement
Cul-De-Sac geometry		City Standard No. 2211.240		
Centre Median	None	Direction from City		

5 INVESTIGATIONS AND ASSESSMENTS

5.1 TRAFFIC ANALSIS

The following is a summary of the traffic study completed by WSP for the corridor and the compete study including the detailed analysis results in tabular form can be found in **Appendix C**.

The traffic study was conducted following the City of Ottawa's Multimodal Analysis Guidelines, 2015. The Multi-Modal Level of Service (MMLOS) is a tool that evaluates the performance of each mode – pedestrians, bicycles, transit, and vehicles, that provides an integrated depiction of the multi-modal levels of service. For each travel mode, the level of service (LOS) is required to be assessed for each side of the segments (between two or more intersections) and at the intersections within the study area.

The vehicular (auto) level of service analysis was conducted using Synchro software for the study area intersections. This analysis was conducted for the existing (2020) conditions and future alternative scenarios for 2041 conditions and interim (2031) conditions.

The pedestrian, cycling, and transit LOS were estimated using the City of Ottawa's Guidelines for the existing (2020) and future (2041) conditions.

The following key tasks were conducted for the traffic analysis for this study:

- Identify the study area and review the existing road network,
- Collect and summarize existing (2020) traffic volumes for the study area intersections, conduct signal warrant analysis, collision data analysis, existing traffic operational analysis, existing LOS analysis for other modes of transportation – pedestrians, bicycles, and transit.
- Estimate future (2041) traffic volumes, conduct level of service analysis for all transportation modes for two alternative network scenarios conducted for future (2041) conditions.

5.1.1 VEHICULAR TRAFFIC

Vehicular traffic was analysed under existing conditions and future conditions for projected years 2031 and 2041 under two (2) scenarios:

- Scenario 1 – no changes to road configuration
- Scenario 2 – with the following preliminary proposed modifications to the road configuration:
  - 4 lanes on main road Rathburn / Ponytrail (Dixie Road to Burnhamthorpe Road)
  - 2 lanes on Rathburn Road (Ponytrail Drive to end of the cul-de-sac)
  - Removal of all Channelized RTL's at Dixie
  - Removing east and west bound RTL's at Fieldgate
  - Removing both channelized RTL's at Rathburn / Ponytrail and acceleration lane
  - Removed RTL at Maple Ridge Drive
  - All way stop at Rathburn / Bough Beeches

The traffic analysis for the study area was conducted for the following ten intersections along Rathburn Road East and Ponytrail Drive.

- Rathburn Road East at Dixie Road

- Rathburn Road East at Bough Beeches Boulevard (West)
- Rathburn Road East at Rockwood Road
- Rathburn Road East at Fieldgate Drive
- Rathburn Road East at Capilano Court
- Rathburn Road East at Ponytrail Drive
- Rathburn Road East at Bough Beeches Boulevard (East)
- Ponytrail Drive at Tapestry Trail
- Ponytrail Drive at Maple Ridge Drive/Lookout Court
- Ponytrail Drive at Burnhamthorpe Road East

5.1.1.1 *EXISTING CONDITIONS*

The existing (2020) intersection capacity analysis results indicate that all the study area intersections operate well and provide satisfactory traffic operations with an overall average delay of less than 35 seconds/vehicle during both the morning and afternoon peak hours.

The following individual movements have been identified as critical movements – which experience congestion with delay of more than 55 seconds/vehicle include:

- The eastbound left and westbound left-turning movements during both the peak hours and northbound left-turning movement during the afternoon peak hour at Rathburn Road East intersection with Dixie Road; and
- The northbound and southbound movements, which include left, through, and right turning movements during the morning and afternoon peak hours at Ponytrail Drive and Burnhamthorpe Road East intersection. In addition, the queue lengths for the eastbound and northbound left-turning movements at the intersection of Rathburn Road East and Dixie Road, extend beyond the available storage lengths.

In addition, the queue lengths for the eastbound and northbound left-turning movements at the intersection of Rathburn Road East and Dixie Road, extend beyond the available storage lengths.

5.1.1.2 *FUTURE CONDITIONS (SCENARIO 1)*

Scenario 1 considered the existing (2020) lane-configurations on Rathburn Road East and Ponytrail Drive with the future (2041) traffic volumes and the existing signal timing plans that were optimized using Synchro 10 software.

Under the future (2041) Conditions and Scenario 1, the study area intersections are expected to operate well and provide satisfactory traffic operations with an overall average delay no longer than 30 and 50 seconds during the morning and afternoon peak hours, respectively.

The following individual movements have been identified as critical movements – which are expected to experience congestion with delay of more than 55 seconds/vehicle operate at greater levels of delay (persistent queuing):

- The eastbound left, westbound left and northbound left-turning movements during the afternoon peak hour at the intersection of Rathburn Road East and Dixie Road;
- The shared northbound and southbound left/through/right turning movements during the afternoon peak hour at the Rathburn Road East and Rockwood Road intersection;
- The shared westbound left/through/right turning movements during the afternoon peak hour at the Ponytrail Drive and Tapestry Trail intersection; and

- The shared northbound through/right and southbound left-turning movements during both the peak hours and eastbound left and northbound left-turning movements during the afternoon peak hour at Ponytrail Drive intersection with Burnhamthorpe Road East.

Also, the queue lengths for the eastbound, westbound, and northbound left-turning movements at Rathburn Road East and Dixie Road intersection, and eastbound left-turning movement at Ponytrail Drive and Burnhamthorpe Road East intersection are expected to exceed the available queuing space during (2041) traffic conditions.

5.1.1.3 *FUTURE CONDITIONS (SCENARIO 2)*

Scenario 2 represents complete street future (2041) conditions which accommodates the needs of all the road users, including motorists, pedestrians, cyclists, and transit, by considering the proposed improvements to the study area network as noted above.

The intersection capacity results for Scenario 2, indicate that the study area intersections are expected to provide satisfactory traffic operationsexcept for the intersection of Rathburn Road East with Dixie Road, which is likely to experience higher delay, i.e., an overall average delay of 56 seconds/vehicle during an afternoon peak hour.

- The analysis results for the future (2041) Scenario 2 indicate that the following individual movements are expected to operate as critical movements – which are expected to experience congestion with delay of more than 55 seconds/vehicle include: The eastbound left turning movement during both the peak hours, and westbound left, the shared westbound through/right and northbound left turning movements during the afternoon peak hour at Rathburn Road intersection with Dixie Road;
- The shared northbound and southbound left/through/right turning movements at the Rathburn Road East and Rockwood Road intersection during the afternoon peak hour;
- The shared westbound left/through/right turning movements during the afternoon peak hour at the Ponytrail Drive and Tapestry Trail intersection; and
- The shared northbound through/right, southbound left-turning movement during both the peak hours, and eastbound left and northbound left-turning movements during the afternoon peak hour at the intersection of Ponytrail Drive and Burnhamthorpe Road East.

Similar to future (2041) Scenario 1, the queue lengths for the movements – eastbound left, westbound left and northbound left-turning movements at Rathburn Road East and Dixie Road intersection, and eastbound left-turning movement at the Ponytrail Drive and Burnhamthorpe Road East intersection are expected to surpass the available storage length under the future Scenario 2 conditions. However, no changes have been proposed to address these issues as they are outside the scope of the Integrated Road Project

With the planned road improvements in 2041, an overall average delay at the study area intersections is expected to be similar to the future (2041) Scenario 1 (i.e., existing network configurations) expect for the Rathburn Road East and Dixie Road, and Ponytrail Drive and Burnhamthorpe Road East intersections. These intersections are expected to experience slightly higher overall delays compared to Scenario 1 during the morning and afternoon peak hours.

5.1.2 PEDESTRIAN LEVEL OF SERVICE

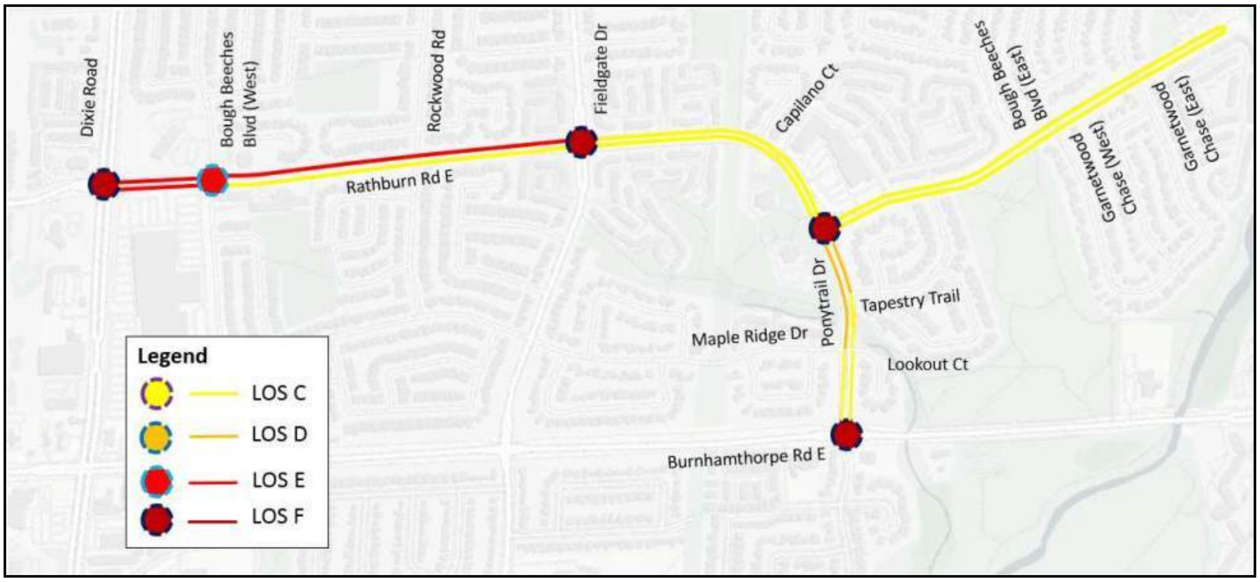
The pedestrian level of service (PLOS) analysis for the Rathburn Road East/ Ponytrail Drive Integrated study area was conducted following the City of Ottawa's Multimodal Analysis Guidelines. The PLOS analysis is presented as a ranking of intersections and mid-block (segments) that a pedestrian could encounter in the study area. Refer to **Appendix C** for additional detail on the PLOS methodology.

5.1.2.1 *EXISTING CONDITIONS*

Within the study area, sidewalks are present on both sides of Rathburn Road East and Ponytrail Drive with a minimum width of 1.5 m and at least 2.0 m wide boulevards. Therefore, the majority of study area segments have acceptable pedestrian level of service.

The follow illustrates the PLOS under existing conditions:

Figure 5.1 Existing (2020) Pedestrian Level of Service Results



The pedestrians' overall PLOS in study area intersections is mainly poor due to wide crossing distance. There is no such facility as island refugee at the study area intersections. The pavements, such as raised or textured crosswalks, which enhance pedestrians' safety, are not present at any intersection.

The existing crosswalks are either standard transverse markings or zebra stripe markings, which are the forms of conventional crosswalks. However, due to sufficient walk time, pedestrian delay at the signalized intersections is in the acceptable range, except for the intersections at Rathburn Road East and Dixie Road, and Ponytrail Drive and Burnhamthorpe Road East, where the pedestrians are experiencing higher average delays.

Therefore, the signalized intersections located within the study area operate at marginally acceptable or unacceptable PLOS.

5.1.2.2 *FUTURE CONDITIONS (SCENARIO 1)*

During future Scenario 1 pedestrian conditions are expected to worsen. With the increased traffic demand on the adjacent roadways in 2041 conditions, the Rathburn Road East segments between Fieldgate Drive and Ponytrail Drive in both the eastbound and westbound directions, and between Bough Beeches Boulevard (West) and Rockwood Road in the eastbound direction are expected to experience a marginally acceptable level of service as compared an acceptable level during existing (2020) condition.

Similarly, the Ponytrail Drive segments between Tapestry Trail and Burnhamthorpe Road East in the northbound direction are likely to have acceptable, but approaching marginally acceptable under future (2041) Scenario 1 condition compared an acceptable level during existing (2020) conditions.

Because of no change in crossing conditions, each approach at the study area intersection is expected to operate at the existing (2020) Pedestrian Exposure to Traffic LOS. However, with traffic signal optimization, pedestrians are expected to experience a slightly lower delay at the approaches of Ponytrail Drive and Burnhamthorpe Road East intersection during the existing (2020) conditions.

5.1.2.3 *FUTURE CONDITIONS (SCENARIO 2)*

The network improvements assumed for Scenario 2 will have no major impacts on the segment PLOS, therefore the future (2041) Scenario 2 PLOS for the study area segments are expected to remain consistent with future (2041) Scenario 1 segment PLOS results, where the effect of increased curb lane volumes under the future (2041) traffic conditions has already been captured.

The additional improvements (e.g., removal of channelized right-turn lanes and dedicated right-turning lanes at the study area intersections) is expected to improve the crossing conditions marginally for pedestrians.

5.1.3 *BICYCLE LEVEL OF SERVICE*

The Bicycle Level of Service (BLOS) analysis was performed using the methodology provided in the City of Ottawa's Multimodal Analysis Guidelines. Refer to **Appendix C** for additional detail on the BLOS methodology.

5.1.3.1 *EXISTING CONDITIONS*

The study area corridors have an abundance of stressors for cyclists due to the absence of cycling infrastructure and facilities. Additionally, there are no provisions for cyclists on the crossing streets, except for the in-boulevard multi-use paths on the west side of Dixie Road and north side of Burnhamthorpe Road East. The cross-rides facilitated with bicycle signals are also available along the Burnhamthorpe Road East where the existing multi-use pathway intersects the roads. The segments and intersections have a marginally acceptable and unacceptable BLOS, respectively because of the lack of provisions for bicycles.

5.1.3.2 *FUTURE CONDITIONS (SCENARIO 1)*

Assuming there are no plans to introduce the cycling facilities under Scenario 1, the study area is expected to operate at the existing (2020) BLOS.

5.1.3.3 *FUTURE CONDITIONS (SCENARIO 2)*

With the introduction of cycling facilities, the cycling environment is expected to improve significantly. The study area segments are expected to operate at highly acceptable BLOS during the future (2041) Scenario 2.

5.1.4 *TRANSIT LEVEL OF SERVICE*

Similar to other travel modes, the Transit Level of Service (TLOS) analysis was conducted utilizing the City of Ottawa's Multimodal Analysis Guidelines and an average delay experienced by transit on an approach to entering the intersection.

5.1.4.1 *EXISTING CONDITIONS*

Within the study area, there is currently one MiWay (City of Mississauga) bus route – Route # 20, which serves Rathburn Road East (west of Ponytrail Drive), and Ponytrail Drive. It should be noted that transit does not operate on Rathburn Road East, east of Ponytrail Drive.

Route 20 (Rathburn Road) operates on Rathburn Road East and Ponytrail Drive seven days a week. On a typical weekday, this route serves with an approximate headway of 10-20 minutes during morning peak hour, and 20 minutes during afternoon peak hours MiWay buses on this route operate with a frequency of about 25 minutes on Saturday, and 35 minutes on Sunday peak hours.

The study area corridors have regular bus routes with no consideration to transit priority – rapid transit. However, due to limited driveway/parking friction, the Rathburn Road East and Ponytrail Dr segments have acceptable TLOS, except for Rathburn Road East segment between Dixie Road and Bough

Beeches Boulevard (West) – which connects to a busy parking driveway of Rockwood Mall – resulting in a marginally acceptable TLOS.

Despite having a lack of transit-specific signals, the overall environment for transit is favorable at the intersections, except for the Dixie Road and Burnhamthorpe Road East intersections, which have unacceptable TLOS. The transit vehicle performance at intersections was evaluated by measuring the curb lane delay (seconds/vehicle).

5.1.4.2 *FUTURE CONDITIONS (SCENARIO 1)*

Under Scenario 1, which considers the existing transit services with no transit priority, the study area segments are expected to operate at the existing (2020) TLOS.

Under Scenario 1, overall transit conditions at the study area intersections are expected to be similar to the existing (2020) conditions, with some changes in the delay experience by transit vehicles at individual approaches. The intersections are expected to have acceptable TLOS, except for the Rathburn Road East and Dixie Road and Ponytrail Drive and Burnhamthorpe Road East intersections, which are expected to operate at an unacceptable overall intersection TLOS.

5.1.4.3 *FUTURE CONDITIONS (SCENARIO 2)*

Assuming there are no major plans to revise the existing transit services, which are regular bus routes with no dedicated bus lanes, the transit environment in the study area segments is expected to be similar for future (2041) Scenario 1 conditions.

The roadway improvements considered under future (2041) Scenario 2 will have no major impact on an overall intersection TLOS; however marginal increase in the delay at individual approaches of the intersections considered for the roadway improvements is expected. Therefore, the future (2041) Scenario 2 TLOS for the study area intersections are expected to be similar to the future (2041) intersection TLOS results

5.2 DRAINAGE AND SWM

The following is a summary of the drainage and SWM study completed by WSP for the corridor and the complete technical memorandum can be found in **Appendix D**. The technical memorandum documents the drainage and stormwater management (SWM) review and design requirements for the proposed roadway improvements and outlines the required standards / guidelines to be followed to ensure the appropriate stormwater management quality and quantity controls are adhered to during detail design.

The assessment has incorporated the recommendations of the storm sewer inspection and LID assessment. The analysis includes a review of background information / related studies, internal and external drainage catchment delineations, quantity control, quality control, erosion control, water balance, existing storm sewer capacity analysis and proposed storm sewer replacement recommendations.

A list of the relevant background information and the City of Mississauga design criteria used to develop the analysis can be found within the technical memorandum(s).

5.2.1 WATER QUANTITY CONTROL

Runoff flows after the proposed improvements are implemented are required to be controlled to the conditions that existed prior to the improvements for all return period storms (i.e. 2 year to 100 year event). Four catchments (Catchment 100, 200, 300 and 400) have been delineated as shown in **Exhibit 1** based on storm sewer outlets and overland flow patterns for the study limits and the required storage volume needed for each of the catchments was calculated.

With the proposed improvements, no overland flow patterns have been changed and the only change to existing conditions is the added impervious area from the additional bike lanes. This has slightly increased the overall runoff coefficients for catchment 100 and 200.

Proposed water quantity control measures are only responsible for controlling the flows generated by the roadway (added track lanes impervious area) within the study limits. Therefore, the external area flows are not included in the total catchment flows. The analysis calculated the pre-development flows, post-development flows as well as storage volume required to match post-development condition to pre-development conditions. Based on the calculations, catchment 100 and 200 require 62 and 76 m^3 of storage volume respectively. There is no imperviousness area increase or any other changes to catchment 300 and 400, therefore no quantity control measures are required.

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wsp	STORMWATER MANAGEMENT, DRAINAGE MOSAIC	EXHIBIT
	19M-00836-03 Rathburn Road & Ponytrail Drive	1

5.2.2 WATER QUALITY CONTROL

The Stormwater Management Planning and Design Manual (SWMPDM) provides technical and procedural guidance for the planning, design and review of SWM practices. In particular, the manual regulates water quality treatment levels corresponding to the removal of a percentage of total suspended solids (TSS) from the runoff prior to discharging to the receiving water body.

The stormwater management criterion stipulates that all watercourses and water bodies within TRCA's jurisdiction are classified as requiring an Enhanced level of protection (Level 1). Level 1 water quality protection is equivalent to 80% TSS removal on an average annual basis shall be provided through stand-alone measures or treatment trains. To minimize thermal impacts, preventative measures (i.e. LID practices) and mitigation measures should be applied.

Water quality control calculations conducted assume that all water quality treatment for all the newly added paved area is to be provided by infiltration facilities (i.e. LID features). CB Shields (catch basin baffle), Oil and grit separator (OGS units) and level spreaders / inlet sumps should be considered as options available as water quality control at places where LID features aren't feasible and to be explored further as part of the detail design.

As per Table 3.2 of the MOECC SWMPDM, an infiltration volume of 10.1 m^3 is required to provide 80% TSS removal for the newly added impervious area of 0.26 ha for Catchment 100 and an infiltration volume of 12.5 m3 is required to provide 80% TSS removal for the newly added impervious area of 0.31 ha for Catchment 200. There are no proposed changes to the roadway for Catchments 300 and 400 with no new impervious area added. Therefore, no water quality treatment is required for Catchments 300 and 400.

5.2.3 EROSION CONTROL AND WATER BALANCE

Stormwater runoff from developed sites impacts streams and watercourses by introducing erosive forces during frequent storms. In addition, the alteration of the hydrologic regime from raw land reduces the amount of water that would naturally evaporate, transpire or infiltrate, essentially generating more runoff volume. These impacts are the target of the requirement outlined within this section with the goal being to reduce stormwater runoff volume from developing sites. Practices implemented to address this criterion may assist in mitigating erosion and water balance to address the City of Mississauga and Conservation Authority requirements.

The first 5 mm of runoff shall be retained on-site and managed by way of infiltration, evapotranspiration or re-use. It is assumed that all landscaped areas will retain at least 5 mm of rainwater prior to runoff generation due to shallow depression storage and wetting, with consequent evaporation. The volume of runoff during a 5 mm storm event are listed below for each catchment:

- Catchment 100: 12.8 m^3
- Catchment 200: 15.6 m^3

There are no proposed changes to the roadway for catchments 300 and 400 with no new impervious area added. Therefore, no stormwater runoff volume reduction is needed for catchments 300 and 400. Note that these volumes are greater than the water quality treatment volume requirements and are the governing factor of the stormwater retention on site for catchments 100 and 200.

5.2.4 SUMMARY OF SWM CRITERIA AND RECOMMENDED MITIGATION

Table 5.1 SWM criteria, requirements and recommendation mitigation

Catchment ID	Increase in Impervious area under Proposed Condition (ha)	Water Quantity Required Storage (m^3)	Water Quality Required Treatment Volume (m^3)	Stormwater volume runoff reduction (m^3)	Recommended Measures
100	0.26	62	10.1	12.8	Surface and/or underground storage options to be further explored during detail design.
200	0.32	76	12.5	15.6	Infiltration gallery, infiltration chamber or bioretention units can provide up to 400 m3 of storage which satisfies all criteria.

5.2.5 STORM SEWER CAPACITY ANALYSIS

There are multiple storm sewer systems in the study area that discharge to various locations as shown in below in **Exhibit 2**. There are five main outlets for the study area, as summarized below:

- Outfall MH-31 located at the intersection of Rathburn Rd. E and Fieldgate Dr.
- Outfall MH-50 located at the intersection of Ponytrail Dr. and Maple Ridge Dr.
- Outfall MH-122 located around 65 m north of the intersection of Ponytrail Dr. and Maple Ridge Dr.
- Outfall MH-169 located at the intersection of Rathburn Rd. E and south exit of Garnetwood Chase.
- Outfall MH-181 located at the intersection of Rathburn Rd. E and north exit of Garnetwood Chase.

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STORM SEWER ASSESSMENT

19M-00836-03 Rathburn Road & Ponytrail Drive

EXHIBIT

2

The storm system analysis summary is noted below and is based on the following criteria and assumptions:

- Information derived from the available as-built drawing sets;
- the capacity of the storm sewer system was computed using the standard City of Mississauga storm sewer design sheet;
- assumed a Manning's n of 0.013;
- A rainfall intensity of 63.5 mm/hr (approximate 2-year storm event) has been assumed as part of the existing conditions capacity analysis for the segments with missing data as it is an average intensity for the runoff calculations; and
- Pipes that exceed a maximum capacity of 90% were recommended to be replaced.

Table 5.2 Storm Sewer System Assessment

Catchment	MH U/S	MH D/S	Ex. Size (mm)	Length (m)	Slope (m/m)	Ext. Capacity	Meets Criteria (Y / N)	Size which meets the 90% Cap. Req. (mm)	Prop. Capacity
MH31 Outfall									
CM-1	MH-17	MH-18	1350	100	0.005	98%	N	**1500**	74%
CM-2	MH-18	MH-30	1350	103.6	0.005	99%	N	**1500**	75%
CM-3	MH-30	MH-29	1200	109.7	0.011	91%	N	**1500**	50%
CM-4	MH-29	MH-12	1350	91.4	0.007	83%	Y	**1500**	63%
CM-5	MH-12	MH-13	1350	91.1	0.008	106%	N	**1500**	80%
CM-6	MH-13	MH-14	1350	91.4	0.008	106%	N	**1500**	80%
CM-7	MH-14	MH-29 EX	1350	24.7	0.008	113%	N	**1500**	86%
CM-8	MH-29 EX	MH-31	1350	135.3	0.011	99%	N	**1500**	75%
Junction at MH 70									
N/A	MH-65	MH-66	375	80.2	0.009	45%	Y	N/A	N/A
N/A	MH-66	MH-67	750	90.2	0.006	83%	Y	N/A	N/A
N/A	MH-67	MH-68	825	91.4	0.006	87%	Y	N/A	N/A
CM-21	MH-68	MH-70	975	95.4	0.007	81%	Y	N/A	N/A
MH122 Outfall									
CM-9	MH-48	MH-49	600	85.3	0.006	78%	Y	N/A	N/A
CM-10	MH-49	MH-50	675	90.2	0.007	80%	Y	N/A	N/A
CM-11	MH-50	MH-61	750	44.5	0.012	46%	Y	N/A	N/A
CM-12	MH-61	MH-61A	825	69.8	0.011	69%	Y	N/A	N/A
CM-12	MH-61A	MH-63	825	25.9	0.011	87%	Y	N/A	N/A
CM-13/14	MH-63	MH-64	825	82.3	0.013	79%	Y	N/A	N/A
CM-15/16	MH-64	MH-70	825	89.3	0.015	84%	Y	N/A	N/A
CM-17	MH-70	MH-71	1350	80.8	0.006	70%	Y	N/A	N/A

Catchment	MH U/S	MH D/S	Ex. Size (mm)	Length (m)	Slope (m/m)	Ext. Capacity	Meets Criteria (Y / N)	Size which meets the 90% Cap. Req. (mm)	Prop. Capacity
CM-18	MH-71	MH-95	1350	76.8	0.006	71%	Y	N/A	N/A
N/A	MH-95	MH-122	2700	162.5	0.002	17%	Y	N/A	N/A
MH 50 Outfall									
CM-19	MH-110	MH-112	375	94.5	0.004	103%	N	**450**	63%
CM-20	MH-112	MH-50	675	47.2	0.006	47%	Y	N/A	N/A
MH 169 Outfall									
N/A	MH-154	MH-169	1050	55.5	0.012	90%	Y	N/A	N/A
N/A	MH-166	MH-167	300	50.9	0.032	47%	Y	N/A	N/A
N/A	MH-167	MH-169	450	52.1	0.025	128%	N	**525**	85%
MH 181 Outfall									
N/A	MH-179	MH-180	525	89.9	0.008	102%	N	**600**	90%
N/A	MH-180	MH-181	525	91.4	0.01	92%	N	**600**	64%

The storm sewer analysis recommended the replacement of some storm sewers based on capacity considerations. However, the City does not intend replacing these sewers at this time, Instead the City will evaluate the installation of a super pipe and inlet structure at the Rathburn Road East cul-de-sac as part of the detail design phase. Additional downstream analysis should also be carried out as part of the detail design phase o assess the downstream impacts on the storm sewers within the project limits.

5.2.6 STORM SEWER CONDITION ASSESSMENT

A CCTV condition assessment was completed for storm sewers not previously assessed by the City. A map which identifies the sewers previously assessed and those completed as part of this project is located below in **Exhibit 3**

The CCTV inspections were completed in two (2) separate occasions due to access limitations and sewer conditions. Storm sewer runs 2028949 and 9854 were removed from the inspection program as they were deemed to not be a priority.

The first inspections were completed on December 22, 2020 and included storm sewer segments 9979, 10038, 9870, and 9825. The CCTV Summary and Inspection Reports are included in **Appendix G** and CCTV media files have been delivered to the City for each section.

The second inspections were completed on January 20, 2022 and included storm sewer segments 9852, 9975, 31637, and 31639. The CCTV Summary and Inspection Reports are included in **Appendix G** and CCTV media files have been delivered to the City for each section.

5.2.6.1 *INSPECTION RESULTS*

The CCTV program attempted to inspect eight (8) sewer runs as noted above with sewer sizes ranging from 375 to 2700mm in diameter for a total distance of 573.9m. All inspected sewers are made of concrete. Due to a significant obstruction, pipe run 31639 could not be inspected.

<u>Structural Deficiencies</u>

The structural condition of the pipes were assessed, and the following deficiencies were found:

- Longitudinal cracking
- Circumferential cracking
- Spiral cracking
- Fracture

<u>Operation and Maintenance Deficiencies</u>

The operational and maintenance of the pipes were assessed, and the following deficiencies were found:

- Obstructions including metal bars, MH lids, leaves, rocks and sediment
- Standing water
- Infiltration

5.2.6.2 *RECOMMENDATIONS AND COMMENTS*

<u>Structural Recommendations</u>

The majority of the defects observed are minor in nature and will not affect the operation of the sewers. There was one pipe fracture observed in pipe segment 9870 located 1.0m in from STMH8 and a spot repair at this location is recommended.

<u>Operations and Maintenance Recommendations</u>

There were several obstructions observed within the surveyed sewers that are impacting the operation of the sewers. These obstructions range from minor obstructions (leaves / sediment) to more substantial obstructions (metal bars / MH lids).

It is recommended that the sewers with significant obstructions be cleaned / flushed to remove the obstructions to allow the sewers to operate with maximum efficiency.

A spot repair is recommended to alleviate the infiltration runner observed within pipe segment 9975 located 41.3m from STMH3.

Given the relatively minor nature of the deficiencies the City will not be undertaking any major capital repair or replacement of drainage infrastructure as part of the Integrated Road Project aside from opportunistic scenarios such as the proposed super-pipe construction on Rathburn Road East.


HICKORY
DRIVE
POLTAV
BACCHUS CRES
HARTFIELD GROVE
LOVELADY
WARREN
DRIVE
ROAD
CORKSTONE
GLADE
DRIVE
ROWNTREE
CT.
CLAYPINE
RISE
BEECHES
SCADDEN
OWLSNEST
LANE
BEECHKNOLL
AVE.
GARNETWOOD
MARBLETHORNE
COURT
CHASE
EAST
9870
CREEK
ANWORLD
PLACE
ANWORLD
COURT
GRAZIA
CT.
BLVD.
FIELDGATE
CAPILANO
COURT
9975
10038
9825
ROAD
RATHBURN
ROAD
EAST
RATHBURN
BLVD.
9979
OAK
CT.
OTTEWELL
BRYCE
COLFAX
CT.
ROCKWOOD
SHALE
SHALE OAK
MEWS
UNICORN
CT.
TAPESTRY
TRAIL
GARNETWOOD
TRAIL
GARROWHILL
BEECHES
BOOTH
CRES.
ROAD
MAPLE
DRIVE
BRANCHWOOD
PARK
RIDGE
PONYTRAIL
31637
31639
2028949
DRIVE
RIVER
WAY
CHASE
9854
MILL
DEWBERRY
CRES.
LANDING
CT.
KINGS
LEWES
WAY
DIXIE
FIELDGATE
SALTDENE
TERRACE
MAHOGANY
ROW
DR.
9852
LOOKOUT
COURT
ETOBICOKE
RUTLEY
CIRCLE
PICKMERE
CT.
BURNHAMTHORPE
ROAD
EAST
GULLEDEN
DR.
GLEN
CHIPLOW RD.
DENBURN
PLACE
CIRCLE
DR.
PAGEHURST
AVE.
PAGEHURST AVE.
PAGEHURST
CT.
DR.
STONEPATH
CRES.
ROAD
CITY OF TORONTO
SCALE 1:2500
LEGEND
STORM SEWER WITH NO INSPECTION RECORDS
STORM SEWER WITH INSPECTION RECORDS
STORM SEWER OUT OF STUDY AREA

5.3 LOW IMPACT DEVELOPMENT ASSESSMENT (LID)

The City has identified two potential LID locations within the study area to be reviewed for prospective LID opportunities as part of the roadway improvements as follows:

- Potential LID to enhance an existing drainage feature within the boulevard at the Rathburn Road East cul-de-sac.
- Potential LID within the centre medians and traffic islands on Ponytrail Drive, between Rathburn Road East and Maple Ridge Drive.

The technical memo attached as **Appendix E** outlines that the first location noted above is not an ideal opportunity for LID implementation due to surface water flowing away from the potential location.

The second location has been reviewed and WSP has identified three (3) potential alternatives which are analysed in the table below:

Table 5-3: Different LID alternatives comparison

LID Type	Advantage	Disadvantage	Criteria Assessment
Infiltration Gallery	Well suited where available space for infiltration is limited to narrow strips of land along road rights-of-way.	Risk of ground water and soil contamination (low to moderate possibility)	Achieves water balance benefit, water quality improvement benefits and partial stream channel erosion control benefit (depending on soil infiltration rate). There is 3320 m^2 of space available within the boulevard to be used for LID features (does not have to utilize all of it). Assuming a 300 mm depth and 40% void ratio, around 400 m^3 of storage is available which satisfies all criteria.
Infiltration Chamber	Due to the large volume of underground void space an infiltration chamber creates in comparison to a soakaway of the same dimensions, and the modular nature of the design, infiltration chambers are well suited to sites where available space for other LIDs are limited, or where it's desirable for the facility to have little or no surface footprint.	Risk of ground water and soil contamination (low to moderate possibility)	Achieves water balance benefit, water quality improvement benefits and partial stream channel erosion control benefit (depending on soil infiltration rate). There is 3320 m^2 of space available within the boulevard to be used for LID features (does not have to utilize all of it). Assuming a 300 mm depth for the infiltration tank, around 500 m^3 of storage is available which satisfies all criteria.

LID Type	Advantage	Disadvantage	Criteria Assessment
Bioretention	Bioretention can be adapted to fit into many different development contexts and provides a convenient area for snow storage and treatment. It meets the local stormwater requirements while using space that would be landscaped anyway.	Risk of ground water and soil contamination (low to moderate possibility)	Provides partial water balance benefits (based on available storage volume beneath the underdrain and soil infiltration rate), satisfies water quality improvement and partial stream channel erosion control benefits (based on available storage volume beneath the underdrain and soil infiltration rate). There is 3320 m^2 of space available within the boulevard to be used for LID features (does not have to utilize all of it). Assuming a 300 mm depth and 40% void ratio, around 400 m^3 of storage is available which satisfies all criteria.

There are different options that can be explored further and even though all three possible alternatives provide similar disadvantages, each provides a unique advantage. All of the three options listed satisfies the infiltration volume required. More design details of the LID features listed should be further explored in the detail design stage. Discussion with City Staff will be required to determine which LID solution shall be selected for detailed design.

5.4 CULVERT ASSESSMENT

As part of the preliminary design the existing 1800 mm diameter culvert that crosses Ponytrail Drive immediately north of Maple Ridge Drive was assessed for capacity.

This memorandum attached as **Appendix F** outlines the required performance standards, documents design flows, recommended replacement methodology, and details the development of the hydrologic methodology and hydraulic model used to evaluate the drainage system.

This assessment assumed that the minor flows will be captured by the existing stormwater network system and the flows beyond the 5 year return period will be diverted through the culvert.

The following summarizes the report findings:

- The existing Culvert meets desirable and minimum freeboard criteria and also achieves the minimum 0.6 m cover above the culvert.
- For the replacement option like for like is recommended
- It is recommended that the culvert be replaced by open-cut excavation as part of the road reconstruction project

5.5 UTILITIES

As part of the preliminary design the project team undertook a Subsurface Utility Engineering (SUE) Level B study to collect all available utility data for the corridor within the project limits. The SUE information acquired is attached as **Appendix R** The information gathered was utilized to complement the topographical survey and base plan to present a comprehensive existing conditions plan.

The preliminary design was derived with the understanding that existing utilities may conflict with the proposed improvements however relocations should be minimized where possible

The preliminary engineering design plans are included as **Appendix A** and note the requirements for utility relocations based on the preliminary design.

All utilities impacted by the proposed improvements will need to be relocated. As detailed design progresses, there will be ongoing coordination with affected utility companies.

A summary of impacted utilities and infrastructure is noted below:

Table 5.4 Utility Conflicts

Utility Relocations and Conflicts				
Original Location				WSP Comments
Approx. Station	Location			
	Offset (m)	L/R	Alignment	
Bell Pedestal Relocates				
0+019.07	8.7	L	Rathburn Cul de Sac	Bell pedestal in conflict with proposed sidewalk and curb.
0+214.73	16.6	R	Rathburn Cul de Sac	Bell pedestal in conflict with proposed cycle track
Bell Handwell Relocate (TBD, see alt in roll plan)				
1+846.8	14.1	L	Rathburn Ponytrail	Bell handwell in conflict with proposed cycle track. Alternate solution is to raise bell handwell to finished grade
Rogers Pedestal Relocate				
1+537.42	15.1	R	Rathburn Ponytrail	Rogers pedestal in conflict with the proposed cycle track.
Traffic Control Cabinet Relocate				
0+022.44	9.3	L	Rathburn Cul de Sac	Traffic Control Cabinet in conflict with the proposed sidewalk.
Fire Hydrant Relocate				
0+282.32	12.7	L	Rathburn Ponytrail	Fire Hydrant in conflict with proposed cycle track
1+023.56	17.5	L	Rathburn Ponytrail	Fire Hydrant in conflict with proposed sidewalk
1+457.39	11.0	L	Rathburn Ponytrail	Fire Hydrant in conflict with proposed cycle track
1+621.20	12.9	L	Rathburn Ponytrail	Fire Hydrant in conflict with proposed cycle track
0+415.33	16.8	R	Rathburn Cul de Sac	Fire Hydrant in conflict with proposed cycle track
Traffic Signal Pole (TSP) Relocate				

Utility Relocations and Conflicts				
Original Location				**WSP Comments**
Approx. Station	**Location**			
	Offset (m)	**L/R**	**Alignment**	
0+024.1	0.9	L	Rathburn Ponytrail	TSP in conflict with proposed crossride in intersection
0+029.8	13.0	R	Rathburn Ponytrail	TSP in conflict with proposed crossride in intersection
0+031.25	12.8	L	Rathburn Ponytrail	TSP in conflict with proposed crossride in intersection
0+063.77	14.8	R	Rathburn Ponytrail	TSP in conflict with proposed travel lane in intersection
0+064.32	12.4	L	Rathburn Ponytrail	TSP in conflict with proposed crossride in intersection
0+070.64	1.0	R	Rathburn Ponytrail	TSP in conflict with proposed crossride in intersection
0+241.94	11.7	L	Rathburn Ponytrail	TSP in conflict with proposed cycle track in intersection
0+245.24	14.3	R	Rathburn Ponytrail	TSP in conflict with proposed sidewalk in intersection
0+250.87	15.9	L	Rathburn Ponytrail	TSP in conflict with proposed sidewalk in intersection
0+271.42	12.6	L	Rathburn Ponytrail	TSP in conflict with proposed cycle track in intersection
0+271.88	9.9	R	Rathburn Ponytrail	TSP in conflict with proposed cycle track in intersection
0+976.86	1.4	L	Rathburn Ponytrail	TSP in conflict with proposed left-turn lane
1+021.2	1.8	R	Rathburn Ponytrail	TSP in conflict with proposed travel lane (TSP shown in Utilities file)
1+552.44	1.1	L	Rathburn Ponytrail	TSP in conflict with proposed crosswalk in intersection
1+557.48	12.8	L	Rathburn Ponytrail	TSP in conflict with proposed travel lane in intersection
1+561.82	12.8	R	Rathburn Ponytrail	TSP in conflict with proposed realignment of Rathburn
1+584.42	12.5	R	Rathburn Ponytrail	TSP in conflict with proposed realignment of Rathburn
1+585.54	12.4	L	Rathburn Ponytrail	TSP in conflict with proposed curb

Notes

Street light poles to be replaced / relocated as per the illumination assessment

Traffic signals to be redesigned and replaced as part of detailed design

5.6 STREET LIGHTING

5.6.1 EXISTING CONDITIONS

Continuous roadway illumination exists within the entire project limits. Based on information provided by the City of Mississauga, most of the lighting infrastructure was constructed prior to 1979, making the installation more than 40 years old. The infrastructure consists of cobrahead style roadway luminaire mounted on direct buried concrete poles along both sides of the roadway, with underground ducts and cables.

The original high pressure sodium luminaires were converted to LED luminaires as part of the City's energy saving initiatives in 2014.

According to the City's streetlighting asset management and maintenance personnel, there have been operational issues with the underground wiring, requiring remedial work. Additionally, there have also been concerns raised from the residents and users that illumination levels on the roadway are not bright enough and also a few concerns have also been raised about the brightness of the lighting being too high.

5.6.2 CURRENT ILLUMINATION STANDARDS

The City has adopted the ANSI/IES RP-8-18, Recommended Practice for Design and Maintenance of Roadway and Parking Facility Lighting. This document is published by the Roadway Lighting Committee of Illuminating Engineering Society of North America (IESNA).

Rathburn Road has been classified as a Major Roadway, with High Pedestrian Activity. Based on this classification, the following criteria are applicable for illumination of the roadway:

- Average Maintained Pavement Illuminance (Lavg) = 1.2 cd/m2
- Average to Minimum Uniformity Ratio (Lavg/ Lmin) = 3.0:1
- Maximum to Minimum Uniformity Ratio (Lmax/ Lmin) = 5.0:1
- Maximum Veiling Luminance Ratio (LV, max/ Lavg) = 0.3

Rathburn Road, north of Ponytrail Drive, has been classified as a Collector Roadway, with Medium Pedestrian Activity. Based on this classification, the following criteria are applicable for illumination of the roadway:

- Average Maintained Pavement Illuminance (Lavg) = 0.6 cd/m2
- Average to Minimum Uniformity Ratio (Lavg/ Lmin) = 3.5:1
- Maximum to Minimum Uniformity Ratio (Lmax/ Lmin) = 6.0:1
- Maximum Veiling Luminance Ratio (LV, max/ Lavg) = 0.4

The City has established a Light Loss Factor (LLF) of 0.85 (a maintenance factor allowing for the degradation of light output over time due to two major factors - age of luminaire, and dirt accumulation on the optical system of the luminaire).

5.6.3 ANALYSIS AND CONSULTATION

As part of the lighting study, WSP performed lighting calculations modeling the existing street lighting infrastructure in AGI32. The photometrics utilized were provided by the City for their approved luminaires. The goal of this assessment was to determine whether the existing lighting meets the current lighting criteria.

The assessment determined that along Rathburn Road East, west of Ponytrail Drive, is severely under illuminated. Calculations determined that the average roadway luminance is 0.82 cd/m^2, 68.5% of the recommended level outlined in the City's criteria. Roadway lighting levels along Rathburn Road East, north of Ponytrail Drive, are significantly higher than the City's criteria for a collector roadway with medium pedestrian conflict. Calculations determined that the average roadway luminance along segments of this roadway ranged from 0.8 cd/m^2 to 1.3 cd/m^2, much higher than the recommended 0.6 cd/m^2. Additionally, the average illuminance at four of the five intersections within the project scope fall below the recommended lighting levels.

Table 5.5 Intersection Illumination Summary

Area	Functional/Street Classification	Description	Design Criteria	Calculated Values/Existing lighting levels
Intersection	Major/Major (High)	Dixie Road & Rathburn Road	Avg. Illuminance (Lux) = 34 Avg. Uniformity Avg/min (u0) = 3	Avg. Illuminance (Lux) = 25.9 Avg. Uniformity Avg/min (u0) = 2.1 Max/min ratio = 4.5
Intersection	Major/Local (High)	Bough beeches & Rathburn Road	Avg. Illuminance (Lux) = 26 Avg. Uniformity Avg/min (u0) = 3	Avg. Illuminance (Lux) = 20.0 Avg. Uniformity Avg/min (u0) = 2.7 Max/min ratio = 4.2
Intersection	Major/Collector (High)	Fieldgate Drive & Rathburn Road	Avg. Illuminance (Lux) = 29 Avg. Uniformity Avg/min (u0) = 3	Avg. Illuminance (Lux) = 22.1 Avg. Uniformity Avg/min (u0) = 1.4 Max/min ratio = 1.8
Intersection	Major/Major (High)	Ponytrail Drive & Rathburn Road	Avg. Illuminance (Lux) = 34 Avg. Uniformity Avg/min (u0) = 3	Avg. Illuminance (Lux) = 22.2 Avg. Uniformity Avg/min (u0) = 2.6 Max/min ratio = 3.0
Intersection	Major/Major (High)	Ponytrail Drive & Burhamthorpe Road	Avg. Illuminance (Lux) = 34 Avg. Uniformity Avg/min (u0) = 3	Avg. Illuminance (Lux) = 38.9 Avg. Uniformity Avg/min (u0) = 1.8 Max/min ratio = 2.5

Assessment of the existing lighting on the proposed cycletrack and sidewalks was also conducted, using the below criteria from RP-8-18:

Avg Maintained Illuminance (horizontal) = 5 Lux

Avg/Min Ratio (horizontal) = 4:1

Minimum Vertical Illuminance = 5 Lux

The existing lighting is not providing enough illumination for pedestrians/bicyclists along the proposed facilities. Additionally, a significant portion of the existing lighting infrastructure is impacted by the proposed improvements. As a result of the impact, the City's streetlighting asset management and maintenance personnel a completely new lighting plan has been developed as shown on the preliminary engineering design plans included in **Appendix A**.

Preliminary illumination design calculations were performed to generate a general scheme for lighting pole layout. Calculations were performed with AGI32 lighting design software using the latest photometric files for the City's approved luminaires. The design of new lighting takes into consideration the proposed facilities.

5.7 TRAFFIC SIGNALS

There are currently four intersections operating with traffic signals within the project area including:

- Rathburn Road E / Dixie Road
- Rathburn Road E / Bough Beeches Boulevard (West)
- Rathburn Road E / Fieldgate Drive
- Rathburn Road E / Ponytrail Drive

The preliminary design does not suggest any changes to the location of existing traffic signals. The proposed including the alterations to the curb radii and the pedestrian and cycling improvements will require the relocation of the existing traffic signals.

Improvements to Rathburn Road E and Dixie Road intersection will be undertaken by the Region of Peel as part of a separate Dixie Road improvement project. As such, the traffic signal detailed design and construction will only include the modifications to the three remaining intersections noted above.

In addition, City staff recommended three new signalised pedestrian crossing facilities along Rathburn Road and Ponytrail Drive at the following locations:

- Rathburn Road E / Rockwood Intersection
- Rathburn Road E / ORT 11 Trail Crossing
- Ponytrail Drive / Shaver Trail Crossing

These recommendations have been based on the City's Vision Zero Action Plan that includes a Vision Zero Checklist for road-related projects to identify opportunities to exceed facilities provided for vulnerable road users where the existing warrant process is not sufficient.

The design of the traffic signals shall be completed as part of the detailed design stage.

5.8 NOISE WALLS

The City completed a noise assessment for the road corridors within the project limits and identified candidate locations for its Noise Barrier Retrofit Program. The identified locations include all four quadrants of the Rathburn Road and Fieldgate Drive intersection and along Ponytrail Drive towards Burnhamthorpe Road.

The City's preferred noise wall design includes a 2.2m high concrete noise wall located 0.3m inside the road right of way, similar to the noise wall utilized elsewhere along the corridor and as shown below

Figure 5.1 Example of Existing Noisewall

5.8.1 OPTIONS ANALYSIS

Based on potential utility conflict considerations, the project team reviewed the following locations for the proposed noise wall at the Rathburn Road and Fieldgate intersection:

- Option 1 - 0.3m inside of existing City road right of way
- Option 2 - At the location of existing wood privacy fencing (property required).

City staff met with appropriate condo boards to review the potential for constructing the noise walls, alternative locations, wall esthetics, and impacts to existing facilities. All condo boards were notified that the installation of the noise walls was at their discretion and subject to the City obtaining the necessary easements or land interests then the noise wall installation.

The project team analysed the two options and found the following challenges:

Option 1

- Multiple underground infrastructure would require relocation as noted below
  - 700m underground hydro
  - 500m underground gas
  - 500m underground communication cable
  - Various pedestals and utility MH's
- The proposed noisewall created a sightline obstruction for right turning vehicles on southeast and northwest quadrants of the Rathburn Road E and Fieldgate Drive intersection
- Constructing a noisewall adjacent to the property line will create an open space between the proposed noisewall and existing privacy fence. This causes maintenance and safety concerns.

Option 2

- The City will be required to acquire approximately 1960 m2 of private property
- Existing privacy fence would need to be removed prior to installation of noisewall
- Several mature trees would be impacted and require removal
- Potential impacts to underground utility servicing that can likely be mitigated during the detailed design stage.

5.8.2 PREFERRED ALTERNATIVE

After reviewing the two options and discussing with the condo boards, the preferred alternative is to replace the existing privacy fences with concrete noisewalls were required (Option 2).

The preliminary noisewall plan is included as **Appendix H**.

5.9 TREE ASSESSMENT

Certified arborists conducted a tree assessment of 201 trees within the City ROW and an additional 41 trees on private property as part of the Rathburn Road East and Ponytrail Drive Integrated Road Project. The complete Arborist Report can be found in **Appendix J**. The trees are comprised of 19 species. Trees ranged in age from young to mature, with a DBH range of 10 to 58 cm. Most trees are in good condition. Additional trees under 10 cm DBH are present and were not inventoried.

Street trees are not protected under a by-law; however, the Tree Preservation and Protection Standards apply. The City of Mississauga's Private Tree By-law applies to trees on private property. If any parkland trees are identified during detailed design as being impacted by the proposed works, the Parks By-law will apply.

TRCA regulations apply to trees within its regulation area along Armour Creek (within the study area), and along Etobicoke Creek (just outside of the study area).

Ash (Fraxinus ssp.) trees are present within the study area. CFIA restrictions on the movement of ash wood apply due to possible infestation by the invasive Emerald Ash Borer beetle. One tree species is a Species at Risk: Kentucky Coffee Tree, however these represent planted trees and therefore they are not regulated under the Endangered Species Act.

Suitable migratory bird habitat is present within the study area; therefore, the Migratory Birds Convention Act and its Regulations apply. Infractions to the Migratory Birds Convention Act and its Regulations has the potential to occur during the construction phase, potentially impacting migratory birds, nests and eggs. Migratory bird habitat on the subject property may be found in trees, shrubs, ground vegetation (i.e. grass and forbs) and built structures. To minimize the possibility of contravention to the Act and its Regulations, vegetation removals and work within vegetated areas (e.g. moving of heavy equipment), or work on buildings where birds may nest, should occur outside of the "regional bird nesting period" (approximately April 1 to August 31). If work must occur during this period, please, mitigation measures as noted within the Arborist report should be followed.

5.9.1 TREE REMOVAL

In general, tree removals are required where the proposed works will either completely impact the tree or significantly affect the critical root zone and encroach into 3x the trunk diameter. The report identified 59 trees for removal which are identified within the report.

5.9.2 TREE INJURY

The location of the limit of excavation, work to access to install cycle facilities has the potential to encroach into and require a reduction of the Tree Protection Zone's (TPZ) of trees. Specific mitigation measures e.g. Air Spade / Hydro-vacuum excavation or horizontal root protection may be recommended to be applied as detailed in the report to reduce the potential for root damage by excavation, compaction and construction. There are 34 trees identified as potential tree injury candidates and the mitigation measures include roots and branches pruning in accordance with the recommendations identified in the report.

5.9.3 MITIGATION MEASURES

The survival rates for trees, which are in proximity to construction, are dependent on the resultant changes to a variety of environmental and anthropogenic factors. These construction activities bring about changes to a variety of environmental features such as the existing microclimate that includes winds, air temperature, soil moisture, amount of available sunlight, soil quality, and the level of the water table. Increased human activities may also damage the structure and/or physiological activities of the trees. The full effects of any damage that occurs may not appear until several years after its occurrence. Thus, it is essential that both vegetative clearing and preservation methods follow the guidelines below and those generally accepted as keeping with good horticultural and construction practices. The guidelines are subject to adjustments deemed reasonable and appropriate considering the proximity and number of trees involved and the site-specific servicing requirements.

The mitigation measures recommended for this project are identified in detail within the can be found with the report and include vacuum excavation, root protection, root pruning, branch pruning, migratory bird protection and construction implementation techniques.

5.9.4 COMPENSATION

To facilitate the proposed works tree removals may be required. The proposed compensation for the 55 trees identified for removal is 169 new trees. The details of the compensation criteria and ratios are outlined within the report.

5.10 SAFETY

5.10.1 EXISTING CONDITIONS

A quantitative analysis of the safety performance of eight existing intersections on the Rathburn Road and Ponytrail Drive corridors was conducted. The safety performance of the eight existing intersections was examined to identify intersections with the greatest potential for road safety improvement. This analysis was based on the most recent collision data, traffic volumes and physical characteristics for the study area intersections.

The safety analysis approach calculated expected average collision frequency for each of the existing intersections using regression equations called Safety Performance Functions (SPFs). An SPF is a relationship between the amount of traffic approaching a particular type of intersection and its safety performance. The City of Mississauga has developed SPF’s for several classes of roadways and intersections to estimate expected collision frequencies based on regression analysis of their collision dataset. These SPF’s are adjusted as necessary using Collision Modification Factors (CMFs) contained in the HSM to account for existing intersection features (geometry, lighting, turning lanes, etc.).

The SPF was then combined with historical collision data from the study area intersections to calculate a Smoothed SPF Estimate. The potential for safety improvement is then determined by comparing the smoothed collision estimates (Column C) to the expected collision estimates (Column A), indicating if any intersection location is experiencing more collisions than expected. These results are summarized below.

Table 5.3 Intersection Collision Analysis

		A	B	C
#	Rathburn/Ponytrail Intersections	SPF Estimates Annually Expected and Collision Frequency (collisions/year)	Observed Collisions Average Annually Observed Collision Frequency (collisions/year)	Smoothed SPF Estimates Annually Expected Collision Frequency (collision/year)
1	Burnhamthorpe Rd and Ponytrail Dr	3.83	0.80	2.26

		A	B	C
#	Rathburn/Ponytrail Intersections	SPF Estimates Annually Expected and Collision Frequency (collisions/year)	Observed Collisions Average Annually Observed Collision Frequency (collisions/year)	Smoothed SPF Estimates Annually Expected Collision Frequency (collision/year)
2	Rathburn Rd and Bough Beeches Blvd (east)	0.38	0.40	0.40
3	Rathburn Rd and Bough Beeches Blvd (west)	1.83	1.80	1.85
4	Rathburn Rd and Capilano Ct	0.10	0.40	0.12
5	Rathburn Rd and Garnetwood Chase	0.31	0.40	0.31
6	Rathburn Rd and Ponytrail Dr	1.60	0.40	1.06
7	Rathburn Rd and Rockwood Rd	0.51	0.40	0.47
8	Rathburn Rd and Tapestry Ct	0.37	0.41	0.35

The review indicated that intersections 2, 3 and 4 (highlighted yellow) may have some potential for road safety improvement. However the potential is very low (<0.02 collision per year) and it would be difficult to see a noticeable increase in the safety at these intersections.

For the remainder of the intersections, they are operating as expected (or better) and indicate no safety concerns.

5.10.2 PROPOSED CONDITIONS

While no specific intersection improvements were recommended by the safety assessment a number of general safety improvement were proposed by the Project Team to advance the City's Vision Zero policy.

5.10.2.1 PROMOTE SPEED REDUCTION

Currently the operating speed on both sections of Rathburn Road are between 65km/h and 70 km/h. It is hoped that the following countermeasures will help reduce the operating speed and bring it closer to the posted speed of 50km/h.

- Tighter turning radii at intersections
- Narrower lane widths in conjunction with City of Mississauga future Changing Lane Study
- Reduction in number of lanes on Rathburn Road, east of Ponytrail Drive

5.10.2.2 *PHYSICALLY SEPARATE VULNERABLE ROAD USERS*

Studies have shown that separate bike facilities can result in a 40% reduction in the cyclist and motor vehicle collisions

- Installation of dedicated and separated cycling infrastructure

5.10.2.3 *SEPARATE VULNERABLE ROAD USERS FROM VEHICLE TRAFFIC THROUGH TIME BY*

- Removal of channelized right turn lanes
- Providing cross rides with dedicated traffic signals

5.10.2.4 *SUPPORT OR ASSIST DRIVER DECISION-MAKING*

- Improved lighting

5.11 ARCHAEOLOGY ASSESSMENT

The full Stage 1 Archaeological Assessment can be found **in Appendix M** and is summarized below.

The archaeological assessment was requested by the City due to its proximity to Etobicoke Creek and also to be compliant with the Ontario Heritage Act.

Archaeological activities were carried out in accordance with the Standards and Guidelines for Consultant Archaeologists (MHSTCI, 2011). This study involved a review of documents pertaining to the property including historic maps, local histories, archaeological literature and a property inspection. The property inspection was conducted on November 26th, 2020 and all work was conducted from publicly accessible lands.

5.11.1 ARCHAEOLOGICAL POTENTIAL

The study area exhibits several criteria for the presence of Indigenous and Euro-Canadian archaeological potential, including proximity to water sources, historic roadways, and areas of early Euro-Canadian settlement; however, aerial imagery and a property inspection determined that the area has been extensively previously disturbed by modern construction activities. These construction activities are demonstrated by the presence of roadways, modern structures, utilities, grading, ditching, and soil berms. Further evidence of deep and extensive disturbance was demonstrated by the aerial imagery, which documented the use of the eastern part of Rathburn Road East as a quarry throughout much of the early twentieth century before its development as a subdivision.

5.11.2 RECOMENDATIONS

Archaeological recommendations have been made based on the background historic research, locations of known or registered archaeological sites, indicators of archaeological potential, and property inspection. These recommendations include the following:

Background research and a property inspection determined that the study area has been deeply and extensively disturbed. No further archaeological assessment is required.

5.12 TRANSIT

MiWay route 20 services the proposed project area and has standard (40’) buses operating on this route. Within the peak hour this will impact approximately 4 buses.

After a review of existing stops along Rathburn Road and Ponytrail Drive MiWay confirmed there was no opportunity to remove or consolidate any stops based on existing ridership, stop spacing, adjacent land-uses and previous community feedback.

The proposed projects will affect many of the transit stops along Rathburn Road and Ponytrail Drive. Transit stop improvements have been made in consultation with MiWay staff. The project team have modified the transit stop layouts as shown on the preliminary design drawings based on application of MiWay's standard drawings.

MiWay prepared a memo outlining the transit stop improvement requirements for the project which is provided in **Appendix P**. MiWay have confirmed that any improvements to relocate or replace stop markers will be undertaken by them separately. The memo provides consideration for mitigation measures during construction.

6 DESIGN DECISIONS

The following direction was provided by the City during the preliminary stages of design analysis:

- The City's Cycling Master Plan has recommended new cycling facilities on Rathburn Road East and Ponytrail Drive including construction of a cycle track along Ponytrail Drive and Rathburn Road East, between Dixie Road and Burnhamthorpe Road, and a bike lane along Rathburn Road East, east of Ponytrail Drive. Following the public consultation process the Project Team have proposed a two way cycle track on Rathburn Road west of Ponytrail Drive instead of separated bike lane
- To promote slower operating speeds on Rathburn Road west of Ponytrail Drive the Project Team has confirmed that it is feasible to reduce the number of travel lanes from 4 to 2. The project assignment is to facilitate the future detail design and construction of road improvements by completing the planning and preliminary design using a complete streets and multi-modal design approach.
- The preferred option would be to prepare a preliminary design that would not require acquisition of private property. The Project Team reviewed the feasibility of a new multi-lane roundabout at the intersection of Rathburn Road and Ponytrail Drive. However, based on property and cost consideration the Project Team did not recommend a roundabout for this location.
- All travel lanes that accommodate buses can be reduced to a minimum of 3.5m. All other through and turn lanes will be reduced to 3.3m on the 4 lane cross section. The through lanes on the cul-de-sac section to be a minimum of 3.5m
- No raised centre median on the cul-de-sac section.
- Curb radii to be reduced to 9.0m.
- Existing curb and gutter will be replaced as part of the proposed reconstruction.
- It has been assumed that the existing pavement structure (full depth) will be replaced as part of the reconstruction. This shall be confirmed during the detail design phase by means of a geotechnical investigation.
- The designs to be consistent with the latest design guidance from the TAC and Ontario Traffic Manual, including 2020 OTM Book 18 (cycling) update.
- The project shall implement the City's Vision Zero Action Plan including removal of channelized right turn lanes and identify opportunities to exceed facilities provided for vulnerable road users where the existing warrant process is not sufficient.
- The intersection at Dixie Road is under the jurisdiction of Peel Region and is scheduled for improvements for construction in 2028. The proposed cycling and pedestrian upgrades are part of the preliminary design, however, will not be included in the construction work.

7 CONSULTATION

7.1 INTERNAL STAKEHOLDERS

The preliminary design was made available and presented to varies internal stakeholders for feedback in February 2021. The stakeholders attending the presentation meeting included representation from several internal departments including:

- Active Transportation;
- Drainage;
- Capital Works;
- Transit;
- Landscape;
- Forestry; and
- Traffic Signals

Region of Peel staff were also invited and attended this meeting.

The project has been carefully deliberated between the project team and interested internal stakeholders throughout the development of the preferred preliminary design.

7.2 EXTERNAL STAKEHOLDERS

External stakeholders include local residents, business owners, neighbourhood associations and the various utility organizations and companies that own property and infrastructure along Rathburn Drive and Ponytrail Drive. The utility related stakeholders have been contacted to collect data related to their existing plant.

As the project proceeds through detailed design, copies of the design drawings illustrating the service and utility data collected should be distributed to the various organizations for infrastructure confirmation.

7.3 PUBLIC CONSULTATION

There have been several opportunities for the public consultation throughout the preliminary design process of the project. The project team added additional consultation venues during the development of the preferred preliminary design to address the significant interest in the corridor modifications. Details of each event are summarized below and detailed in **Appendix N**.

7.3.1 COMMUNITY INFORMATION CENTRE

City Staff held a Community Information Session prior to the official start of the project in November of 2019 to present potential active transportation improvements and received feedback on the alternatives presented.

7.3.2 PUBLIC INFORMATION CENTRE (PIC) #1

Due to the circumstances caused by the COVID-19 pandemic, the Public Information Centre (PIC) was held exclusively online.

The purpose of the online PIC was to:

- Provide an overview of the study purpose and study area;
- Identify the opportunities and considerations for improvements along the Study corridors;
- Provide an overview of the applicable policies;
- Review the existing conditions in the study area;
- Identify the opportunities for improvement for Rathburn Road and Ponytrail within the study area;
- Present the design concept alternatives and preliminary preferred design concept; and,
- Provide the next steps and how to provide comments.

The PIC was prepared and published in two digital formats on the study website:

- A PDF of the PIC display boards; and,
- A video presentation of the display boards with narration.

Table 7.1 Online Public Information Centre Publication

Date Published	**Friday, January 22, 2021**
Formal Viewing and Comment Period	**Friday, January 22, 2021 – February 5, 2021 (extended until February 12, 2021)**
Project Webpage and Video Publication URL Address	www.mississauga.ca/rathburn-ponytrail
Display Panels Publication URL Address	https://www.mississauga.ca/wp-content/uploads/2021/01/21130434/Rathburn-Ponytrail-Virtual-PIC-AODA.pdf

The display materials for PIC #1 are available with **Appendix N.** A summary of the suggested improvements presented at PIC #1 include the following:

- Separated cycling facility (cycle track) behind the curb on Rathburn Road and Ponytrail Drive between Dixie Road and Burnhamthorpe Road.
- On street bike lanes on Rathburn Road between Ponytrail Drive and End of the cul-de-sac with buffer separating cyclists from vehicles.
- Reduction of travel lanes from 4 to 2 on Rathburn Road between Ponytrail Drive and End of the cul-de-sac.
- Removal of channelized right turn lanes at Dixie Road intersection and Rathburn Road / Ponytrail Drive intersection.
- All way controlled stop implementation at the Rathburn Road / Bough Beeches Boulevard intersection.
- New signalized pedestrian crossing at the hydro corridor trail crossing.

- Landscaping improvements including within the existing concrete centre medians.

Members of the public were invited to provide comments by completing an online comment form and/or to email additional comments to the City. Please refer to **Appendix N** for more details on the received comments.

The following summarizes the main concerns and interests expressed by the comments received from the general public, including from the Rockwood Ratepayers' Association and its executive and general members.

Table 7.2 Concerns and Interests

Common Themes	Key Messages Frequently Noted from the Received Comments
General	General requests to be added to the mailing list were received. General inquiries regarding the timeline of the Study and/or construction of the project were noted.
Support for the Study	General support for the preliminary preferred Alternative 3 were noted. Additionally, there are received comments that notes support for the preliminary preferred cycling facilities, including the types of preferred cycling facilities, as well as the reduction the road from 4 to 2 lanes, landscaping and complete street design.
Concerns for pedestrian safety and pedestrian crossing locations	General concerns about safety for all road users in the Study area. For example, pedestrian safety, including safe pedestrian crossing within the Study area, as well as speeding. There are requests / suggestions to the Project Team to provide consideration to: • Illuminated overhead lights, warning signs countdowns and pedestrian push buttons; • Crosswalk or stop signs at various pedestrian crossings/intersections; • A crosswalk and/or pedestrian crossing at various locations, including at Bough Beeches to Garnetwood Park, Ponytrail Drive and Shaver Trail, and Rathburn Road and Tapestry Trail; • A new signalized intersection with at Rathburn Road and Rockwood Road.
Concerns for cycling safety and the maintenance of cycling infrastructure	General concerns about the safety of cyclists. Comments noted include: • Concerns about whether cyclists will abide to the rules; • Inquiries as to how snow removal will be carried out with cycling facilities.
Concerns about the geometry of the preliminary preferred Alternative 3	General comments received that noted inquiries about: • Whether the preliminary design will to minimize any straight-line portions • Whether the Project Team is considering a bridge connecting Rathburn Road East over Etobicoke Creek; • If the City will repave the concrete; • Whether the Project Team has considered the proposed development on Ponytrail Drive across from Tapestry Trail in the Study;

Common Themes	Key Messages Frequently Noted from the Received Comments
	• Request to provide consideration to indent bus stops into the roadway; • Request to provide consideration to traffic sensing operations; • Request to provide consideration to raised cycling facilities; • Inquiry regarding the justification for about connecting the cycling facilities east of Fieldgate Drive; • Inquiry as to whether intersections are proposed to be "smart".
Concerns for the preliminary preferred landscape plan and the aesthetics of bollards on the cycling facilities	General concerns that the preliminary preferred landscape plan may not beautify the streetscape enough. Requests / suggestions to the Project Team to provide consideration to have more mature landscaping in the median, such as trees or shrubs. Concerns about the aesthetics of the bollards of the preliminary preferred Alternative 3.
Preference for Alternative 1, Alternative 2, or the "Do Nothing" alternative.	Comments that show preference to other presented Alternatives. Comments include: • Concerns about cyclist safety; • Concerns regarding the longevity of bollards; • Inquiry about the assessment of alternatives.
Inquiry regarding parking and the Bus Route	Inquiries about whether parking is included/considered in this Study. Further, there are inquiries about what the future bus routes will be.
Support for a roundabout	Requests / suggestions to the Project Team to provide consideration to roundabouts in the Study area. Comments have noted the benefits of roundabouts.
Concerns about future traffic congestion	Concerns that the removal of some or all of the dedicated turning lanes may result in traffic congestion. There are inquiries received about the existing and future traffic volumes in the Study area, as well as the traffic flow. Concerns about congestion that may result from reducing the roadway from 4 lanes to 2 lanes.
Concerns about noise walls and concerns about their location	Opposition to noise walls and concerns that they are not aesthetically pleasing and may damage tree. Further, there are comments that indicate that noise walls are not needed. Requests / suggestions to the Project Team to provide consideration to provide noise walls along Ponytrail Drive to Burnhamthorpe Road.
Opposition to the Study	General opposition to the Study and/or its implementation were received. There are some concerns and opposition to the funding of the Study by tax dollars.

7.3.3 PUBLIC INFORMATION CENTRE (PIC) # 2

Due to significant interest in the project, the City held a second PIC to address concerns brought forward by the public. PIC #2 format was changed to include a live on-line presentation by City staff, followed by mediated break out rooms and a question and answer session.

PIC #2, was held on June 9, 2021, from 6:30 pm to 8:00 pm; static display boards from the presentation portion of PIC #2 was posted on the City of Mississauga's website for the project website on June 9, 2021 at: www.mississauga.ca/rathburn-ponytrail.

The purpose of the virtual PIC was to:

- Provide an overview of the study purpose and study area;
- Share the key feedback received about the Integrated Road Project following PIC #1;
- Confirm the proposed changes to the final design concept;
- Discuss next steps and how to provide comments;
- Answer any questions the public may have on the proposed improvements.

The formal review period was between June 10, 2021 and July 14, 2021; members of the public were asked to provide comments by July 14, 2021.

The presentation materials for PIC #2 are available in the Summary report within **Appendix N**. A summary of the revised preliminary design are noted in **Section 8** of this report below.

After the presentation, attendees were divided into 5 virtual breakout rooms of approximately 15 participants, where a discussion was facilitated by City staff. A Project Team member was present in each breakout room to answer technical questions. The reflection questions that were posed to attendees were:

- What information stood out for you in the presentation?
- How do you think this will help us to achieve our goal of prioritizing safety and access for all?
- What questions are you left with?
- If you had to go back to your neighbours and describe what you learned tonight, what might you tell them?
- How might you sum up our breakout room discussion?

When the breakout rooms concluded, attendees were reassembled to the main room. Here, the facilitators from each breakout room summarized the discussions and the Project Team answered the remaining unanswered questions that were posed in each room.

A summary of the discussion from each breakout room and the main room can be found within the PIC Summary report.

The Project team also compiled a list of Frequently Asked Questions. This list is provided in the PIC Summary report and was published to the project website on Friday October 22, 2021.

The received comments from the public via the online Comment Form included a survey of their level of support of the Integrated Road Project. Further, the received comments from the general public and from agencies via email were categorized based in their support of the Integrated Road Project. The level of support for both responses received via the comment form and via email summarized in the following table.

Table 7.3 Summary of Support from Received Responses

Level of Support	Responses Received out of 37 Total Responses	Percentage
Strongly Agree	*10*	*26.3%*
Agree	*7*	*18.4%*
Neutral	*8*	*21.1%*
Disagree	*6*	*15.8%*
Strongly Disagree	*7*	*18.4%*

All comments received can be found within PIC Summary report.

7.3.4 ROCKWOOD HOMEOWNERS ASSOCIATION

Separate information sessions were conducted specifically for members and executives of the Rockwood Homeowners Association (RHA). The presentation was similar to the PIC #2 presentation held as follows:

- Presentation to RHA executive – May 17th,2021
- Presentation to RHA membership – May 26th, 2021

8 DESIGN ALTERNATIVES

8.1 TYPICAL CROSS SECTION

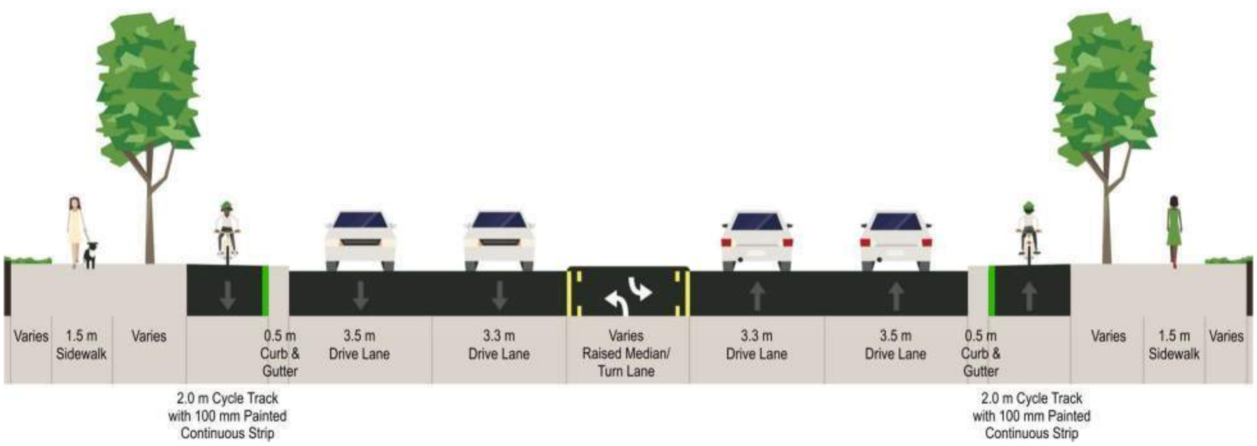
8.1.1 RATHBURN ROAD / PONYTRAIL DRIVE (DIXIE ROAD TO BURNHAMTHORPE DRIVE)

The Cycling Master Plan identifies cycle tracks / separated bike lanes on Rathburn Road East from Dixie Road to Ponytrail Drive and on Ponytrail Drive from Rathburn Road East to Burnhamthorpe Road East.

The Cycling Master Plan was the basis for the starting point of the typical cross section for this section. The typical cross section is illustrated below and includes:

- 2.0m separated cycle track
- 3.5m curb lane
- 3.3m though lane
- Raised median at various locations and widths throughout

Figure 8.1 Typical Cross Section – Rathburn Road / Ponytrail Drive (Dixie Rd to Burnhamthorpe Rd)



The typical cross section for this portion of the project remained consistent from the onset of the project through all consultation events.

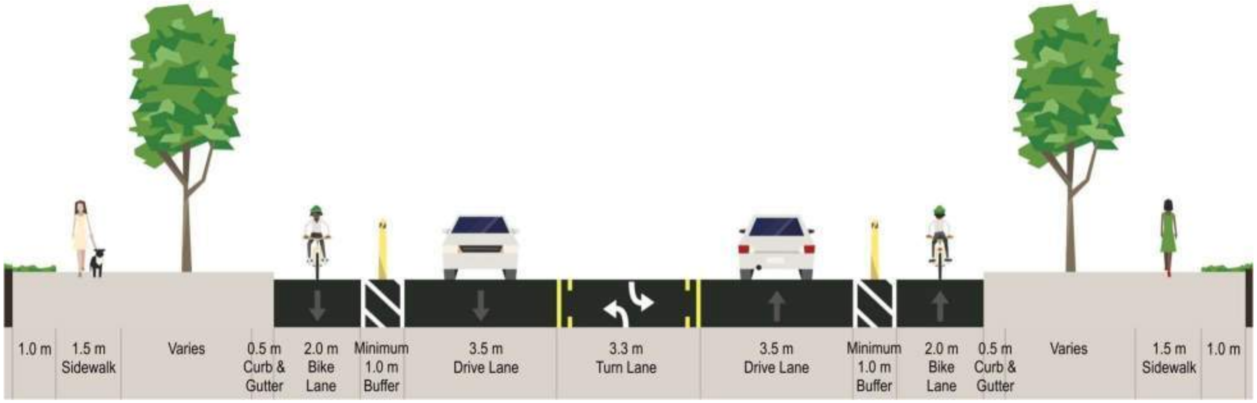
8.1.2 RATHBURN ROAD (PONYTRAIL DRIVE TO END OF CUL-DE-SAC)

The Cycling Master Plan identifies on-road bike lanes on both sides of the road in this section. The typical cross section illustrated below was presented at the first PIC as the preferred alternative and included:

- Reduced travel lanes from 2 lanes to 1 lane in each direction.

- 2.0m on-road bike lanes
- Cyclists are separated from vehicular traffic by a painted buffer on the road
- Collapsible bollards within the buffer zone
- Cyclists are physically separated from pedestrians.
- Landscaping of the existing concrete median

Figure 8.2 Cycling Master Plan Typical Cross Section - Rathburn Road (Ponytrail Dr to End of Cul-de-Sac)



Considering feedback from PIC #1 and upon reflection the Project Team felt that the two way cycle track option should be considered instead of separated bike lanes as it enables additional tree planting and landscaping features to be incorporated into the streetscape deign for Rathburn Road.

In addition to the landscaping benefits there are also a number of other benefits associated with the two cycle track alternative including

- Reduction in stormwater runoff drainage due to a reduction in the hard surface area
- Opportunity to provide additional pedestrian crossings along this stretch of Rathburn Road
- Easier maintenance of the pavement surface and landscape features.

The preferred alternative typical cross section was revised as illustrated below and included:

- Reduced travel lanes from 2 lanes to 1 lane in each direction.
- A 3.5m two way cycle track
- Painted median and maintain existing turn lanes
- Boulevard landscaping opportunities

Figure 8.3 Preferred Alternative Typical Cross Section - Rathburn Road (Ponytrail Dr to End of Cul-de-Sac)

8.2 MIWAY TRANSIT

Within the study area, there is currently one MiWay (City of Mississauga) bus route – Route # 20, which serves Rathburn Road East (west of Ponytrail Drive), and Ponytrail Drive as shown below. It should be noted that MiWay does not operate on Rathburn Road East, east of Ponytrail Drive

Figure 8.4 MiWay Route 20

Route #20 (Rathburn Road) operates on Rathburn Road East and Ponytrail Drive seven days a week. On a typical weekday, this route serves with an approximate headway of 10-20 minutes during morning peak hour, and 20 minutes during afternoon peak hours MiWay buses on this route operate with a frequency of about 25 minutes on Saturday, and 35 minutes on Sunday peak hours.

At the start of the project, MiWay provided the Project Team with a memo detailing their requirements for the project This memo is provided in **Appendix P** and included requested transit stop improvements and design standards.

The proposed improvements will affect many of the transit stops along Rathburn Road and Ponytrail Drive. The project team have modified the transit stop layouts as shown on the preliminary design drawings based on application of MiWay's standard drawings and in consultation with MiWay staff. It was not possible to design three stops 1529,1539, and 1532 to MiWay's preferred standard. Details of the deliberations regarding these stops can be found in the Comment and Responses Tracking Log located in **Appendix Q.** The Project Team has also confirmed that MiWay stop 1540 (at Dixie Road), that will be completed as part of the Region's improvement project, will require additional property to construct.

8.3 INTERSECTIONS

8.3.1 DIXIE ROAD / RATHBURN ROAD

Dixie Road intersection is under the jurisdiction of the Region of Peel and as such any construction within the Region's right-of-way requires their approval. Preliminary design improvements to the Dixie Road intersection include the following:

- Elimination of the channelized right turn lane from westbound Rathburn Road to northbound Dixie Road and replaced with a combined through / right turn lane.
- Elimination of the channelized right turn lane from northbound Dixie Road to eastbound Rathburn Road and replaced with a standard right turn lane
- Reduced curb radii at all 4 quadrants to 9.0m
- Upgraded connections to the existing asphalt multi-use path and concrete sidewalk on the west side of Dixie Road
- Enhanced treatment to meet AODA standards including ramping, tactile warning plates, signage, and pavement markings.
- New cross rides on westside (two-way) and eastside (one-way) of Dixie Road
- Improved transit stops

The intersection at Dixie Road is scheduled for improvements for construction in 2028. The proposed cycling and pedestrian upgrades have been included in the preliminary design; however, will not be constructed as part of the Rathburn Road and Ponytrail Drive Integrated Road Project

8.3.2 RATHBURN ROAD / BOUGH BEECHES BOULEVARD (WEST)

Preliminary design improvements to the Rathburn Road / Bough Beeches intersection include the following:

- All existing travel lanes and auxiliary lanes have been retained
- Reduced curb radii at all 4 quadrants to 9.0m
- Upgraded connections to the concrete sidewalk at all 4 quadrants
- Enhanced treatment to meet AODA standards including ramping, tactile warning plates, signage, and pavement markings.

- New cross rides on north and south side of Rathburn Road
- Improved transit stops

8.3.3 RATHBURN ROAD / ROCKWOOD ROAD

Preliminary design improvements to the Rathburn Road / Rockwood Road intersection include the following:

- All existing travel lanes and auxiliary lanes have been retained
- Reduced curb radii at all 4 quadrants to 9.0m
- Upgraded connections to the concrete sidewalk at all 4 quadrants
- Enhanced treatment to meet AODA standards including ramping, tactile warning plates, signage, and pavement markings.
- New cross rides on north and south side of Rathburn Road
- Improved transit stops.

8.3.4 RATHBURN ROAD / FIELDGATE DRIVE

Preliminary design improvements to the Rathburn Road / Fieldgate Drive intersection include the following:

- The eastbound and westbound dedicated right turn lanes have been replaced with a combined through / right turn lane.
- Reduced curb radii at all 4 quadrants to 9.0m
- Upgraded connections to the concrete sidewalk at all 4 quadrants
- Enhanced treatment to meet AODA standards including ramping, tactile warning plates, signage, and pavement markings.
- New cross rides on north and south side of Rathburn Road
- Improved transit stops

8.3.5 RATHBURN ROAD / PONYTRAIL DRIVE

Preliminary design improvements to the Rathburn Road / Ponytrail Drive intersection include the following:

- Replacement of the channelized right turn lane from westbound Ponytrail Drive to northbound Rathburn Road with a standard right turn lane
- Replacement of the channelized right turn lane from southbound Rathburn Road to westbound Rathburn Road with a standard right turn lane
- Reduced curb radii at all quadrants to 9.0m
- Upgraded connections to the concrete sidewalk at all 4 quadrants
- Enhanced treatment to meet AODA standards including ramping, tactile warning plates, signage, and pavement markings.

- New cross rides on north and south side of Rathburn Road (one-way) and eastside of Rathburn Road (two-way)
- Improved transit stops
- Open space created for landscaping opportunities

The removal of the channelized right turn lane from westbound Ponytrail Drive to northbound Rathburn Road does not allow for large trucks to complete this right turn movement and stay within the dedicated lane. The project team considered options including maintaining the channelized turn lane and providing additional hard surface treatment (stamped concrete) within the boulevard. After deliberating, the project team concluded that the safety features for pedestrians and cyclist that are desired (i.e shorter road crossings) outweighed the occasional truck turning movement. The turning movement was analysed and concluded that a large truck can make this turn by encroaching on adjacent lanes and this was deemed acceptable.

8.3.6 PONYTRAIL DRIVE / TAPESTRY TRAIL

Preliminary design improvements to the Ponytrail Drive / Tapestry Trail intersection include the following:

- All existing travel lanes and auxiliary lanes have been retained.
- Reduced curb radii at all quadrants to 9.0m
- Upgraded connections to the concrete sidewalk at all 4 quadrants
- Enhanced treatment to meet AODA standards including ramping, tactile warning plates, signage, and pavement markings.
- New cross rides on north and north side of Rathburn Road

8.3.7 PONYTRAIL DRIVE / MAPLE RIDGE DRIVE

Preliminary design improvements to the Ponytrail Drive / Maple Ridge Drive intersection include the following:

- All existing travel lanes and auxiliary lanes have been retained
- The eastbound right turn lane no longer continues through the intersection. This was considered a safety concern for pedestrians and cyclist due to vehicles continuing through to Burnhamthorpe Road.
- Reduced curb radii at all 4 quadrants to 9.0m
- Upgraded connections to the concrete sidewalk at all 4 quadrants
- Enhanced treatment to meet AODA standards including ramping, tactile warning plates, signage, and pavement markings.
- New cross rides on north and south side of Rathburn Road
- Improved transit stops

8.3.8 RATHBURN ROAD / TAPESTRY TRAIL

Preliminary design improvements to the Rathburn Road / Tapestry Trail intersection include the following:

- All existing travel lanes and auxiliary lanes have been retained.

- Reduced curb radii at all quadrants to 9.0m
- Upgraded connections to the concrete sidewalk at all quadrants
- Enhanced treatment to meet AODA standards including ramping, tactile warning plates, signage, and pavement markings.
- New set back two-way cross rides on east side of Rathburn Road

8.3.9 RATHBURN ROAD / BOUGH BEECHES BOULEVARD (EAST)

Preliminary design improvements to the Rathburn Road / Bough Beeches Boulevard (East) intersection include the following:

- All existing travel lanes and auxiliary lanes have been retained.
- Intersection has been converted to an all-way stop condition
- Reduced curb radii at all quadrants to 9.0m
- Upgraded connections to the concrete sidewalk at all quadrants
- Enhanced treatment to meet AODA standards including ramping, tactile warning plates, signage, and pavement markings.
- New set back two-way cross rides on east side of Rathburn Road

8.3.10 RATHBURN ROAD / GARNETWOOD CHASE (SOUTH)

Preliminary design improvements to the Rathburn Road / Garnetwood Chase (South) intersection include the following:

- All existing travel lanes and auxiliary lanes have been retained.
- Reduced curb radii at all quadrants to 9.0m
- Upgraded connections to the concrete sidewalk at all quadrants
- Enhanced treatment to meet AODA standards including ramping, tactile warning plates, signage, and pavement markings.
- New set back two-way cross rides on east side of Rathburn Road

8.3.11 RATHBURN ROAD / GARNETWOOD CHASE (NORTH)

Preliminary design improvements to the Rathburn Road / Garnetwood Chase (North) intersection include the following:

- All existing travel lanes and auxiliary lanes have been retained.
- Reduced curb radii at all quadrants to 9.0m
- Upgraded connections to the concrete sidewalk at all quadrants
- Enhanced treatment to meet AODA standards including ramping, tactile warning plates, signage, and pavement markings.
- New set back two-way cross rides on east side of Rathburn Road

8.3.12 PONYTRAIL DRIVE / BURNHAMTHORPE ROAD

The Burnhamthorpe Road intersection is outside of the scope of this project and as such the preliminary design improvements to the Ponytrail Drive matched into existing conditions. All existing travel lanes and auxiliary lanes approaching Burnhamthorpe Road have been retained. The eastbound right turn lane no longer continues through the Maple Ridge Drive intersection.

8.4 PEDESTRIAN CROSSINGS

There are several types of pedestrian crossing design that ensures the safety and comfort of its users. The pedestrian crossing improvements that are available include refuge islands, pedestrian crossovers or signalized crossings.

The project team reviewed the known pedestrian desire lines and opportunities for potential pedestrian crossing improvements and evaluated these pedestrian crossing locations within the study area. Based on a number of considerations including traffic volumes, collision information and a review pedestrian desire lines the Project Team proposed pedestrian crossing improvements and presented these to the public at PIC #1. These locations included:

- A signalized pedestrian crossing at the recently constructed multi-use trail within the hydro corridor between Fieldgate Drive and the Rathburn Road East / Ponytrail intersection.
- Improvements to the uncontrolled refuge island crossing at Shaver Trail crossing of Ponytrail Drive.
- A proposed all-way stop condition at the intersection of Rathburn Road East and Bough Beeches Boulevard.

When the proposed cross section on Rathburn Road (cul-de-sac section) was revised the project team reviewed opportunities to provided additional pedestrian crossings in this area. Two additional uncontrolled pedestrian crossings were added to the preliminary design at the following locations:

- Intersection of Rathburn Road and Tapestry Trail
- Intersection of Rathburn Road and Garnetwood Chase

The Project Team also received requests to further improve the pedestrian crossing facilities at a number of locations including the Shaver Trail and the Rockwood and Rathburn Road intersection. Following completion of the preliminary design City staff completed a Vision Zero Checklist for theses location and recommended provision of controlled pedestrian crossings even though signal warrants were not satisfied.

8.5 STREETSCAPE

In the preliminary streetscape plans for Rathburn Road East & Ponytrail Drive, the Project Team has identified opportunities to enhance the character of this street, as well as improve the pedestrian and cyclist experience through the addition and improvement of active transportation infrastructure, boulevards, street trees, and focussed design in key areas such as intersections. The streetscape design encourages active transportation by providing green spaces while minimizing maintenance requirements and increasing likelihood of plant success by proposing vegetation only in areas where this vegetation is most likely to survive and thrive.

8.5.1 STREET TREES

These two street corridors contain mature trees, many of which will be impacted due to the proposed works. Although some vegetation will need to be removed to accommodate the road widening, where feasible existing vegetation in the right-of-way should be preserved to the greatest extent possible. The arborist report outlines, among other information, mitigation and protection measures to minimize harm to existing trees in proximity to the proposed works.

In addition to preserving existing vegetation, new street trees are proposed throughout the corridors. Street trees are to be planted at regular intervals along the corridors where sufficient rooting space is available (generally within boulevard areas 2.5m and wider), and where trees do not conflict with existing buried or overhead utilities. For street trees, a maximum of 10-15 trees of the same species should be planted in a row within the right-of-way.

8.5.2 BOULEVARD AND INTERSECTION ENHANCEMENTS

Boulevards are an important element in defining the streetscape of the corridor, providing valuable continuous rooting space for street trees, permeable surface for rainwater infiltration, as well as a buffer separating the sidewalk, cycle track and traffic lanes, enhancing safety for all users. Due to the length and suburban nature of the corridor, grass is a suitable ground cover for most boulevard areas that are 1.0m and wider. Median areas that are 2.5m and wider are also recommended to be planted with grass. Where space for grass is insufficient within the boulevard, decorative pavement such as coloured and/or stamped concrete is proposed, which will visually differentiate the sidewalk and cycle track from the boulevard spaces.

At the Rathburn Road East and Ponytrail Drive intersection, planting beds of low-growing, salt tolerant native and ornamental shrubs and perennials are proposed, to provide a sense of character and arrival for drivers and active transportation users.

All plantings (trees, shrubs and perennials) should be non-invasive, hardy and drought-tolerant species, well-suited to roadside conditions and planted exclusively within the road right-of-way. Plant species should be selected to provide year-round visual interest and should be sufficiently diversified so that monocultures are avoided.

8.5.3 LOW-IMPACT DEVELOPMENT & INTEGRATION WITH LANDSCAPE FEATURES

Certain locations along the cul-de-sac portion of Rathburn Road East have been identified as candidates for the integration of low-impact development measures, such as bioretention, within the boulevard areas. Properly sited and constructed, LID structures often contribute aesthetically to their surroundings as well as provide habitat value when they are planted with a diverse native mix of plantings. LID and its potential integration with landscape features will be explored further in the future detailed design phase.

8.6 PROPERTY IMPACTS

Every effort was made by the project team to avoid the requirement to obtain private property. The preliminary design of the majority of the improvements was successful in this regard with the notable exceptions being:

- Construction of the proposed noise walls
- MiWay stop 1540 (at Dixie Road)

The property required to construct the noise walls and the MiWay stop are included in the property impact plans in **Appendix I**. Summary is noted below:

Table 8.1 Property Impacts

Property	Required Acquisition (m2)
1315 Bough Beeches Blvd	32.6
4230 Fieldgate Dr	332.5
1755 Rathburn Rd E.	845.3
4156 Fieldgate Dr	230.5
4163 Fieldgate Dr	440.3
1794 Rathburn Rd E.	109.7

At the intersection of Bough Beeches Boulevard and Rathburn Road, there is an existing condition on the southwest quadrant, where the existing MiWay shelter pad is partially located on private property. As part of the preliminary design the design team was directed to replace all concrete pads associated with MiWay infrastructure. As a result, the plans show construction activities to occur on private property.

As the pad is only partially located on private property, the City does not intend on acquiring any additional property at this location. Instead, the impacted property owner will be contacted prior to construction and permission will be requested to reconstruct the pad.

8.7 COST ESTIMATE

The preliminary cost estimate for the project, including property, utility relocations, design and construction administration fees is **$ 15.339,280**. Further details are provided in **Appendix O**.

8.8 SUMMARY OF ENVIRONMENTAL EFFECTS AND COMMITMENTS TO FURTHER WORK

Throughout the development of the preliminary design, feedback and comments were received from a number of City departments through Technical Advisory Committee (TAC) meeting and design circulations. Comments were addressed and integrated into the functional design where possible. The following are considerations for the detailed design stage.

Table 8.2 Environmental Effects and Commitments

Consideration	Approach
Permits / Approvals	A permit will be required from the TRCA to construct / replace the 1800mm dia. culvert crossing Ponytrail Drive immediately north of Maple Ridge Drive Surface and/or underground storage options to be further explored during detail design on the Rathburn Road cul-de-sac. A permit from the MOECP will be required to construct.
Trees and Vegetation	All existing trees and vegetation adjacent to the construction zone and not identified for removal will be protected from damage during construction including the installation of tree protection fencing where necessary.
Water Quality Control	Water quality control calculations conducted assume that all water quality treatment for all the newly added paved area is to be provided by infiltration facilities (i.e. LID features). CB Shields (catch basin baffle), Oil and grit separator (OGS units) and level spreaders / inlet sumps should be considered as options available as water quality control at places where LID features aren't feasible and to be explored further as part of the detail design.
Migratory Birds Convention Act	To minimize the possibility of contravention to the Act and its Regulations, vegetation removals and work within vegetated areas (e.g. moving of heavy equipment), or work on buildings where birds may nest, should occur outside of the "regional bird nesting period" (approximately April 1 to August 31). If work must occur during this period, please, mitigation measures as noted within the Arborist report should be followed.
Geotechnical Investigation	Geotechnical Investigation and Pavement Analysis in support of the final design.
Utility Relocations	All utilities impacted by the proposed improvements will need to be relocated. As detailed design progresses, there will be ongoing coordination with affected utility companies and PUCC permit will be required.
Traffic Signals / Pedestrian Crossings	The design of the traffic signals shall be completed as part of the detailed design stage.

Consideration	Approach
Property	Property will be required to construct the noise wall at the Rathburn Road and Fieldgate intersections

APPENDICIES

APPENDIX

A PRELIMINARY PREFERRED PLAN DRAWINGS

DESIGN BY	APPROVED BY
C.E.T.	
DEPARTMENTAL APPROVAL	
SILVIO CESARIO P.ENG.	

MISSISSAUGA

PRODUCED FOR - T&W, ENGINEERING AND WORKS

PRELIMINARY DESIGN
RATHBURN RD. E./ PONYTRAIL DR.
INTEGRATED PROJECT

SCALE 1:250	AREA	PROJECT No.
C.A.D.D. BY S.L./ M.N.	CHECKED BY S.L./ D.M.	PLAN No.
DATE 2022-01-17	SHEET 1 OF 3	

DESIGN BY	APPROVED BY
C.E.T.	
DEPARTMENTAL APPROVAL	
SILVIO CESARIO P.ENG.	

MISSISSAUGA

PRODUCED FOR - T&W, ENGINEERING AND WORKS

PRELIMINARY DESIGN
RATHBURN RD. E./ PONYTRAIL DR.
INTEGRATED PROJECT

SCALE 1:250	AREA	PROJECT No.
C.A.D.D. BY S.L./ M.N.	CHECKED BY S.L./ D.M.	PLAN No.
DATE 2022-01-17	SHEET 2 OF 3	

SERVICE DATA					
SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN. SEWERS	________	______	GAS MAINS	________	______
STM. SEWERS	________	______	BELL U/G CABLE	________	______
WATERMAINS	________	______	HYDRO U/G CABLE	________	______
M.O.E.	________	______	ROGERS U/G CABLE	________	______

REVISIONS		
DATE	DETAILS	INIT.

DESIGN BY	APPROVED BY
________________ C.E.T.	
DEPARTMENTAL APPROVAL	
SILVIO CESARIO P.ENG.	

MISSISSAUGA

PRODUCED FOR - T&W, ENGINEERING AND WORKS

PRELIMINARY DESIGN
RATHBURN RD. E./ PONYTRAIL DR.
INTEGRATED PROJECT

SCALE 1:250	AREA ______________	PROJECT No.________
C.A.D.D. BY S.L./ M.N.	CHECKED BY S.L./ D.M.	PLAN No.
DATE 2022-01-17	SHEET 3 OF 3	________

Printed: Jan. 24, 2022

APPENDIX

B LANDSCAPE PLANS

LEGEND

- PROPOSED DECIDUOUS TREES
- EXISTING TREE ANTICIPATED TO REMAIN - TO BE CONFIRMED
- PROPOSED SOD & SOD REPAIR WHERE DISTURBED
- PROPOSED CYCLE TRACK
- CONCRETE SIDEWALK TO REMAIN
- NEW CONCRETE PAVING / RE-ALIGNED SIDEWALK
- DECORATIVE PAVEMENT AT BOULEVARD AND MEDIAN
- ASPHALT PAVEMENT
- ENHANCED LANDSCAPE OPPORTUNITY
- RIGHT-OF-WAY
- POTENTIAL NOISE WALL - REFER TO NOTE, THIS SHEET

NOTE:
THE CITY WILL ONLY PROCEED WITH CONSTRUCTION OF NEW NOISE WALLS WITH THE AGREEMENT OF THE PROPERTY OWNERS DIRECTLY IMPACTED BY THE WORK. CITY STAFF WILL CONSULT WITH THESE PROPERTY OWNERS TO PROVIDE ADDITIONAL DETAILS ABOUT THE PROPOSED NOISE WALL AND CONFIRM THEIR SUPPORT.

FOR INFORMATION ONLY

THESE PLANS ARE FOR INFORMATION PURPOSES ONLY AND ARE SUBJECT TO CHANGE AS PART OF THE DETAIL DESIGN PHASE OF THE PROJECT.

0 5 10 20 30 40
SCALE 1:500 (m)

wsp

PRELIMINARY DESIGN CONCEPT PLAN - SHEET 1

RATHBURN ROAD & PONYTRAIL DRIVE FROM DIXIE ROAD TO BURNHAMTHORPE ROAD EAST ENVIRONMENTAL ASSESSMENT

CITY OF MISSISSAUGA

DATE:	SCALE:	DWG No.:
JANUARY, 2022	1:500	L-1 OF L-3


MATCHLINE C - SEE SHEET L-3
KINGSBURY MALL
PRECISE PARKLINK
1891 RATHBURN ROAD EAST
1+400
1+500
1+600
1+700
1+800
1+900
BUS STOP
RATHBURN RD. E.
PONYTRAIL DR.
REFER TO ENLARGEMENT PLAN
CAPILANO CRT.
MATCHLINE B - SEE SHEET L-1
PRECISE PARKLINK
1850 RATHBURN ROAD EAST
FOREST PARK CIRCLE
APARTMENTS
4100 PONYTRAIL DRIVE
TAPESTRY TRL.
POTENTIAL NOISE WALL
CONNECTION TO EXISTING NEIGHBOURHOOD TRAIL NETWORK
OPPORTUNITIES TO INCLUDE A SIGNALIZED PEDESTRIAN CROSSING AT THIS LOCATION WILL BE CONFIRMED AS PART OF THE DETAIL DESIGN PROCESS
LOOKOUT CT.
MAPLE RIDGE DR.
BURNHAMTHORPE RD E.
NOTE:
THE CITY WILL ONLY PROCEED WITH CONSTRUCTION OF NEW NOISE WALLS WITH THE AGREEMENT OF THE PROPERTY OWNERS DIRECTLY IMPACTED BY THE WORK. CITY STAFF WILL CONSULT WITH THESE PROPERTY OWNERS TO PROVIDE ADDITIONAL DETAILS ABOUT THE PROPOSED NOISE WALL AND CONFIRM THEIR SUPPORT.
LEGEND
PROPOSED DECIDUOUS TREES
EXISTING TREE ANTICIPATED TO REMAIN - TO BE CONFIRMED
PROPOSED SOD & SOD REPAIR WHERE DISTURBED
PROPOSED CYCLE TRACK
CONCRETE SIDEWALK TO REMAIN
NEW CONCRETE PAVING / RE-ALIGNED SIDEWALK
DECORATIVE PAVEMENT AT BOULEVARD AND MEDIAN
ASPHALT PAVEMENT
ENHANCED LANDSCAPE OPPORTUNITY
RIGHT-OF-WAY
POTENTIAL NOISE WALL - REFER TO NOTE, THIS SHEET
BUS STOP
PROPOSED BIKE RACKS: SURFACE MOUNTED POST & RING STYLE
OPPORTUNITY FOR PLANTING LOW-GROWING, SALT-TOLERANT SHRUBS AND PERENNIALS TO ENHANCE PEDESTRIAN, CYCLIST AND DRIVER EXPERIENCE AT THIS IMPORTANT INTERSECTION
POTENTIAL NOISE WALL - REFER TO NOTE, THIS SHEET
ENLARGEMENT AT PONYTRAIL/RATHBURN INTERSECTION
FOR INFORMATION ONLY
THESE PLANS ARE FOR INFORMATION PURPOSES ONLY AND ARE SUBJECT TO CHANGE AS PART OF THE DETAIL DESIGN PHASE OF THE PROJECT.
N
PRELIMINARY DESIGN CONCEPT PLAN - SHEET 2
RATHBURN ROAD & PONYTRAIL DRIVE FROM DIXIE ROAD TO BURNHAMTHORPE ROAD EAST ENVIRONMENTAL ASSESSMENT
CITY OF MISSISSAUGA
DATE: JANUARY, 2022
SCALE: 1:500
DWG No.: L-2 OF L-3

LEGEND

- PROPOSED DECIDUOUS TREES
- EXISTING TREE ANTICIPATED TO REMAIN - TO BE CONFIRMED
- PROPOSED SOD & SOD REPAIR WHERE DISTURBED
- PROPOSED CYCLE TRACK
- CONCRETE SIDEWALK TO REMAIN
- NEW CONCRETE PAVING / RE-ALIGNED SIDEWALK
- DECORATIVE PAVEMENT AT BOULEVARD AND MEDIAN
- ASPHALT PAVEMENT
- ENHANCED LANDSCAPE OPPORTUNITY
- RIGHT-OF-WAY

FOR INFORMATION ONLY

THESE PLANS ARE FOR INFORMATION PURPOSES ONLY AND ARE SUBJECT TO CHANGE AS PART OF THE DETAIL DESIGN PHASE OF THE PROJECT.

wsp

PRELIMINARY DESIGN CONCEPT PLAN - SHEET 3

RATHBURN ROAD & PONYTRAIL DRIVE FROM DIXIE ROAD TO BURNHAMTHORPE ROAD EAST ENVIRONMENTAL ASSESSMENT

CITY OF MISSISSAUGA

DATE:	SCALE:	DWG No.:
JANUARY, 2022	1:500	L-3 OF L-3

APPENDIX

C TRAFFIC REPORT

CITY OF MISSISSAUGA

RATHBURN ROAD EAST/ PONYTRAIL DRIVE INTEGRATED STUDY

JANUARY 2022

TRAFFIC ANALYSIS REPORT

RATHBURN ROAD EAST/ PONYTRAIL DRIVE INTEGRATED STUDY

TRAFFIC ANALYSIS REPORT

CITY OF MISSISSAUGA

PROJECT NO.: 19M-00836-03
DATE: JANUARY 11, 2022

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Appendix B: Synchro Report for Existing (2020) Conditions

Appendix C: Synchro Report for Future (2041) Conditions - Scenario 1

Appendix D: Synchro Report for Future (2041) Conditions - Scenario 2

Appendix E: Synchro Report for Future (2031) Conditions - Scenario 2

1 INTRODUCTION

The City of Mississauga is proactive in providing multi-modal transportation solutions to support the growth and development in the City. With respect to active transportation, City of Mississauga's 2018 Cycling Master Plan envisions a comfortable, connected and convenient cycling network that includes separated bike lanes, cycle tracks, multi-use trails, conventional bike lanes, and shared routes. The goals of the Cycling Master Plan are to improve safety for cycling, build a connected, convenient and comfortable bicycle network, increase the number of cycling trips in Mississauga, and foster a culture of cycling. The City looks for opportunities to improve cycling network in combination with other ongoing infrastructure projects or initiatives by the City such as Environmental Assessment studies, roadway resurfacing / maintenance, as well as development.

The City of Mississauga is undertaking the Rathburn Road and Ponytrail Drive Integrated Road Project following the Schedule ‘A+’ Municipal Class Environmental Assessment (EA) process. The limits for the proposed road improvements are on:

- Rathburn Road East from Dixie Road to Etobicoke Creek; and,
- Ponytrail Drive from Rathburn Road East to Burnhamthorpe Road East.

The City has planned for road resurfacing of Rathburn Road East and Ponytrail Drive as part of the City's 2021 and 2022 Road Resurfacing Program. The purpose of the Rathburn Road East and Ponytrail Drive Integrated Road Project is to explore and integrate opportunities for the implementation of active transportation facilities and operational improvements on these road segments, such as bike lanes, noise walls, intersection improvements, etc. The cycling facilities on the study area corridor should be designed based on the goals of the Cycling Master Plan; to provide a safe, convenient, and comfortable cycling facility that will encourage ridership. The existing cross-section on Rathburn Road East and Ponytrail Drive provide no cycling facility. The City’s Cycling Master Plan 2018 recommended cycle tracks or separated bike lanes, which may require reconfiguration of the cross-sectional elements within the current right of way (for example, the potential for reducing the number of travel lanes to accommodate the bike lanes). These proposed improvements identified from this study will create a safer, more comfortable, and more sustainable environment for all road users, including pedestrians, cyclists and transit users.

WSP has been retained by the City of Mississauga to conduct the Rathburn Road East/ Ponytrail Drive Integrate Study. The traffic study was conducted following the City of Ottawa’s Multimodal Analysis Guidelines, 2015. The Multi-Modal Level of Service (MMLOS) is a tool that evaluates the performance of each mode – pedestrians, bicycles, transit, and vehicles, that provides an integrated depiction of the multi-modal levels of service. For each travel mode, the level of service (LOS) is required to be assessed for each side of the segments (between two or more intersections) and at the intersections within the study area. The vehicular (auto) level of service analysis was conducted using *Synchro* software for the study area intersections. This analysis was conducted for the existing (2020) conditions and future alternative scenarios for 2041 conditions and interim (2031) conditions. The pedestrian, cycling, and transit LOS were estimated using the City of Ottawa's Guidelines for the existing (2020) and future (2041) conditions.

The following key tasks were conducted for the traffic analysis for this study:

- Identify the study area and review the existing road network, as described in Section 2.
- Collect and summarize existing (2020) traffic volumes for the study area intersections, conduct signal warrant analysis, collision data analysis, existing traffic operational analysis, existing LOS analysis for other modes of transportation – pedestrians, bicycles, and transit as presented in Section 3.
- Estimate future (2041) traffic volumes, conduct level of service analysis for all transportation modes for two alternative network scenarios conducted for future (2041) conditions, as summarized in Section 4. The level of service analysis for the interim conditions is summarized in Section 5.
- The study findings are described in Section 6.

2 STUDY AREA

The project study area for the Rathburn Road East/Ponytrail Drive Integrated Study incorporates Rathburn Road East corridor extending from Dixie Road in the west to the Cul-de-sac, located east of Ponytrail Drive; and the segment of Ponytrail Drive between Rathburn Road East and Burnhamthorpe Road East. The study area is presented in Figure 1. Within the study area, the posted speed limit on Rathburn Road East and Ponytrail Drive is 50 km/h.

Figure 1: Study Area

Rathburn Road East is an east-west corridor, designated as a major collector in the City's Official Plan. It operates with a four-lane cross-section (two through lanes in each direction) within the study area. Rathburn Road East connects to Rockwood Mall and intersects regional arterial roadways, including Dixie Road and Cawthra Road, and arterial roadway, Hurontario Street. It runs parallel to other east-west corridors, including Eastgate Parkway to the north and Burnhamthorpe Road East to the south.

Within the study area, Ponytrail Drive operates as a north-south major collector with a four-lane cross-section. It is connected to a pre-school (Sunshine Children's Centre), which is situated south of Burnhamthorpe Road East. The study area corridors – Rathburn Road East and Ponytrail Drive provide access to various residential properties, large multi-residential condominiums and a few commercial properties.

The study area includes thirteen intersections and many property accesses/driveways. Currently, five intersections are operating with traffic signals and other intersections are operating with 'two-way stop control – i.e. traffic approaching from minor streets are controlled with a 'stop-sign' and traffic on the major street (Rathburn Road/Ponytrail Drive) operates in free-flow conditions).

Sidewalks are present on both sides of the Rathburn Road East and Ponytrail Drive along the entirety of the study area and are at least 1.5 m wide, typically set back from the curb by a boulevard with a minimum width of 2 m. There is no existing dedicated cycling facility available on the study area corridors – Rathburn Road East and Ponytrail drive. The transit routes serving the study area are the regular bus routes with no transit priority.

It should be noted that trucks are not permitted on the routes within the study area. In addition, on-street parking is not allowed on Rathburn Road East, except daytime parking east of Garnetwood Chase (East); however, parking is permitted on Ponytrail Drive within the study area.

3 EXISTING (2020) TRAFFIC CONDITIONS

3.1 EXISTING (2020) ROAD NETWORK

The traffic analysis for the study area was conducted for the following ten intersections along Rathburn Road East and Ponytrail Drive within the study area.

- Rathburn Road East at Dixie Road
- Rathburn Road East at Bough Beeches Boulevard (West)
- Rathburn Road East at Rockwood Road
- Rathburn Road East at Fieldgate Drive
- Rathburn Road East at Capilano Court
- Rathburn Road East at Ponytrail Drive
- Rathburn Road East at Bough Beeches Boulevard (East)
- Ponytrail Drive at Tapestry Trail
- Ponytrail Drive at Maple Ridge Drive/Lookout Court
- Ponytrail Drive at Burnhamthorpe Road East

The following are descriptions of the major crossing roads – Dixie Road, Bough Beeches Boulevard (West), Fieldgate Drive, Bough Beeches Boulevard (East), Maple Ridge Drive/Lookout Court and Burnhamthorpe Road East.

Dixie Road **(Regional Road 4)** is a six-lane north-south regional road under the jurisdiction of Peel Region, which connects City of Brampton and City of Mississauga. It serves the residential, commercial, and commuting traffic; and provides connections to/from Provincial Highways, including Queen Elizabeth Way (QEW), Highway 401 and Highway 407. Within the study area, the posted speed limit on Dixie Road is 60 km/h.

Bough Beeches Boulevard is a two-lane north-south minor collector corridor under the jurisdiction of the City of Mississauga. The posted speed limit for Bough Beeches Boulevard is 50 km/h within the study area. This corridor intersects Rathburn Road East at two locations, and also extends in the south to Burnhamthorpe Road East (outside of study area).

Fieldgate Drive is a two-lane north-south minor collector road, which is operating with a posted speed limit of 50 km/h within the study area. It provides access to condominiums and various private properties.

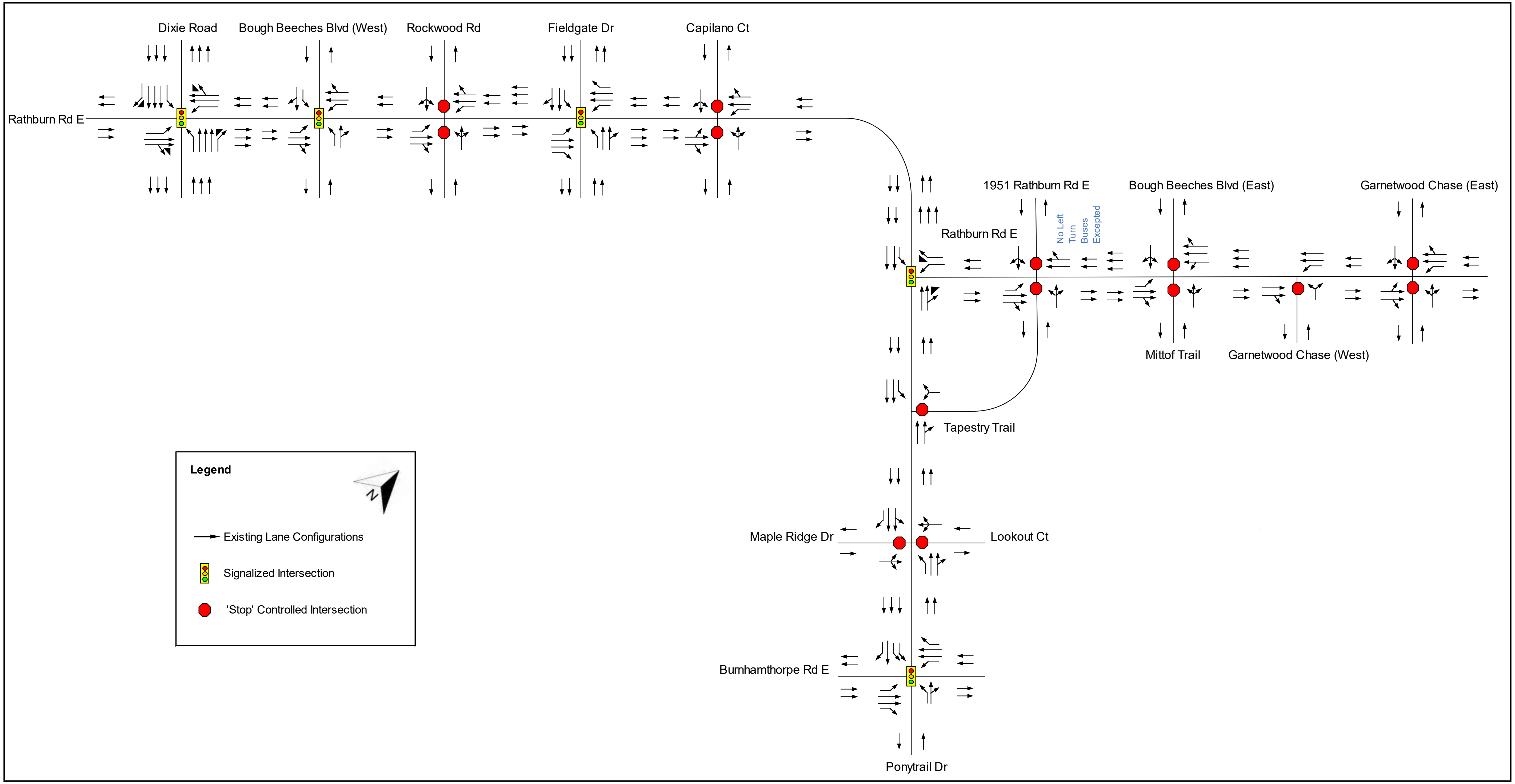
Maple Ridge Drive/Lookout Court is a minor collector road with a two-lane cross-section, operates with a posted speed limit of 50 km/h. It is an east-west corridor, runs parallel to Rathburn Road East to the north and Burnhamthorpe Road East to the south, and connects to Ponytrail Drive with a ‘stop’ sign.

Burnhamthorpe Road East is a four-lane arterial roadway under the jurisdiction of City of Mississauga. It connects to Highway 427 to the east and provides crucial connections between the City of Mississauga in the west and City of Toronto in the east. The posted speed limit on Burnhamthorpe Road East is 60 km/h within the study area.

All other roads intersecting with Rathburn Road East and Ponytrail Drive are local roads providing access to the local residential areas, operating with a posted speed limit of 50 km/h within the study area.

The existing (2020) intersection lane configurations for the study area road network are presented in Figure 2.

Figure 2: Existing (2020) Intersection Lane Configurations



3.2 EXISTING (2020) TRAFFIC VOLUMES

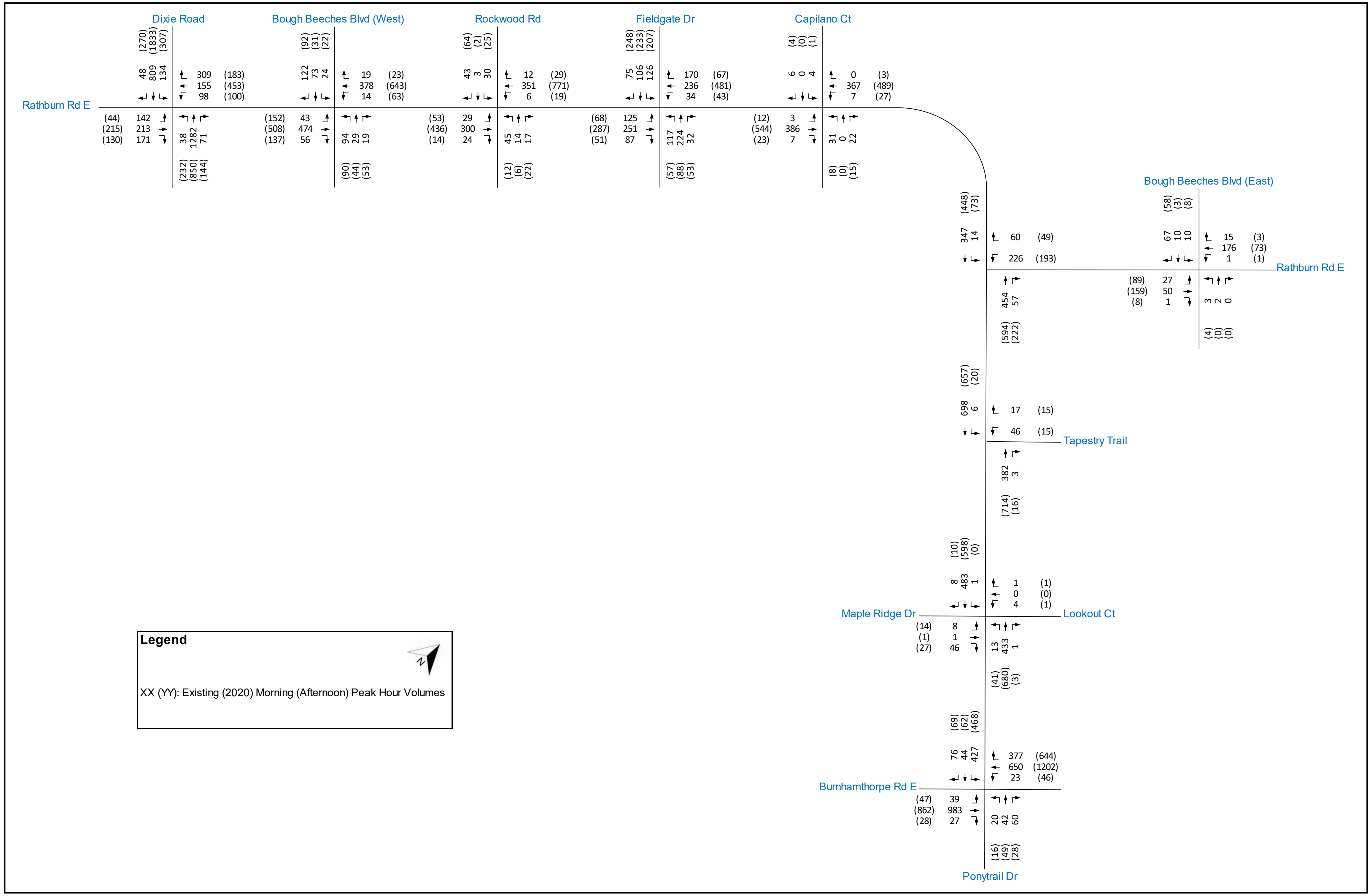
The turning movement counts (TMCs) for the study area intersections were provided by the City of Mississauga, which were collected between 2014 and 2019. The actual survey dates for the turning movement counts are presented in Table 1.

Table 1: Survey Dates for Turning Movement Counts Data

Intersection	Data Collection Dates
Rathburn Road East at Dixie Road	Wednesday, April 5, 2017
Rathburn Road East at Bough Beeches Boulevard (West)	Tuesday, January 6, 2015
Rathburn Road East at Rockwood Road	Thursday, September 26, 2019
Rathburn Road East at Fieldgate Drive	Tuesday, February 26, 2008
Rathburn Road East at Capilano Court	Wednesday, January 25, 2012
Rathburn Road East at Ponytrail Drive	Thursday, February 1, 2018
Rathburn Road East at Bough Beeches Boulevard (East)	Tuesday, October 28, 2014
Ponytrail Drive at Tapestry Trail	Thursday, May 2, 2013
Ponytrail Drive at Maple Ridge Drive/ Lookout Court	Thursday, October 17, 2019
Ponytrail Drive at Burnhamthorpe Road East	Wednesday, December 18, 2019

The turning movement counts (TMC) for the morning and afternoon peak hours were projected to 2020 base year by applying a linear growth rate of 0.7% per annum. The growth rate of 0.7% per annum was derived conducting the regression analysis of the available historical Annual Average Daily Traffic (AADT) data for the Rathburn Road East corridor. Before applying the growth rate to the TMC, sensitivity check was undertaken to avoid over-estimating the traffic volumes. The growth rate was applied to most of the intersections in the study area, except for the intersections with older counts and showing similar or higher volumes than the adjacent intersection with the recent counts. The existing (2020) traffic volumes for the weekday morning and afternoon peak hours are presented in Figure 3.

Figure 3: Existing (2020) Weekday Peak Hour Turning Movement Volumes



3.3 COLLISION DATA ANALYSIS

Collision data was provided by the City for a five-year period (2015-2019) for the study area intersections and mid-blocks. The collision data identifies the total number of collisions and the following characteristics:

- Type of collisions – non-fatal Injury, and property damage only (PDO).
- Initial impact types – angle, rear-end, sideswipe, turning movement, and single motor vehicle (SMV) other.
- Environmental conditions – clear, rain, snow, and freezing rain.
- Road surface conditions – dry, wet, loose snow, and slush.

Within the data collection period, a total of 34 collisions were recorded on the study area corridors. Among the total number of collisions, two bicycle-related collisions were recorded on Rathburn Road:

- At Bough Beeches Boulevard (West) intersection (year 2015), which was an 'angle' collision with 'clear' environmental condition and resulted in PDO, and
- At Garnetwood Chase (East) intersection (year 2019), which was an 'angle' collision with 'rain' environmental condition and resulted in non-fatal injury.

3.3.1 Intersection Collisions

Within a five-year period (2015-2019), 24 collisions were recorded at study area intersections. Most of the intersection collisions resulted in 'PDO' (approximately 88%), and the remaining collisions resulted in 'non-fatal injuries' (12%).

The primary impact type was an 'angle' (33%), followed by 'SMV other' and 'turning movement' accounted for 25% and 21%, respectively. Approximately, 79% of the collisions reported in a 'clear' environmental condition with a 'dry' road surface. The details of collision data for the study area intersections are presented in Table 2.

Using the number of collisions and traffic volumes entering the respective intersections, a collision rate for each intersection was calculated, reflecting an average number of collisions per million vehicles approaching the intersection. For a five-year period, all the intersections are experiencing collision rates lower than 0.25; except the Rathburn Road and Bough Beeches Boulevard (west) intersection has a relatively higher collision rate of 0.26.

3.3.2 Mid-block Collisions

Within a five-year period (2015-2019), a total of ten mid-blocks collisions were recorded in the study area. There are seven collisions (70%) resulted in 'PDO' and the remaining three collisions resulted in non-fatal injury. The primary impact type was 'SMV other' with four collisions. Approximately half of the collisions were related to 'rain' environmental conditions and 'wet' road surface. The details of the collision data for study area mid-blocks are presented in Table 3.

A collision rate for each mid-block was calculated using the data related to the number of collisions, traffic volume, and distance travelled along the mid-block, reflecting an average number of collisions per million vehicle kilometers travelled. Within the study area, the highest collision rate of 0.91 was observed on Ponytrail Drive between Rathburn Road and Tapestry Trail.

Table 2: Collision Data Summary for Intersections

Intersection	No. of Collisions	Collision Rate	Collision Type		Initial Impact Type					Environmental Condition				Road Surface Condition			
			Non-fatal Injury	P.D. Only	Angle	Rear end	Sideswipe	SMV other	Turning movement	Clear	Freezing Rain	Rain	Snow	Dry	Loose snow	Slush	Wet
Burnhamthorpe Rd and Ponytrail Dr	4	0.17		4		3			1	4				4			
				100%		75%			25%	100%				100%			
Rathburn Rd and Bough Beeches Blvd (East)	2	0.23		2	1			1				1	1			1	1
				100%	50%			50%				50%	50%			50%	50%
Rathburn Rd and Bough Beeches Blvd (West)	9	0.26	1	8	4		1	2	2	7	1		1	7	1		1
			11%	89%	44%		11%	22%	22%	78%	11%		11%	78%	11%		11%
Rathburn Rd and Capilano Ct	2	0.12		2		1		1		2				2			
				100%		50%		50%		100%				100%			
Rathburn Rd and Garnetwood Chase (East)	2	0.23	1	1	1				1	1		1		1			1
			50%	50%	50%				50%	50%		50%		50%			50%
Rathburn Rd and Ponytrail Dr	2	0.06		2				1	1	2				2			
				100%				50%	50%	100%				100%			
Rathburn Rd and Rockwood Rd	2	0.09	1	1	2					2				2			
			50%	50%	100%					100%				100%			
Rathburn Rd and Tapestry Ct	1	0.13		1				1		1				1			
				100%				100%		100%				100%			
Total	**24**	**-**	**3**	**21**	**8**	**4**	**1**	**6**	**5**	**19**	**1**	**2**	**2**	**19**	**1**	**1**	**3**
			12%	**88%**	**33%**	**17%**	**4%**	**25%**	**21%**	**79%**	**4%**	**8%**	**8%**	**79%**	**4%**	**4%**	**13%**

Table 3: Collision Data Summary for Mid-Blocks

Intersections forming the Mid-Block	No. of Collisions	Collision Rate	Collision Type		Initial Impact Type				Environmental Condition		Road Surface Condition	
			Non-fatal Injury	P.D. Only	Rear end	Sideswipe	SMV other	Turning movement	Clear	Rain	Dry	Wet
Ponytrail Dr between Rathburn Rd and Tapestry Trail	4	0.91		4		1	2	1	3	1	2	2
				100%		25%	50%	25%	75%	25%	50%	50%
Rathburn Rd between Dixie Rd and Bough Beeches Blvd (East)	3	0.55	2	1	1		1	1	2	1	2	1
			67%	33%	33%		33%	33%	67%	33%	67%	33%
Rathburn Rd between Capilano Ct and Ponytrail Dr	2	0.51		2	1			1	1	1	1	1
				100%	50%			50%	50%	50%	50%	50%
Rathburn Rd between Fieldgate Dr and Capilano Ct	1	0.16	1				1			1		1
			100%				100%			100%		100%
Total	**10**	**-**	**3**	**7**	**2**	**1**	**4**	**3**	**6**	**4**	**5**	**5**
			30%	**70%**	**20%**	**10%**	**40%**	**30%**	**60%**	**40%**	**50%**	**50%**

3.4 TRAFFIC CONTROL WARRANT ANALYSIS

3.4.1 Traffic Signal Warrant Analysis

The signal warrant analysis for the existing condition was conducted for the three 'two-way stop-controlled' intersections within the study area, using turning movement counts collected for 'eight-hour' period.

As per the Ontario Traffic Manual (OTM) Book 12 guideline (March 2012), a number of justification procedures assist in determining the need for traffic signals. For traffic signal control to be technically justified, at least one of the justification criteria must be satisfied:

- Justification 1 – Minimum Eight-Hour Vehicle Volume
- Justification 2 – Delay to Cross Traffic
- Justification 3 – Combination Warrant
- Justification 4 – Minimum Four-Hour Vehicle Volume
- Justification 5 – Collision Experience
- Justification 6 – Pedestrian Volume

In this study, traffic signal warrant analysis was based on the evaluation of Justification Criteria 1 through 4, which focus on Vehicular Volume/Delay Warrants. The Justifications 5 and 6 were not followed due to the lack of sufficient data. (The traffic data provided by the City for these stop-controlled intersections do not included Pedestrian volumes, therefore, Justification 6 was not considered. Similarly, the available collision data is not sufficient to include Justification 5, which requires the most recent 3 years' data. Based on the data available: 2 collisions occurred at Bough Beeches Boulevard East intersection in 2019; 2 collisions occurred at Rockwood Road intersection in 2015; and no collision has been reported so far at Maple Ridge Dr/Lookout Court. If this is the actual case, signals would not be warranted using Justification 5.)

The traffic signal control justification criteria are satisfied when either Justification 1 or 2 is 100% satisfied, or each is at least 80% satisfied (using Justification 3 - Combination Warrant). Justification 4 - Minimum 4 Hour Vehicle Volume is applicable for locations where the intersection experiences excessive delays for four or more peak hours of the day, but do not have the prolonged demands throughout the day to meet an eight-hour warrant. Example locations include commuter-dominated roadways with heavy demands for two or more hours in each of the morning and afternoon peak periods, but considerably reduced demand for the remainder of the day. Ontario Traffic Manual - Book 12 describes the volume thresholds for each of these justification criteria and based on a comparison of these thresholds with observed traffic counts, the degree of compliance is evaluated.

The existing (2020) signal warrant analysis was performed for intersections of Rathburn Road East at Rockwood Road and Bough Beeches Boulevard (East), and Ponytrail Drive and Maple Ridge Drive/Lookout Court intersection. A summary of the signal warrant analysis results is presented in Table 4 and detailed analysis sheets are presented in **Appendix A**.

Table 4: Existing (2019) Signal Warrant Analysis Summary

Intersection	Compliance for Signals				Traffic Signals Justified?
	Justification 1	Justification 2	Justification 3	Justification 4	
	'Minimum 8-Hour Volume'	'Delay to Cross Traffic'	'Combination Warrant'	'4-Hour Volume'	
Rathburn Rd E at Rockwood Rd	57%	58%	57%	37%	No
Rathburn Rd E at Bough Beeches Blvd E	33%	20%	20%	12%	No
Ponytrail Dr at Maple Ridge Dr/Lookout Court	23%	16%	16%	21%	No

The signal warrant analysis results, presented in Table 4, indicate that the minimum eight-hour volume (Justification 1) and delay to cross traffic (Justification 2) are not satisfied for any of the intersections for existing volumes. The Combination Warrant (Justification 3) is also not met for these intersections such that percentage of compliance for Justification 3 is 57% for the intersection of Rathburn Road East and Rockwood Road, 20% for Rathburn Road East and Bough Beeches Boulevard (East) intersection, and 16% for Ponytrail Drive and Maple Ridge Drive/Lookout Court. Similarly, these intersections do not meet Justification 4 (less than 40% for these intersections).

As the intersections considered for signal warrant analysis are not meeting the compliance for traffic signals; traffic signals are not being recommended for these four intersections.

3.4.2 All-Way Stop-Control (AWSC) Warrant Analysis

All-Way Stop-Control (AWSC) warrant analysis was conducted for the intersection of Rathburn Road East and Bough Beeches Boulevard (East), presented in Figure 4, under the estimated 2020 traffic conditions.

Figure 4: Rathburn Road East and Bough Beeches Boulevard (East) Intersection

This intersection is currently with ‘two-way stop-control’ (TWSC), such that traffic approaching from Bough Beeches Boulevard (East) operates with a ‘stop-control’ and traffic on Rathburn Road East operates without any control (i.e. free-flow). The south approach to the intersection provides access to the parking lot at Lorrie Mitoff Trail and is currently not controlled by any ‘stop’ sign. The AWSC warrant analysis follows criteria set out by Ontario Traffic Manual (OTM Book 5), and the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD).

AWSC Warrant Analysis: Minimum Traffic Volume

The OTM minimum volume warrant for arterial and major roads align with the requirements specified in Section 2B.07 – Multi-Way Stop Application of the MUTCD:

1. The total vehicle volume on all intersection approaches exceeds 500 vehicles per hour for each of any eight hours of the day;

2. The combined vehicular and pedestrian volume on the minor street exceeds 200 per hour for each of the same hour;

3. The vehicular volume on the major street exceeds 300 per hour; and

4. The volume split does not exceed 70/30.

Additionally, the OTM specifies the following requirements for minor roads:

- The total vehicle volume entering the intersection exceeds 350 for the highest hour recorded; and

- The volume split does not exceed 75/25 for three-way control and 65/35 for four-way control.

Table 5 below summarizes the eight-hour volumes at the intersection, and the AWSC warrant criteria as set out by OTM and the MUTCD. The 2020 volumes were projected based on available counts from 2014. The total intersection volume ranges from 208 vehicles per hour to 408 vehicles per hour for the eight hours counted. The directional split ranges from 67/33 to 82/18, with an average of 76/24. Based on the estimated traffic volumes, the volume warrants for arterials and major roads are not satisfied.

Table 5: Summary of Traffic Volumes and Applicable Volume Warrants

Hour Ending	Total Vehicles			Directional Split	
	All Approaches	Major Approaches	Minor Approaches	Major	Minor
Estimated 2020 volumes					
8:00	260	174	86	67%	33%
9:00	361	269	92	75%	25%
12:00	208	149	59	72%	28%
13:00	239	187	52	78%	22%
14:00	239	171	68	72%	28%
16:00	317	249	68	79%	21%
17:00	353	287	66	81%	19%
18:00	408	335	73	82%	18%
Total/Average	2,385	1,821	564	76%	24%
Justification Criteria					
OTM Book 5 (arterials and major roads)	500	-	200	70%	30%
MUTCD	-	300	200	-	-
OTM Book 5 (minor roads)	350	-	-	75% (three-way) 65% (four-way)	25% (three-way) 35% (four-way)
Findings	Criteria met based on OTM (minor roads)			Criteria met based on OTM (minor roads) considering three-way control	

The OTM volume warrant for minor roads of 350 vehicles for the highest hour is satisfied. AWSC is very close to being warranted based on the directional split of 75/25, considering a three-way control. The intersection is best classified as a ‘three-way’, since the fourth leg does not provide a connection to the adjacent road network and the approach volume is less than 10 vehicles per hour.

AWSC Warrant Analysis: Collision

The OTM Book 5 specifies a high collision frequency warranting consideration for AWSC to be an average of four collisions per year over a three-year period. Only collisions susceptible to correction through AWSC should be considered, which include right-angle and turning collisions. The MUTCD requires five or more crashes within a 12-month period to satisfy the AWSC collision warrant.

A comprehensive review of collision history at the intersection was conducted for a seven-year period from 2014 to 2020. During this period, there were a total of eleven reported collisions, out of which eight were related to right-angle or turning impacts. The average number of collisions is 1 to 2 per year, which is lower than the threshold identified by the OTM and MUTCD. Therefore, AWSC is not warranted based on collision frequency. However, it should be noted that AWSC has potential of reducing the number of right-angle and turning-related conflicts.

Findings and Recommendations

The following observations are made with respect to the AWSC warrant analysis:

- The peak hour traffic volumes for a minor road meet the requirement for AWSC (>350 vehicles).

- AWSC is very close to being warranted based on the volume splits between the major and minor approaches, considering a three-way control (<75/25). The intersection could be considered as a ‘three leg’ intersection since the fourth leg only connects to a parking lot and has less than 10 vehicles recorded per hour.

- The number of angle or turning-related collisions recorded at this intersection is 1-2 per year between 2014 and 2020. AWSC is not warranted based on collision frequency. However, the collision frequency could potentially reduce with a provision of AWSC at the intersection.

- Based on the above discussion, the Rathburn Road East and Bough Beeches Boulevard (East) is recommended to convert from a ‘two-way stop control’ to an ‘all-way stop control’ intersection.

3.5 EXISTING (2020) INTERSECTION CAPACITY ANALYSIS

The intersection capacity analysis for the study area intersections was conducted with Synchro software (version 10) using the parameters, suggested by the City. This software considers the traffic volumes and road network (i.e. posted speed, number of travel lanes, types of traffic control – e.g. traffic signals, 'Stop'/'Yield' signs, etc.). The evaluation elements include average delays, Level of Service (LOS), volume to capacity (v/c) ratio, and 95th percentile queue length. The analysis results for the intersection capacity analysis were summarized using the Synchro report outputs for the Highway Capacity Manual (HCM) 6th Edition. The LOS criteria for the signalized and unsignalized intersections are presented in Table 6.

Capacity is defined as the maximum number of vehicles that can pass over a road segment or through an intersection within a set time duration. Capacity is combined with a level of service (LOS) to describe the operating characteristics of a road segment or intersection. LOS is a qualitative measure that describes operational conditions within a traffic stream. The Highway Capacity Manual (HCM) defines six levels of service for autos, LOS A through LOS F. LOS A represents lower average delay and LOS F represents the higher average delay.

Table 6: Intersection Level of Service Criteria for Autos

LOS	Intersection Delay Criteria (seconds per vehicle)		Traffic Operation
	Signalized	'Stop' Controlled/ Roundabout	
A	≤ 10	≤ 10	Acceptable operation
B	> 10.0 and ≤ 20.0	> 10.0 and ≤ 15.0	
C	> 20.0 and ≤ 35.0	> 15.0 and ≤ 25.0	
D	> 35.0 and ≤ 55.0	> 25.0 and ≤ 35.0	
E	> 55.0 and ≤ 80.0	> 35.0 and ≤ 50.0	Marginally Acceptable – occasional queuing
F	> 80.0	> 50.0	Unacceptable – persistent queuing

Source: Highway Capacity Manual, 2000

The highest possible rating is LOS A under which the average total delay on a movement, approach or intersection is less than 10 seconds per vehicle. When the average delay exceeds 50 seconds at unsignalized intersections, or 80 seconds at signalized intersections, the movement is classified as LOS ‘F’. Up to LOS ‘D’ is generally considered as an acceptable level of service for signalized intersections in urban areas. LOS ‘E’ is the point at which remedial measures are considered, depending on the nature and extent of the delays.

The intersection capacity analysis results for the existing (2020) conditions (using existing signal timing plans, provided by the City) are presented in Table 7 and Table 8 for the morning and afternoon peak hours, respectively. The detailed Synchro reports for the existing conditions are provided in **Appendix B**.

Table 7: Existing (2020) Intersection Capacity Analysis Results for AM Peak Hour

Intersection	Overall Delay (s)	Overall LOS	Critical Movements				
			Turning Movement	HCM 6th Edition			95th Percentile Queue (m)
				Delay (s/veh)	V/C	LOS	
Rathburn Rd E at Dixie Road	27	C	EBL	65	0.59	E	92
			WBL	63	0.46	E	55
Rathburn Rd E at Bough Beeches Blvd W	14	B	-	-	-	-	-
Rathburn Road E at Rockwood Rd [1]	3	A	-	-	-	-	-
Rathburn Rd E at Fieldgate Dr	19	B	-	-	-	-	-
Rathburn Road E at Capilano Ct [1]	1	A	-	-	-	-	-
Rathburn Rd E at Ponytrail Dr	15	B	-	-	-	-	-
Rathburn Rd E at Bough Beeches Blvd E [1]	4	A	-	-	-	-	-
Ponytrail Dr at Tapestry Trail [1]	1	A	-	-	-	-	-
Ponytrail Dr at Maple Ridge Dr/Lookout Ct [1]	1	A	-	-	-	-	-
Ponytrail Dr at Burnhamthorpe Rd E	28	C	NBL	70	0.16	E	16
			NBT/R	92	0.83	F	44
			SBL	69	0.83	E	89
			SBT	58	0.16	E	25
			SBR	61	0.36	E	14

Note 1: Intersections are controlled by ‘Stop’ sign

Table 8: Existing (2020) Intersection Capacity Analysis Results for PM Peak Hour

Intersection	Overall Delay (s)	Overall LOS	Critical Movements				
			Turning Movement	HCM 6th Edition			95th Percentile Queue (m)
				Delay (s/veh)	V/C	LOS	
Rathburn Rd E at Dixie Road	32	C	EBL	67	0.29	E	29
			WBL	60	0.41	E	51
			NBL	69	0.93	E	141
Rathburn Rd E at Bough Beeches Blvd W	12	B	-	-	-	-	-
Rathburn Road E at Rockwood Rd[1]	3	A	-	-	-	-	-
Rathburn Rd E at Fieldgate Dr	21	C	-	-	-	-	-
Rathburn Road E at Capilano Ct [1]	1	A	-	-	-	-	-
Rathburn Rd E at Ponytrail Dr	11	B	-	-	-	-	-
Rathburn Rd E at Bough Beeches Blvd E [1]	4	A	-	-	-	-	-
Ponytrail Dr at Tapestry Trail [1]	1	A	-	-	-	-	-
Ponytrail Dr at Maple Ridge Dr/Lookout Ct [1]	1	A	-	-	-	-	-
Ponytrail Dr at Burnhamthorpe Rd E	27	C	NBL	70	0.13	E	14
			NBT/R	77	0.63	E	41
			SBL	71	0.85	E	96
			SBT	57	0.20	E	32
			SBR	59	0.31	E	12

Note 1: Intersections are controlled by 'Stop' sign

As presented in Table 7 and Table 8, the existing (2020) intersection capacity analysis results indicate that all the study area intersections are operating at an overall LOS 'C' or better with an overall average delay of less than 35 seconds/vehicle during both the morning and afternoon peak hours. The following individual movements that are expected to operate at LOS 'F' or 'E' include:

- The eastbound left and westbound left turning movements during both the peak hours and northbound left-turning movement during the afternoon peak hour at

Rathburn Road East intersection with Dixie Road; and

- The northbound and southbound movements, which include left, through, and right turning movements during the morning and afternoon peak hours at Ponytrail Drive and Burnhamthorpe Road East intersection.

In addition, the queue lengths for the eastbound and northbound left-turning movements at the intersection of Rathburn Road East and Dixie Road, extend beyond the available storage lengths.

3.6 PEDESTRIAN LEVEL OF SERVICE

The pedestrian level of service (PLOS) analysis for the Rathburn Road East/ Ponytrail Drive Integrated study area was conducted following the City of Ottawa's Multimodal Analysis Guidelines. The PLOS analysis is presented as a ranking of intersections and mid-block (segments) that a pedestrian could encounter in the study area. The methodology measures the level of traffic stress (LTS) experienced by a pedestrian for each segment and signalized intersection. Each LTS score is associated with roadway characteristics and scored (from A to F) based on the degree a pedestrian will encounter these types of stressors such that:

- Segment PLOS considers the width of the facility and the horizontal separation between pedestrians and moving motor vehicles (Buffer/Boulevard). The analysis also adds considerations to traffic volumes on the adjacent roadways, the presence of on-street parking and roadway operating speeds.

- Intersection PLOS is based on two measures – the Pedestrian Exposure to Traffic at Signalized Intersections (PETSI) and Pedestrian Delay LOS. The evaluation of PETSI is based on crossing characteristics, such as crossing distance, and signal phasing and timing features; whereas, Pedestrian Delay LOS is based on a simple equation, considering cycle length and Pedestrian Effective Walk Time.

The inputs for the segment PLOS and Pedestrian Exposure to Traffic LOS are summarized in Table 9 and Table 10, respectively. Table 11 provides examples of how the criteria were applied to roadways in the study area.

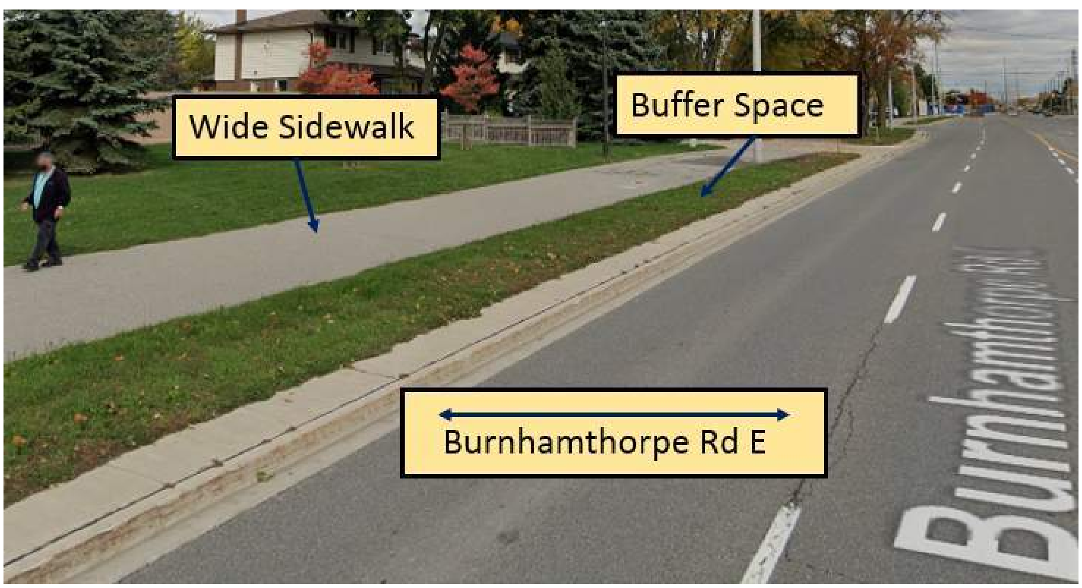
Table 9: Pedestrian Segment LOS Considerations

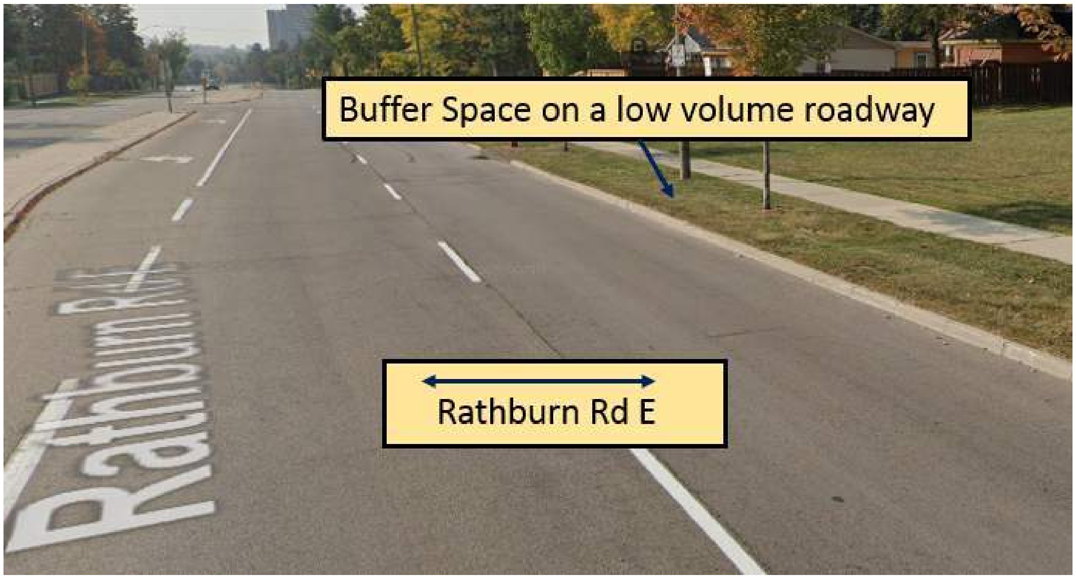
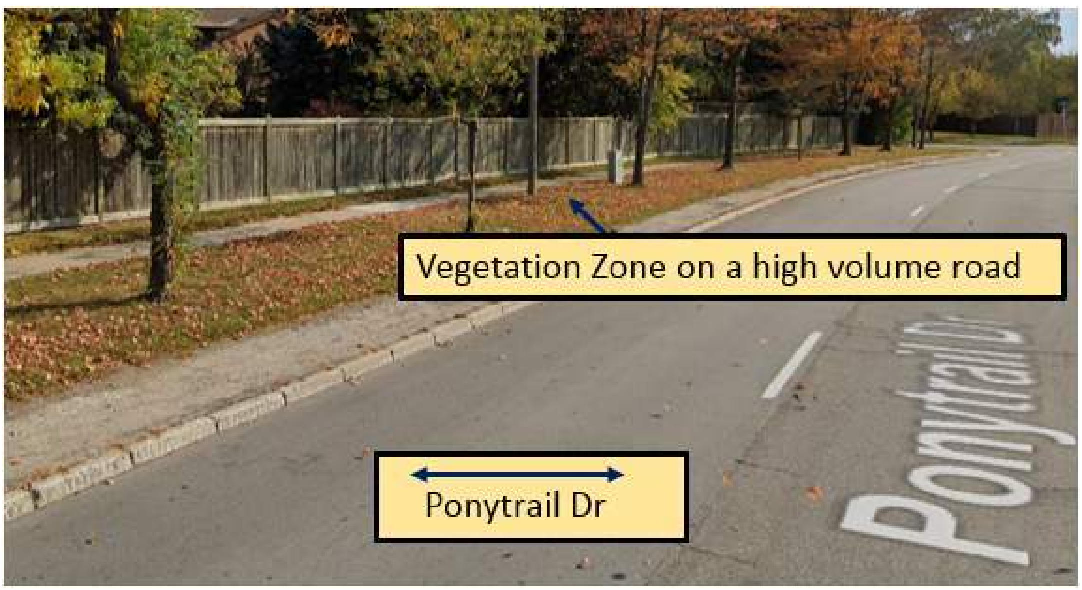
Sidewalk Width	Is the sidewalk wide enough (i.e.,1.5 meters) to meet Provincial accessibility standards?
Separation	Is the pedestrian facility separated from travels lanes (e.g., vegetation zone, on-street parking, asphalt maintenance strip, bicycle lane)?
Vehicular Volumes	Is this a high-volume road with Average Daily Curb Lane Traffic Volumes greater than 3000?
Operating Speed	Are the operating speed limits lower (30-50 km/h) or higher (≥60 km/h)?

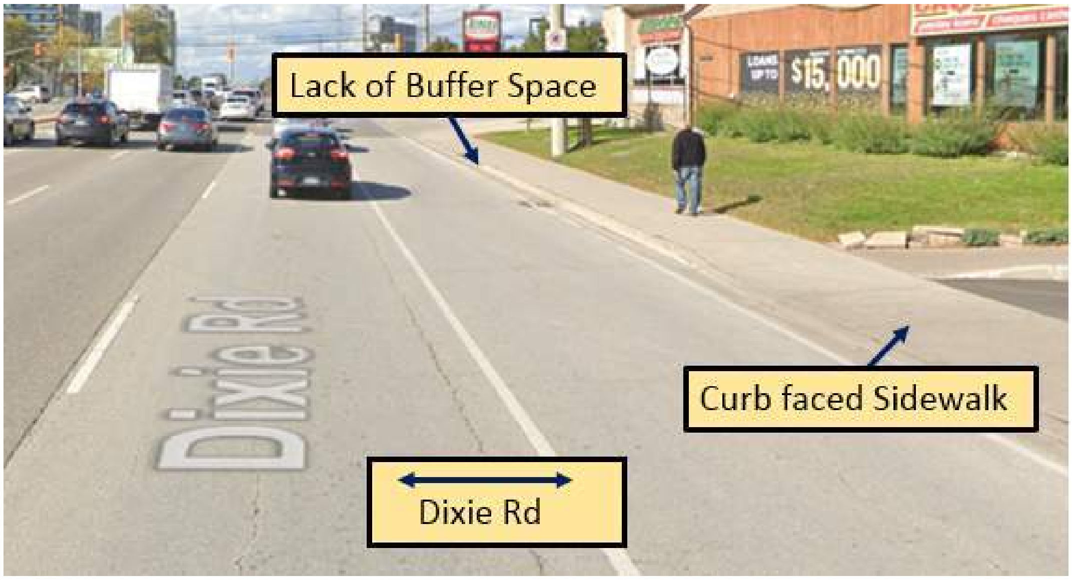
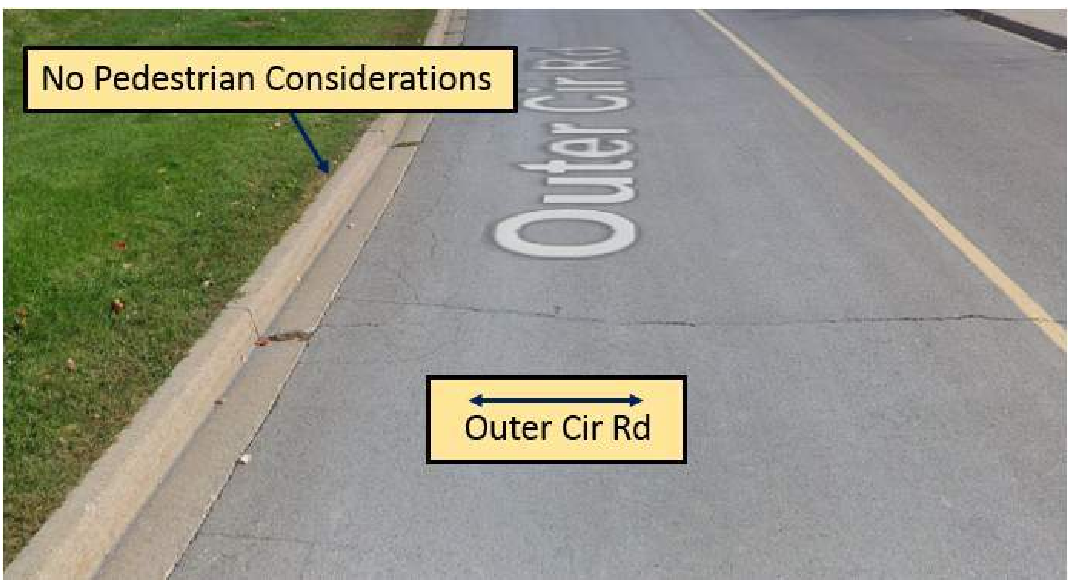
Table 10: Pedestrian Exposure to Traffic LOS Considerations

Crossing Distance	If the crossing side has multi-lane, is there any island refuge for a safe crossing?
Corner Radius	Is the turning radius for vehicles wide (typically indicating an environment that is suited for the movement of goods and vehicular flow as opposed to pedestrian safety)?
Channelized Right	Is the channelized right a smart channel (channel intersecting street at an angle of 70° or greater) or conventional right turn channel?
Potential Conflicts	If the conflicting left and right turning movements are allowed, what is a type of conflicting movement – e.g., Protected, Permissive, Protective/Permissive, etc.?
Right turn on Red (RTOR); Leading Pedestrian Interval (LPI)	Is RTOR allowed or prohibited at certain times; Is LPI allowed for minimizing the conflicts between pedestrians and vehicles?
Crosswalk Treatment	Is the crosswalk raised, coloured or textured, which could increase the visibility for approaching vehicles?

Table 11: Illustrations of LOS for Pedestrians

LOS	Example
A	
B	

LOS	Example
C	
D	

LOS	Example
E	
F	

Within the study area, sidewalks are present on both sides of Rathburn Road East and Ponytrail Drive with a minimum width of 1.5 m and at least 2.0 m wide boulevards (Therefore, the majority of study area segments have PLOS 'C'. The Ponytrail Drive segments between Rathburn Road East and Tapestry Trail in both the northbound and southbound directions, and between Tapestry Trail and Maple Ridge Drive/Lookout Court in the southbound direction () have an existing PLOS 'D' because of high curb lane traffic volumes. The Rathburn Road East segments between Dixie Road and

Fieldgate Drive in the westbound direction; and between Dixie Road and Bough Beeches Boulevard (West) in the eastbound direction, located adjacent to high volume roadway, experience segment PLOS ‘E’. Additionally, on-street parking, which provides an extra horizontal separation between pedestrians and travel lanes, is also prohibited on these Rathburn Road East segments.

The pedestrians' overall condition at the study area intersections is mainly poor due to wide crossing distance. There is no such facility as island refugee at the study area intersections. The pavements, such as raised or textured crosswalks, which enhance pedestrians’ safety, are not present at any intersection. The existing crosswalks are either standard transverse markings or zebra stripe markings, which are the forms of conventional crosswalks. However, due to sufficient walk time, pedestrian delay LOS at the intersections is ‘D’ or better, except for the intersections at Rathburn Road East and Dixie Road, and Ponytrail Drive and Burnhamthorpe Road East, where the pedestrians are experiencing higher average delays.

Therefore, the signalized intersections located within the study area have PLOS ‘E/F’. The pedestrian existing (2020) level of service analysis results for segments and intersections are presented in Figure 5. The existing (2020) intersection PLOS results for each approach of intersection are summarized further in Table 12.

Figure 5: Existing (2020) Pedestrian Level of Service Results

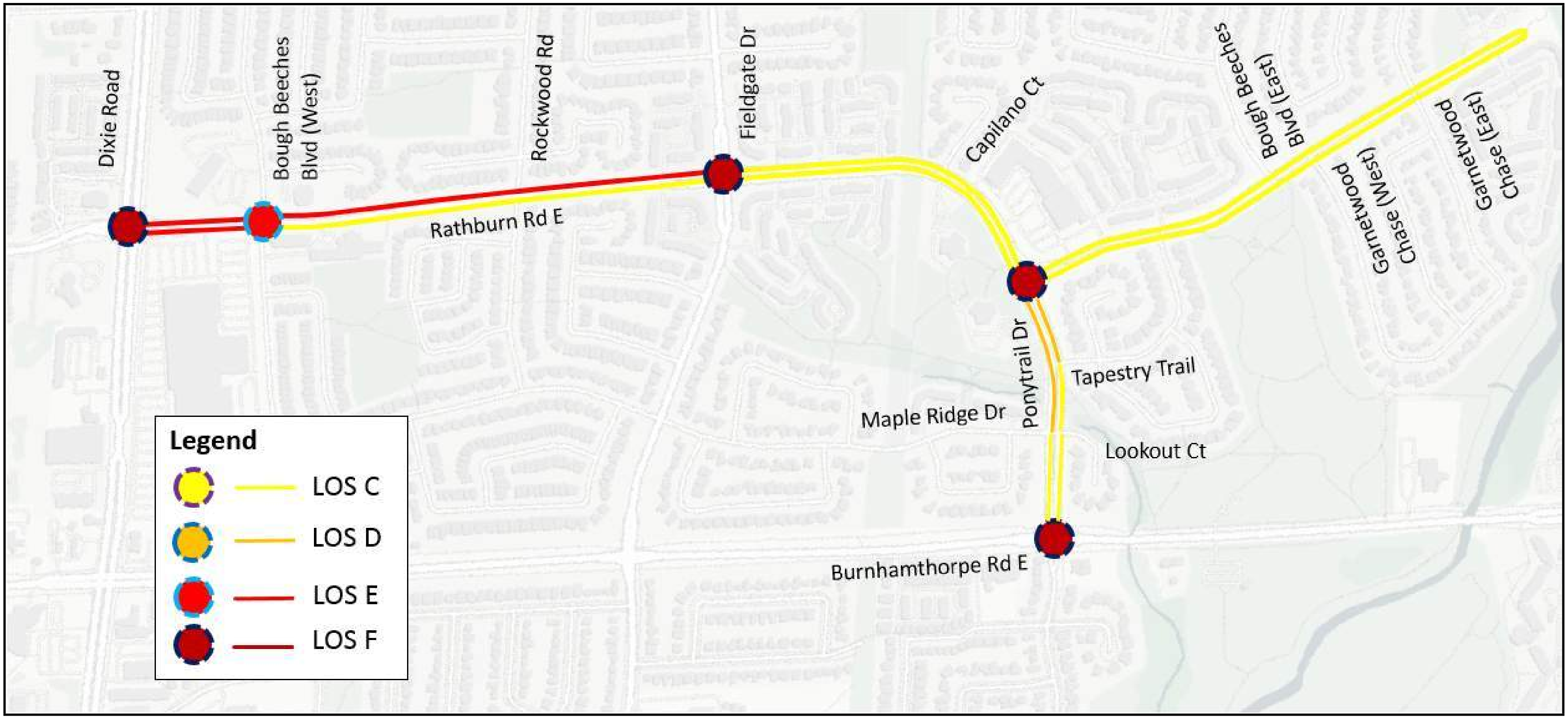


Table 12: Existing (2020) Intersection PLOS Results

Intersection	Approach	Pedestrian Exposure to Traffic LOS	Pedestrian Delay LOS
Rathburn Rd E at Dixie Road	North	F	F
	South	F	F
	East	F	F
	West	F	F
Rathburn Rd E at Bough Beeches Blvd (West)	North	C	C
	South	C	C
	East	E	C
	West	E	C
Rathburn Rd E at Fieldgate Dr	North	E	D
	South	E	D
	East	F	D
	West	F	D
Rathburn Rd E at Ponytrail Dr	North	F	D
	South	E	D
	East	D	D
Ponytrail Dr at Burnhamthorpe Rd E	North	F	F
	South	C	F
	East	F	F
	West	F	F

3.7 BICYCLE LEVEL OF SERVICE

Similar to the PLOS, the Bicycle Level of Service (BLOS) analysis was performed using the methodology provided in the City of Ottawa's Multimodal Analysis Guidelines. The BLOS was evaluated for the study area intersections and segments. The basic criteria applied to measure the BLOS is similar to the criteria used for the PLOS analysis, such as facility type and cycling-specific facilities that can improve the level of stress for cyclists at the intersection and is elaborated below:

- Segment BLOS considers the type of facility, number of travel lanes vehicular operating speed and parking characteristics. It also considers the blockage of bike lanes by commercial deliveries and median refuge width at unsignalized crossings.

- Intersection BLOS specifically identifies left turn accommodation, such as the bike box and the number of lanes crossed, and the right turn characteristics, such as the length of the turning lane and the turning speed.

Table 13 and Table 14 below indicate the inputs for the segment and intersection BLOS, respectively, while examples of how these criteria were applied to the study area network are provided in Table 15.

Table 13: Bicycle Segment LOS Considerations

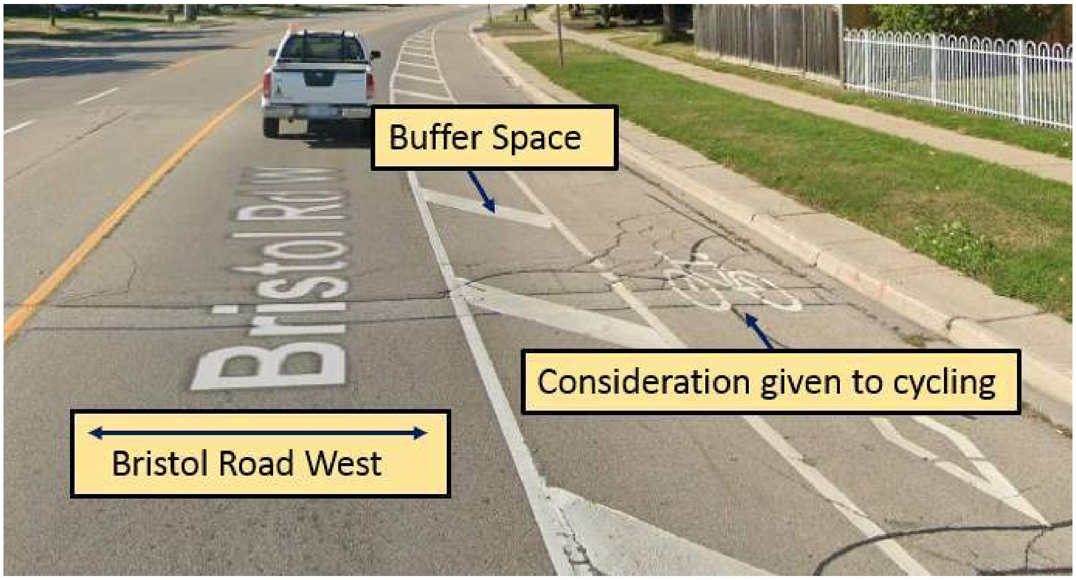
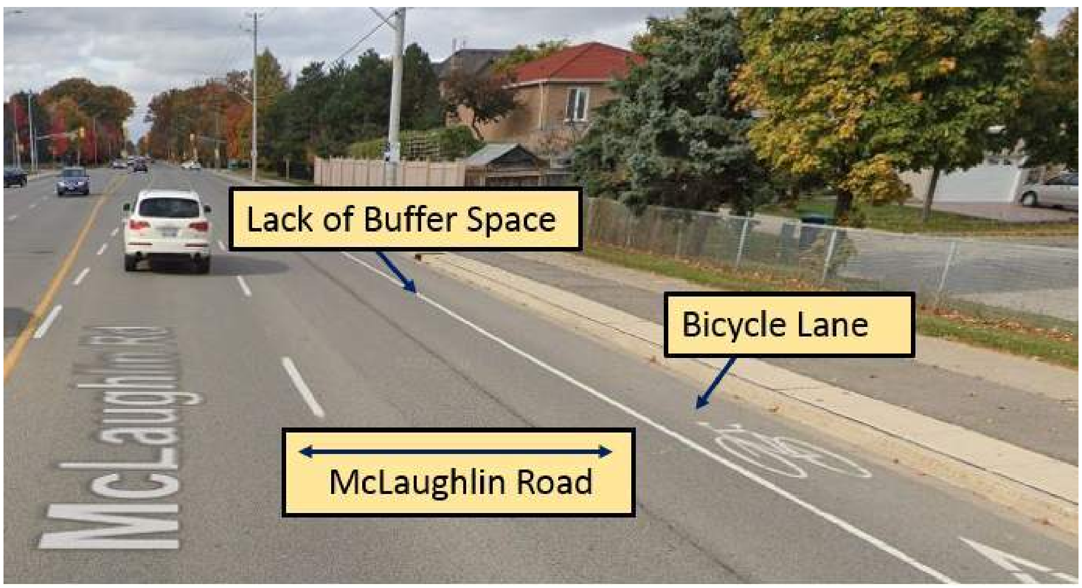
Conflicts with Right Turning Vehicles	• On an approach to an intersection, if the facility is at right of turning lane, which could enhance bicycle visibility and reduce the conflicts? • If the facility is located left of right turning lane (i.e., pocket bike lane), does it cross the turning lane?
Left Turn Impediments	• Does the intersection have consideration for left turning bicycles (i.e., two-stage bicycle box)?

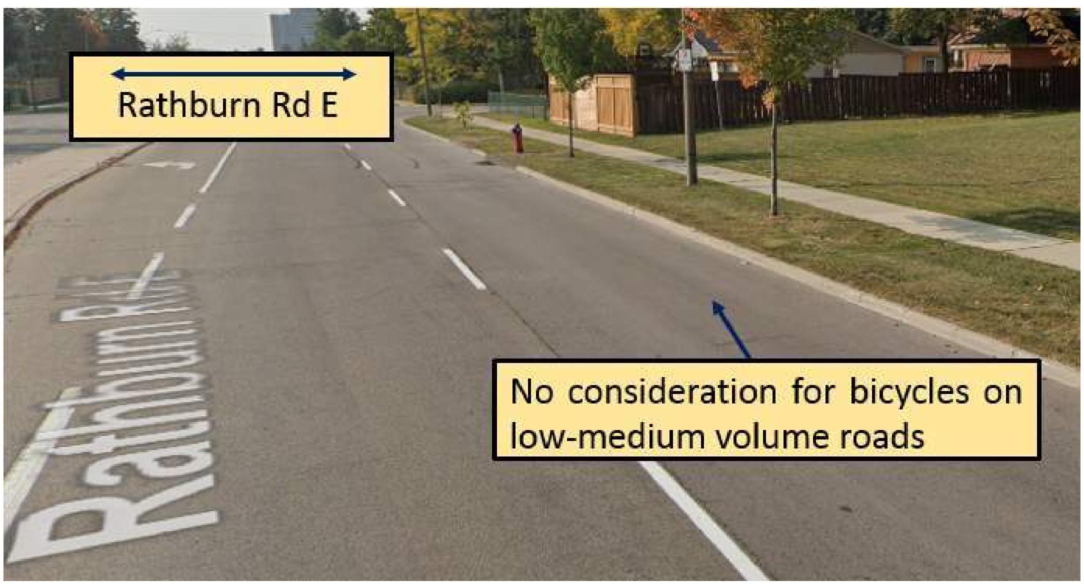
Table 14: Bicycle Intersection LOS Considerations

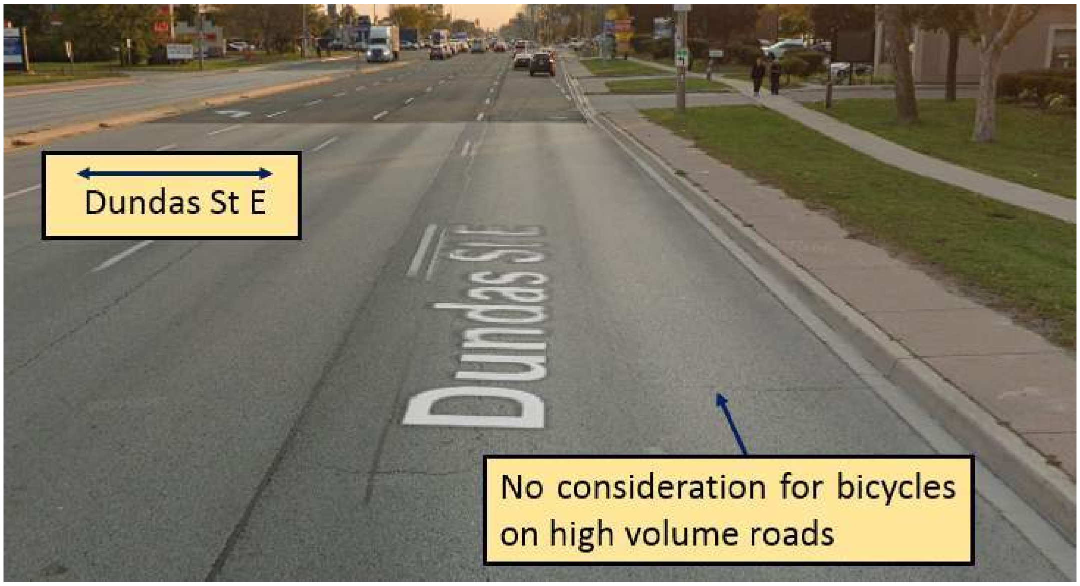
Facility Characteristics	• Is the facility physically separated including cycle tracks, protected bike lanes and multi-use path? • Does the facility have a painted buffer? • Is there parking beside the bike lane or the facility is a curbside bike lane? • Is the facility appropriately signed?
Street Dimensions and Vehicular Speeds	• How many vehicle lanes are there? • Are the operating speed limits lower (30-50 km/h) or higher (≥60 km/h)?
Bike lane Blockage	• Is there an abundance of conflict points (i.e., parking driveways or commercial access driveways)?
Unsignalized Crossings	• If the crossing side has median refuge, is this appropriate for bicycle storage (i.e., ≥ 1.8 metres wide)? • Is the crossing side wide (≥ 6 lanes) or narrow (≤ 3 lanes), and what are the operating speeds on the side street?

Table 15: Illustrations of LOS for Bicycles

<table>
<tr><th>LOS</th><th>Example</th></tr>
<tr><td>A</td><td>
</td></tr>
</table>

LOS	Example
B	
C	

LOS	Example
D	
E	

LOS	Example
F	

The study area corridors – Rathburn Road East and Ponytrail Drive have an abundance of stressors for cyclists due to the absence of cycling infrastructure and facilities. Additionally, there are no provisions for cyclists on the crossing streets, except for the in-boulevard multi-use paths on the west side of Dixie Road and north side of Burnhamthorpe Road East The cross-rides facilitated with bicycle signals are also available along the Burnhamthorpe Road East where the existing multi-use pathway intersects the roads. Therefore, the segments and intersections have an existing BLOS of 'E' and 'F,' respectively because of the lack of provisions for bicycles.

The existing (2020) bicycle level of service analysis results for segments and intersections are presented in Figure 8. The existing (2020) intersection BLOS results for each approach of intersection are summarized further in Table 16.

Figure 6: Existing (2020) Bicycle Level of Service Results

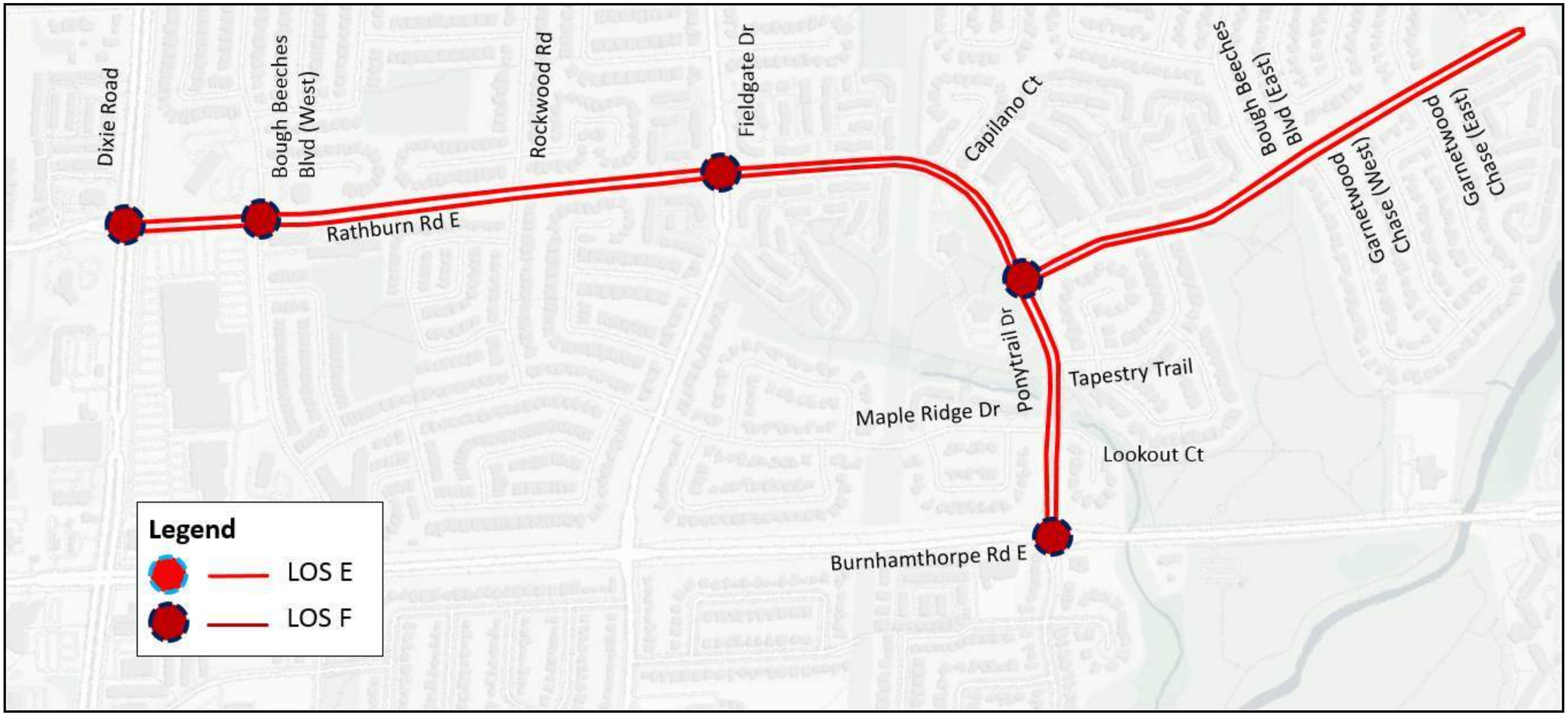


Table 16: Existing (2020) Intersection BLOS Results

Intersection	Approach	Bicycle LOS
Rathburn Rd E at Dixie Road	North	C
	South	C
	East	F
	West	F
Rathburn Rd E at Bough Beeches Blvd (West)	North	E
	South	E
	East	F
	West	F
Rathburn Rd E at Fieldgate Dr	North	F
	South	F
	East	F
	West	F
Rathburn Rd E at Ponytrail Dr	North	F
	South	C
	East	E
Ponytrail Dr at Burnhamthorpe Rd E	North	F
	South	E
	East	C
	West	C

3.8 TRANSIT LEVEL OF SERVICE

Similar to other travel modes, the Transit Level of Service (TLOS) analysis was conducted utilizing the City of Ottawa's Multimodal Analysis Guidelines. To evaluate the TLOS for the study area segments and intersections, the following elements were considered:

- Segment TLOS considers facility type – dedicated bus lane and segregated right-of-way, and level of exposure to congestion in terms of parking driveways or commercial access driveway.
- Intersection TLOS identifies transit-specific signal phase and an average delay experienced by transit on an approach to entering the intersection.

The LOS criteria for transit at the signalized intersections is presented in Table 17.

Table 17: Signalized Intersection Level of Service Criteria for Transit

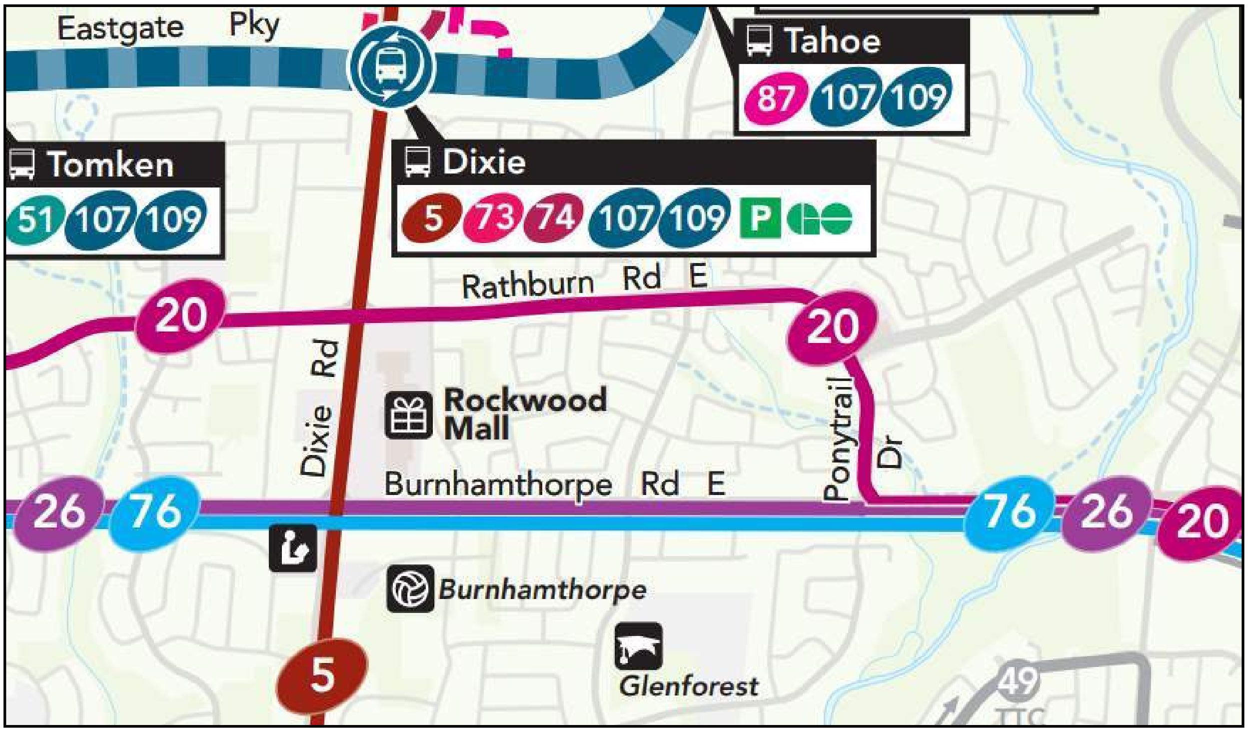
LOS	Delay (seconds per vehicle)
A	0
B	≤ 10.0
C	≤ 20.0
D	≤ 30.0
E	≤ 40.0
F	> 40.0

Source: The City of Ottawa's Multimodal Analysis Guidelines, 2015

Within the study area, there is currently one MiWay (City of Mississauga) bus route –Route # 20, which serves Rathburn Road East (west of Ponytrail Drive), and Ponytrail Drive. The transit route within the study area is presented in Figure 7. It should be noted that transit does not operate on Rathburn Road East, east of Ponytrail Drive.

Route 20 (Rathburn Road) operates on Rathburn Road East and Ponytrail Drive seven days a week. On a typical weekday, this route serves with an approximate headway of 10-20 minutes during morning peak hour, and 20 minutes during afternoon peak hours MiWay buses on this route operate with a frequency of about 25 minutes on Saturday, and 35 minutes on Sunday peak hours.

Figure 7: Existing Transit Routes in the Study Area



Source: Mississauga Transit Routes

The study area corridors have regular bus routes with no consideration to transit priority – rapid transit. However, due to limited driveway/parking friction, the Rathburn Road East and Ponytrail Dr segments have TLOS ‘D’, except for Rathburn Road East segment between Dixie Road and Bough Beeches Boulevard (West) – which connects to a busy parking driveway of Rockwood Mall – resulting in TLOS ‘E’.

Despite having a lack of transit-specific signals, the overall environment for transit is favorable at the intersections, except for the Dixie Road and Burnhamthorpe Road East intersections, which have TLOS ‘F’. The transit vehicle performance at intersections was evaluated by measuring the curb lane delay (seconds/vehicle). The curb lane delay outputs were summarized using the Synchro reports for the Highway Capacity Manual (HCM) 6th Edition. Within the study area, transit experiences an average delay between 5-92 seconds/vehicle.

The existing (2020) transit level of service analysis results for segments and intersections are presented in Figure 8. The existing (2020) intersection TLOS results for each approach of intersection are summarized further in Table 18.

Figure 8: Existing (2020) Transit Level of Service Results

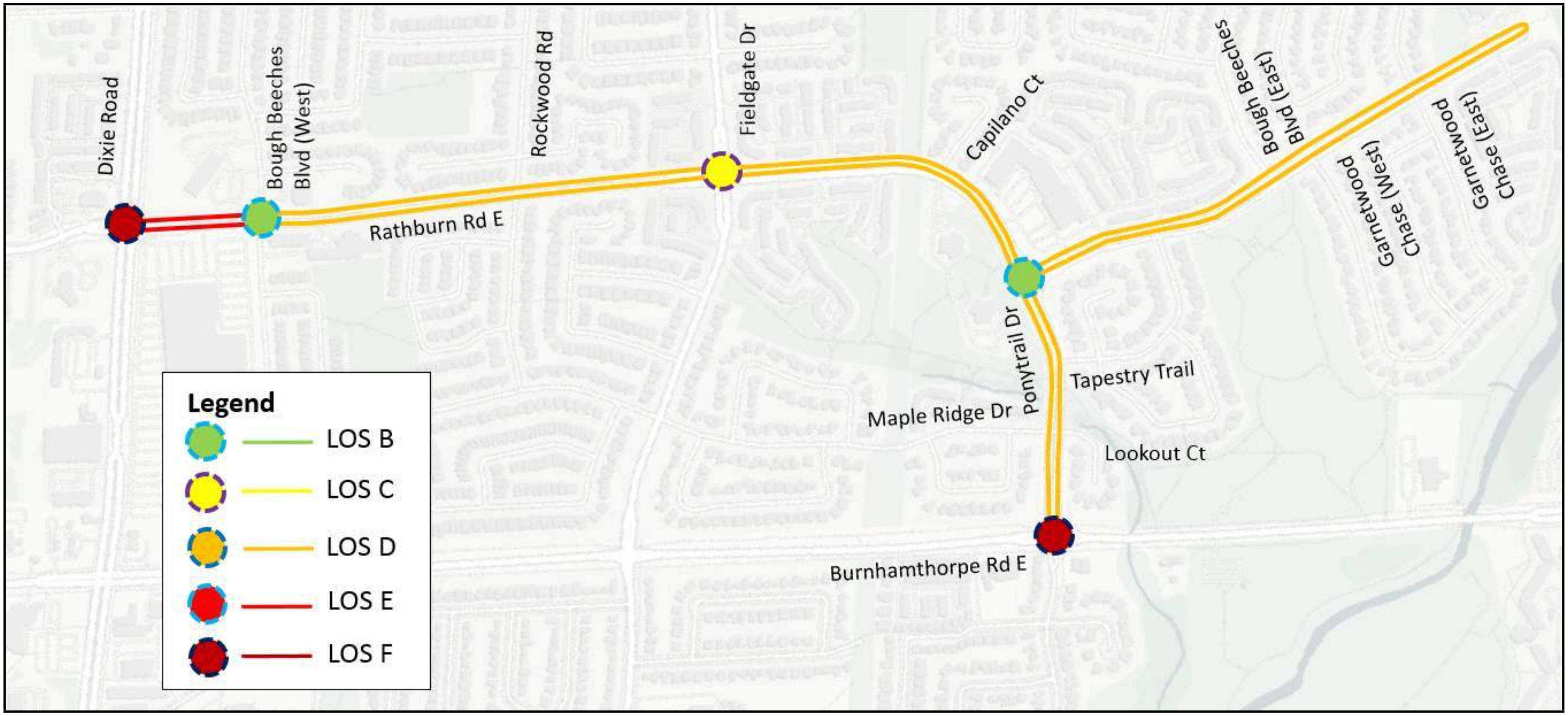


Table 18: Existing (2020) Intersection TLOS Results

Intersection	Approach	Delay (sec/veh)	Transit LOS
Rathburn Rd E at Dixie Road	North	24	D
	South	19	C
	East	55	F
	West	51	F
Rathburn Rd E at Bough Beeches Blvd (West)	East	8	B
	West	8	B
Rathburn Rd E at Fieldgate Dr	East	11	C
	West	10	B
Rathburn Rd E at Ponytrail Dr	North	5	B
	South	5	B
Ponytrail Dr at Burnhamthorpe Rd E	North	59	F
	South	92	F
	East	20	C
	West	17	C

4 TRAFFIC ANALYSIS FOR FUTURE (2041) CONDITIONS

The cycling facilities on Rathburn Road East and Ponytrail Drive are planned to be introduced through the road resurfacing. The cycle tracks or bike lanes will be provided by the reduction of four-lane cross-section to two-lane cross-section or through the reconstruction of the existing boulevard within the right of way.

In order to understand and assess the potential transportation impacts for the future (2041) traffic conditions, with and without the road reconstruction and proposed improvements, the following two scenarios were analyzed for the future (2041) conditions:

- **Future (2041) Scenario 1:** represents the future (2041) base case scenario – i.e. existing configurations without roadway improvements or associated lane reduction. Thus, under this scenario, the study area corridors assume to operate with an existing four-lane cross-section.

- **Future (2041) Scenario 2:** represents the future (2041) conditions with a four-lane cross-section throughout the study area and a two-lane network on Rathburn Road East between Ponytrail Drive and Cul-de-sac along with the provisions for cyclists on Rathburn Road East and Ponytrail Drive, and additional changes or improvements.

It is noted that the future (2041) traffic conditions also include the proposed re-development of condos located at 4100 Ponytrail Drive, Forest Park Circle Ltd. The site is situated in the north-west quadrant of Ponytrail Drive/Gunthorpe Road East intersection. The implementation of the proposed residential development will relocate the existing site access to the west side of the Ponytrail Drive and Tapestry Trail intersection (as presented in Figure 14), which is currently operating as a 'T-intersection' (as presented in Figure 2).

The future (2041) traffic demands at the study area intersections were estimated based on the City's travel demand model (Emme model) outputs, and the future site traffic volumes assumed in the Traffic Impact and Parking Study of the proposed residential development.

The City's travel demand model suggests an annual growth rate of 0.8% and 1.4% for the existing (2020) morning and afternoon peak hour traffic volumes, respectively. The respective annual traffic growth rate was applied only to the major movements – including eastbound and westbound through traffic on Rathburn Road East between Dixie Road and Capilano Court, northbound and southbound through traffic on Ponytrail

Drive between Capilano Court and Burnhamthorpe Road East, and all the movements at major intersections of Dixie Road, Fieldgate Drive and Burnhamthorpe Road East.

4.1 FUTURE (2041) SCENARIO 1: WITHOUT ROADWAY IMPROVEMENTS

As mentioned above, Scenario 1 considered the existing (2020) lane-configurations on Rathburn Road East and Ponytrail Drive (as presented in Figure 2) with the future (2041) traffic volumes and the existing signal timing plans that were optimized using *Synchro 10* software. The estimated future (2041) traffic volumes for the morning (AM) and afternoon (PM) peak hours are presented in Figure 9.

4.1.1 Auto Level of Service

The future (2041) intersection capacity analysis for the morning and afternoon peak hours with the existing (2020) road network configurations are presented in Table 19 and Table 20, respectively and the detailed Synchro reports are provided in **Appendix C**.

Figure 9: Future (2041) Weekday Peak Hour Turning Movement Volumes

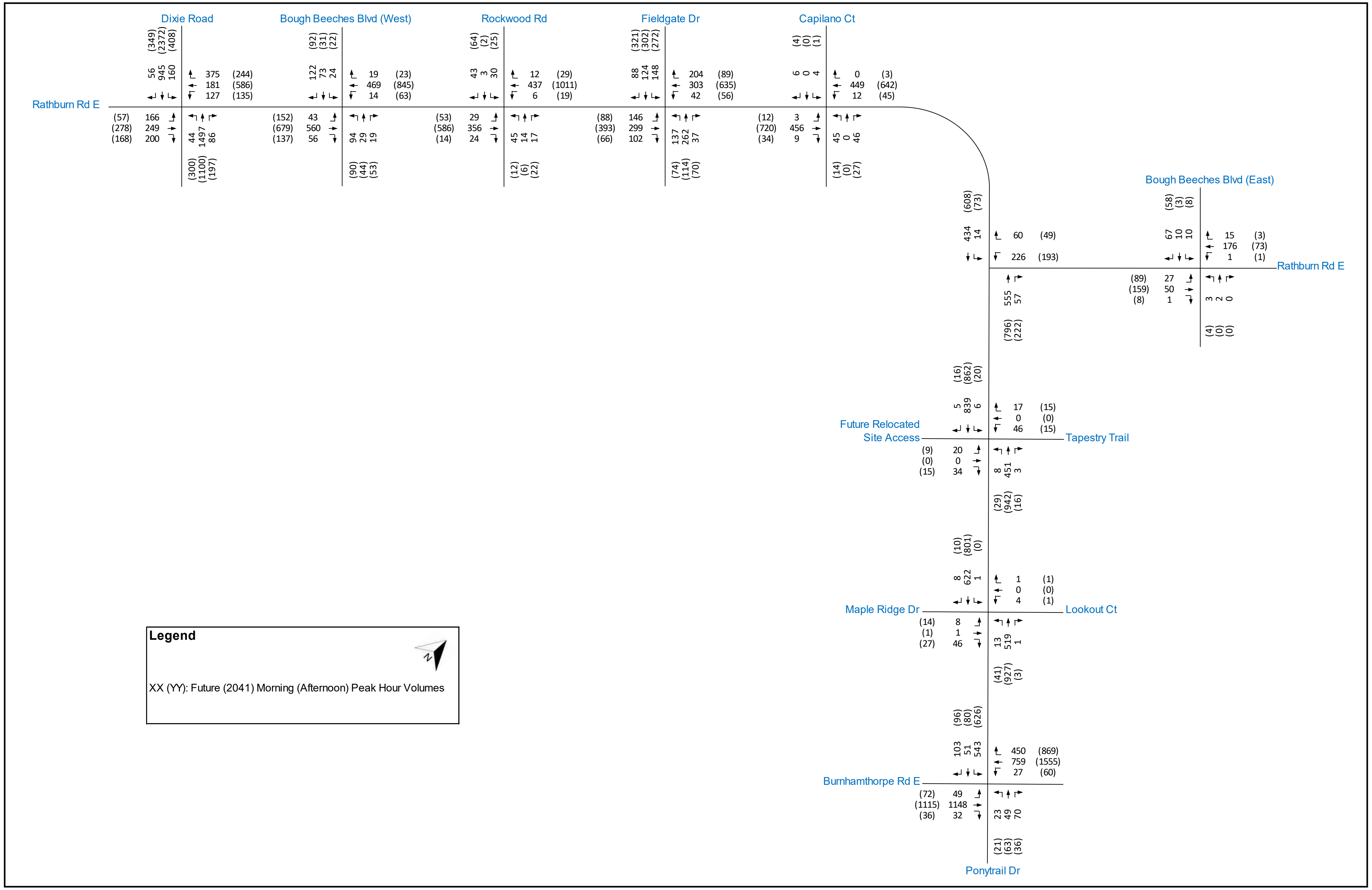


Table 19: Future Scenario 1 Intersection Capacity Analysis Results for AM Peak Hour

Intersection	Overall Delay (s)	Overall LOS	Critical Movements				
			Turning Movement	HCM 6th Edition			95th Percentile Queue (m)
				Delay (s/veh)	V/C	LOS	
Rathburn Rd E at Dixie Road	24	**C**	-	-	-	-	-
Rathburn Rd E at Bough Beeches Blvd W	14	B	-	-	-	-	-
Rathburn Road E at Rockwood Rd [1]	3	A	-	-	-	-	-
Rathburn Rd E at Fieldgate Dr	19	B	-	-	-	-	-
Rathburn Road E at Capilano Ct [1]	1	A	-	-	-	-	-
Rathburn Rd E at Ponytrail Dr	14	B	-	-	-	-	-
Rathburn Rd E at Bough Beeches Blvd E [1]	3	A	-	-	-	-	-
Ponytrail Dr at Tapestry Trail [1]	2	A	-	-	-	-	-
Ponytrail Dr at Maple Ridge Dr/Lookout Ct [1]	1	A	-	-	-	-	-
Ponytrail Dr at Burnhamthorpe Rd E	30	C	NBT/R	63	0.77	**E**	43
			SBL	56	0.86	**E**	88

Note 1: Intersections are controlled by 'Stop' sign

Table 20: Future Scenario 1 Intersection Capacity Analysis Results for PM Peak Hour

Intersection	Overall Delay (s)	Overall LOS	Critical Movements				
			Turning Movement	HCM 6th Edition			95th Percentile Queue (m)
				Delay (s/veh)	V/C	LOS	
Rathburn Rd E at Dixie Road	50	**D**	EBL	68	0.42	E	52
			WBL	59	0.54	E	74
			NBL	150	1.14	F	165
Rathburn Rd E at Bough Beeches Blvd W	12	B	-	-	-	-	-
Rathburn Road E at Rockwood Rd [1]	4	A	NBL/T/R	36	0.27	E	1
			SBL/T/R	51	0.56	F	3
Rathburn Rd E at Fieldgate Dr	22	C	-	-	-	-	-
Rathburn Road E at Capilano Ct [1]	1	A	-	-	-	-	-
Rathburn Rd E at Ponytrail Dr	11	B	-	-	-	-	-
Rathburn Rd E at Bough Beeches Blvd E [1]	4	A	-	-	-	-	-
Ponytrail Dr at Tapestry Trail [1]	1	A	WBL/T/R	49	0.29	E	1
Ponytrail Dr at Maple Ridge Dr/Lookout Ct [1]	1	A	-	-	-	-	-
Ponytrail Dr at Burnhamthorpe Rd E	37	D	EBL	193	1.06	F	56
			NBL	62	0.15	E	15
			NBT/R	71	0.71	E	45
			SBL	74	0.93	E	110

Note 1: Intersections are controlled by 'Stop' sign

Under the future (2041) Conditions and Scenario 1, the study area intersections are expected at operate at an overall acceptable LOS, i.e., LOS 'D' or better with an overall average delay no longer than 30 and 50 seconds during the morning and afternoon peak hours, respectively. As presented in Table 19 and Table 20, the following individual movements have been identified as critical movements – which are expected to operate at LOS 'E/F':

- The eastbound left, westbound left and northbound left turning movements during the afternoon peak hour at the intersection of Rathburn Road East and Dixie Road;
- The shared northbound and southbound left/through/right turning movements during

the afternoon peak hour at the Rathburn Road East and Rockwood Road intersection;

- The shared westbound left/through/right turning movements during the afternoon peak hour at the Ponytrail Drive and Tapestry Trail intersection; and
- The shared northbound through/right and southbound left turning movements during both the peak hours and eastbound left and northbound left turning movements during the afternoon peak hour at Ponytrail Drive intersection with Burnhamthorpe Road East.

Also, the queue lengths for the eastbound, westbound, and northbound left-turning movements at Rathburn Road East and Dixie Road intersection, and eastbound left-turning movement at Ponytrail Drive and Burnhamthorpe Road East intersection are expected to exceed the available queuing space during (2041) traffic conditions.

4.1.2 Pedestrian Level of Service

During future (2041) Scenario 1 – which assumes future (2041) traffic volumes and no improvement in network conditions including pedestrian infrastructure – pedestrian conditions are expected to worsen. With the increased traffic demand on the adjacent roadways in 2041 conditions, the Rathburn Road East segments between Fieldgate Drive and Ponytrail Drive in both the eastbound and westbound directions, and between Bough Beeches Boulevard (West) and Rockwood Road in the eastbound direction are expected to experience a PLOS 'E' as compared to a PLOS 'C' during existing (2020) condition. Similarly, the Ponytrail Drive segments between Tapestry Trail and Burnhamthorpe Road East in the northbound direction are likely to have PLOS 'D' under future (2041) Scenario 1 condition compared to PLOS 'C' during existing (2020) conditions.

Because of no change in crossing conditions, each approach at the study area intersection is expected to operate at the existing (2020) Pedestrian Exposure to Traffic LOS. However, with traffic signal optimization, pedestrians are expected to experience a slightly lower delay at the approaches of Ponytrail Drive and Burnhamthorpe Road East intersection with Pedestrian LOS 'E' as compared to LOS 'F' during the existing (2020) conditions. The pedestrian level of service analysis results for future (2041) Scenario 1 at study area segments and intersections are presented in Figure 10 and the intersection PLOS results for each approach of intersection are summarized further in Table 21.

Figure 10: Future (2041) Scenario 1 Pedestrian Level of Service Results

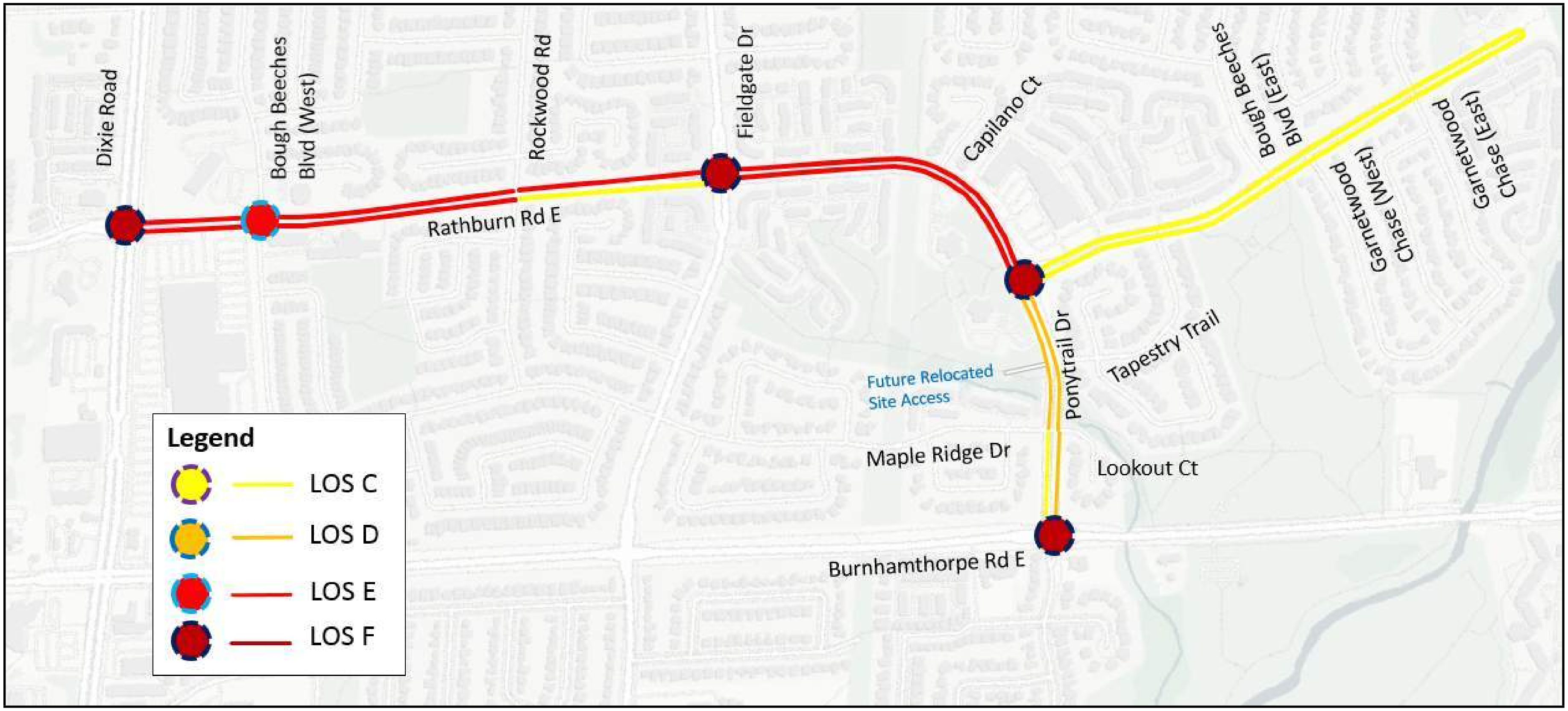


Table 21: Future (2041) Scenario 1 Intersection PLOS Results

Intersection	Approach	Pedestrian Exposure to Traffic LOS	Pedestrian Delay LOS
Rathburn Rd E at Dixie Road	North	F	F
	South	F	F
	East	F	F
	West	F	F
Rathburn Rd E at Bough Beeches Blvd (West)	North	C	C
	South	C	C
	East	E	C
	West	E	C
Rathburn Rd E at Fieldgate Dr	North	E	D
	South	E	D
	East	F	D
	West	F	D
Rathburn Rd E at Ponytrail Dr	North	F	D
	South	E	D
	East	D	D
Ponytrail Dr at Burnhamthorpe Rd E	North	F	E
	South	C	E
	East	F	E
	West	F	E

4.1.3 Bicycle Level of Service

Assuming there are no plans to introduce the cycling facilities under Scenario 1, the study area is expected to operate at the existing (2020) BLOS, i.e., BLOS 'E' or 'F' (as presented in Figure 6 and Table 16).

4.1.4 Transit Level of Service

Under Scenario 1, which considers the existing transit services with no transit priority, the study area segments are expected to operate at the existing (2020) TLOS (as presented in Figure 8).

The transit is expected to experience an average delay of up to 72 seconds/vehicle within the study area under future (2041) Scenario 1 condition. Under Scenario 1, overall transit conditions at the study area intersections are expected to be similar to the existing (2020) conditions, and the intersections are expected to have TLOS 'B' or 'C', except for the Rathburn Road East and Dixie Road and Ponytrail Drive and Burnhamthorpe Road East intersections, which are expected to operate at an overall intersection TLOS 'F' (as presented in Figure 8). The future (2041) Scenario 1 TLOS results for each approach of intersection are summarized in Table 22.

Table 22: Future (2041) Scenario 1 Intersection TLOS Results

Intersection	Approach	Delay (sec/veh)	Transit LOS
Rathburn Rd E at Dixie Road	North	49	F
	South	27	D
	East	51	F
	West	44	F
Rathburn Rd E at Bough Beeches Blvd (West)	East	8	B
	West	9	B
Rathburn Rd E at Fieldgate Dr	East	17	C
	West	15	C
Rathburn Rd E at Ponytrail Dr	North	5	B
	South	6	B
Ponytrail Dr at Burnhamthorpe Rd E	North	48	F
	South	72	F
	East	31	E
	West	23	D

4.2 FUTURE (2041) SCENARIO 2: WITH ROADWAY IMPROVEMENTS

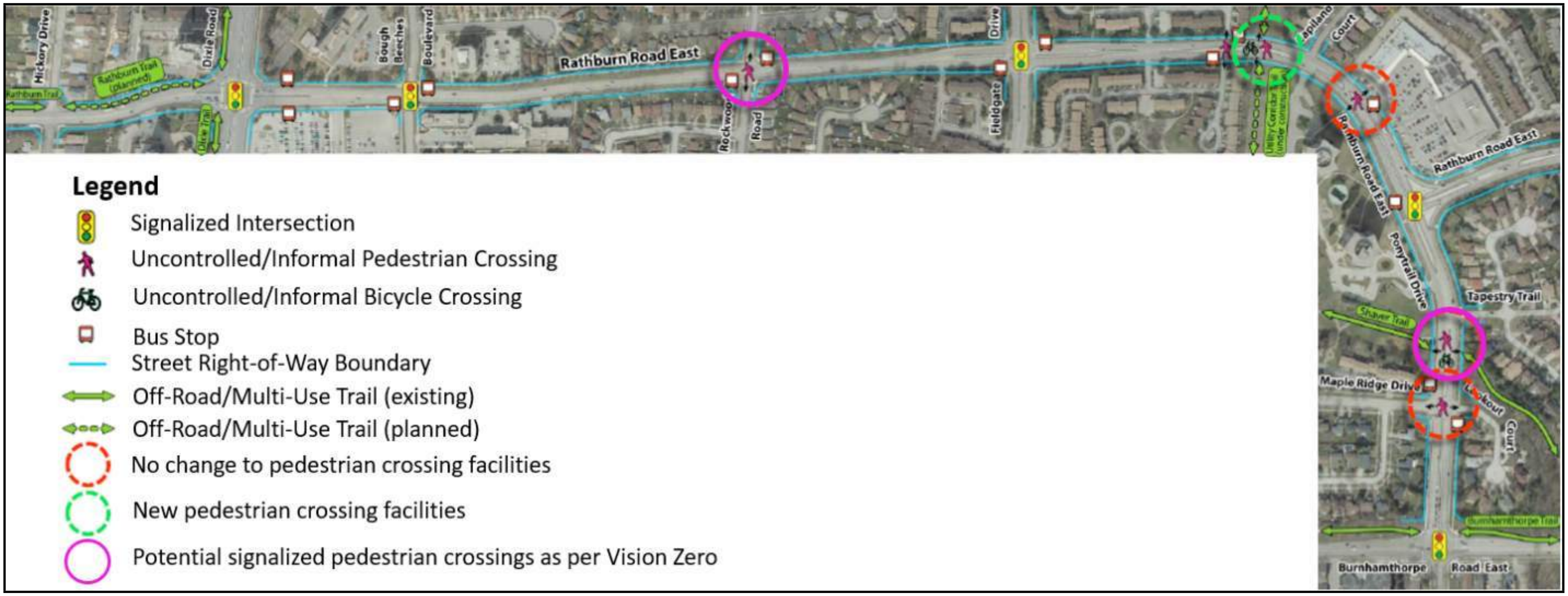
Scenario 2 represents complete street future (2041) conditions with the road resurfacing of Rathburn Road East and Ponytrail Drive. The Scenario accommodates the needs of all the road users, including motorists, pedestrians, cyclists, and transit, by considering the following improvements to the study area network. The proposed design that has been chosen for Rathburn Road East/Ponytrail Integrated Study is presented in Figure 13 (Source: Public Information Centre (PIC), Mississauga).

- **Pedestrian Facilities:**

  As presented in Figure 11, the project team assessed the five locations for the pedestrian crossing opportunities along the Rathburn Road East and Ponytrail Drive within the limits of the study area. The criteria chosen to review the pedestrian crossing locations include – safety, width of road, proximity to signalized road crossings, potential pedestrian travel paths/crossing locations and budget.

  Therefore, a Mid-block Pedestrian Signal (MPS) is proposed to be installed at the hydro corridor located between Fieldgate Drive and Capilano Court on Rathburn Road East. Based on Vision Zero considerations, the City is also considering to signalize the uncontrolled/informal pedestrian crossings at Rockwood Road intersection and Shaver Trail Crossing, which is located between Tapestry Trail and Maple Ridge Drive.

Figure 11: Pedestrian Crossing Locations Evaluation



- **Cycling Facilities**: The two types of cycling facilities have been envisaged under the future (2041) Scenario 2 conditions as follows:

    - In-Boulevard cycle track on the Rathburn Road East between Dixie Road and Ponytrail drive, and on Ponytrail Drive between Rathburn Road East and Burnhamthorpe Road East. Cyclists will be off road and will be physically separated from vehicles/pedestrians.

      Two Way cycle track on Rathburn Road East between Ponytrail Drive and end of Cul-de-sac. Cyclists will be in the boulevard, behind the curb with some separation from the sidewalk and pedestrians. These cycling facilities offer more safety and comfort to cyclists than traditional facilities like bicycle lanes and are illustrated below in Figure 12.

Figure 12: Examples of the planned cycling facilities to be implemented in 2041

In-Boulevard Cycle Track | Two Way Cycle Track

Source: Public Information Centre (PIC), Mississauga

- **Lane Configurations:** With the introduction of the cycling facilities on both sides of Rathburn Road East and Ponytrail Drive, the following changes are planned on Rathburn Road East and Ponytrail Drive:

    - Reconstruction of existing four-lane cross-section boulevards of Rathburn Road East between Dixie Road and Ponytrail Drive, and Ponytrail Drive Between Rathburn Road East and Burnhamthorpe Road East within the right of way.

- Reduction of four-lane to two-lane cross-section on Rathburn Road East between Ponytrail Drive and Cul-de-sac with the provision of a dedicated right turn in the westbound direction at Rathburn Road East and Ponytrail Drive intersection. **Additional Improvements:** The following additional roadway improvements have been considered under Scenario 2:

    - Removal of channelized right turns from all the approaches at the intersection of Rathburn Road East and Dixie Road, including an acceleration lane on the east side of the intersection.

- Removal of eastbound and westbound dedicated right-turn lanes at Rathburn Road East intersection with Fieldgate Drive.
- Removal of channelized right turns from the westbound and northbound direction at Rathburn Road East and Ponytrail Drive intersection. The channelized right turns were subsequently modified to dedicated right-turn lanes in the westbound and northbound directions. However, the northbound dedicated right-turn lane was not included in the analysis.
- Removal of the southbound dedicated right turn at the Ponytrail Drive and Maple Ridge Drive/Lookout Court intersection.
- Provision of 'all-way stop-control' at the Rathburn Road East and Bough Beeches Boulevard (East) intersection, which is currently operating with 'two-way stop-control'.

Scenario 2 considered the future (2041) traffic volumes (as presented in Figure 9) with the optimized signal timing plans. The lane configurations considered under the Scenario are presented in Figure 14.

Figure 13: Proposed Improvements for Future (2041) Scenario 2

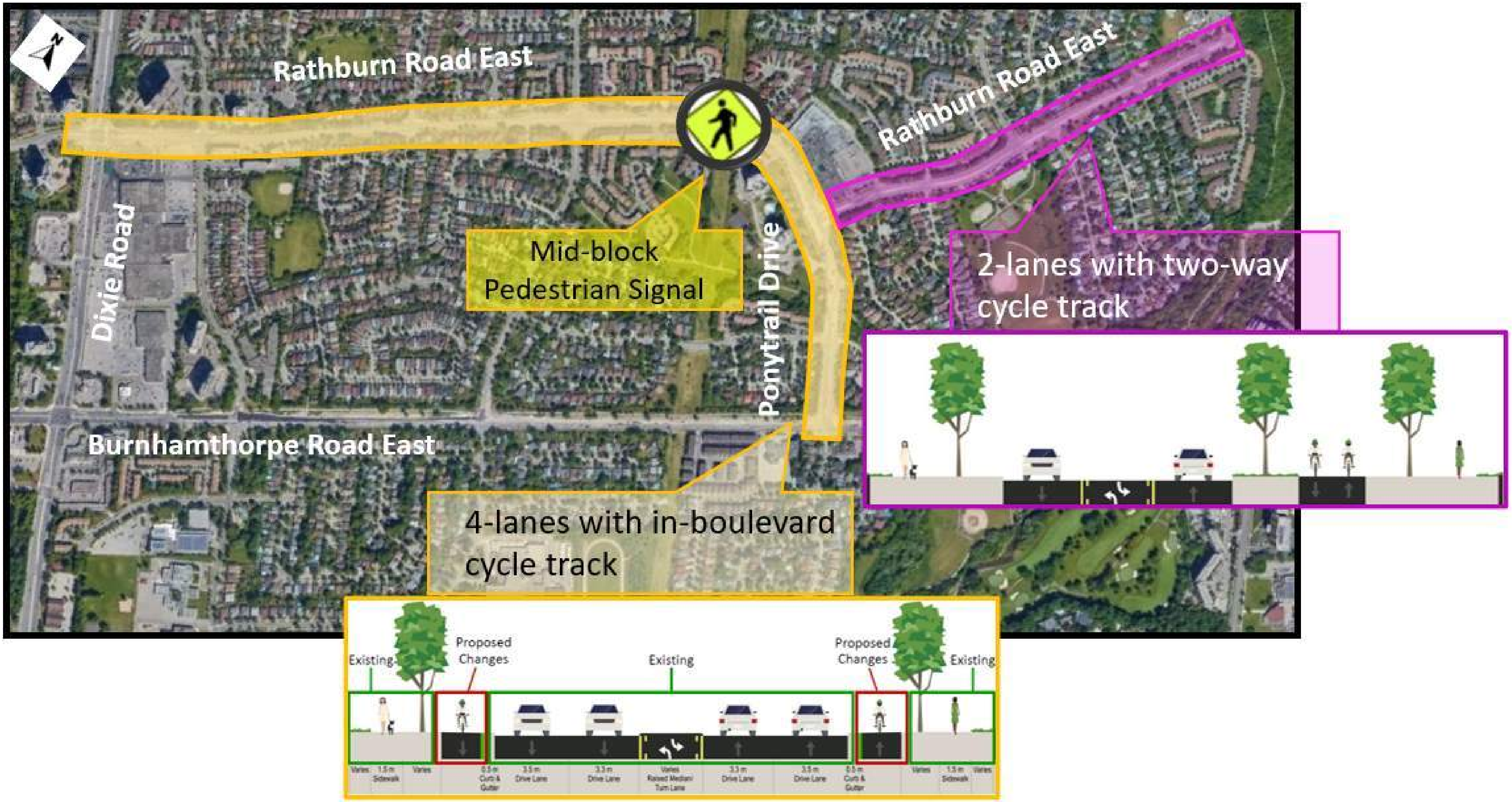
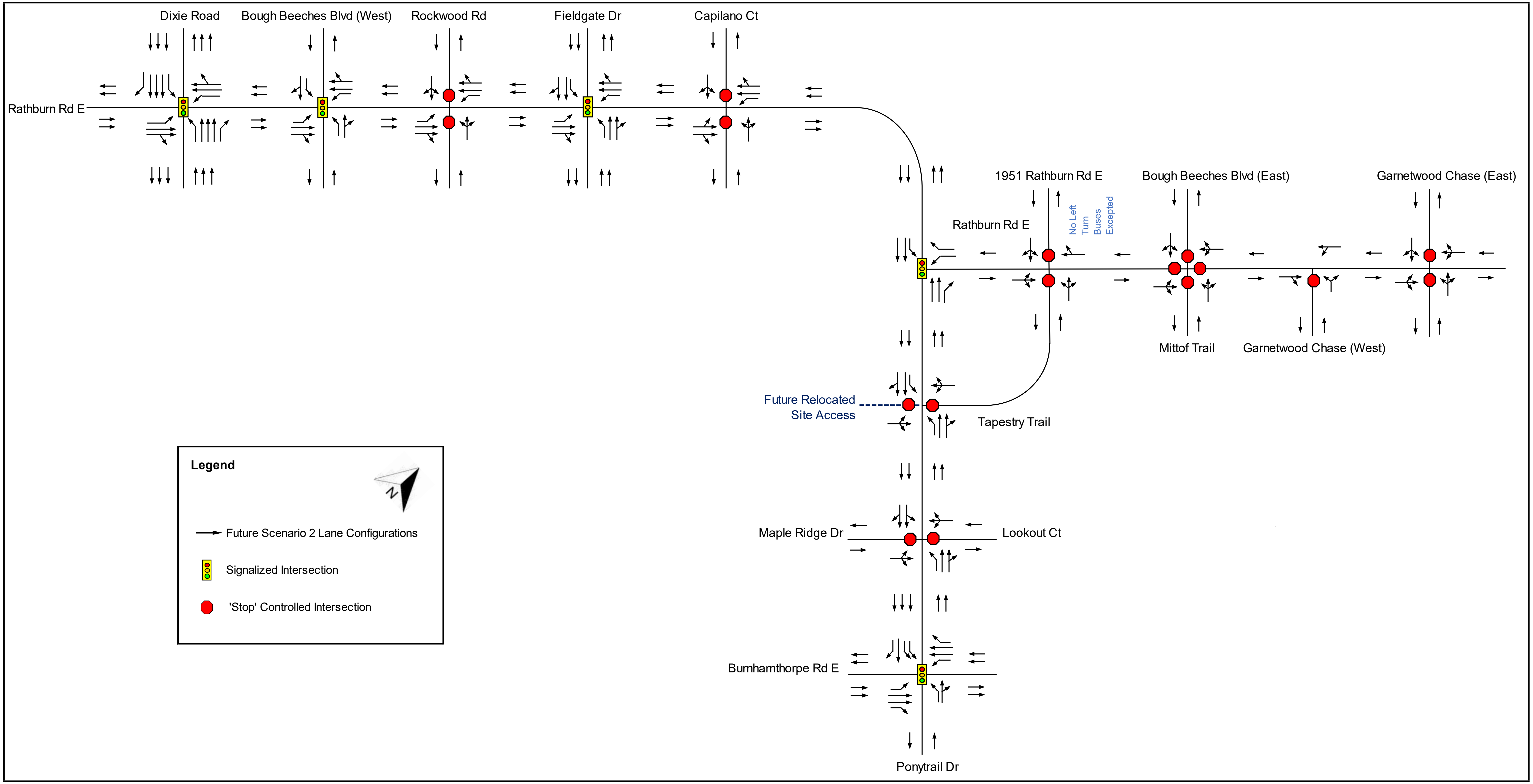


Figure 14: Future (2041) Scenario 2 Lane Configurations



4.2.1 Auto Level of Service

The intersection capacity analysis results for the future (2041) Scenario 2 are presented in Table 23 and Table 24 for morning and afternoon peak hours, respectively. The detailed Synchro reports are provided in **Appendix D**.

Table 23: Future Scenario 2 Intersection Capacity Analysis Results for AM Peak Hour

Intersection	Overall Delay (s)	Overall LOS	Critical Movements				
			Turning Movement	HCM 6th Edition			95th Percentile Queue (m)
				Delay (s/veh)	V/C	LOS	
Rathburn Rd E at Dixie Road	36	D	EBL	68	0.84	E	70
Rathburn Rd E at Bough Beeches Blvd W	14	B	-	-	-	-	-
Rathburn Road E at Rockwood Rd [1]	3	A	-	-	-	-	-
Rathburn Rd E at Fieldgate Dr	20	B	-	-	-	-	-
Rathburn Road E at Capilano Ct [1]	1	A	-	-	-	-	-
Rathburn Rd E at Ponytrail Dr	14	B	-	-	-	-	-
Rathburn Rd E at Bough Beeches Blvd E [2]	8	A	-	-	-	-	-
Ponytrail Dr at Tapestry Trail [1]	2	A	-	-	-	-	-
Ponytrail Dr at Maple Ridge Dr/Lookout Ct [1]	1	A	-	-	-	-	-
Ponytrail Dr at Burnhamthorpe Rd E	30	C	NBT/R SBL	63 56	0.77 0.86	E E	43 88

Note 1: Intersections are controlled by 'Stop' sign

Note 2: Intersection is 'All-Way Stop-Controlled'

Table 24: Future Scenario 2 Intersection Capacity Analysis Results for PM Peak Hour

Intersection	Overall Delay (s)	Overall LOS	Critical Movements				
			Turning Movement	HCM 6th Edition			95th Percentile Queue (m)
				Delay (s/veh)	V/C	LOS	
Rathburn Rd E at Dixie Road	56	E	EBL	115	0.77	F	52
			WBL	74	0.70	E	74
			WBT/R	70	0.88	E	159
			NBL	195	1.26	F	172
Rathburn Rd E at Bough Beeches Blvd W	12	B	-	-	-	-	-
Rathburn Road E at Rockwood Rd [1]	4	A	NBL/T/R	36	0.27	E	1
			SBL/T/R	51	0.56	F	3
Rathburn Rd E at Fieldgate Dr	22	C	-	-	-	-	-
Rathburn Road E at Capilano Ct [1]	1	A	-	-	-	-	-
Rathburn Rd E at Ponytrail Dr	11	B	-	-	-	-	-
Rathburn Rd E at Bough Beeches Blvd E [2]	9	A	-	-	-	-	-
Ponytrail Dr at Tapestry Trail [1]	1	A	WBL/T/R	49	0.29	E	1
Ponytrail Dr at Maple Ridge Dr/Lookout Ct [1]	1	A	-	-	-	-	-
Ponytrail Dr at Burnhamthorpe Rd E	37	D	EBL	193	1.06	F	56
			NBL	62	0.15	E	15
			NBT/R	71	0.71	E	45
			SBL	74	0.93	E	110

Note 1: Intersections are controlled by 'Stop' sign

Note 2: Intersection is 'All-Way Stop-Controlled'

The intersection capacity results for Scenario 2, which assumes future (2041) traffic demands and roadway improvements, indicate that the study area intersections are expected to operate at LOS 'D' or better except for the intersection of Rathburn Road East with Dixie Road, which is likely to operate at overall LOS 'E' with an overall average delay of 56 seconds/vehicle during an afternoon peak hour.

The analysis results for the future (2041) Scenario 2, as presented in Table 23 and Table 24, indicate that the following individual movements are expected to operate at LOS 'E/F'.

- The eastbound left-turning movement during both the peak hours, and westbound left, the shared westbound through/right and northbound left turning movements during the afternoon peak hour at Rathburn Road intersection with Dixie Road;
- The shared northbound and southbound left/through/right turning movements at the Rathburn Road East and Rockwood Road intersection during the afternoon peak hour;
- The shared westbound left/through/right turning movements during the afternoon peak hour at the Ponytrail Drive and Tapestry Trail intersection; and
- The shared northbound through/right, southbound left turning movement during both the peak hours, and eastbound left and northbound left turning movements during the afternoon peak hour at the intersection of Ponytrail Drive and Burnhamthorpe Road East.

Under Scenario 2 traffic conditions, the queue lengths for the movements – eastbound left, westbound left and northbound left-turning movements at Rathburn Road East and Dixie Road intersection, and eastbound left-turning movement at the Ponytrail Drive and Burnhamthorpe Road East intersection are expected to surpass the available storage length.

With the planned road improvements in 2041, an overall average delay at the study area intersections is expected to be similar to the future (2041) Scenario 1 (i.e., existing network configurations) except for the Rathburn Road East intersections with Dixie Road and Bough Beeches Boulevard (East). These intersections are expected to experience slightly higher overall delays compared to Scenario 1 during the morning and afternoon peak hours.

4.2.2 Pedestrian Level of Service

The network improvements assumed for Scenario 2 will have no major impacts on the segment PLOS, therefore the future (2041) Scenario 2 PLOS for the study area segments are expected to remain similar to future (2041) Scenario 1 segment PLOS results, where the effect of increased curb lane volumes under the future (2041) traffic conditions has already been captured.

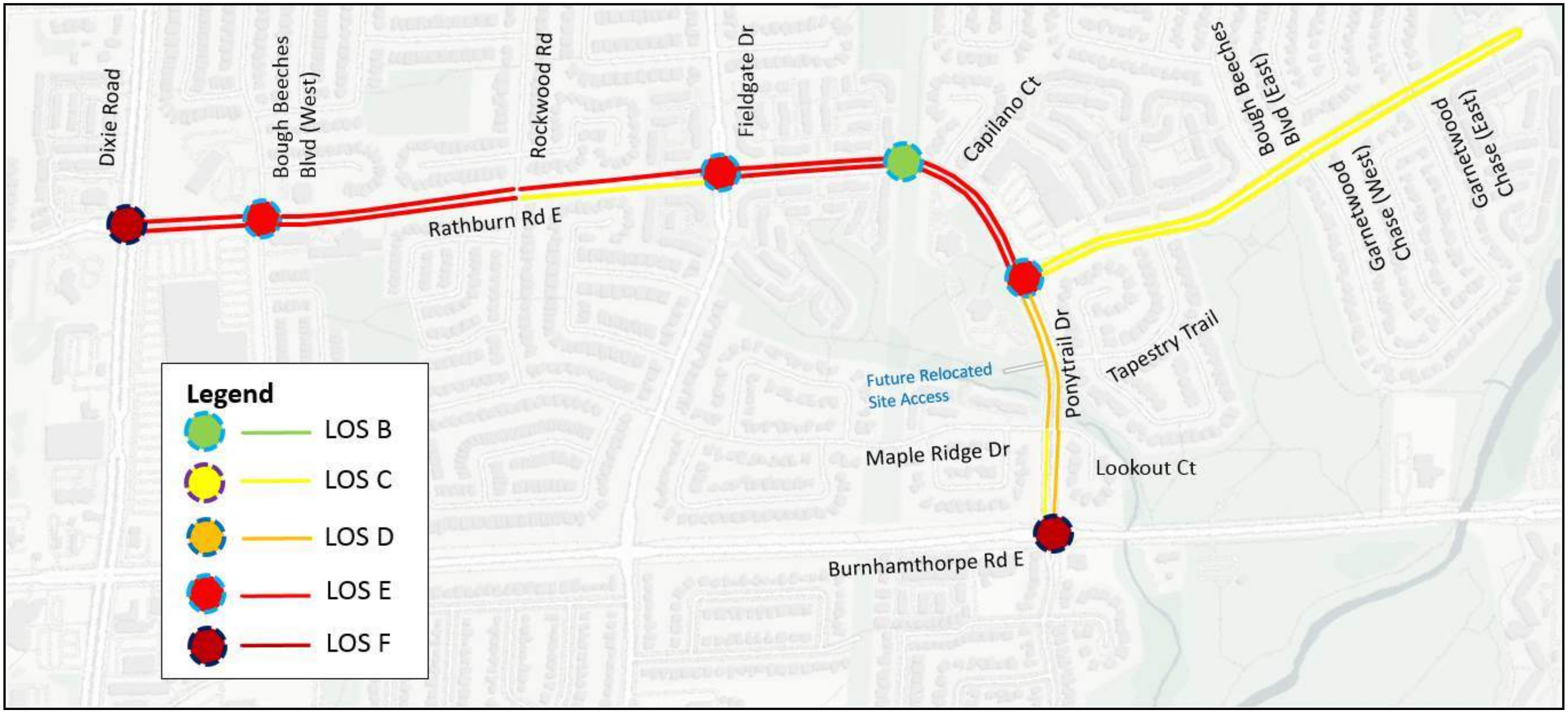
The installation of MPS at the hydro corridor would significantly improve the pedestrian conditions at the mid-block between Fieldgate Drive and Capilano Court on Rathburn Road East. The mid-block is expected to experience a good pedestrian LOS i.e., PLOS "B" due to the absence of conflicting left or right turning movements, and minimal pedestrian delays. The additional improvements (e.g., removal of channelized right-turn lanes and dedicated right-turning lanes at the study area intersections) is expected to improve the crossing conditions marginally for pedestrians. Therefore, the Rathburn Road intersections with Fieldgate Drive and Ponytrail Drive are expected to experience PLOS 'E' compared to PLOS 'F' during the future (2041) Scenario 1.

The pedestrian level of service analysis results for future (2041) conditions under Scenario 2 for each approach of intersection are summarized in Table 25, and the study area segments and intersections are presented in Figure 15.

Table 25: Future (2041) Scenario 2 Intersection PLOS Results

Intersection/Mid-Block	Approach	Pedestrian Exposure to Traffic LOS	Pedestrian Delay LOS
Rathburn Rd E at Dixie Road	North	F	E
	South	F	E
	East	E	F
	West	E	F
Rathburn Rd E at Bough Beeches Blvd (West)	North	C	C
	South	C	C
	East	E	C
	West	E	C
Rathburn Rd E at Fieldgate Dr	North	E	D
	South	E	D
	East	E	D
	West	E	D
Rathburn Rd E at Hydro Corridor (MPS)	East	B	A
	West	B	A
Rathburn Rd E at Ponytrail Dr	North	E	D
	South	C	D
	East	C	D
Ponytrail Dr at Burnhamthorpe Rd E	North	F	E
	South	C	E
	East	F	E
	West	F	E

Figure 15: Future (2041) Scenario 2 Pedestrian Level of Service Results



4.2.3 Bicycle Level of Service

With the introduction of in-boulevard cycle tracksand two-way cycle track on Rathburn Road East and Ponytrail Drive, the cycling environment is expected to improve significantly. Therefore, the study area segments are expected to operate at BLOS ‘A’ during the future (2041) Scenario 2 compared to BLOS ‘E’ under the Scenario 1 condition.

Rathburn Road intersections with Dixie Road and Ponytrail Drive are expected to operate at BLOS ‘C’ compared to the intersection BLOS ‘F’ under the future (2041) Scenario 1 conditions. However, the remaining intersections would continue to experience BLOS ‘E’ or ‘F’ due to lack of cycling-specific accommodations (e.g., left turn boxes) at the crossing streets on Rathburn Road East and Ponytrail Drive.

The bicycle level of service analysis results for future (2041) Scenario 2 at study area segments and intersections are presented in Figure 16 and the intersection BLOS results for each approach of intersection are summarized further in Table 26.

Figure 16: Future (2041) Scenario 2 Bicycle Level of Service Results

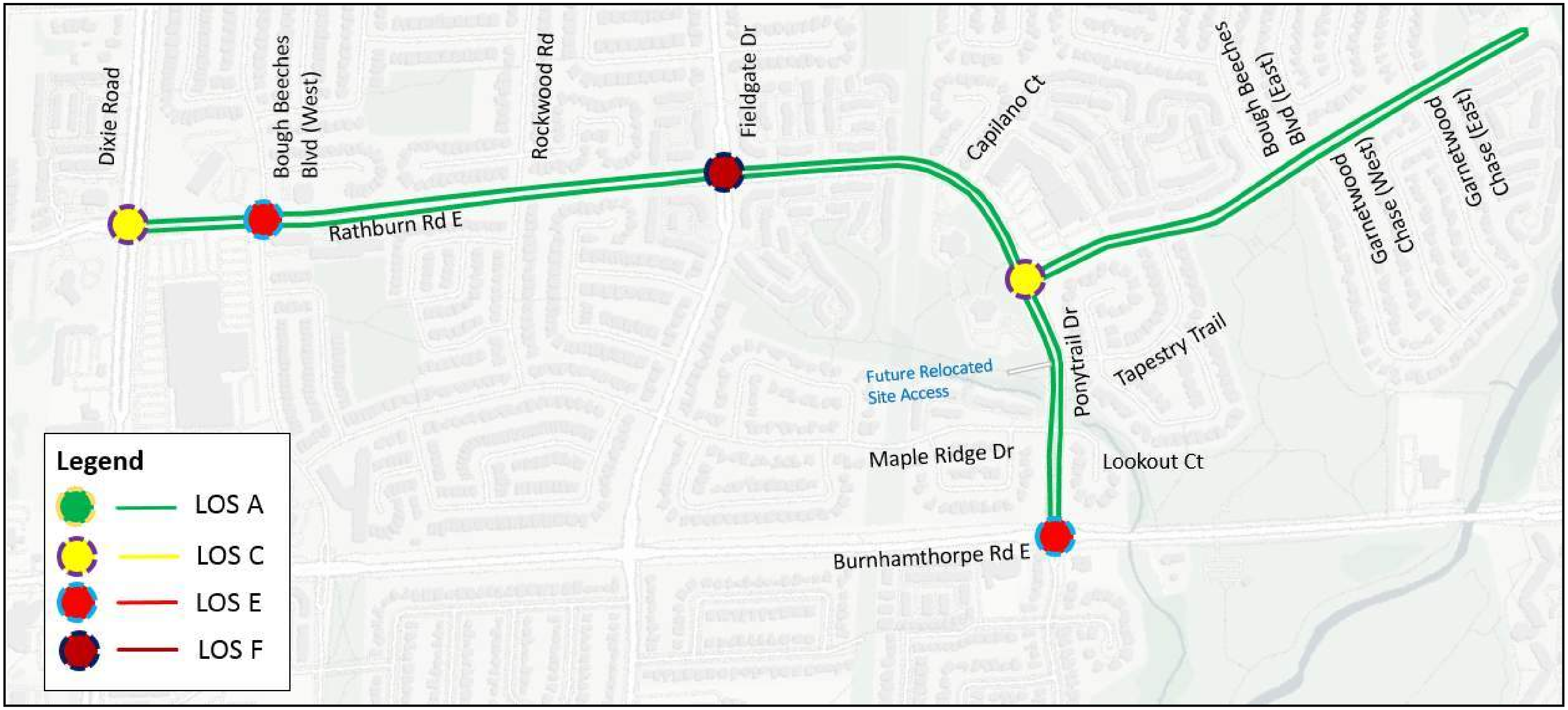


Table 26: Future (2041) Scenario 2 Intersection BLOS Results

Intersection	Approach	Bicycle LOS
Rathburn Rd E at Dixie Road	North	C
	South	C
	East	C
	West	C
Rathburn Rd E at Bough Beeches Blvd (West)	North	E
	South	E
	East	C
	West	C
Rathburn Rd E at Fieldgate Dr	North	F
	South	F
	East	C
	West	C
Rathburn Rd E at Ponytrail Dr	North	C
	South	C
	East	C
Ponytrail Dr at Burnhamthorpe Rd E	North	C
	South	E
	East	C
	West	C

4.2.4 Transit Level of Service

Assuming there are no major plans to revise the existing transit services, which are regular bus routes with no dedicated bus lanes, the transit environment in the study area segments is expected to be similar for future (2041) Scenario 1 conditions. The segments are expected to have TLOS 'D', except for the Rathburn Road East segment located between Dixie Road and Bough Beeches Boulevard (West), which is likely to operate with TLOS 'E' (as presented in Figure 8).

The roadway improvements considered under future (2041) Scenario 2 will have no major impact on an overall intersection TLOS. Therefore, the future (2041) Scenario 2

TLOS for the study area intersections are expected to be similar to the future (2041) intersection TLOS results (as presented in Figure 8).

Because of the signal timings optimization based on roadway improvements assumed under Scenario 2, the average delays experienced by transit vehicles at individual approaches – ranging between 5-71 seconds/vehicle – are expected to be marginally different from the delays expected under future (2041) Scenario 1 conditions. The future (2041) Scenario 2 TLOS results for each approach of intersection are summarized in Table 27.

Table 27: Future (2041) Scenario 2 Intersection TLOS Results

Intersection	Approach	Delay (sec/veh)	Transit LOS
Rathburn Rd E at Dixie Road	North	52	F
	South	49	F
	East	68	F
	West	46	F
Rathburn Rd E at Bough Beeches Blvd (West)	East	8	B
	West	9	B
Rathburn Rd E at Fieldgate Dr	East	18	C
	West	16	C
Rathburn Rd E at Ponytrail Dr	North	5	B
	South	7	B
Ponytrail Dr at Burnhamthorpe Rd E	North	48	F
	South	71	F
	East	31	E
	West	23	D

The traffic analysis results confirm that with the proposed improvements (including reduction of four-lane to two-lane cross-section on Rathburn Road East between Ponytrail Drive and cul-de-sac, and provision of bicycle lanes) considered in Scenario 2, the study area is expected to improve the bicycles level of service, without impacting the level of service for autos, pedestrian and transit.

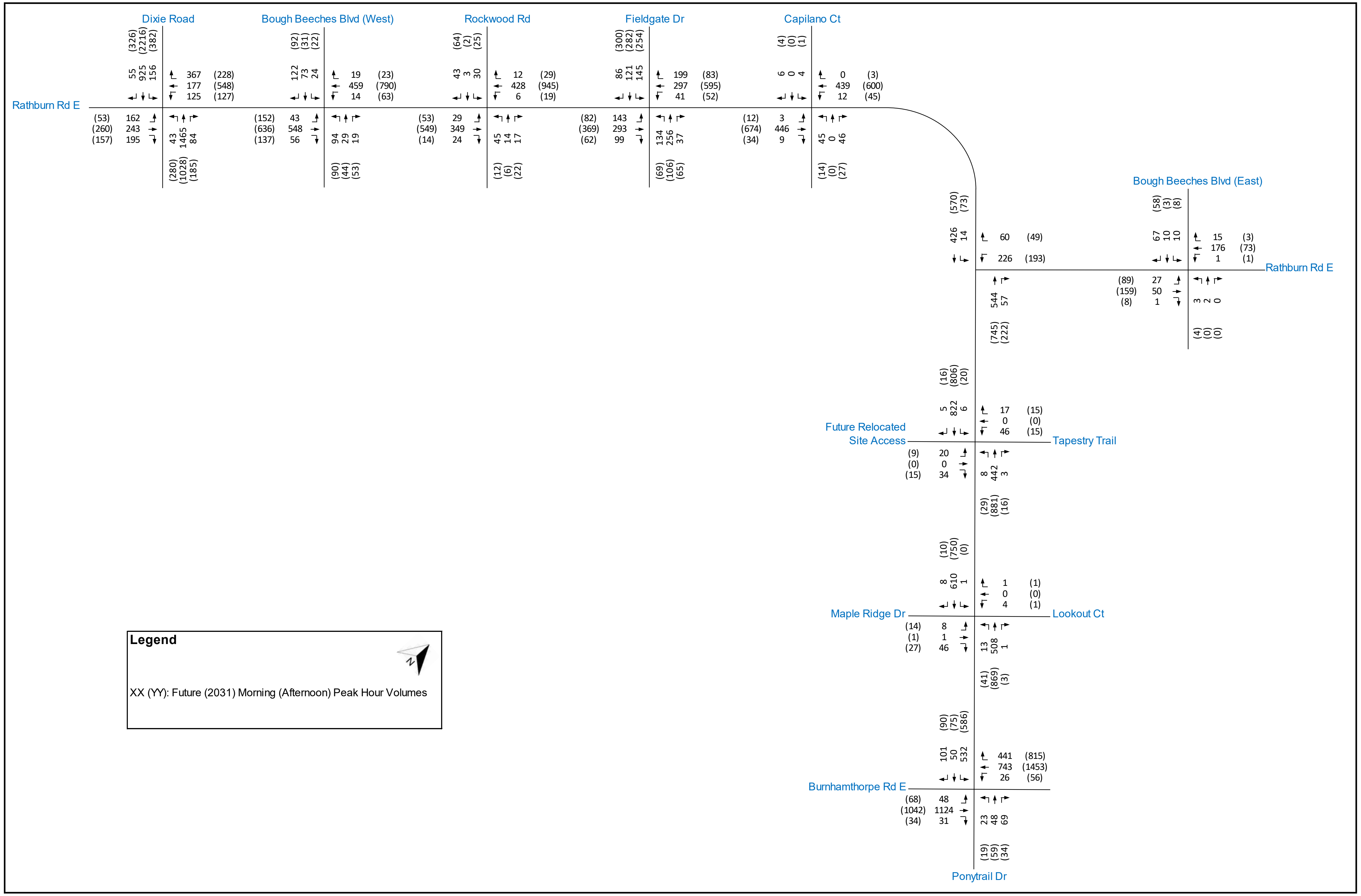
5 TRAFFIC ANALYSIS FOR INTERIM (2031) CONDITIONS

To assess the road reconstruction impacts for the interim (2031) planning horizon year, the future (2031) Scenario 2 was evaluated, with the assumed roadway improvements considered for Scenario 2 analyzed for the future (2041) conditions.

The future (2031) traffic volumes were estimated following the approach used to predict the future (2041) traffic volumes. The future (2031) traffic demands were estimated using the City's travel demand model – which indicates an annual growth rate of 1.3% and 1.9% for the existing (2020) morning and afternoon peak hour traffic volumes, respectively –and the proposed residential redevelopment at 4100 Ponytrail Drive, Forest Park Circle Ltd. As mentioned in Section 4, an annual growth rate was applied only to the major movements. The estimated future (2031) traffic volumes for the morning (AM) and afternoon (PM) peak hours are presented in Figure 17.

The future (2031) Scenario considered the future (2041) Scenario 2 network configurations (as presented in Figure 14), i.e., the four-lane cross-section along Rathburn Road East and Ponytrail Drive corridors and reduction of four-lane to two-lane cross-section on Rathburn Road East between Ponytrail Drive and Cul-de-sac along with the introduction of cycle tracks/ bike lanes and other additional improvements, as described in Section 4.2.

Figure 17: Future (2031) Weekday Peak Hour Turning Movement Volumes



The intersection capacity analysis for the future (2031) Scenario 2 was conducted considering the optimized signal timing plans. The future (2031) Scenario 2 intersection capacity analysis results are presented in Table 28 and Table 29 for morning and afternoon peak hours, respectively. The detailed Synchro reports are provided in **Appendix E**.

Table 28: Future (2031) Scenario 2 Intersection Capacity Analysis Results for AM Peak Hour

Intersection	Overall Delay (s)	Overall LOS	Critical Movements				
			Turning Movement	HCM 6th Edition			95th Percentile Queue (m)
				Delay (s/veh)	V/C	LOS	
Rathburn Rd E at Dixie Road	33	**C**	EBL	62	0.80	**E**	68
Rathburn Rd E at Bough Beeches Blvd W	14	B	-	-	-	-	-
Rathburn Road E at Rockwood Rd [1]	3	A	-	-	-	-	-
Rathburn Rd E at Fieldgate Dr	20	B	-	-	-	-	-
Rathburn Road E at Capilano Ct [1]	1	A	-	-	-	-	-
Rathburn Rd E at Ponytrail Dr	14	B	-	-	-	-	-
Rathburn Rd E at Bough Beeches Blvd E [2]	8	A	-	-	-	-	-
Ponytrail Dr at Tapestry Trail [1]	2	A	-	-	-	-	-
Ponytrail Dr at Maple Ridge Dr/Lookout Ct [1]	1	A	-	-	-	-	-
Ponytrail Dr at Burnhamthorpe Rd E	29	C	NBT/R	63	0.77	**E**	42
			SBL	56	0.86	**E**	86

Note 1: Intersections are controlled by 'Stop' sign

Note 2: Intersection is 'All-Way Stop-Controlled'

Table 29: Future (2031) Scenario 2 Intersection Capacity Analysis Results for PM Peak Hour

Intersection	Overall Delay (s)	Overall LOS	Critical Movements				
			Turning Movement	HCM 6th Edition			95th Percentile Queue (m)
				Delay (s/veh)	V/C	LOS	
Rathburn Rd E at Dixie Road	47	**D**	EBL	87	0.60	**F**	46
			WBL	67	0.62	**E**	63
			WBT/R	63	0.82	**E**	144
			NBL	152	1.14	**F**	159
Rathburn Rd E at Bough Beeches Blvd W	12	B	-	-	-	-	-
Rathburn Road E at Rockwood Rd [1]	3	A	SBL/T/R	40	0.49	**E**	2
Rathburn Rd E at Fieldgate Dr	22	C	-	-	-	-	-
Rathburn Road E at Capilano Ct [1]	1	A	-	-	-	-	-
Rathburn Rd E at Ponytrail Dr	11	B	-	-	-	-	-
Rathburn Rd E at Bough Beeches Blvd E [2]	9	A	-	-	-	-	-
Ponytrail Dr at Tapestry Trail [1]	1	A	WBL/T/R	41	0.25	**E**	1
Ponytrail Dr at Maple Ridge Dr/Lookout Ct [1]	1	A	-	-	-	-	-
Ponytrail Dr at Burnhamthorpe Rd E	33	C	EBL	129	0.86	**F**	55
			NBL	62	0.14	**E**	14
			NBT/R	70	0.68	**E**	42
			SBL	71	0.90	**E**	102

Note 1: Intersections are controlled by 'Stop' sign

Note 2: Intersection is 'All-Way Stop-Controlled'

Under interim (2031) traffic conditions for Scenario 2, the study area intersections are expected to operate at acceptable LOS, i.e., LOS 'D' or better with an overall average delay slightly lower or similar as the future (2041) Scenario 2 conditions.

The study area intersections are expected to experience an overall average delay less than 30 and 50 seconds during the morning and afternoon peak hours, respectively. As presented in Table 28 and Table 29, the individual movements which are expected to operate at LOS ‘E’ or ‘F’ are similar to the critical movements identified under the future (2041) Scenario 2 conditions, except for the shared northbound left/through/right turning movements at the Rathburn Road East and Rockwood Road intersection. The critical movements identified for the study area intersections are as follows:

- The eastbound left turning movement during both the peak hours, and westbound left, the shared westbound through/right and northbound left turning movements during the afternoon peak hour at the intersection of Rathburn Road East and Dixie Road;
- The shared southbound left/through/right turning movements at the Rathburn Road East and Rockwood Road intersection during the afternoon peak hour;
- The shared westbound left/through/right turning movements during the afternoon peak hour at the Ponytrail Drive intersection with and Tapestry Trail; and
- The shared northbound through/right, southbound left turning movement during both the peak hours, and eastbound left and northbound left turning movements during the afternoon peak hour at the Ponytrail Drive and Burnhamthorpe Road East intersection.

In terms of storage length requirements, the queue lengths for the eastbound and northbound left turning movements at Rathburn Road East and Dixie Road intersection, and eastbound left turning movement at Ponytrail Drive and Burnhamthorpe Road East intersection are expected to exceed the available space under the future (2031) traffic conditions.

6 STUDY FINDINGS

6.1 EXISTING (2020) CONDITIONS

The following key notes summarize the study findings from the existing (2020) traffic conditions analysis:

Collision Data Analysis (2015-19):

The summary of collision data analysis for the study area intersections is described below:

- The primary impact type and collision type were 'angle' (33%) and 'PDO only' (88%). Most of the collisions occurred under 'clear' weather conditions (79%) and 'dry' road surface conditions (79%).

- The Rathburn Road East and Bough Beeches Boulevard (West) intersection is identified with the highest collision rate of 0.26 as compared to the other study area intersections, which account for the collision rates less than 0.25.

The summary of collision data analysis for the mid-block locations is provided below:

- Most of the collisions resulted in 'PDO' (70%) and the primary impact type was 'SMV other' (40%). The environmental conditions and road surface conditions primarily associated with the collisions were 'clear' (60%), and 'dry' (50%) and 'wet' (50%) respectively.

- The mid-block segment on Ponytrail Drive between Rathburn Road and Tapestry Trail account for the collision rates of 0.91, in comparison to other mid-blocks that are identified with collision rates less than 0.60.

Existing (2020) Intersection Capacity Analysis:

- Within the study area, all the intersections are operating at an overall LOS 'C' or better during both morning and afternoon peak hours.

- All individual turning movements are currently operating at an acceptable level of service (i.e. LOS 'D' or better), except for the left-turning movements in the eastbound and westbound directions during both the peak hours, and northbound direction during the afternoon peak hour at the Rathburn Road East and Dixie Road intersection (operating at LOS 'E'); and the northbound and southbound movements during both the peak hours at the intersection of Ponytrail Drive and Burnhamthorpe Road East.

Existing (2020) Level of Service for the modes – Pedestrians, Cyclists and Transit:

- Under the existing conditions, the study area segments have PLOS 'D' or better, except for the Rathburn Road East segments between Dixie Road and Fieldgate Drive in the westbound direction; and between Dixie Road and Bough Beeches Boulevard (West) in the eastbound direction (which have PLOS 'E'). The overall pedestrians' condition is poor at the study area intersections which results in intersection PLOS 'E' or 'F'.

- Due to lack of cycling facilities and infrastructure in the study area, the segments and intersections have an existing BLOS of 'E' and 'F', respectively.

- The overall existing environment is favourable for the transit within the study area, the segments and intersection have an existing TLOS 'D' or better, except for the intersections of Rathburn Road East and Dixie Road, and Ponytrail Drive and Burnhamthorpe Road East, which have TLOS 'F'.

6.2 FUTURE (2041) SCENARIO 1 CONDITIONS

The following key notes summarize the study findings from the Future (2041) Scenario 1 traffic conditions analysis:

Future (2041) Scenario 1 Intersection Capacity Analysis:

- With the future (2041) traffic volumes and existing (2020) network configurations, the study area intersections are expected to operate at LOS 'D' or better during both the peak hours.

- The following individual turning movements are expected to operate at LOS 'E/F' under the future (2041) Scenario 1 conditions:

  - Rathburn Road East and Dixie Road intersection: The eastbound left, westbound left and northbound left turning movements during the afternoon peak hour;
  - Rathburn Road East intersection with Rockwood Road: The shared

northbound and southbound left/through/right turning movements during the afternoon peak hour;

- Ponytrail Drive and Tapestry Trail intersection: The shared westbound left/through/right turning movements during the afternoon peak hour at the intersection;
- Ponytrail Drive intersection with Burnhamthorpe Road East: The shared northbound through/right and southbound left-turning movements during both the peak hours, and eastbound left and northbound left turning movements during the afternoon peak hour.

Future (2041) Scenario 1 Level of Service for Pedestrians, Cyclists and Transit:

- **Pedestrian Level of Service**: The study area mid-block segments are expected to experience PLOS ‘D’ or better, except for the Rathburn Road East segments between Dixie Road and Ponytrail Drive in the westbound direction, between Dixie Road and Rockwood Road in the eastbound direction, and between Fieldgate Drive and Ponytrail Drive in the eastbound direction, which are expected to operate at PLOS ‘E’ due to expected increase in traffic demand in the 2041. The study area intersections in the future (2041) conditions are expected to operate at a similar pedestrian LOS as the existing (2020) conditions (i.e., PLOS ‘E’ or ‘F’).

- **Bicycle Level of Service:** With no plans to introduce the cycling facilities under Scenario 1, the BLOS at the study area segments and intersections is expected to be similar as the existing (2020) BLOS (i.e., BLOS ‘E’ or ‘F’).

- **Transit Level of Service:** With the existing transit services under the future (2041) Scenario 1, the segment and intersection TLOS results are expected to be similar as the existing (2020) conditions TLOS, such that segments and intersections are likely to have TLOS ‘D’ or better except for TLOS ‘F’ at the intersections of Rathburn Road East and Dixie Road, and Ponytrail Drive and Burnhamthorpe Road East.

6.3 FUTURE (2041) SCENARIO 2 CONDITIONS

The list of proposed improvements considered in Scenario 2 (including reduction of four-lane to two-lane cross-section on Rathburn Road East between Ponytrail Drive and cul-de-sac, and provision of cycle tracks, etc.) are described in Section 4.2 of this report. The following key notes summarize the study findings from the Future (2041) Scenario 2 traffic conditions analysis:

Future (2041) Scenario 2 Intersection Capacity Analysis:

- Considering the provisions of cycle tracks ollowing the road resurfacing on Rathburn Road East and Ponytrail Drive with the future (2041) traffic volumes and additional roadway improvements, the intersections are expected to operate at LOS 'D' or better, except for the intersection of Rathburn Road East and Dixie Road, which is likely to operate at an overall LOS 'E' during the afternoon peak hour (compared to LOS "D" under Scenario 1 conditions).

- The individual turning movements which are expected to operate at LOS "E/F" are similar to the critical movements identified under Scenario 1 except for a few additional movements at the Rathburn Road East and Dixie Road intersection and are as follows:

  - Rathburn Road intersection with Dixie Road: The eastbound left turning movement during both the peak hours, and westbound left, the shared westbound through/right and northbound left turning movements during the afternoon peak hour;

  - Rathburn Road East and Rockwood Road intersection: The shared northbound and southbound left/through/right turning movements during the afternoon peak hour;

  - Ponytrail Drive and Tapestry Trail intersection: The shared westbound left/through/right turning movements during the afternoon peak hour; and

  - Ponytrail Drive and Burnhamthorpe Road East intersection: The shared northbound through/right, southbound left-turning movement during both the peak hours, and eastbound left and northbound left turning movements during the afternoon peak hour.

Future (2041) Scenario 2 Level of Service for Pedestrians, Cyclists and Transit:

- **Pedestrian Level of Service**: Under the future (2041) Scenario 2 conditions, the PLOS results at the study area segments is expected to be similar as the future (2041) Scenario 1. With the assumed additional improvements for Scenario 2, the Rathburn Road East intersections with Fieldgate Drive and Ponytrail are expected to operate with an improved PLOS 'E' compared to PLOS 'F' under Scenario 1, whereas the remaining intersections are expected to operate with a similar pedestrian level of service.

  The proposed Mid-block Pedestrian Signal (MPS) under the Scenario 2 on Rathburn Road East at hydro corridor would ease the crossing of pedestrians on Rathburn Road East, further enhancing the walkable environment. The mid-block on Rathburn Road East is likely to experience pedestrian LOS "B" because of absence of potential conflicts with turning vehicles, and the marginal pedestrian delays.

- **Bicycle Level of Service:** With an introduction of in-boulevard cycle tracks and two-way cycle track, the BLOS at the segments is expected to improve and the segments are likely to experience BLOS 'A' compared to BLOS 'F' during the future (2041) Scenario 1. Also, the intersections of Rathburn Road East at Dixie Road and Ponytrail Drive are expected to operate BLOS 'C' compared to the BLOS 'F' under the future (2041) Scenario 1 conditions.

- **Transit Level of Service:** The Transit level of service under Scenario 2 is expected to be similar as Scenario 1 for future (2041) conditions as described above.

The traffic analysis results confirm that with the proposed improvements considered in Scenario 2, the study area is expected to improve the bicycles level of service significantly, without impacting the level of service for pedestrian and transit. However, delays for vehicular traffic are expected to increase slightly compared to Scenario 1.

6.4 INTERIM (2031) CONDITIONS - SCENARIO 2

Future (2031) Scenario 2 Intersection Capacity Analysis:

- With the future (2031) traffic volumes and the Scenario 2 assumed network improvements, the intersections along Rathburn Road East and Ponytrail Drive are expected to operate at LOS 'D' or better.

- The following individual movements are likely to operate with an unacceptable level of service (i.e. LOS 'E/F') under the future (2031) Scenario 2 conditions:

    - Rathburn Road East and Dixie Road intersection: The eastbound left turning movement during both the peak hours, and westbound left, the shared westbound through/right and northbound left turning movements during afternoon peak hour;

    - Road East and Rockwood Road intersection: The shared southbound left/through/right turning movements during the afternoon peak hour;

    - Ponytrail Drive and Tapestry Drive intersection: The shared westbound left/through/right turning movements during the afternoon peak hour, and

    - Ponytrail Drive and Burnhamthorpe Road: East intersection: The shared northbound through/right, southbound left turning movement during both the peak hours, and eastbound left and northbound left turning movements during the afternoon peak hour.

7 NOTE TO APPENDICES B THROUGH E

The traffic volumes documented in the Synchro Reports should not be interpreted as actual estimated volumes. The volumes shown in the Synchro Reports are the input volumes before the application of Growth Factor – which is again not explicitly present anywhere in the Synchro Reports.

The actual estimated volumes are reflected in Adjusted Flow Rate, i.e., adjustment of input volumes based on Peak Hour Factor, Heavy Vehicle % and Growth Factor.

APPENDIX A

SIGNAL WARRANT ANALYSIS REPORT

Input Data Sheet

Analysis Sheet | Results Sheet | Proposed Collision

GO TO Justification:

What are the intersecting roadways? Rathburn Rd E/ Rockwood Rd

What is the direction of the Main Road street? East-West

When was the data collected? 26/09/2019

Justification 1 - 4: Volume Warrants

a.- Number of lanes on the Main Road? 2 or more

b.- Number of lanes on the Minor Road? 1

c.- How many approaches? 4

d.- What is the operating environment? Urban **Population >= 10,000** **AND** **Speed < 70 km/hr**

e.- What is the eight hour vehicle volume at the intersection? (Please fill in table below)

Hour Ending	Main Eastbound Approach			Minor Northbound Approach			Main Westbound Approach			Minor Southbound Approach			Pedestrians Crossing Main Road
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
8:00	17	205	12	28	2	7	3	249	4	33	5	42	
9:00	29	298	24	45	14	17	6	349	12	30	3	43	
12:00	15	210	10	16	7	4	16	203	8	9	8	24	
13:00	26	212	6	15	5	4	3	246	19	13	7	32	
14:00	17	274	19	8	7	12	10	208	20	13	7	24	
16:00	46	303	11	12	13	8	7	238	24	14	9	23	
17:00	45	373	19	7	7	5	6	493	33	12	9	47	
18:00	53	433	14	12	6	22	19	766	29	25	2	64	
Total	**248**	**2,308**	**115**	**143**	**61**	**79**	**70**	**2,752**	**149**	**149**	**50**	**299**	**0**

Analysis Sheet

Input Sheet | Results Sheet | Proposed Collision

GO TO Justification:

Intersection: Rathburn Rd E/ Rockwood Rd

Count Date: 26/09/2019

Justification 1: Minimum Vehicle Volumes

Restricted Flow Urban Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 Lanes		2 or More Lanes		Hour Ending									
Flow Condition	FREE FLOW ☐	RESTR. FLOW ☐	FREE FLOW ☐	RESTR. FLOW ☑	8:00	9:00	12:00	13:00	14:00	16:00	17:00	18:00		
1A	480	720	600	900	607	870	530	588	619	708	1,056	1,445		
	COMPLIANCE %				67	97	59	65	69	79	100	100	636	79
1B	120	170	120	170	117	152	68	76	71	79	87	131		
	COMPLIANCE %				69	89	40	45	42	46	51	77	459	57

Restricted Flow Signal Justification 1:			
	Both 1A and 1B 100% Fulfilled each of 8 hours	Yes ☐	No ☑
	Lesser of 1A or 1B at least 80% fulfilled each of 8 hours	Yes ☐	No ☑

Justification 2: Delay to Cross Traffic

Restricted Flow Urban Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 lanes		2 or More lanes		Hour Ending									
Flow Condition	FREE FLOW ☐	RESTR. FLOW ☐	FREE FLOW ☐	RESTR. FLOW ☑	8:00	9:00	12:00	13:00	14:00	16:00	17:00	18:00		
2A	480	720	600	900	490	718	462	512	548	629	969	1,314		
	COMPLIANCE %				54	80	51	57	61	70	100	100	573	72
2B	50	75	50	75	66	89	33	35	28	39	28	43		
	COMPLIANCE %				88	100	44	47	37	52	37	57	463	58

Restricted Flow Signal Justification 2:			
	Both 2A and 2B 100% fulfilled each of 8 hours	Yes ☐	No ☑
	Lesser of 2A or 2B at least 80% fulfilled each of 8 hours	Yes ☐	No ☑

Justification 3: Combination

Combination Justification 1 and 2

Justification Satisfied 80% or More				Two Justifications Satisfied 80% or More	
Justification 1	Minimum Vehicle Volume	YES ☐	NO ☑	YES ☐	NO ☑
Justification 2	Delay Cross Traffic	YES ☐	NO ☑		NOT JUSTIFIED

Justification 4: Four Hour Volume

Justification	Time Period	Total Volume of Both Approaches (Main) X	Heaviest Minor Approach Y (actual)	Required Value Y (warrant threshold)	Average % Compliance	Overall % Compliance
Justification 4	9:00	718	76	319	24 %	37 %
	16:00	629	46	368	12 %	
	17:00	969	68	206	33 %	
	18:00	1,314	91	116	78 %	

Results Sheet

Input Sheet | Analysis Sheet | Proposed Collision

GO TO Justification:

Intersection: Rathburn Rd E/ Rockwood Rd

Count Date: 26/09/2019

Summary Results

Justification			Compliance		Signal Justified? YES	Signal Justified? NO
1. Minimum Vehicular Volume	A	Total Volume	79	%	☐	☑
	B	Crossing Volume	57	%		
2. Delay to Cross Traffic	A	Main Road	72	%	☐	☑
	B	Crossing Road	58	%		
3. Combination	A	Justificaton 1	57	%	☐	☑
	B	Justification 2	58	%		
4. 4-Hr Volume			37	%	☐	☑

Input Data Sheet

Analysis Sheet | Results Sheet | Proposed Collision

GO TO Justification:

What are the intersecting roadways? Rathburn Rd E/ Bough Beeches Blvd (East)

What is the direction of the Main Road street? East-West

When was the data collected? 28/10/2014,TMCs are bumped to 2020

Justification 1 - 4: Volume Warrants

a.- Number of lanes on the Main Road? 2 or more

b.- Number of lanes on the Minor Road? 1

c.- How many approaches? 4

d.- What is the operating environment? Urban **Population >= 10,000** **AND** **Speed < 70 km/hr**

e.- What is the eight hour vehicle volume at the intersection? (Please fill in table below)

Hour Ending	Main Eastbound Approach			Minor Northbound Approach			Main Westbound Approach			Minor Southbound Approach			Pedestrians Crossing Main Road
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
8:00	13	27	1	3	0	1	0	118	15	4	4	74	
9:00	26	51	1	3	2	0	1	176	14	10	10	67	
12:00	26	53	1	3	1	0	1	61	7	9	2	44	
13:00	35	66	4	6	1	0	1	75	6	2	2	41	
14:00	33	61	2	4	3	3	0	69	6	5	3	50	
16:00	68	98	4	2	0	0	0	65	14	16	1	49	
17:00	77	116	3	6	1	0	0	86	5	6	2	51	
18:00	89	160	8	4	0	0	1	74	3	8	3	58	
Total	**367**	**632**	**24**	**31**	**8**	**4**	**4**	**724**	**70**	**60**	**27**	**434**	**0**

Analysis Sheet

Input Sheet | Results Sheet | Proposed Collision

GO TO Justification:

Intersection: Rathburn Rd E/ Bough Beeches Blvd (East)   Count Date: 28/10/2014,TMCs are bumped to 2020

Justification 1: Minimum Vehicle Volumes

Restricted Flow Urban Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 Lanes		2 or More Lanes		Hour Ending									
Flow Condition	FREE FLOW ☐	RESTR. FLOW ☐	FREE FLOW ☐	RESTR. FLOW ☑	8:00	9:00	12:00	13:00	14:00	16:00	17:00	18:00		
1A	480	720	600	900	260	361	208	239	239	317	353	408		
	COMPLIANCE %				29	40	23	27	27	35	39	45	265	33
1B	120	170	120	170	86	92	59	52	68	68	66	73		
	COMPLIANCE %				51	54	35	31	40	40	39	43	332	41

Restricted Flow Signal Justification 1:			
	Both 1A and 1B 100% Fulfilled each of 8 hours	Yes ☐	No ☑
	Lesser of 1A or 1B at least 80% fulfilled each of 8 hours	Yes ☐	No ☑

Justification 2: Delay to Cross Traffic

Restricted Flow Urban Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 lanes		2 or More lanes		Hour Ending									
Flow Condition	FREE FLOW ☐	RESTR. FLOW ☐	FREE FLOW ☐	RESTR. FLOW ☑	8:00	9:00	12:00	13:00	14:00	16:00	17:00	18:00		
2A	480	720	600	900	174	269	149	187	171	249	287	335		
	COMPLIANCE %				19	30	17	21	19	28	32	37	202	25
2B	50	75	50	75	11	23	14	10	12	19	14	15		
	COMPLIANCE %				15	31	19	13	16	25	19	20	157	20

Restricted Flow Signal Justification 2:			
	Both 2A and 2B 100% fulfilled each of 8 hours	Yes ☐	No ☑
	Lesser of 2A or 2B at least 80% fulfilled each of 8 hours	Yes ☐	No ☑

Justification 3: Combination

Combination Justification 1 and 2

Justification Satisfied 80% or More				Two Justifications Satisfied 80% or More	
Justification 1	Minimum Vehicle Volume	YES ☐	NO ☑	YES ☐	NO ☑
Justification 2	Delay Cross Traffic	YES ☐	NO ☑		NOT JUSTIFIED

Justification 4: Four Hour Volume

Justification	Time Period	Total Volume of Both Approaches (Main) X	Heaviest Minor Approach Y (actual)	Required Value Y (warrant threshold)	Average % Compliance	Overall % Compliance
Justification 4	9:00	269	87	621	14 %	12 %
	16:00	249	66	638	10 %	
	17:00	287	59	607	10 %	
	18:00	335	69	569	12 %	

Results Sheet

Input Sheet | Analysis Sheet | Proposed Collision

GO TO Justification:

Intersection: Rathburn Rd E/ Bough Beeches Blvd (East)   Count Date: 28/10/2014,TMCs are bumped to 2020

Summary Results

Justification			Compliance		Signal Justified? YES	Signal Justified? NO
1. Minimum Vehicular Volume	A	Total Volume	33	%	☐	☑
	B	Crossing Volume	41	%		
2. Delay to Cross Traffic	A	Main Road	25	%	☐	☑
	B	Crossing Road	20	%		
3. Combination	A	Justificaton 1	33	%	☐	☑
	B	Justification 2	20	%		
4. 4-Hr Volume			12	%	☐	☑

Input Data Sheet

Analysis Sheet | Results Sheet | Proposed Collision

GO TO Justification:

What are the intersecting roadways? Ponytrail Dr/ Maple Ridge Dr

What is the direction of the Main Road street? North-South

When was the data collected? October 17, 2019

Justification 1 - 4: Volume Warrants

a.- Number of lanes on the Main Road? 2 or more

b.- Number of lanes on the Minor Road? 1

c.- How many approaches? 4

d.- What is the operating environment? Urban **Population >= 10,000** **AND** **Speed < 70 km/hr**

e.- What is the eight hour vehicle volume at the intersection? (Please fill in table below)

Hour Ending	Main Northbound Approach			Minor Eastbound Approach			Main Southbound Approach			Minor Westbound Approach			Pedestrians Crossing Main Road
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
8:00	6	260	1	4	0	38	2	482	3	3	0	1	
9:00	13	430	1	8	1	46	1	480	8	4	0	1	
12:00	21	331	2	10	1	33	0	353	6	2	0	1	
13:00	10	281	3	8	0	22	0	318	17	2	0	0	
14:00	20	319	2	11	0	13	2	313	12	1	0	2	
16:00	28	438	2	11	2	14	3	343	12	3	0	2	
17:00	44	595	0	9	0	11	0	501	21	1	1	0	
18:00	37	686	3	13	1	28	0	567	12	1	0	1	
Total	**179**	**3,340**	**14**	**74**	**5**	**205**	**8**	**3,357**	**91**	**17**	**1**	**8**	**0**

Analysis Sheet

Input Sheet | Results Sheet | Proposed Collision

GO TO Justification:

Intersection: Ponytrail Dr/ Maple Ridge Dr — Count Date: October 17, 2019

Justification 1: Minimum Vehicle Volumes

Restricted Flow Urban Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 Lanes		2 or More Lanes		Hour Ending									
Flow Condition	FREE FLOW ☐	RESTR. FLOW ☐	FREE FLOW ☐	RESTR. FLOW ☑	8:00	9:00	12:00	13:00	14:00	16:00	17:00	18:00		
1A	480	720	600	900	800	993	760	661	695	858	1,183	1,349		
	COMPLIANCE %				89	100	84	73	77	95	100	100	719	90
1B	120	170	120	170	46	60	47	32	27	32	22	44		
	COMPLIANCE %				27	35	28	19	16	19	13	26	182	23

Restricted Flow Signal Justification 1:			
	Both 1A and 1B 100% Fulfilled each of 8 hours	Yes ☐	No ☑
	Lesser of 1A or 1B at least 80% fulfilled each of 8 hours	Yes ☐	No ☑

Justification 2: Delay to Cross Traffic

Restricted Flow Urban Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 lanes		2 or More lanes		Hour Ending									
Flow Condition	FREE FLOW ☐	RESTR. FLOW ☐	FREE FLOW ☐	RESTR. FLOW ☑	8:00	9:00	12:00	13:00	14:00	16:00	17:00	18:00		
2A	480	720	600	900	754	933	713	629	668	826	1,161	1,305		
	COMPLIANCE %				84	100	79	70	74	92	100	100	699	87
2B	50	75	50	75	7	13	13	10	12	16	11	15		
	COMPLIANCE %				9	17	17	13	16	21	15	20	129	16

Restricted Flow Signal Justification 2:			
	Both 2A and 2B 100% fulfilled each of 8 hours	Yes ☐	No ☑
	Lesser of 2A or 2B at least 80% fulfilled each of 8 hours	Yes ☐	No ☑

Justification 3: Combination

Combination Justification 1 and 2

Justification Satisfied 80% or More				Two Justifications Satisfied 80% or More	
Justification 1	Minimum Vehicle Volume	YES ☐	NO ☑	YES ☐	NO ☑
Justification 2	Delay Cross Traffic	YES ☐	NO ☑		NOT JUSTIFIED

Justification 4: Four Hour Volume

Justification	Time Period	Total Volume of Both Approaches (Main) X	Heaviest Minor Approach Y (actual)	Required Value Y (warrant threshold)	Average % Compliance	Overall % Compliance
Justification 4	9:00	933	55	219	25 %	21 %
	16:00	826	27	265	10 %	
	17:00	1,161	20	146	14 %	
	18:00	1,305	42	117	36 %	

Results Sheet

Input Sheet | Analysis Sheet | Proposed Collision

GO TO Justification:

Intersection: Ponytrail Dr/ Maple Ridge Dr   Count Date: October 17, 2019

Summary Results

Justification			Compliance		Signal Justified? YES	Signal Justified? NO
1. Minimum Vehicular Volume	A	Total Volume	90	%	☐	☑
	B	Crossing Volume	23	%		
2. Delay to Cross Traffic	A	Main Road	87	%	☐	☑
	B	Crossing Road	16	%		
3. Combination	A	Justificaton 1	23	%	☐	☑
	B	Justification 2	16	%		
4. 4-Hr Volume			21	%	☐	☑

APPENDIX B

SYNCHRO REPORT FOR EXISTING (2020) CONDITIONS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	139	209	167	96	152	303	37	1256	70	131	792	47
Future Volume (veh/h)	139	209	167	96	152	303	37	1256	70	131	792	47
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		1.00	0.99		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1802	1841	1589	1816	1856	1602	1802	1841	1589	1744	1781	1538
Adj Flow Rate, veh/h	158	237	0	109	172	0	42	1423	0	148	898	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	4	4	4	3	3	3	4	4	4	8	8	8
Cap, veh/h	267	811		238	818		407	3095		283	3307	
Arrive On Green	0.23	0.23	0.00	0.23	0.23	0.00	0.62	0.62	0.00	0.05	0.68	0.00
Sat Flow, veh/h	1153	3589	0	1098	3618	0	596	5025	1346	1661	4863	1303
Grp Volume(v), veh/h	158	237	0	109	172	0	42	1423	0	148	898	0
Grp Sat Flow(s),veh/h/ln	1153	1749	0	1098	1763	0	596	1675	1346	1661	1621	1303
Q Serve(g_s), s	20.5	8.9	0.0	14.5	6.3	0.0	4.8	24.3	0.0	5.1	11.6	0.0
Cycle Q Clear(g_c), s	26.8	8.9	0.0	23.5	6.3	0.0	6.1	24.3	0.0	5.1	11.6	0.0
Prop In Lane	1.00		0.00	1.00		0.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	267	811		238	818		407	3095		283	3307	
V/C Ratio(X)	0.59	0.29		0.46	0.21		0.10	0.46		0.52	0.27	
Avail Cap(c_a), veh/h	386	1172		351	1181		407	3095		312	3307	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	60.4	50.6	0.0	60.3	49.6	0.0	13.3	16.5	0.0	13.1	10.1	0.0
Incr Delay (d2), s/veh	4.4	0.4	0.0	2.9	0.3	0.0	0.5	0.5	0.0	1.5	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.1	3.8	0.0	4.1	2.7	0.0	0.6	8.1	0.0	1.6	3.4	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	64.8	51.0	0.0	63.2	49.9	0.0	13.8	17.0	0.0	14.6	10.3	0.0
LnGrp LOS	E	D		E	D		B	B		B	B	
Approach Vol, veh/h		395	A		281	A		1465	A		1046	A
Approach Delay, s/veh		56.6			55.0			16.9			10.9	
Approach LOS		E			E			B			B	

Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		115.5		44.5	10.2	105.3		44.5				
Change Period (Y+Rc), s		* 6.7		7.4	3.0	* 6.7		7.4				
Max Green Setting (Gmax), s		* 92		53.6	10.0	* 79		53.6				
Max Q Clear Time (g_c+I1), s		13.6		25.5	7.1	26.3		28.8				
Green Ext Time (p_c), s		19.1		3.6	0.1	33.6		4.9				

Intersection Summary		
HCM 6th Ctrl Delay		23.2
HCM 6th LOS		C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
6: Rathburn Rd E & Bough Beeches Blvd (West)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	43	474	56	14	365	18	94	29	19	24	73	122
Future Volume (veh/h)	43	474	56	14	365	18	94	29	19	24	73	122
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1787	1826	1576	1773	1811	1563	1802	1841	1589	1802	1841	1589
Adj Flow Rate, veh/h	46	504	60	15	404	20	100	31	20	26	78	130
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	5	5	5	6	6	6	4	4	4	4	4	4
Cap, veh/h	590	1871	222	508	1999	99	225	240	155	359	143	238
Arrive On Green	0.60	0.60	0.60	0.60	0.60	0.60	0.23	0.23	0.23	0.23	0.23	0.23
Sat Flow, veh/h	921	3123	370	802	3337	165	1131	1045	674	1304	620	1034
Grp Volume(v), veh/h	46	279	285	15	208	216	100	0	51	26	0	208
Grp Sat Flow(s),veh/h/ln	921	1735	1759	802	1721	1781	1131	0	1719	1304	0	1655
Q Serve(g_s), s	1.9	6.2	6.2	0.7	4.4	4.4	6.8	0.0	1.9	1.3	0.0	8.9
Cycle Q Clear(g_c), s	6.4	6.2	6.2	6.9	4.4	4.4	15.7	0.0	1.9	3.2	0.0	8.9
Prop In Lane	1.00		0.21	1.00		0.09	1.00		0.39	1.00		0.63
Lane Grp Cap(c), veh/h	590	1039	1054	508	1030	1067	225	0	395	359	0	380
V/C Ratio(X)	0.08	0.27	0.27	0.03	0.20	0.20	0.45	0.00	0.13	0.07	0.00	0.55
Avail Cap(c_a), veh/h	590	1039	1054	508	1030	1067	452	0	741	622	0	714
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	8.8	7.7	7.7	9.3	7.3	7.3	34.1	0.0	24.5	25.7	0.0	27.1
Incr Delay (d2), s/veh	0.3	0.6	0.6	0.1	0.4	0.4	1.4	0.0	0.1	0.1	0.0	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	1.7	1.7	0.1	1.2	1.2	1.7	0.0	0.7	0.4	0.0	3.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	9.0	8.3	8.3	9.4	7.8	7.8	35.4	0.0	24.6	25.8	0.0	28.4
LnGrp LOS	A	A	A	A	A	A	D	A	C	C	A	C
Approach Vol, veh/h		610			439			151			234	
Approach Delay, s/veh		8.4			7.8			31.8			28.1	
Approach LOS		A			A			C			C	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		54.1		25.9		54.1		25.9				
Change Period (Y+Rc), s		* 6.2		7.5		* 6.2		7.5				
Max Green Setting (Gmax), s		* 32		34.5		* 32		34.5				
Max Q Clear Time (g_c+I1), s		8.4		17.7		8.9		10.9				
Green Ext Time (p_c), s		4.6		0.7		3.1		1.6				

Intersection Summary			
HCM 6th Ctrl Delay			13.9
HCM 6th LOS			B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	125	251	87	34	236	170	117	224	32	126	106	75
Future Volume (veh/h)	125	251	87	34	236	170	117	224	32	126	106	75
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1787	1826	1576	1802	1841	1589	1802	1841	1589	1816	1856	1602
Adj Flow Rate, veh/h	137	276	96	37	259	187	129	246	35	138	116	82
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	5	5	5	4	4	4	4	4	4	3	3	3
Cap, veh/h	595	2107	811	634	2124	818	287	723	102	254	479	314
Arrive On Green	0.61	0.61	0.61	0.61	0.61	0.61	0.23	0.23	0.23	0.23	0.23	0.23
Sat Flow, veh/h	902	3469	1336	973	3497	1346	1141	3079	433	1067	2039	1339
Grp Volume(v), veh/h	137	276	96	37	259	187	129	138	143	138	99	99
Grp Sat Flow(s),veh/h/ln	902	1735	1336	973	1749	1346	1141	1749	1763	1067	1763	1615
Q Serve(g_s), s	7.2	3.2	2.9	1.6	3.0	6.0	9.9	6.2	6.4	11.8	4.3	4.7
Cycle Q Clear(g_c), s	10.2	3.2	2.9	4.8	3.0	6.0	14.6	6.2	6.4	18.2	4.3	4.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.25	1.00		0.83
Lane Grp Cap(c), veh/h	595	2107	811	634	2124	818	287	411	414	254	414	379
V/C Ratio(X)	0.23	0.13	0.12	0.06	0.12	0.23	0.45	0.34	0.34	0.54	0.24	0.26
Avail Cap(c_a), veh/h	595	2107	811	634	2124	818	517	764	770	470	770	705
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	10.1	8.0	7.9	9.0	7.9	8.5	35.6	30.2	30.3	37.8	29.5	29.6
Incr Delay (d2), s/veh	0.9	0.1	0.3	0.2	0.1	0.7	1.1	0.5	0.5	1.8	0.3	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	0.9	0.7	0.3	0.9	1.4	2.6	2.4	2.5	2.9	1.7	1.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	11.0	8.1	8.2	9.2	8.0	9.2	36.7	30.7	30.8	39.6	29.8	30.0
LnGrp LOS	B	A	A	A	A	A	D	C	C	D	C	C
Approach Vol, veh/h		509			483			410			336	
Approach Delay, s/veh		8.9			8.6			32.6			33.9	
Approach LOS		A			A			C			C	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		65.2		29.8		65.2		29.8				
Change Period (Y+Rc), s		7.5		7.5		7.5		7.5				
Max Green Setting (Gmax), s		38.5		41.5		38.5		41.5				
Max Q Clear Time (g_c+I1), s		12.2		16.6		8.0		20.2				
Green Ext Time (p_c), s		3.8		2.7		3.4		2.1				
Intersection Summary												
HCM 6th Ctrl Delay			19.2									
HCM 6th LOS			B									

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	223	59	448	56	14	342
Future Volume (veh/h)	223	59	448	56	14	342
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1802	1589	1870	1614	1802	1841
Adj Flow Rate, veh/h	248	0	497	0	16	380
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	4	4	2	2	4	4
Cap, veh/h	291		2466		635	2427
Arrive On Green	0.17	0.00	0.69	0.00	0.69	0.69
Sat Flow, veh/h	1716	1346	3741	0	868	3589
Grp Volume(v), veh/h	248	0	497	0	16	380
Grp Sat Flow(s),veh/h/ln	1716	1346	1777	0	868	1749
Q Serve(g_s), s	13.3	0.0	4.7	0.0	0.6	3.5
Cycle Q Clear(g_c), s	13.3	0.0	4.7	0.0	5.4	3.5
Prop In Lane	1.00	1.00		0.00	1.00	
Lane Grp Cap(c), veh/h	291		2466		635	2427
V/C Ratio(X)	0.85		0.20		0.03	0.16
Avail Cap(c_a), veh/h	479		2466		635	2427
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	38.3	0.0	5.2	0.0	6.1	5.0
Incr Delay (d2), s/veh	7.9	0.0	0.2	0.0	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.7	0.0	1.1	0.0	0.1	0.8
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	46.2	0.0	5.4	0.0	6.2	5.1
LnGrp LOS	D		A		A	A
Approach Vol, veh/h	248	A	497	A		396
Approach Delay, s/veh	46.2		5.4			5.2
Approach LOS	D		A			A

Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		72.4		22.6		72.4
Change Period (Y+Rc), s		6.5		6.5		6.5
Max Green Setting (Gmax), s		55.5		26.5		55.5
Max Q Clear Time (g_c+I1), s		7.4		15.3		6.7
Green Ext Time (p_c), s		3.5		0.8		4.6

Intersection Summary			
HCM 6th Ctrl Delay			14.2
HCM 6th LOS			B

Notes

Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	39	976	27	23	645	374	20	42	60	424	44	75
Future Volume (veh/h)	39	976	27	23	645	374	20	42	60	424	44	75
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1816	1856	1602	1816	1856	1602	1802	1841	1589	1816	1856	1602
Adj Flow Rate, veh/h	41	1016	28	24	672	389	21	44	62	441	46	78
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	3	3	3	3	3	3	4	4	4	3	3	3
Cap, veh/h	322	2202	848	293	2202	1062	132	53	75	531	293	215
Arrive On Green	0.62	0.62	0.62	0.62	0.62	0.62	0.08	0.08	0.08	0.16	0.16	0.16
Sat Flow, veh/h	517	3526	1357	525	3526	1357	1716	691	974	3356	1856	1357
Grp Volume(v), veh/h	41	1016	28	24	672	389	21	0	106	441	46	78
Grp Sat Flow(s),veh/h/ln	517	1763	1357	525	1763	1357	1716	0	1665	1678	1856	1357
Q Serve(g_s), s	6.4	24.3	1.3	4.0	14.1	14.0	1.8	0.0	10.0	20.4	3.4	8.2
Cycle Q Clear(g_c), s	20.5	24.3	1.3	28.4	14.1	14.0	1.8	0.0	10.0	20.4	3.4	8.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.58	1.00		1.00
Lane Grp Cap(c), veh/h	322	2202	848	293	2202	1062	132	0	128	531	293	215
V/C Ratio(X)	0.13	0.46	0.03	0.08	0.31	0.37	0.16	0.00	0.83	0.83	0.16	0.36
Avail Cap(c_a), veh/h	322	2202	848	293	2202	1062	188	0	182	891	493	361
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	18.7	15.8	11.5	23.3	13.9	5.3	69.0	0.0	72.8	65.3	58.1	60.2
Incr Delay (d2), s/veh	0.8	0.7	0.1	0.5	0.4	1.0	0.6	0.0	19.0	3.4	0.2	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	8.5	0.3	0.5	4.9	6.6	0.8	0.0	4.8	8.6	1.6	2.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	19.5	16.5	11.6	23.9	14.3	6.3	69.6	0.0	91.8	68.7	58.4	61.2
LnGrp LOS	B	B	B	C	B	A	E	A	F	E	E	E
Approach Vol, veh/h		1085			1085			127			565	
Approach Delay, s/veh		16.5			11.6			88.1			66.8	
Approach LOS		B			B			F			E	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		107.4		19.8		107.4		32.8				
Change Period (Y+Rc), s		7.5		7.5		7.5		7.5				
Max Green Setting (Gmax), s		77.5		17.5		77.5		42.5				
Max Q Clear Time (g_c+I1), s		26.3		12.0		30.4		22.4				
Green Ext Time (p_c), s		12.5		0.3		9.8		2.9				
Intersection Summary												
HCM 6th Ctrl Delay			27.8									
HCM 6th LOS			C									

Notes

User approved pedestrian interval to be less than phase max green.

Intersection	
Int Delay, s/veh	3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	29	298	24	6	349	12	45	14	17	30	3	43
Future Vol, veh/h	29	298	24	6	349	12	45	14	17	30	3	43
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	300	-	-	200	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	6	6	6	5	5	5	9	9	9	1	1	1
Mvmt Flow	31	320	26	6	375	13	48	15	18	32	3	46

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	388	0	0	346	0	0	596	795	173	624	802	194
Stage 1	-	-	-	-	-	-	395	395	-	394	394	-
Stage 2	-	-	-	-	-	-	201	400	-	230	408	-
Critical Hdwy	4.22	-	-	4.2	-	-	7.68	6.68	7.08	7.52	6.52	6.92
Critical Hdwy Stg 1	-	-	-	-	-	-	6.68	5.68	-	6.52	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.68	5.68	-	6.52	5.52	-
Follow-up Hdwy	2.26	-	-	2.25	-	-	3.59	4.09	3.39	3.51	4.01	3.31
Pot Cap-1 Maneuver	1139	-	-	1188	-	-	373	306	819	372	318	818
Stage 1	-	-	-	-	-	-	583	586	-	605	606	-
Stage 2	-	-	-	-	-	-	762	583	-	755	598	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1139	-	-	1188	-	-	341	296	819	341	308	818
Mov Cap-2 Maneuver	-	-	-	-	-	-	341	296	-	341	308	-
Stage 1	-	-	-	-	-	-	567	570	-	589	603	-
Stage 2	-	-	-	-	-	-	712	580	-	699	582	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.7	0.1	17	13.5
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	380	1139	-	-	1188	-	-	506
HCM Lane V/C Ratio	0.215	0.027	-	-	0.005	-	-	0.161
HCM Control Delay (s)	17	8.2	-	-	8	-	-	13.5
HCM Lane LOS	C	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.8	0.1	-	-	0	-	-	0.6

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL	SWR
Lane Configurations										
Traffic Vol, veh/h	3	386	7	7	367	0	31	0	0	6
Future Vol, veh/h	3	386	7	7	367	0	31	0	0	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	-	None
Storage Length	-	-	-	150	-	-	-	0	0	-
Veh in Median Storage, #	-	0	-	-	0	-	0	-	0	-
Grade, %	-	0	-	-	0	-	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	420	8	8	399	0	34	0	0	7

Major/Minor	Major1			Major2			Minor1		Minor2	
Conflicting Flow All	399	0	0	428	0	0	646	214	631	200
Stage 1	-	-	-	-	-	-	430	-	415	-
Stage 2	-	-	-	-	-	-	216	-	216	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.94	7.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	-	6.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	-	6.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	3.32	3.52	3.32
Pot Cap-1 Maneuver	1156	-	-	1128	-	-	357	791	366	808
Stage 1	-	-	-	-	-	-	574	-	585	-
Stage 2	-	-	-	-	-	-	766	-	766	-
Platoon blocked, %		-	-		-	-				
Mov Cap-1 Maneuver	1156	-	-	1128	-	-	351	791	352	808
Mov Cap-2 Maneuver	-	-	-	-	-	-	351	-	352	-
Stage 1	-	-	-	-	-	-	572	-	583	-
Stage 2	-	-	-	-	-	-	754	-	741	-

Approach	EB	WB	NB	SW
HCM Control Delay, s	0.1	0.2	9.7	11.9
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SWLn1
Capacity (veh/h)	791	1156	-	-	1128	-	-	532
HCM Lane V/C Ratio	0.03	0.003	-	-	0.007	-	-	0.02
HCM Control Delay (s)	9.7	8.1	0	-	8.2	-	-	11.9
HCM Lane LOS	A	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	8	1	46	4	0	1	13	430	1	1	480	8
Future Vol, veh/h	8	1	46	4	0	1	13	430	1	1	480	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	500	-	-	-	-	500
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	4	4	4	0	0	0	3	3	3	3	3	3
Mvmt Flow	9	1	49	4	0	1	14	462	1	1	516	9

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	777	1009	258	752	1018	232	525	0	0	463	0	0
Stage 1	518	518	-	491	491	-	-	-	-	-	-	-
Stage 2	259	491	-	261	527	-	-	-	-	-	-	-
Critical Hdwy	7.58	6.58	6.98	7.5	6.5	6.9	4.16	-	-	4.16	-	-
Critical Hdwy Stg 1	6.58	5.58	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.58	5.58	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.54	4.04	3.34	3.5	4	3.3	2.23	-	-	2.23	-	-
Pot Cap-1 Maneuver	283	235	735	303	239	776	1031	-	-	1088	-	-
Stage 1	504	526	-	533	552	-	-	-	-	-	-	-
Stage 2	718	541	-	727	532	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	280	231	735	278	235	776	1031	-	-	1088	-	-
Mov Cap-2 Maneuver	280	231	-	278	235	-	-	-	-	-	-	-
Stage 1	497	525	-	526	544	-	-	-	-	-	-	-
Stage 2	707	533	-	676	531	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12	16.5	0.3	0
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1031	-	-	576	319	1088	-	-
HCM Lane V/C Ratio	0.014	-	-	0.103	0.017	0.001	-	-
HCM Control Delay (s)	8.5	-	-	12	16.5	8.3	0	-
HCM Lane LOS	A	-	-	B	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.3	0.1	0	-	-

Intersection	
Int Delay, s/veh	1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	46	17	382	3	6	698
Future Vol, veh/h	46	17	382	3	6	698
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	300	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	50	18	415	3	7	759

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	811	209	0	0	418	0
Stage 1	417	-	-	-	-	-
Stage 2	394	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	317	797	-	-	1138	-
Stage 1	633	-	-	-	-	-
Stage 2	650	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	315	797	-	-	1138	-
Mov Cap-2 Maneuver	315	-	-	-	-	-
Stage 1	629	-	-	-	-	-
Stage 2	650	-	-	-	-	-

Approach	WB		NB		SB	
HCM Control Delay, s	16.7		0		0.1	
HCM LOS	C					

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	376	1138	-
HCM Lane V/C Ratio	-	-	0.182	0.006	-
HCM Control Delay (s)	-	-	16.7	8.2	-
HCM Lane LOS	-	-	C	A	-
HCM 95th %tile Q(veh)	-	-	0.7	0	-

Intersection	
Int Delay, s/veh	3.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	26	48	1	1	169	14	3	2	0	10	10	64
Future Vol, veh/h	26	48	1	1	169	14	3	2	0	10	10	64
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	500	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	83	83	83	83	83	83	83	83	83	83	83	83
Heavy Vehicles, %	3	3	3	2	2	2	0	0	0	1	1	1
Mvmt Flow	33	60	1	1	212	18	4	3	0	13	13	80

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	230	0	0	61	0	0	220	359	31	321	350	115
Stage 1	-	-	-	-	-	-	127	127	-	223	223	-
Stage 2	-	-	-	-	-	-	93	232	-	98	127	-
Critical Hdwy	5.36	-	-	4.14	-	-	6.95	6.5	6.9	6.97	6.52	7.12
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	7.32	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.7	5.5	-	6.52	5.52	-
Follow-up Hdwy	3.13	-	-	2.22	-	-	3.65	4	3.3	3.66	4.01	3.91
Pot Cap-1 Maneuver	901	-	-	1540	-	-	720	571	1043	619	575	780
Stage 1	-	-	-	-	-	-	836	795	-	699	720	-
Stage 2	-	-	-	-	-	-	869	716	-	865	792	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	901	-	-	1540	-	-	616	549	1043	599	553	780
Mov Cap-2 Maneuver	-	-	-	-	-	-	616	549	-	599	553	-
Stage 1	-	-	-	-	-	-	805	766	-	673	719	-
Stage 2	-	-	-	-	-	-	765	715	-	831	763	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	3.2	0	11.2	10.9
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	587	901	-	-	1540	-	-	719
HCM Lane V/C Ratio	0.011	0.036	-	-	0.001	-	-	0.146
HCM Control Delay (s)	11.2	9.1	-	-	7.3	0	-	10.9
HCM Lane LOS	B	A	-	-	A	A	-	B
HCM 95th %tile Q(veh)	0	0.1	-	-	0	-	-	0.5

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	158	426	109	515	42	1423	79	148	898	53
v/c Ratio	0.97	0.43	0.54	0.53	0.14	0.52	0.06	0.65	0.30	0.07
Control Delay	117.5	32.5	60.6	38.3	22.5	24.8	0.1	25.6	14.7	3.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	117.5	32.5	60.6	38.3	22.5	24.8	0.1	25.6	14.7	3.6
Queue Length 50th (m)	51.1	41.7	32.5	45.7	7.2	114.7	0.0	19.0	50.4	0.0
Queue Length 95th (m)	#91.8	55.3	54.7	79.5	16.5	136.1	0.0	32.8	64.9	6.6
Internal Link Dist (m)		126.7		96.8		217.9			205.6	
Turn Bay Length (m)	40.0		60.0		110.0		90.0	110.0		150.0
Base Capacity (vph)	195	1157	242	1130	298	2747	1320	234	3030	800
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.81	0.37	0.45	0.46	0.14	0.52	0.06	0.63	0.30	0.07

Intersection Summary

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

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	46	564	15	424	100	51	26	208
v/c Ratio	0.08	0.26	0.03	0.20	0.48	0.14	0.10	0.48
Control Delay	4.7	4.9	6.3	6.5	36.7	19.0	26.8	15.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.7	4.9	6.3	6.5	36.7	19.0	26.8	15.5
Queue Length 50th (m)	1.9	12.3	0.8	12.6	14.5	4.1	3.5	10.8
Queue Length 95th (m)	m4.2	17.7	3.3	21.7	28.2	12.6	9.6	28.5
Internal Link Dist (m)		66.9		389.9		79.7		64.4
Turn Bay Length (m)	40.0		15.0		15.0		15.0	
Base Capacity (vph)	565	2144	488	2139	456	752	558	787
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	0.08	0.26	0.03	0.20	0.22	0.07	0.05	0.26

Intersection Summary

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

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	137	276	96	37	259	187	129	281	138	198
v/c Ratio	0.20	0.12	0.11	0.05	0.11	0.20	0.60	0.42	0.69	0.28
Control Delay	9.1	7.5	2.3	2.9	2.6	0.6	45.4	31.7	52.1	18.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.1	7.5	2.3	2.9	2.6	0.6	45.4	31.7	52.1	18.3
Queue Length 50th (m)	9.5	9.5	0.0	0.8	2.7	0.0	23.0	23.3	25.0	9.9
Queue Length 95th (m)	23.6	19.0	6.8	2.2	5.2	0.0	37.8	31.5	40.9	17.4
Internal Link Dist (m)		305.1			325.3			80.8		164.2
Turn Bay Length (m)	70.0		70.0	60.0		60.0	60.0		60.0	
Base Capacity (vph)	682	2236	897	677	2257	937	489	1499	456	1482
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.20	0.12	0.11	0.05	0.11	0.20	0.26	0.19	0.30	0.13

Intersection Summary

Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Group Flow (vph)	248	65	559	16	380
v/c Ratio	0.73	0.05	0.24	0.03	0.17
Control Delay	47.6	0.1	7.1	10.1	9.4
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	47.6	0.1	7.1	10.1	9.4
Queue Length 50th (m)	45.1	0.0	19.3	1.4	18.6
Queue Length 95th (m)	65.7	0.0	33.3	6.0	34.2
Internal Link Dist (m)	210.5		116.0		76.9
Turn Bay Length (m)				50.0	
Base Capacity (vph)	473	1340	2312	524	2299
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	0.52	0.05	0.24	0.03	0.17

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	41	1016	28	24	672	389	21	106	441	46	78
v/c Ratio	0.10	0.48	0.03	0.10	0.32	0.33	0.14	0.61	0.76	0.14	0.26
Control Delay	16.9	20.0	0.1	17.7	17.3	1.1	69.0	60.8	71.3	54.8	11.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.9	20.0	0.1	17.7	17.3	1.1	69.0	60.8	71.3	54.8	11.0
Queue Length 50th (m)	5.5	95.4	0.0	3.2	55.4	0.0	6.7	23.1	73.2	13.2	0.0
Queue Length 95th (m)	14.4	136.3	0.0	10.0	82.0	6.4	16.0	43.6	88.7	24.7	13.7
Internal Link Dist (m)		211.6			225.4			53.9		148.6	
Turn Bay Length (m)	50.0		35.0	40.0		40.0	30.0		40.0		
Base Capacity (vph)	392	2100	843	242	2100	1180	185	214	884	490	419
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.48	0.03	0.10	0.32	0.33	0.11	0.50	0.50	0.09	0.19

Intersection Summary

HCM 6th Signalized Intersection Summary
3: Rathburn Rd E & Dixie Rd

Existing Scenario-PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	43	211	127	98	444	179	227	833	141	301	1795	264
Future Volume (veh/h)	43	211	127	98	444	179	227	833	141	301	1795	264
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		1.00	0.98		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1831	1870	1614	1831	1870	1614	1816	1856	1602	1831	1870	1614
Adj Flow Rate, veh/h	45	222	0	103	467	0	239	876	0	317	1888	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	2	2	2	2	2	2	3	3	3	2	2	2
Cap, veh/h	155	847		253	847		258	2862		495	2940	
Arrive On Green	0.24	0.24	0.00	0.24	0.24	0.00	0.08	0.56	0.00	0.09	0.58	0.00
Sat Flow, veh/h	894	3647	0	1108	3647	0	1730	5066	1357	1744	5106	1368
Grp Volume(v), veh/h	45	222	0	103	467	0	239	876	0	317	1888	0
Grp Sat Flow(s),veh/h/ln	894	1777	0	1108	1777	0	1730	1689	1357	1744	1702	1368
Q Serve(g_s), s	7.4	8.1	0.0	13.3	18.4	0.0	10.6	14.6	0.0	12.1	39.8	0.0
Cycle Q Clear(g_c), s	25.9	8.1	0.0	21.4	18.4	0.0	10.6	14.6	0.0	12.1	39.8	0.0
Prop In Lane	1.00		0.00	1.00		0.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	155	847		253	847		258	2862		495	2940	
V/C Ratio(X)	0.29	0.26		0.41	0.55		0.93	0.31		0.64	0.64	
Avail Cap(c_a), veh/h	197	1013		305	1013		262	2862		512	2940	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	64.8	49.5	0.0	58.2	53.4	0.0	32.8	18.3	0.0	12.8	22.8	0.0
Incr Delay (d2), s/veh	2.2	0.3	0.0	2.2	1.2	0.0	36.2	0.3	0.0	2.6	1.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	3.5	0.0	3.8	8.0	0.0	7.4	5.1	0.0	4.2	14.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	67.0	49.9	0.0	60.5	54.6	0.0	69.0	18.6	0.0	15.4	23.9	0.0
LnGrp LOS	E	D		E	D		E	B		B	C	
Approach Vol, veh/h		267	A		570	A		1115	A		2205	A
Approach Delay, s/veh		52.7			55.7			29.4			22.7	
Approach LOS		D			E			C			C	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	15.6	98.8		45.5	17.4	97.1		45.5
Change Period (Y+Rc), s	3.0	* 6.7		7.4	3.0	* 6.7		7.4
Max Green Setting (Gmax), s	13.0	* 84		45.6	16.0	* 81		45.6
Max Q Clear Time (g_c+I1), s	12.6	41.8		23.4	14.1	16.6		27.9
Green Ext Time (p_c), s	0.0	35.9		7.3	0.3	17.9		2.9

Intersection Summary	
HCM 6th Ctrl Delay	31.0
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	152	508	137	61	621	22	90	44	53	22	31	92
Future Volume (veh/h)	152	508	137	61	621	22	90	44	53	22	31	92
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1802	1841	1589	1816	1856	1602	1715	1752	1512	1773	1811	1563
Adj Flow Rate, veh/h	162	540	146	67	687	24	96	47	56	23	33	98
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	4	4	4	3	3	3	10	10	10	6	6	6
Cap, veh/h	480	1737	468	492	2216	77	227	139	166	255	77	228
Arrive On Green	0.64	0.64	0.64	0.64	0.64	0.64	0.19	0.19	0.19	0.19	0.19	0.19
Sat Flow, veh/h	712	2724	734	734	3475	121	1154	728	868	1224	402	1194
Grp Volume(v), veh/h	162	346	340	67	348	363	96	0	103	23	0	131
Grp Sat Flow(s),veh/h/ln	712	1749	1709	734	1763	1834	1154	0	1596	1224	0	1596
Q Serve(g_s), s	10.6	7.1	7.2	3.6	7.1	7.1	6.4	0.0	4.5	1.3	0.0	5.8
Cycle Q Clear(g_c), s	17.8	7.1	7.2	10.8	7.1	7.1	12.2	0.0	4.5	5.8	0.0	5.8
Prop In Lane	1.00		0.43	1.00		0.07	1.00		0.54	1.00		0.75
Lane Grp Cap(c), veh/h	480	1115	1090	492	1124	1170	227	0	305	255	0	305
V/C Ratio(X)	0.34	0.31	0.31	0.14	0.31	0.31	0.42	0.00	0.34	0.09	0.00	0.43
Avail Cap(c_a), veh/h	480	1115	1090	492	1124	1170	504	0	688	550	0	688
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	10.6	6.5	6.6	9.0	6.5	6.5	33.9	0.0	28.0	30.5	0.0	28.5
Incr Delay (d2), s/veh	1.9	0.7	0.7	0.6	0.7	0.7	1.3	0.0	0.7	0.2	0.0	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	1.8	1.8	0.5	1.8	1.9	1.7	0.0	1.5	0.4	0.0	2.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	12.5	7.3	7.3	9.6	7.3	7.2	35.1	0.0	28.6	30.6	0.0	29.5
LnGrp LOS	B	A	A	A	A	A	D	A	C	C	A	C
Approach Vol, veh/h		848			778			199			154	
Approach Delay, s/veh		8.3			7.4			31.8			29.7	
Approach LOS		A			A			C			C	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		57.2		22.8		57.2		22.8				
Change Period (Y+Rc), s		* 6.2		7.5		* 6.2		7.5				
Max Green Setting (Gmax), s		* 32		34.5		* 32		34.5				
Max Q Clear Time (g_c+I1), s		19.8		14.2		12.8		7.8				
Green Ext Time (p_c), s		5.1		1.1		5.7		1.0				

Intersection Summary		
HCM 6th Ctrl Delay		12.0
HCM 6th LOS		B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	63	265	47	43	481	67	53	81	49	191	215	229
Future Volume (veh/h)	63	265	47	43	481	67	53	81	49	191	215	229
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1787	1826	1576	1816	1856	1602	1816	1856	1602	1845	1885	1627
Adj Flow Rate, veh/h	76	318	56	48	534	74	64	97	59	229	258	275
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	5	5	5	3	3	3	3	3	3	1	1	1
Cap, veh/h	446	1929	743	577	1961	755	192	620	351	379	512	457
Arrive On Green	0.56	0.56	0.56	0.56	0.56	0.56	0.29	0.29	0.29	0.29	0.29	0.29
Sat Flow, veh/h	777	3469	1336	979	3526	1357	846	2168	1229	1214	1791	1598
Grp Volume(v), veh/h	76	318	56	48	534	74	64	78	78	229	258	275
Grp Sat Flow(s),veh/h/ln	777	1735	1336	979	1763	1357	846	1763	1634	1214	1791	1598
Q Serve(g_s), s	5.4	4.3	1.8	2.4	7.5	2.4	6.7	3.1	3.4	16.6	11.4	14.1
Cycle Q Clear(g_c), s	12.9	4.3	1.8	6.6	7.5	2.4	20.8	3.1	3.4	20.0	11.4	14.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.75	1.00		1.00
Lane Grp Cap(c), veh/h	446	1929	743	577	1961	755	192	504	467	379	512	457
V/C Ratio(X)	0.17	0.16	0.08	0.08	0.27	0.10	0.33	0.15	0.17	0.60	0.50	0.60
Avail Cap(c_a), veh/h	446	1929	743	577	1961	755	320	770	714	563	782	698
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	14.4	10.3	9.8	11.9	11.0	9.9	38.2	25.3	25.4	32.9	28.3	29.2
Incr Delay (d2), s/veh	0.8	0.2	0.2	0.3	0.3	0.3	1.0	0.1	0.2	1.5	0.8	1.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	1.3	0.5	0.5	2.4	0.6	1.3	1.2	1.2	4.5	4.5	4.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.2	10.5	10.0	12.2	11.4	10.2	39.2	25.5	25.6	34.5	29.1	30.5
LnGrp LOS	B	B	A	B	B	B	D	C	C	C	C	C
Approach Vol, veh/h		450			656			220			762	
Approach Delay, s/veh		11.2			11.3			29.5			31.2	
Approach LOS		B			B			C			C	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		60.3		34.7		60.3		34.7				
Change Period (Y+Rc), s		7.5		7.5		7.5		7.5				
Max Green Setting (Gmax), s		38.5		41.5		38.5		41.5				
Max Q Clear Time (g_c+I1), s		14.9		22.8		9.5		22.0				
Green Ext Time (p_c), s		3.4		1.4		5.4		5.2				
Intersection Summary												
HCM 6th Ctrl Delay			20.5									
HCM 6th LOS			C									

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	190	48	586	219	72	442
Future Volume (veh/h)	190	48	586	219	72	442
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1831	1614	1870	1614	1831	1870
Adj Flow Rate, veh/h	206	0	636	0	78	480
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	248		2561		587	2561
Arrive On Green	0.14	0.00	0.72	0.00	0.72	0.72
Sat Flow, veh/h	1744	1368	3741	0	775	3647
Grp Volume(v), veh/h	206	0	636	0	78	480
Grp Sat Flow(s),veh/h/ln	1744	1368	1777	0	775	1777
Q Serve(g_s), s	10.9	0.0	5.8	0.0	3.6	4.1
Cycle Q Clear(g_c), s	10.9	0.0	5.8	0.0	9.4	4.1
Prop In Lane	1.00	1.00		0.00	1.00	
Lane Grp Cap(c), veh/h	248		2561		587	2561
V/C Ratio(X)	0.83		0.25		0.13	0.19
Avail Cap(c_a), veh/h	486		2561		587	2561
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	39.6	0.0	4.5	0.0	6.1	4.3
Incr Delay (d2), s/veh	7.0	0.0	0.2	0.0	0.5	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.7	0.0	1.2	0.0	0.5	0.9
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	46.6	0.0	4.7	0.0	6.6	4.4
LnGrp LOS	D		A		A	A
Approach Vol, veh/h	206	A	636	A		558
Approach Delay, s/veh	46.6		4.7			4.7
Approach LOS	D		A			A
Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		75.0		20.0		75.0
Change Period (Y+Rc), s		6.5		6.5		6.5
Max Green Setting (Gmax), s		55.5		26.5		55.5
Max Q Clear Time (g_c+I1), s		11.4		12.9		7.8
Green Ext Time (p_c), s		5.3		0.7		6.2
Intersection Summary						
HCM 6th Ctrl Delay			10.9			
HCM 6th LOS			B			

Notes

Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	47	856	28	46	1194	640	16	49	28	465	62	69
Future Volume (veh/h)	47	856	28	46	1194	640	16	49	28	465	62	69
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1845	1885	1627	1845	1885	1627	1845	1885	1627	1845	1885	1627
Adj Flow Rate, veh/h	50	910	30	49	1269	680	17	52	30	494	66	73
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	135	2201	847	329	2201	1083	130	83	48	582	322	236
Arrive On Green	0.61	0.61	0.61	0.61	0.61	0.61	0.07	0.07	0.07	0.17	0.17	0.17
Sat Flow, veh/h	223	3582	1379	588	3582	1379	1758	1122	647	3410	1885	1379
Grp Volume(v), veh/h	50	910	30	49	1269	680	17	0	82	494	66	73
Grp Sat Flow(s),veh/h/ln	223	1791	1379	588	1791	1379	1758	0	1769	1705	1885	1379
Q Serve(g_s), s	27.6	21.0	1.4	7.5	33.8	33.4	1.4	0.0	7.2	22.5	4.8	7.4
Cycle Q Clear(g_c), s	61.4	21.0	1.4	28.5	33.8	33.4	1.4	0.0	7.2	22.5	4.8	7.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.37	1.00		1.00
Lane Grp Cap(c), veh/h	135	2201	847	329	2201	1083	130	0	131	582	322	236
V/C Ratio(X)	0.37	0.41	0.04	0.15	0.58	0.63	0.13	0.00	0.63	0.85	0.20	0.31
Avail Cap(c_a), veh/h	135	2201	847	329	2201	1083	247	0	249	799	442	323
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	36.7	15.9	12.2	23.3	18.4	7.3	69.3	0.0	71.9	64.3	57.0	58.1
Incr Delay (d2), s/veh	7.6	0.6	0.1	1.0	1.1	2.8	0.4	0.0	4.8	6.3	0.3	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	7.5	0.4	1.0	12.2	17.0	0.6	0.0	3.3	9.9	2.2	2.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	44.4	16.5	12.2	24.3	19.5	10.0	69.7	0.0	76.7	70.7	57.3	58.8
LnGrp LOS	D	B	B	C	B	B	E	A	E	E	E	E
Approach Vol, veh/h		990			1998			99			633	
Approach Delay, s/veh		17.8			16.4			75.5			67.9	
Approach LOS		B			B			E			E	

Timer - Assigned Phs	2	4	6	8
Phs Duration (G+Y+Rc), s	105.8	19.4	105.8	34.8
Change Period (Y+Rc), s	7.5	7.5	7.5	7.5
Max Green Setting (Gmax), s	77.5	22.5	77.5	37.5
Max Q Clear Time (g_c+I1), s	63.4	9.2	35.8	24.5
Green Ext Time (p_c), s	7.4	0.4	23.8	2.9

Intersection Summary	
HCM 6th Ctrl Delay	27.1
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

Intersection												
Int Delay, s/veh	2.7											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	53	433	14	19	766	29	12	6	22	25	2	64
Future Vol, veh/h	53	433	14	19	766	29	12	6	22	25	2	64
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	300	-	-	200	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	6	6	6	6	6	6	3	3	3	3	3	3
Mvmt Flow	56	456	15	20	806	31	13	6	23	26	2	67

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	837	0	0	471	0	0	1020	1453	236	1205	1445	419
Stage 1	-	-	-	-	-	-	576	576	-	862	862	-
Stage 2	-	-	-	-	-	-	444	877	-	343	583	-
Critical Hdwy	4.22	-	-	4.22	-	-	7.56	6.56	6.96	7.56	6.56	6.96
Critical Hdwy Stg 1	-	-	-	-	-	-	6.56	5.56	-	6.56	5.56	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.56	5.56	-	6.56	5.56	-
Follow-up Hdwy	2.26	-	-	2.26	-	-	3.53	4.03	3.33	3.53	4.03	3.33
Pot Cap-1 Maneuver	768	-	-	1059	-	-	189	128	763	138	130	580
Stage 1	-	-	-	-	-	-	467	498	-	314	368	-
Stage 2	-	-	-	-	-	-	560	362	-	643	494	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	768	-	-	1059	-	-	153	116	763	120	118	580
Mov Cap-2 Maneuver	-	-	-	-	-	-	153	116	-	120	118	-
Stage 1	-	-	-	-	-	-	433	462	-	291	361	-
Stage 2	-	-	-	-	-	-	483	355	-	570	458	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.1	0.2	22.1	25.4
HCM LOS			C	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	252	768	-	-	1059	-	-	271
HCM Lane V/C Ratio	0.167	0.073	-	-	0.019	-	-	0.353
HCM Control Delay (s)	22.1	10.1	-	-	8.5	-	-	25.4
HCM Lane LOS	C	B	-	-	A	-	-	D
HCM 95th %tile Q(veh)	0.6	0.2	-	-	0.1	-	-	1.5

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL	SWR
Lane Configurations										
Traffic Vol, veh/h	12	544	23	27	489	3	8	0	0	4
Future Vol, veh/h	12	544	23	27	489	3	8	0	0	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	-	None
Storage Length	-	-	-	150	-	-	-	0	0	-
Veh in Median Storage, #	-	0	-	-	0	-	0	-	0	-
Grade, %	-	0	-	-	0	-	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	13	591	25	29	532	3	9	0	0	4

Major/Minor	Major1			Major2			Minor1		Minor2	
Conflicting Flow All	535	0	0	616	0	0	954	308	914	268
Stage 1	-	-	-	-	-	-	630	-	592	-
Stage 2	-	-	-	-	-	-	324	-	322	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.94	7.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	-	6.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	-	6.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	3.32	3.52	3.32
Pot Cap-1 Maneuver	1029	-	-	960	-	-	213	688	228	730
Stage 1	-	-	-	-	-	-	436	-	460	-
Stage 2	-	-	-	-	-	-	662	-	664	-
Platoon blocked, %		-	-		-	-				
Mov Cap-1 Maneuver	1029	-	-	960	-	-	204	688	214	730
Mov Cap-2 Maneuver	-	-	-	-	-	-	204	-	214	-
Stage 1	-	-	-	-	-	-	428	-	451	-
Stage 2	-	-	-	-	-	-	638	-	636	-

Approach	EB	WB	NB	SW
HCM Control Delay, s	0.3	0.5	10.4	12.4
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SWLn1
Capacity (veh/h)	688	1029	-	-	960	-	-	492
HCM Lane V/C Ratio	0.024	0.013	-	-	0.031	-	-	0.011
HCM Control Delay (s)	10.4	8.5	0.1	-	8.9	-	-	12.4
HCM Lane LOS	B	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	0.1	0	-	-	0.1	-	-	0

Intersection												
Int Delay, s/veh	0.9											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	14	1	27	1	0	1	41	675	3	0	594	10
Future Vol, veh/h	14	1	27	1	0	1	41	675	3	0	594	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	500	-	-	-	-	500
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	7	7	7	0	0	0	2	2	2	1	1	1
Mvmt Flow	15	1	29	1	0	1	44	718	3	0	632	11

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1079	1441	316	1125	1451	361	643	0	0	721	0	0
Stage 1	632	632	-	808	808	-	-	-	-	-	-	-
Stage 2	447	809	-	317	643	-	-	-	-	-	-	-
Critical Hdwy	7.64	6.64	7.04	7.5	6.5	6.9	4.14	-	-	4.12	-	-
Critical Hdwy Stg 1	6.64	5.64	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.64	5.64	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.57	4.07	3.37	3.5	4	3.3	2.22	-	-	2.21	-	-
Pot Cap-1 Maneuver	166	126	665	162	132	641	938	-	-	883	-	-
Stage 1	423	460	-	345	397	-	-	-	-	-	-	-
Stage 2	547	380	-	674	472	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	160	120	665	148	126	641	938	-	-	883	-	-
Mov Cap-2 Maneuver	160	120	-	148	126	-	-	-	-	-	-	-
Stage 1	403	460	-	329	378	-	-	-	-	-	-	-
Stage 2	520	362	-	643	472	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	18.7	20.1	0.5	0
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	938	-	-	308	240	883	-	-
HCM Lane V/C Ratio	0.046	-	-	0.145	0.009	-	-	-
HCM Control Delay (s)	9	-	-	18.7	20.1	0	-	-
HCM Lane LOS	A	-	-	C	C	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.5	0	0	-	-

Intersection						
Int Delay, s/veh	0.6					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	15	15	714	16	20	657
Future Vol, veh/h	15	15	714	16	20	657
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	300	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	16	16	776	17	22	714

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1186	397	0	0	793	0
Stage 1	785	-	-	-	-	-
Stage 2	401	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.14	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.22	-
Pot Cap-1 Maneuver	181	602	-	-	824	-
Stage 1	410	-	-	-	-	-
Stage 2	645	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	176	602	-	-	824	-
Mov Cap-2 Maneuver	176	-	-	-	-	-
Stage 1	399	-	-	-	-	-
Stage 2	645	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	20	0	0.3
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	272	824	-
HCM Lane V/C Ratio	-	-	0.12	0.026	-
HCM Control Delay (s)	-	-	20	9.5	-
HCM Lane LOS	-	-	C	A	-
HCM 95th %tile Q(veh)	-	-	0.4	0.1	-

Intersection	
Int Delay, s/veh	3.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	85	153	8	1	70	3	4	0	0	8	3	56
Future Vol, veh/h	85	153	8	1	70	3	4	0	0	8	3	56
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	500	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	3	3	3	4	4	4	0	0	0	1	1	1
Mvmt Flow	94	169	9	1	77	3	4	0	0	9	3	62

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	80	0	0	178	0	0	396	444	89	354	447	40
Stage 1	-	-	-	-	-	-	362	362	-	81	81	-
Stage 2	-	-	-	-	-	-	34	82	-	273	366	-
Critical Hdwy	5.36	-	-	4.18	-	-	6.95	6.5	6.9	6.97	6.52	7.12
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	7.32	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.7	5.5	-	6.52	5.52	-
Follow-up Hdwy	3.13	-	-	2.24	-	-	3.65	4	3.3	3.66	4.01	3.91
Pot Cap-1 Maneuver	1057	-	-	1381	-	-	558	511	958	590	507	869
Stage 1	-	-	-	-	-	-	613	629	-	869	829	-
Stage 2	-	-	-	-	-	-	942	831	-	687	624	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1057	-	-	1381	-	-	480	465	958	549	461	869
Mov Cap-2 Maneuver	-	-	-	-	-	-	480	465	-	549	461	-
Stage 1	-	-	-	-	-	-	558	573	-	792	828	-
Stage 2	-	-	-	-	-	-	870	830	-	626	568	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	3	0.1	12.6	10.1
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	480	1057	-	-	1381	-	-	783
HCM Lane V/C Ratio	0.009	0.089	-	-	0.001	-	-	0.095
HCM Control Delay (s)	12.6	8.7	-	-	7.6	0	-	10.1
HCM Lane LOS	B	A	-	-	A	A	-	B
HCM 95th %tile Q(veh)	0	0.3	-	-	0	-	-	0.3

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	45	356	103	655	239	876	148	317	1888	278
v/c Ratio	0.57	0.42	0.53	0.78	0.90	0.31	0.11	0.69	0.70	0.39
Control Delay	80.8	39.8	58.4	56.0	77.2	20.4	0.2	18.9	30.3	16.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	80.8	39.8	58.4	56.0	77.2	20.4	0.2	18.9	30.3	16.5
Queue Length 50th (m)	13.3	40.9	25.7	105.3	60.1	57.8	0.0	37.7	170.5	36.1
Queue Length 95th (m)	28.6	54.2	50.7	124.4	#141.0	73.4	0.0	59.7	187.6	58.8
Internal Link Dist (m)		126.7		96.8		217.9			205.6	
Turn Bay Length (m)	40.0		60.0		110.0		90.0	110.0		150.0
Base Capacity (vph)	93	995	228	980	267	2799	1326	475	2679	720
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.48	0.36	0.45	0.67	0.90	0.31	0.11	0.67	0.70	0.39

Intersection Summary

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

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	162	686	67	711	96	103	23	131
v/c Ratio	0.39	0.32	0.15	0.32	0.43	0.29	0.10	0.34
Control Delay	9.1	5.7	7.4	7.3	34.8	16.4	27.0	12.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.1	5.7	7.4	7.3	34.8	16.4	27.0	12.0
Queue Length 50th (m)	14.5	28.9	3.8	23.4	13.8	6.4	3.1	4.4
Queue Length 95th (m)	24.6	27.3	10.2	36.5	27.3	18.8	9.0	18.1
Internal Link Dist (m)		66.9		389.9		79.7		64.4
Turn Bay Length (m)	40.0		15.0		15.0		15.0	
Base Capacity (vph)	419	2146	437	2210	490	715	522	742
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	0.39	0.32	0.15	0.32	0.20	0.14	0.04	0.18

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	76	318	56	48	534	74	64	156	229	533
v/c Ratio	0.16	0.16	0.07	0.08	0.26	0.09	0.39	0.17	0.74	0.54
Control Delay	12.8	10.7	3.9	6.9	7.0	0.7	33.6	15.3	45.7	19.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.8	10.7	3.9	6.9	7.0	0.7	33.6	15.3	45.7	19.7
Queue Length 50th (m)	6.3	13.8	0.0	1.9	11.5	0.0	10.2	7.5	40.4	28.7
Queue Length 95th (m)	17.7	26.4	6.5	5.7	29.2	0.5	19.9	13.1	58.1	38.0
Internal Link Dist (m)		305.1			325.3			80.8		164.2
Turn Bay Length (m)	70.0		70.0	60.0		60.0	60.0		60.0	
Base Capacity (vph)	468	2008	799	589	2048	821	277	1476	525	1550
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.16	0.07	0.08	0.26	0.09	0.23	0.11	0.44	0.34

Intersection Summary

Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Group Flow (vph)	206	52	874	78	480
v/c Ratio	0.68	0.04	0.37	0.20	0.20
Control Delay	47.8	0.0	6.4	9.3	6.9
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	47.8	0.0	6.4	9.3	6.9
Queue Length 50th (m)	37.6	0.0	27.9	6.1	19.6
Queue Length 95th (m)	57.1	0.0	47.1	18.1	37.4
Internal Link Dist (m)	210.5		116.0		76.9
Turn Bay Length (m)				50.0	
Base Capacity (vph)	483	1367	2368	385	2437
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	0.43	0.04	0.37	0.20	0.20

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	50	910	30	49	1269	680	17	82	494	66	73
v/c Ratio	0.32	0.44	0.04	0.18	0.61	0.55	0.12	0.51	0.75	0.18	0.22
Control Delay	27.5	20.6	0.1	20.1	24.4	2.3	69.1	68.6	67.4	52.9	8.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.5	20.6	0.1	20.1	24.4	2.3	69.1	68.6	67.4	52.9	8.7
Queue Length 50th (m)	8.2	85.2	0.0	7.2	137.2	4.7	5.4	22.0	81.3	18.7	0.0
Queue Length 95th (m)	23.8	122.2	0.0	18.8	192.3	13.9	13.8	40.6	95.7	31.5	11.6
Internal Link Dist (m)		211.6			225.4			53.9		148.6	
Turn Bay Length (m)	50.0		35.0	40.0		40.0	30.0		40.0		
Base Capacity (vph)	154	2078	836	275	2078	1235	246	262	803	444	389
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.32	0.44	0.04	0.18	0.61	0.55	0.07	0.31	0.62	0.15	0.19

Intersection Summary

APPENDIX C

SYNCHRO REPORT FOR FUTURE (2041) CONDITIONS - SCENARIO 1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	166	249	200	127	181	375	44	1497	86	160	945	56
Future Volume (veh/h)	166	249	200	127	181	375	44	1497	86	160	945	56
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		1.00	0.99		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1802	1841	1589	1816	1856	1602	1802	1841	1589	1744	1781	1538
Adj Flow Rate, veh/h	184	277	0	141	201	0	49	1663	0	178	1050	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	4	4	4	3	3	3	4	4	4	8	8	8
Cap, veh/h	372	1077		336	1086		293	2317		226	2680	
Arrive On Green	0.31	0.31	0.00	0.31	0.31	0.00	0.46	0.46	0.00	0.06	0.55	0.00
Sat Flow, veh/h	1127	3589	0	1061	3618	0	516	5025	1346	1661	4863	1303
Grp Volume(v), veh/h	184	277	0	141	201	0	49	1663	0	178	1050	0
Grp Sat Flow(s),veh/h/ln	1127	1749	0	1061	1763	0	516	1675	1346	1661	1621	1303
Q Serve(g_s), s	14.3	6.0	0.0	11.5	4.2	0.0	6.0	26.7	0.0	5.5	12.4	0.0
Cycle Q Clear(g_c), s	18.5	6.0	0.0	17.5	4.2	0.0	9.4	26.7	0.0	5.5	12.4	0.0
Prop In Lane	1.00		0.00	1.00		0.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	372	1077		336	1086		293	2317		226	2680	
V/C Ratio(X)	0.49	0.26		0.42	0.19		0.17	0.72		0.79	0.39	
Avail Cap(c_a), veh/h	487	1434		444	1445		293	2317		226	2680	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	32.2	26.0	0.0	32.6	25.4	0.0	18.1	21.7	0.0	20.4	12.9	0.0
Incr Delay (d2), s/veh	2.2	0.3	0.0	1.8	0.2	0.0	1.2	1.9	0.0	16.8	0.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.5	2.8	0.0	3.4	2.0	0.0	0.9	11.5	0.0	3.3	5.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	34.4	26.3	0.0	34.4	25.6	0.0	19.3	23.7	0.0	37.2	13.3	0.0
LnGrp LOS	C	C		C	C		B	C		D	B	
Approach Vol, veh/h		461	A		342	A		1712	A		1228	A
Approach Delay, s/veh		29.5			29.2			23.5			16.8	
Approach LOS		C			C			C			B	

Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		61.8		38.2	9.0	52.8		38.2				
Change Period (Y+Rc), s		* 6.7		7.4	3.0	* 6.7		7.4				
Max Green Setting (Gmax), s		* 45		41.0	6.0	* 36		41.0				
Max Q Clear Time (g_c+I1), s		14.4		19.5	7.5	28.7		20.5				
Green Ext Time (p_c), s		16.5		4.0	0.0	6.8		5.3				

Intersection Summary	
HCM 6th Ctrl Delay	22.6
HCM 6th LOS	C

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	43	560	56	14	469	19	94	29	19	24	73	122
Future Volume (veh/h)	43	560	56	14	469	19	94	29	19	24	73	122
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1787	1826	1576	1773	1811	1563	1802	1841	1589	1802	1841	1589
Adj Flow Rate, veh/h	46	596	60	15	499	20	100	31	20	26	78	130
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	5	5	5	6	6	6	4	4	4	4	4	4
Cap, veh/h	536	1906	192	463	2020	81	225	240	155	359	143	238
Arrive On Green	0.60	0.60	0.60	0.60	0.60	0.60	0.23	0.23	0.23	0.23	0.23	0.23
Sat Flow, veh/h	843	3183	320	737	3372	135	1131	1045	674	1304	620	1034
Grp Volume(v), veh/h	46	324	332	15	254	265	100	0	51	26	0	208
Grp Sat Flow(s),veh/h/ln	843	1735	1768	737	1721	1787	1131	0	1719	1304	0	1655
Q Serve(g_s), s	2.2	7.4	7.4	0.8	5.6	5.6	6.8	0.0	1.9	1.3	0.0	8.9
Cycle Q Clear(g_c), s	7.8	7.4	7.4	8.2	5.6	5.6	15.7	0.0	1.9	3.2	0.0	8.9
Prop In Lane	1.00		0.18	1.00		0.08	1.00		0.39	1.00		0.63
Lane Grp Cap(c), veh/h	536	1039	1059	463	1030	1070	225	0	395	359	0	380
V/C Ratio(X)	0.09	0.31	0.31	0.03	0.25	0.25	0.45	0.00	0.13	0.07	0.00	0.55
Avail Cap(c_a), veh/h	536	1039	1059	463	1030	1070	452	0	741	622	0	714
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	9.4	7.9	7.9	10.0	7.6	7.6	34.1	0.0	24.5	25.7	0.0	27.1
Incr Delay (d2), s/veh	0.3	0.8	0.8	0.1	0.6	0.6	1.4	0.0	0.1	0.1	0.0	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	3.3	3.4	0.2	2.5	2.6	2.1	0.0	0.9	0.4	0.0	3.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	9.7	8.7	8.7	10.1	8.1	8.1	35.4	0.0	24.6	25.8	0.0	28.4
LnGrp LOS	A	A	A	B	A	A	D	A	C	C	A	C
Approach Vol, veh/h		702			534			151			234	
Approach Delay, s/veh		8.8			8.2			31.8			28.1	
Approach LOS		A			A			C			C	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		54.1		25.9		54.1		25.9				
Change Period (Y+Rc), s		* 6.2		7.5		* 6.2		7.5				
Max Green Setting (Gmax), s		* 32		34.5		* 32		34.5				
Max Q Clear Time (g_c+I1), s		9.8		17.7		10.2		10.9				
Green Ext Time (p_c), s		5.3		0.7		3.8		1.6				

Intersection Summary			
HCM 6th Ctrl Delay			13.5
HCM 6th LOS			B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	146	299	102	42	303	204	137	262	37	148	124	88
Future Volume (veh/h)	146	299	102	42	303	204	137	262	37	148	124	88
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1787	1826	1576	1802	1841	1589	1802	1841	1589	1816	1856	1602
Adj Flow Rate, veh/h	160	329	112	46	333	224	151	288	41	163	136	97
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	5	5	5	4	4	4	4	4	4	3	3	3
Cap, veh/h	500	1967	757	552	1983	764	318	846	119	279	557	371
Arrive On Green	0.57	0.57	0.57	0.57	0.57	0.57	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	814	3469	1336	914	3497	1346	1105	3078	434	1021	2026	1350
Grp Volume(v), veh/h	160	329	112	46	333	224	151	162	167	163	117	116
Grp Sat Flow(s),veh/h/ln	814	1735	1336	914	1749	1346	1105	1749	1763	1021	1763	1613
Q Serve(g_s), s	11.1	4.3	3.8	2.4	4.3	8.2	11.7	7.0	7.2	14.5	4.9	5.3
Cycle Q Clear(g_c), s	15.4	4.3	3.8	6.7	4.3	8.2	17.1	7.0	7.2	21.6	4.9	5.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.25	1.00		0.84
Lane Grp Cap(c), veh/h	500	1967	757	552	1983	764	318	481	485	279	485	444
V/C Ratio(X)	0.32	0.17	0.15	0.08	0.17	0.29	0.48	0.34	0.34	0.58	0.24	0.26
Avail Cap(c_a), veh/h	500	1967	757	552	1983	764	497	764	770	444	770	704
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	13.5	9.8	9.7	11.4	9.8	10.7	33.6	27.5	27.6	36.2	26.7	26.9
Incr Delay (d2), s/veh	1.7	0.2	0.4	0.3	0.2	1.0	1.1	0.4	0.4	1.9	0.3	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.5	1.9	1.3	0.6	1.9	3.0	3.5	3.3	3.4	4.0	2.3	2.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.2	10.0	10.1	11.7	10.0	11.7	34.7	27.9	28.0	38.2	27.0	27.2
LnGrp LOS	B	B	B	B	B	B	C	C	C	D	C	C
Approach Vol, veh/h		601			603			480			396	
Approach Delay, s/veh		11.4			10.8			30.1			31.7	
Approach LOS		B			B			C			C	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		61.4		33.6		61.4		33.6				
Change Period (Y+Rc), s		7.5		7.5		7.5		7.5				
Max Green Setting (Gmax), s		38.5		41.5		38.5		41.5				
Max Q Clear Time (g_c+I1), s		17.4		19.1		10.2		23.6				
Green Ext Time (p_c), s		4.4		3.2		4.3		2.5				

Intersection Summary			
HCM 6th Ctrl Delay			19.4
HCM 6th LOS			B

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	226	60	555	57	14	434
Future Volume (veh/h)	226	60	555	57	14	434
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1802	1589	1870	1614	1802	1841
Adj Flow Rate, veh/h	248	0	610	0	15	477
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	4	4	2	2	4	4
Cap, veh/h	291		2466		568	2427
Arrive On Green	0.17	0.00	0.69	0.00	0.69	0.69
Sat Flow, veh/h	1716	1346	3741	0	782	3589
Grp Volume(v), veh/h	248	0	610	0	15	477
Grp Sat Flow(s),veh/h/ln	1716	1346	1777	0	782	1749
Q Serve(g_s), s	13.3	0.0	6.0	0.0	0.7	4.6
Cycle Q Clear(g_c), s	13.3	0.0	6.0	0.0	6.7	4.6
Prop In Lane	1.00	1.00		0.00	1.00	
Lane Grp Cap(c), veh/h	291		2466		568	2427
V/C Ratio(X)	0.85		0.25		0.03	0.20
Avail Cap(c_a), veh/h	479		2466		568	2427
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	38.3	0.0	5.4	0.0	6.6	5.2
Incr Delay (d2), s/veh	7.9	0.0	0.2	0.0	0.1	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.7	0.0	2.6	0.0	0.1	2.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	46.2	0.0	5.6	0.0	6.7	5.3
LnGrp LOS	D		A		A	A
Approach Vol, veh/h	248	A	610	A		492
Approach Delay, s/veh	46.2		5.6			5.4
Approach LOS	D		A			A

Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		72.4		22.6		72.4
Change Period (Y+Rc), s		6.5		6.5		6.5
Max Green Setting (Gmax), s		55.5		26.5		55.5
Max Q Clear Time (g_c+I1), s		8.7		15.3		8.0
Green Ext Time (p_c), s		4.5		0.8		5.9

Intersection Summary		
HCM 6th Ctrl Delay		13.0
HCM 6th LOS		B

Notes

Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	49	1148	32	27	759	450	23	49	70	543	51	103
Future Volume (veh/h)	49	1148	32	27	759	450	23	49	70	543	51	103
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1816	1856	1602	1816	1856	1602	1802	1841	1589	1816	1856	1602
Adj Flow Rate, veh/h	51	1184	33	28	782	464	24	51	72	560	53	106
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	3	3	3	3	3	3	4	4	4	3	3	3
Cap, veh/h	229	1869	720	188	1869	720	171	66	93	651	649	475
Arrive On Green	0.53	0.53	0.53	0.53	0.53	0.53	0.10	0.10	0.10	0.19	0.35	0.35
Sat Flow, veh/h	433	3526	1357	445	3526	1357	1182	690	975	3356	1856	1357
Grp Volume(v), veh/h	51	1184	33	28	782	464	24	0	123	560	53	106
Grp Sat Flow(s),veh/h/ln	433	1763	1357	445	1763	1357	1182	0	1665	1678	1856	1357
Q Serve(g_s), s	10.1	29.7	1.5	5.9	16.7	30.5	2.3	0.0	9.0	20.2	2.4	6.9
Cycle Q Clear(g_c), s	26.8	29.7	1.5	35.6	16.7	30.5	2.3	0.0	9.0	20.2	2.4	6.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.59	1.00		1.00
Lane Grp Cap(c), veh/h	229	1869	720	188	1869	720	171	0	159	651	649	475
V/C Ratio(X)	0.22	0.63	0.05	0.15	0.42	0.64	0.14	0.00	0.77	0.86	0.08	0.22
Avail Cap(c_a), veh/h	229	1869	720	188	1869	720	422	0	513	846	1150	842
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	25.8	20.8	14.1	33.4	17.7	21.0	52.2	0.0	55.2	48.7	27.2	28.7
Incr Delay (d2), s/veh	2.2	1.6	0.1	1.7	0.7	4.4	0.4	0.0	7.7	7.2	0.1	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.3	13.6	0.5	0.8	7.6	11.6	0.8	0.0	4.4	9.7	1.2	2.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	28.0	22.4	14.3	35.0	18.4	25.4	52.5	0.0	62.8	55.9	27.3	28.9
LnGrp LOS	C	C	B	D	B	C	D	A	E	E	C	C
Approach Vol, veh/h		1268			1274			147			719	
Approach Delay, s/veh		22.4			21.3			61.2			49.8	
Approach LOS		C			C			E			D	

Timer - Assigned Phs		2		4		6	7	8				
Phs Duration (G+Y+Rc), s		73.8		51.2		73.8	31.8	19.5				
Change Period (Y+Rc), s		7.5		7.5		7.5	7.5	7.5				
Max Green Setting (Gmax), s		32.5		77.5		32.5	31.5	38.5				
Max Q Clear Time (g_c+I1), s		31.7		8.9		37.6	22.2	11.0				
Green Ext Time (p_c), s		0.7		0.9		0.0	2.1	1.0				

Intersection Summary			
HCM 6th Ctrl Delay			29.5
HCM 6th LOS			C

Notes

User approved pedestrian interval to be less than phase max green.

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	29	356	24	6	437	12	45	14	17	30	3	43
Future Vol, veh/h	29	356	24	6	437	12	45	14	17	30	3	43
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	300	-	-	200	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	6	6	6	5	5	5	9	9	9	1	1	1
Mvmt Flow	31	379	26	6	465	13	48	15	18	32	3	46

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	478	0	0	405	0	0	700	944	203	743	951	239
Stage 1	-	-	-	-	-	-	454	454	-	484	484	-
Stage 2	-	-	-	-	-	-	246	490	-	259	467	-
Critical Hdwy	4.22	-	-	4.2	-	-	7.68	6.68	7.08	7.52	6.52	6.92
Critical Hdwy Stg 1	-	-	-	-	-	-	6.68	5.68	-	6.52	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.68	5.68	-	6.52	5.52	-
Follow-up Hdwy	2.26	-	-	2.25	-	-	3.59	4.09	3.39	3.51	4.01	3.31
Pot Cap-1 Maneuver	1053	-	-	1129	-	-	313	249	783	305	260	765
Stage 1	-	-	-	-	-	-	537	550	-	535	553	-
Stage 2	-	-	-	-	-	-	716	530	-	726	563	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1053	-	-	1129	-	-	284	241	783	276	251	765
Mov Cap-2 Maneuver	-	-	-	-	-	-	284	241	-	276	251	-
Stage 1	-	-	-	-	-	-	521	534	-	519	550	-
Stage 2	-	-	-	-	-	-	666	527	-	669	547	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.6	0.1	20.1	15.3
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	319	1053	-	-	1129	-	-	430
HCM Lane V/C Ratio	0.253	0.029	-	-	0.006	-	-	0.188
HCM Control Delay (s)	20.1	8.5	-	-	8.2	-	-	15.3
HCM Lane LOS	C	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	1	0.1	-	-	0	-	-	0.7

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL	SWR
Lane Configurations										
Traffic Vol, veh/h	3	456	9	12	449	0	45	0	0	6
Future Vol, veh/h	3	456	9	12	449	0	45	0	0	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	-	None
Storage Length	-	-	-	150	-	-	-	0	0	-
Veh in Median Storage, #	-	0	-	-	0	-	0	-	0	-
Grade, %	-	0	-	-	0	-	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	496	10	13	488	0	49	0	0	7

Major/Minor	Major1			Major2			Minor1		Minor2	
Conflicting Flow All	488	0	0	506	0	0	777	253	768	244
Stage 1	-	-	-	-	-	-	507	-	514	-
Stage 2	-	-	-	-	-	-	270	-	254	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.94	7.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	-	6.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	-	6.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	3.32	3.52	3.32
Pot Cap-1 Maneuver	1071	-	-	1055	-	-	287	746	291	757
Stage 1	-	-	-	-	-	-	516	-	511	-
Stage 2	-	-	-	-	-	-	713	-	728	-
Platoon blocked, %		-	-		-	-				
Mov Cap-1 Maneuver	1071	-	-	1055	-	-	281	746	268	757
Mov Cap-2 Maneuver	-	-	-	-	-	-	281	-	268	-
Stage 1	-	-	-	-	-	-	514	-	509	-
Stage 2	-	-	-	-	-	-	698	-	676	-

Approach	EB	WB	NB	SW
HCM Control Delay, s	0.1	0.2	10.2	13.4
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SWLn1
Capacity (veh/h)	746	1071	-	-	1055	-	-	438
HCM Lane V/C Ratio	0.067	0.003	-	-	0.012	-	-	0.025
HCM Control Delay (s)	10.2	8.4	0	-	8.5	-	-	13.4
HCM Lane LOS	B	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	8	1	46	4	0	1	13	519	1	1	622	8
Future Vol, veh/h	8	1	46	4	0	1	13	519	1	1	622	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	500	-	-	-	-	500
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	4	4	4	0	0	0	3	3	3	3	3	3
Mvmt Flow	9	1	49	4	0	1	14	552	1	1	662	9

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	968	1245	331	915	1254	277	671	0	0	553	0	0
Stage 1	664	664	-	581	581	-	-	-	-	-	-	-
Stage 2	304	581	-	334	673	-	-	-	-	-	-	-
Critical Hdwy	7.58	6.58	6.98	7.5	6.5	6.9	4.16	-	-	4.16	-	-
Critical Hdwy Stg 1	6.58	5.58	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.58	5.58	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.54	4.04	3.34	3.5	4	3.3	2.23	-	-	2.23	-	-
Pot Cap-1 Maneuver	205	170	659	231	173	726	909	-	-	1006	-	-
Stage 1	411	452	-	472	503	-	-	-	-	-	-	-
Stage 2	675	493	-	659	457	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	202	167	659	210	170	726	909	-	-	1006	-	-
Mov Cap-2 Maneuver	202	167	-	210	170	-	-	-	-	-	-	-
Stage 1	405	451	-	465	495	-	-	-	-	-	-	-
Stage 2	664	486	-	607	456	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	13.6	20	0.2	0
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	909	-	-	477	245	1006	-	-
HCM Lane V/C Ratio	0.015	-	-	0.123	0.022	0.001	-	-
HCM Control Delay (s)	9	-	-	13.6	20	8.6	0	-
HCM Lane LOS	A	-	-	B	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.4	0.1	0	-	-

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↑↱		↰	↑↱	
Traffic Vol, veh/h	20	0	34	46	0	17	8	451	3	6	839	5
Future Vol, veh/h	20	0	34	46	0	17	8	451	3	6	839	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	300	-	-	300	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	22	0	37	50	0	18	9	490	3	7	912	5

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1192	1440	459	980	1441	247	917	0	0	493	0	0
Stage 1	929	929	-	510	510	-	-	-	-	-	-	-
Stage 2	263	511	-	470	931	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	143	132	549	204	131	753	740	-	-	1067	-	-
Stage 1	288	344	-	514	536	-	-	-	-	-	-	-
Stage 2	719	535	-	543	344	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	138	129	549	187	129	753	740	-	-	1067	-	-
Mov Cap-2 Maneuver	138	129	-	187	129	-	-	-	-	-	-	-
Stage 1	285	342	-	508	530	-	-	-	-	-	-	-
Stage 2	693	529	-	503	342	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	22.8	26.5	0.2	0.1
HCM LOS	C	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	740	-	-	261	235	1067	-	-
HCM Lane V/C Ratio	0.012	-	-	0.225	0.291	0.006	-	-
HCM Control Delay (s)	9.9	-	-	22.8	26.5	8.4	-	-
HCM Lane LOS	A	-	-	C	D	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.8	1.2	0	-	-

Intersection	
Int Delay, s/veh	3.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	27	50	1	1	176	15	3	2	0	10	10	67
Future Vol, veh/h	27	50	1	1	176	15	3	2	0	10	10	67
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	500	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	83	83	83	83	83	83	83	83	83	83	83	83
Heavy Vehicles, %	3	3	3	2	2	2	0	0	0	1	1	1
Mvmt Flow	33	60	1	1	212	18	4	2	0	12	12	81

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	230	0	0	61	0	0	220	359	31	320	350	115
Stage 1	-	-	-	-	-	-	127	127	-	223	223	-
Stage 2	-	-	-	-	-	-	93	232	-	97	127	-
Critical Hdwy	5.36	-	-	4.14	-	-	6.95	6.5	6.9	6.97	6.52	7.12
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	7.32	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.7	5.5	-	6.52	5.52	-
Follow-up Hdwy	3.13	-	-	2.22	-	-	3.65	4	3.3	3.66	4.01	3.91
Pot Cap-1 Maneuver	901	-	-	1540	-	-	720	571	1043	620	575	780
Stage 1	-	-	-	-	-	-	836	795	-	699	720	-
Stage 2	-	-	-	-	-	-	869	716	-	866	792	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	901	-	-	1540	-	-	616	549	1043	600	553	780
Mov Cap-2 Maneuver	-	-	-	-	-	-	616	549	-	600	553	-
Stage 1	-	-	-	-	-	-	805	766	-	673	719	-
Stage 2	-	-	-	-	-	-	765	715	-	832	763	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	3.2	0	11.2	10.8
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	587	901	-	-	1540	-	-	721
HCM Lane V/C Ratio	0.01	0.036	-	-	0.001	-	-	0.145
HCM Control Delay (s)	11.2	9.1	-	-	7.3	0	-	10.8
HCM Lane LOS	B	A	-	-	A	A	-	B
HCM 95th %tile Q(veh)	0	0.1	-	-	0	-	-	0.5

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	184	499	141	618	49	1663	96	178	1050	62
v/c Ratio	0.91	0.44	0.55	0.53	0.28	0.87	0.07	0.74	0.42	0.09
Control Delay	75.4	23.5	33.5	20.0	28.3	35.1	0.1	40.4	16.9	4.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	75.4	23.5	33.5	20.0	28.3	35.1	0.1	40.4	16.9	4.7
Queue Length 50th (m)	33.5	35.3	21.7	36.5	7.1	117.9	0.0	20.1	50.0	0.0
Queue Length 95th (m)	#70.5	46.6	39.6	49.8	17.8	#150.6	0.0	#68.5	66.4	7.4
Internal Link Dist (m)		126.7		96.8		217.9			205.6	
Turn Bay Length (m)	40.0		60.0		110.0		90.0	110.0		150.0
Base Capacity (vph)	241	1340	307	1364	178	1921	1320	240	2480	675
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.76	0.37	0.46	0.45	0.28	0.87	0.07	0.74	0.42	0.09

Intersection Summary

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

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	46	656	15	519	100	51	26	208
v/c Ratio	0.09	0.31	0.03	0.24	0.48	0.14	0.10	0.48
Control Delay	6.7	7.2	6.4	6.9	36.7	19.0	26.8	15.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.7	7.2	6.4	6.9	36.7	19.0	26.8	15.5
Queue Length 50th (m)	2.5	21.0	0.8	16.0	14.5	4.1	3.5	10.8
Queue Length 95th (m)	7.4	34.1	3.3	26.7	28.2	12.6	9.6	28.5
Internal Link Dist (m)		66.9		389.9		79.7		64.4
Turn Bay Length (m)	40.0		15.0		15.0		15.0	
Base Capacity (vph)	514	2147	438	2140	456	752	558	787
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.31	0.03	0.24	0.22	0.07	0.05	0.26

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	160	329	112	46	333	224	151	329	163	233
v/c Ratio	0.27	0.15	0.13	0.08	0.16	0.25	0.62	0.42	0.74	0.29
Control Delay	11.7	9.1	2.7	4.1	3.8	1.4	42.9	29.8	52.9	16.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.7	9.1	2.7	4.1	3.8	1.4	42.9	29.8	52.9	16.7
Queue Length 50th (m)	12.9	12.8	0.0	1.1	3.8	0.0	26.4	26.8	29.4	11.2
Queue Length 95th (m)	31.6	25.1	8.1	4.7	13.0	2.4	41.3	34.3	46.1	18.4
Internal Link Dist (m)		305.1			325.3			80.8		164.2
Turn Bay Length (m)	70.0		70.0	60.0		60.0	60.0		60.0	
Base Capacity (vph)	603	2124	863	611	2144	913	474	1499	428	1490
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.27	0.15	0.13	0.08	0.16	0.25	0.32	0.22	0.38	0.16

Intersection Summary

Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Group Flow (vph)	248	66	673	15	477
v/c Ratio	0.73	0.05	0.29	0.03	0.21
Control Delay	47.6	0.1	7.5	9.4	9.4
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	47.6	0.1	7.5	9.4	9.4
Queue Length 50th (m)	45.1	0.0	24.5	1.4	25.8
Queue Length 95th (m)	65.7	0.0	41.3	m3.9	43.5
Internal Link Dist (m)	210.5		116.0		76.9
Turn Bay Length (m)				50.0	
Base Capacity (vph)	473	1340	2318	458	2299
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	0.52	0.05	0.29	0.03	0.21

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

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	51	1184	33	28	782	464	24	123	560	53	106
v/c Ratio	0.19	0.66	0.04	0.21	0.44	0.57	0.18	0.63	0.81	0.08	0.20
Control Delay	22.3	26.6	0.1	26.1	21.8	12.8	52.3	54.7	56.5	22.9	15.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.3	26.6	0.1	26.1	21.8	12.8	52.3	54.7	56.5	22.9	15.8
Queue Length 50th (m)	6.9	115.6	0.0	3.9	65.1	32.3	5.8	23.9	71.5	8.8	11.4
Queue Length 95th (m)	18.9	168.5	0.0	13.6	97.9	79.2	14.1	43.0	87.5	15.2	21.1
Internal Link Dist (m)		211.6			225.4			53.9		148.6	
Turn Bay Length (m)	50.0		35.0	40.0		40.0	30.0		40.0		
Base Capacity (vph)	272	1782	739	132	1782	817	397	532	838	1143	853
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.66	0.04	0.21	0.44	0.57	0.06	0.23	0.67	0.05	0.12

Intersection Summary

HCM 6th Signalized Intersection Summary
3: Rathburn Rd E & Dixie Rd

Future (2041) Scenario 1-PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	57	278	168	135	586	244	300	1100	197	408	2372	349
Future Volume (veh/h)	57	278	168	135	586	244	300	1100	197	408	2372	349
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		1.00	0.98		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1831	1870	1614	1831	1870	1614	1816	1856	1602	1831	1870	1614
Adj Flow Rate, veh/h	59	287	0	139	604	0	309	1134	0	421	2445	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	2	2	2	2	2	2	3	3	3	2	2	2
Cap, veh/h	140	946		260	946		271	2413		456	2519	
Arrive On Green	0.27	0.27	0.00	0.27	0.27	0.00	0.13	0.48	0.00	0.14	0.49	0.00
Sat Flow, veh/h	791	3647	0	1049	3647	0	1730	5066	1357	1744	5106	1368
Grp Volume(v), veh/h	59	287	0	139	604	0	309	1134	0	421	2445	0
Grp Sat Flow(s),veh/h/ln	791	1777	0	1049	1777	0	1730	1689	1357	1744	1702	1368
Q Serve(g_s), s	10.7	9.7	0.0	18.3	22.5	0.0	19.0	22.7	0.0	17.7	69.8	0.0
Cycle Q Clear(g_c), s	33.2	9.7	0.0	28.0	22.5	0.0	19.0	22.7	0.0	17.7	69.8	0.0
Prop In Lane	1.00		0.00	1.00		0.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	140	946		260	946		271	2413		456	2519	
V/C Ratio(X)	0.42	0.30		0.54	0.64		1.14	0.47		0.92	0.97	
Avail Cap(c_a), veh/h	154	1009		278	1009		271	2413		671	2519	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	63.4	43.9	0.0	55.1	48.7	0.0	52.3	26.5	0.0	22.1	37.0	0.0
Incr Delay (d2), s/veh	4.3	0.4	0.0	3.6	1.9	0.0	98.1	0.7	0.0	14.0	12.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.4	4.6	0.0	5.4	10.9	0.0	18.2	10.0	0.0	9.7	33.5	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	67.7	44.3	0.0	58.7	50.6	0.0	150.4	27.2	0.0	36.1	49.2	0.0
LnGrp LOS	E	D		E	D		F	C		D	D	
Approach Vol, veh/h		346	A		743	A		1443	A		2866	A
Approach Delay, s/veh		48.3			52.1			53.6			47.3	
Approach LOS		D			D			D			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	22.0	80.7		47.3	24.5	78.1		47.3				
Change Period (Y+Rc), s	3.0	* 6.7		7.4	3.0	* 6.7		7.4				
Max Green Setting (Gmax), s	19.0	* 71		42.6	40.0	* 50		42.6				
Max Q Clear Time (g_c+I1), s	21.0	71.8		30.0	19.7	24.7		35.2				
Green Ext Time (p_c), s	0.0	0.0		6.7	1.9	16.0		2.2				
Intersection Summary												
HCM 6th Ctrl Delay			49.7									
HCM 6th LOS			D									

Notes

User approved pedestrian interval to be less than phase max green.
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.
Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	152	679	137	63	845	23	90	44	53	22	31	92
Future Volume (veh/h)	152	679	137	63	845	23	90	44	53	22	31	92
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1802	1841	1589	1816	1856	1602	1715	1752	1512	1773	1811	1563
Adj Flow Rate, veh/h	162	722	146	67	899	24	96	47	56	23	33	98
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	4	4	4	3	3	3	10	10	10	6	6	6
Cap, veh/h	389	1848	374	411	2237	60	227	139	166	255	77	228
Arrive On Green	0.64	0.64	0.64	0.64	0.64	0.64	0.19	0.19	0.19	0.19	0.19	0.19
Sat Flow, veh/h	584	2898	586	619	3508	94	1154	728	868	1224	402	1194
Grp Volume(v), veh/h	162	436	432	67	452	471	96	0	103	23	0	131
Grp Sat Flow(s),veh/h/ln	584	1749	1735	619	1763	1839	1154	0	1596	1224	0	1596
Q Serve(g_s), s	15.0	9.6	9.6	4.7	10.0	10.0	6.4	0.0	4.5	1.3	0.0	5.8
Cycle Q Clear(g_c), s	25.0	9.6	9.6	14.3	10.0	10.0	12.2	0.0	4.5	5.8	0.0	5.8
Prop In Lane	1.00		0.34	1.00		0.05	1.00		0.54	1.00		0.75
Lane Grp Cap(c), veh/h	389	1115	1107	411	1124	1173	227	0	305	255	0	305
V/C Ratio(X)	0.42	0.39	0.39	0.16	0.40	0.40	0.42	0.00	0.34	0.09	0.00	0.43
Avail Cap(c_a), veh/h	389	1115	1107	411	1124	1173	504	0	688	550	0	688
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	13.1	7.0	7.0	10.4	7.1	7.1	33.9	0.0	28.0	30.5	0.0	28.5
Incr Delay (d2), s/veh	3.3	1.0	1.0	0.9	1.1	1.0	1.3	0.0	0.7	0.2	0.0	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.5	4.3	4.3	0.8	4.5	4.7	2.0	0.0	1.9	0.4	0.0	2.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	16.4	8.0	8.0	11.3	8.1	8.1	35.1	0.0	28.6	30.6	0.0	29.5
LnGrp LOS	B	A	A	B	A	A	D	A	C	C	A	C
Approach Vol, veh/h		1030			990			199			154	
Approach Delay, s/veh		9.3			8.3			31.8			29.7	
Approach LOS		A			A			C			C	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		57.2		22.8		57.2		22.8				
Change Period (Y+Rc), s		* 6.2		7.5		* 6.2		7.5				
Max Green Setting (Gmax), s		* 32		34.5		* 32		34.5				
Max Q Clear Time (g_c+I1), s		27.0		14.2		16.3		7.8				
Green Ext Time (p_c), s		3.1		1.1		6.9		1.0				
Intersection Summary												
HCM 6th Ctrl Delay			12.1									
HCM 6th LOS			B									
Notes												

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	88	393	66	56	635	89	74	114	70	272	302	321
Future Volume (veh/h)	88	393	66	56	635	89	74	114	70	272	302	321
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1787	1826	1576	1816	1856	1602	1816	1856	1602	1845	1885	1627
Adj Flow Rate, veh/h	98	437	73	62	706	99	82	127	78	302	336	357
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	5	5	5	3	3	3	3	3	3	1	1	1
Cap, veh/h	302	1664	641	426	1691	651	206	780	450	447	649	579
Arrive On Green	0.48	0.48	0.48	0.48	0.48	0.48	0.36	0.36	0.36	0.36	0.36	0.36
Sat Flow, veh/h	647	3469	1336	864	3526	1357	729	2153	1241	1161	1791	1598
Grp Volume(v), veh/h	98	437	73	62	706	99	82	102	103	302	336	357
Grp Sat Flow(s),veh/h/ln	647	1735	1336	864	1763	1357	729	1763	1632	1161	1791	1598
Q Serve(g_s), s	11.0	7.1	2.9	4.4	12.4	3.9	9.9	3.7	4.1	22.7	14.0	17.4
Cycle Q Clear(g_c), s	23.4	7.1	2.9	11.5	12.4	3.9	27.3	3.7	4.1	26.8	14.0	17.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.76	1.00		1.00
Lane Grp Cap(c), veh/h	302	1664	641	426	1691	651	206	639	591	447	649	579
V/C Ratio(X)	0.32	0.26	0.11	0.15	0.42	0.15	0.40	0.16	0.17	0.68	0.52	0.62
Avail Cap(c_a), veh/h	302	1664	641	426	1691	651	261	770	713	533	782	698
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	23.7	14.7	13.6	18.1	16.1	13.9	36.1	20.5	20.6	29.7	23.8	24.9
Incr Delay (d2), s/veh	2.8	0.4	0.4	0.7	0.8	0.5	1.2	0.1	0.1	2.6	0.6	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.1	3.2	1.0	1.1	5.7	1.4	2.0	1.7	1.7	7.2	6.6	7.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.5	15.1	14.0	18.9	16.8	14.4	37.3	20.6	20.7	32.3	24.4	26.0
LnGrp LOS	C	B	B	B	B	B	D	C	C	C	C	C
Approach Vol, veh/h		608			867			287			995	
Approach Delay, s/veh		16.8			16.7			25.4			27.4	
Approach LOS		B			B			C			C	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		53.1		41.9		53.1		41.9				
Change Period (Y+Rc), s		7.5		7.5		7.5		7.5				
Max Green Setting (Gmax), s		38.5		41.5		38.5		41.5				
Max Q Clear Time (g_c+I1), s		25.4		29.3		14.4		28.8				
Green Ext Time (p_c), s		3.9		1.6		7.2		5.7				

Intersection Summary			
HCM 6th Ctrl Delay			21.5
HCM 6th LOS			C

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	193	49	796	222	73	608
Future Volume (veh/h)	193	49	796	222	73	608
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1831	1614	1870	1614	1831	1870
Adj Flow Rate, veh/h	208	0	856	0	78	654
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	251		2557		474	2557
Arrive On Green	0.14	0.00	0.72	0.00	0.72	0.72
Sat Flow, veh/h	1744	1368	3741	0	631	3647
Grp Volume(v), veh/h	208	0	856	0	78	654
Grp Sat Flow(s),veh/h/ln	1744	1368	1777	0	631	1777
Q Serve(g_s), s	11.0	0.0	8.5	0.0	4.9	6.0
Cycle Q Clear(g_c), s	11.0	0.0	8.5	0.0	13.4	6.0
Prop In Lane	1.00	1.00		0.00	1.00	
Lane Grp Cap(c), veh/h	251		2557		474	2557
V/C Ratio(X)	0.83		0.33		0.16	0.26
Avail Cap(c_a), veh/h	486		2557		474	2557
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	39.5	0.0	4.9	0.0	7.4	4.6
Incr Delay (d2), s/veh	7.0	0.0	0.4	0.0	0.7	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.5	0.0	3.6	0.0	0.9	2.6
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	46.5	0.0	5.3	0.0	8.1	4.8
LnGrp LOS	D		A		A	A
Approach Vol, veh/h	208	A	856	A		732
Approach Delay, s/veh	46.5		5.3			5.2
Approach LOS	D		A			A

Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		74.9		20.1		74.9
Change Period (Y+Rc), s		6.5		6.5		6.5
Max Green Setting (Gmax), s		55.5		26.5		55.5
Max Q Clear Time (g_c+I1), s		15.4		13.0		10.5
Green Ext Time (p_c), s		7.5		0.7		9.1

Intersection Summary		
HCM 6th Ctrl Delay		10.0
HCM 6th LOS		B

Notes

Unsignalized Delay for [NBR, WBR] is excluded from calculations of the approach delay and intersection delay.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	72	1115	36	60	1555	869	21	63	36	626	80	96
Future Volume (veh/h)	72	1115	36	60	1555	869	21	63	36	626	80	96
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1845	1885	1627	1845	1885	1627	1845	1885	1627	1845	1885	1627
Adj Flow Rate, veh/h	76	1174	38	63	1637	915	22	66	38	659	84	101
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	72	1985	764	203	1985	1052	145	92	53	711	393	288
Arrive On Green	0.55	0.55	0.55	0.55	0.55	0.55	0.08	0.08	0.08	0.21	0.21	0.21
Sat Flow, veh/h	123	3582	1379	455	3582	1379	1758	1123	646	3410	1885	1379
Grp Volume(v), veh/h	76	1174	38	63	1637	915	22	0	104	659	84	101
Grp Sat Flow(s),veh/h/ln	123	1791	1379	455	1791	1379	1758	0	1769	1705	1885	1379
Q Serve(g_s), s	25.9	31.5	1.8	15.5	54.4	67.9	1.7	0.0	8.3	27.5	5.4	9.1
Cycle Q Clear(g_c), s	80.3	31.5	1.8	47.0	54.4	67.9	1.7	0.0	8.3	27.5	5.4	9.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.37	1.00		1.00
Lane Grp Cap(c), veh/h	72	1985	764	203	1985	1052	145	0	145	711	393	288
V/C Ratio(X)	1.06	0.59	0.05	0.31	0.82	0.87	0.15	0.00	0.71	0.93	0.21	0.35
Avail Cap(c_a), veh/h	72	1985	764	203	1985	1052	376	0	378	729	403	295
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	68.5	21.4	14.8	37.0	26.6	12.1	61.8	0.0	64.9	56.3	47.5	49.0
Incr Delay (d2), s/veh	124.1	1.3	0.1	4.0	4.1	9.8	0.5	0.0	6.4	17.7	0.3	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.2	14.7	0.7	2.1	25.9	38.3	0.8	0.0	4.2	14.3	2.7	3.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	192.7	22.8	14.9	41.0	30.6	22.0	62.3	0.0	71.3	74.0	47.8	49.7
LnGrp LOS	F	C	B	D	C	C	E	A	E	E	D	D
Approach Vol, veh/h		1288			2615			126			844	
Approach Delay, s/veh		32.5			27.8			69.7			68.5	
Approach LOS		C			C			E			E	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		87.8		19.4		87.8		37.7				
Change Period (Y+Rc), s		7.5		7.5		7.5		7.5				
Max Green Setting (Gmax), s		60.5		31.0		60.5		31.0				
Max Q Clear Time (g_c+I1), s		82.3		10.3		69.9		29.5				
Green Ext Time (p_c), s		0.0		0.7		0.0		0.7				

Intersection Summary			
HCM 6th Ctrl Delay			37.2
HCM 6th LOS			D

Notes

User approved pedestrian interval to be less than phase max green.

Intersection												
Int Delay, s/veh	3.7											
Movement	**EBL**	**EBT**	**EBR**	**WBL**	**WBT**	**WBR**	**NBL**	**NBT**	**NBR**	**SBL**	**SBT**	**SBR**
Lane Configurations												
Traffic Vol, veh/h	53	586	14	19	1011	29	12	6	22	25	2	64
Future Vol, veh/h	53	586	14	19	1011	29	12	6	22	25	2	64
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	300	-	-	200	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	6	6	6	6	6	6	3	3	3	3	3	3
Mvmt Flow	55	610	15	20	1053	30	13	6	23	26	2	67

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1083	0	0	625	0	0	1296	1851	313	1526	1843	542
Stage 1	-	-	-	-	-	-	728	728	-	1108	1108	-
Stage 2	-	-	-	-	-	-	568	1123	-	418	735	-
Critical Hdwy	4.22	-	-	4.22	-	-	7.56	6.56	6.96	7.56	6.56	6.96
Critical Hdwy Stg 1	-	-	-	-	-	-	6.56	5.56	-	6.56	5.56	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.56	5.56	-	6.56	5.56	-
Follow-up Hdwy	2.26	-	-	2.26	-	-	3.53	4.03	3.33	3.53	4.03	3.33
Pot Cap-1 Maneuver	617	-	-	926	-	-	118	73	680	80	73	482
Stage 1	-	-	-	-	-	-	379	424	-	222	282	-
Stage 2	-	-	-	-	-	-	472	277	-	580	421	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	617	-	-	926	-	-	91	65	680	66	65	482
Mov Cap-2 Maneuver	-	-	-	-	-	-	91	65	-	66	65	-
Stage 1	-	-	-	-	-	-	345	386	-	202	276	-
Stage 2	-	-	-	-	-	-	395	271	-	502	384	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.9	0.2	36.3	51.1
HCM LOS			E	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	156	617	-	-	926	-	-	168
HCM Lane V/C Ratio	0.267	0.089	-	-	0.021	-	-	0.564
HCM Control Delay (s)	36.3	11.4	-	-	9	-	-	51.1
HCM Lane LOS	E	B	-	-	A	-	-	F
HCM 95th %tile Q(veh)	1	0.3	-	-	0.1	-	-	2.9

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL	SWR
Lane Configurations										
Traffic Vol, veh/h	12	720	34	45	642	3	14	0	0	4
Future Vol, veh/h	12	720	34	45	642	3	14	0	0	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	-	None
Storage Length	-	-	-	150	-	-	-	0	0	-
Veh in Median Storage, #	-	0	-	-	0	-	0	-	0	-
Grade, %	-	0	-	-	0	-	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	13	783	37	49	698	3	15	0	0	4

Major/Minor	Major1			Major2			Minor1		Minor2	
Conflicting Flow All	701	0	0	820	0	0	1275	410	1216	351
Stage 1	-	-	-	-	-	-	828	-	798	-
Stage 2	-	-	-	-	-	-	447	-	418	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.94	7.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	-	6.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	-	6.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	3.32	3.52	3.32
Pot Cap-1 Maneuver	892	-	-	805	-	-	124	591	137	645
Stage 1	-	-	-	-	-	-	332	-	346	-
Stage 2	-	-	-	-	-	-	560	-	583	-
Platoon blocked, %		-	-		-	-				
Mov Cap-1 Maneuver	892	-	-	805	-	-	115	591	122	645
Mov Cap-2 Maneuver	-	-	-	-	-	-	115	-	122	-
Stage 1	-	-	-	-	-	-	323	-	337	-
Stage 2	-	-	-	-	-	-	522	-	539	-

Approach	EB	WB	NB	SW
HCM Control Delay, s	0.2	0.6	11.4	15.5
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SWLn1
Capacity (veh/h)	591	892	-	-	805	-	-	347
HCM Lane V/C Ratio	0.05	0.015	-	-	0.061	-	-	0.016
HCM Control Delay (s)	11.4	9.1	0.1	-	9.8	-	-	15.5
HCM Lane LOS	B	A	A	-	A	-	-	C
HCM 95th %tile Q(veh)	0.2	0	-	-	0.2	-	-	0

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	14	1	27	1	0	1	41	927	3	0	801	10
Future Vol, veh/h	14	1	27	1	0	1	41	927	3	0	801	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	500	-	-	-	-	500
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	7	7	7	0	0	0	2	2	2	1	1	1
Mvmt Flow	15	1	28	1	0	1	43	976	3	0	843	11

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1417	1908	422	1486	1918	490	854	0	0	979	0	0
Stage 1	843	843	-	1064	1064	-	-	-	-	-	-	-
Stage 2	574	1065	-	422	854	-	-	-	-	-	-	-
Critical Hdwy	7.64	6.64	7.04	7.5	6.5	6.9	4.14	-	-	4.12	-	-
Critical Hdwy Stg 1	6.64	5.64	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.64	5.64	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.57	4.07	3.37	3.5	4	3.3	2.22	-	-	2.21	-	-
Pot Cap-1 Maneuver	93	64	567	88	68	529	781	-	-	707	-	-
Stage 1	314	366	-	242	302	-	-	-	-	-	-	-
Stage 2	459	287	-	585	378	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	89	60	567	79	64	529	781	-	-	707	-	-
Mov Cap-2 Maneuver	89	60	-	79	64	-	-	-	-	-	-	-
Stage 1	297	366	-	229	285	-	-	-	-	-	-	-
Stage 2	433	271	-	554	378	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	29.6	31.7	0.4	0
HCM LOS	D	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	781	-	-	190	137	707	-	-
HCM Lane V/C Ratio	0.055	-	-	0.233	0.015	-	-	-
HCM Control Delay (s)	9.9	-	-	29.6	31.7	0	-	-
HCM Lane LOS	A	-	-	D	D	A	-	-
HCM 95th %tile Q(veh)	0.2	-	-	0.9	0	0	-	-

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	9	0	15	15	0	15	29	942	16	20	862	16
Future Vol, veh/h	9	0	15	15	0	15	29	942	16	20	862	16
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	300	-	-	300	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	10	0	16	16	0	16	32	1024	17	22	937	17

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1566	2095	477	1610	2095	521	954	0	0	1041	0	0
Stage 1	990	990	-	1097	1097	-	-	-	-	-	-	-
Stage 2	576	1105	-	513	998	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	75	52	534	70	52	500	716	-	-	664	-	-
Stage 1	264	323	-	227	287	-	-	-	-	-	-	-
Stage 2	470	285	-	512	320	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	68	48	534	64	48	500	716	-	-	664	-	-
Mov Cap-2 Maneuver	68	48	-	64	48	-	-	-	-	-	-	-
Stage 1	252	312	-	217	274	-	-	-	-	-	-	-
Stage 2	434	272	-	480	309	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	34	49.3	0.3	0.2
HCM LOS	D	E		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	716	-	-	150	113	664	-	-
HCM Lane V/C Ratio	0.044	-	-	0.174	0.289	0.033	-	-
HCM Control Delay (s)	10.3	-	-	34	49.3	10.6	-	-
HCM Lane LOS	B	-	-	D	E	B	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.6	1.1	0.1	-	-

Intersection	
Int Delay, s/veh	3.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	89	159	8	1	73	3	4	0	0	8	3	58
Future Vol, veh/h	89	159	8	1	73	3	4	0	0	8	3	58
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	500	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	3	3	3	4	4	4	0	0	0	1	1	1
Mvmt Flow	95	169	9	1	78	3	4	0	0	9	3	62

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	81	0	0	178	0	0	399	447	89	357	450	41
Stage 1	-	-	-	-	-	-	364	364	-	82	82	-
Stage 2	-	-	-	-	-	-	35	83	-	275	368	-
Critical Hdwy	5.36	-	-	4.18	-	-	6.95	6.5	6.9	6.97	6.52	7.12
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	7.32	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.7	5.5	-	6.52	5.52	-
Follow-up Hdwy	3.13	-	-	2.24	-	-	3.65	4	3.3	3.66	4.01	3.91
Pot Cap-1 Maneuver	1056	-	-	1381	-	-	555	509	958	588	505	868
Stage 1	-	-	-	-	-	-	611	627	-	868	828	-
Stage 2	-	-	-	-	-	-	941	830	-	685	622	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1056	-	-	1381	-	-	477	463	958	547	459	868
Mov Cap-2 Maneuver	-	-	-	-	-	-	477	463	-	547	459	-
Stage 1	-	-	-	-	-	-	556	571	-	790	827	-
Stage 2	-	-	-	-	-	-	870	829	-	623	566	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	3	0.1	12.6	10.1
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	477	1056	-	-	1381	-	-	784
HCM Lane V/C Ratio	0.009	0.09	-	-	0.001	-	-	0.094
HCM Control Delay (s)	12.6	8.7	-	-	7.6	0	-	10.1
HCM Lane LOS	B	A	-	-	A	A	-	B
HCM 95th %tile Q(veh)	0	0.3	-	-	0	-	-	0.3

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	59	460	139	856	309	1134	203	421	2445	360
v/c Ratio	1.05	0.46	0.71	0.87	1.15	0.58	0.15	0.87	1.01	0.56
Control Delay	187.3	37.4	69.6	59.5	143.9	38.7	0.2	48.0	60.0	27.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	187.3	37.4	69.6	59.5	143.9	38.7	0.2	48.0	60.0	27.3
Queue Length 50th (m)	~20.0	51.1	39.3	129.4	~96.9	103.3	0.0	87.5	~285.1	67.0
Queue Length 95th (m)	#52.4	69.0	#73.7	#158.7	#164.7	128.8	0.0	126.8	#321.0	100.9
Internal Link Dist (m)		126.7		96.8		217.9			205.6	
Turn Bay Length (m)	40.0		60.0		110.0		90.0	110.0		150.0
Base Capacity (vph)	56	996	195	979	269	1957	1326	562	2417	643
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.05	0.46	0.71	0.87	1.15	0.58	0.15	0.75	1.01	0.56

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	162	868	67	923	96	103	23	131
v/c Ratio	0.51	0.40	0.19	0.42	0.43	0.29	0.10	0.37
Control Delay	15.4	7.7	8.2	8.1	34.8	16.4	27.0	20.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	15.4	7.7	8.2	8.1	34.8	16.4	27.0	20.3
Queue Length 50th (m)	12.1	29.4	3.9	33.1	13.8	6.4	3.1	10.8
Queue Length 95th (m)	34.0	45.7	10.9	50.3	27.3	18.8	9.0	25.0
Internal Link Dist (m)		66.9		389.9		79.7		64.4
Turn Bay Length (m)	40.0		15.0		15.0		15.0	
Base Capacity (vph)	318	2156	345	2213	490	715	522	716
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	0.51	0.40	0.19	0.42	0.20	0.14	0.04	0.18

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	98	437	73	62	706	99	82	205	302	693
v/c Ratio	0.31	0.25	0.10	0.14	0.39	0.13	0.49	0.18	0.80	0.60
Control Delay	20.3	15.1	4.7	10.3	11.2	1.6	33.4	12.3	43.5	23.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.3	15.1	4.7	10.3	11.2	1.6	33.4	12.3	43.5	23.3
Queue Length 50th (m)	10.8	24.3	0.0	4.1	42.8	1.1	12.3	8.7	51.5	47.8
Queue Length 95th (m)	28.2	41.5	8.4	12.8	69.1	4.5	24.0	14.2	72.6	55.7
Internal Link Dist (m)		305.1			325.3			80.8		164.2
Turn Bay Length (m)	70.0		70.0	60.0		60.0	60.0		60.0	
Base Capacity (vph)	314	1757	714	459	1791	740	221	1487	501	1502
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.31	0.25	0.10	0.14	0.39	0.13	0.37	0.14	0.60	0.46

Intersection Summary

Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Group Flow (vph)	208	53	1095	78	654
v/c Ratio	0.69	0.04	0.46	0.27	0.27
Control Delay	47.8	0.1	7.6	10.8	7.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	47.8	0.1	7.6	10.8	7.0
Queue Length 50th (m)	38.0	0.0	41.3	6.7	29.4
Queue Length 95th (m)	57.5	0.0	67.4	m9.9	31.6
Internal Link Dist (m)	210.5		116.0		76.9
Turn Bay Length (m)				50.0	
Base Capacity (vph)	483	1367	2373	289	2434
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	0.43	0.04	0.46	0.27	0.27

Intersection Summary

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

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	76	1174	38	63	1637	915	22	104	659	84	101
v/c Ratio	1.49	0.69	0.05	0.55	0.96	0.76	0.13	0.56	0.72	0.16	0.23
Control Delay	333.4	33.4	0.1	52.7	50.5	7.8	60.8	63.3	52.0	39.4	7.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	333.4	33.4	0.1	52.7	50.5	7.8	60.8	63.3	52.0	39.4	7.6
Queue Length 50th (m)	~31.3	139.8	0.0	13.0	241.7	39.3	6.3	25.4	93.2	19.5	0.0
Queue Length 95th (m)	#56.1	189.9	0.0	#40.8	#338.6	108.8	15.0	44.7	110.3	32.6	14.1
Internal Link Dist (m)		211.6			225.4			53.9		148.6	
Turn Bay Length (m)	50.0		35.0	40.0		40.0	30.0		40.0		
Base Capacity (vph)	51	1710	707	114	1710	1196	374	394	924	512	449
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.49	0.69	0.05	0.55	0.96	0.77	0.06	0.26	0.71	0.16	0.22

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

APPENDIX D

SYNCHRO REPORT FOR FUTURE (2041)
CONDITIONS - SCENARIO 2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	166	249	200	127	181	375	44	1497	86	160	945	56
Future Volume (veh/h)	166	249	200	127	181	375	44	1497	86	160	945	56
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.97	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1802	1841	1589	1816	1856	1602	1802	1841	1589	1744	1781	1538
Adj Flow Rate, veh/h	184	277	222	141	201	417	49	1663	96	178	1050	62
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	4	4	4	3	3	3	4	4	4	8	8	8
Cap, veh/h	219	761	588	334	723	630	217	1709	444	207	2184	570
Arrive On Green	0.41	0.41	0.41	0.41	0.41	0.41	0.34	0.34	0.34	0.08	0.45	0.45
Sat Flow, veh/h	773	1857	1435	869	1763	1537	486	5025	1305	1661	4863	1269
Grp Volume(v), veh/h	184	260	239	141	201	417	49	1663	96	178	1050	62
Grp Sat Flow(s),veh/h/ln	773	1749	1543	869	1763	1537	486	1675	1305	1661	1621	1269
Q Serve(g_s), s	19.0	10.3	10.8	13.5	7.6	22.0	7.9	32.6	5.2	6.7	15.2	2.8
Cycle Q Clear(g_c), s	41.0	10.3	10.8	24.3	7.6	22.0	12.1	32.6	5.2	6.7	15.2	2.8
Prop In Lane	1.00		0.93	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	219	717	633	334	723	630	217	1709	444	207	2184	570
V/C Ratio(X)	0.84	0.36	0.38	0.42	0.28	0.66	0.23	0.97	0.22	0.86	0.48	0.11
Avail Cap(c_a), veh/h	219	717	633	334	723	630	217	1709	444	207	2184	570
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	42.4	20.4	20.6	29.1	19.6	23.9	27.5	32.6	23.5	24.1	19.4	16.0
Incr Delay (d2), s/veh	26.1	0.7	0.8	1.8	0.4	3.5	2.4	16.3	1.1	28.9	0.8	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.5	4.8	4.4	3.2	3.5	9.3	1.1	16.5	1.9	4.4	6.3	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	68.5	21.1	21.4	30.9	20.1	27.4	29.9	48.9	24.6	53.0	20.1	16.3
LnGrp LOS	E	C	C	C	C	C	C	D	C	D	C	B
Approach Vol, veh/h		683			759			1808			1290	
Approach Delay, s/veh		34.0			26.1			47.1			24.5	
Approach LOS		C			C			D			C	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		51.6		48.4	10.9	40.7		48.4				
Change Period (Y+Rc), s		* 6.7		7.4	3.0	* 6.7		7.4				
Max Green Setting (Gmax), s		* 45		41.0	7.9	* 34		41.0				
Max Q Clear Time (g_c+I1), s		17.2		26.3	8.7	34.6		43.0				
Green Ext Time (p_c), s		16.2		7.8	0.0	0.0		0.0				

Intersection Summary		
HCM 6th Ctrl Delay		35.2
HCM 6th LOS		D

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	43	560	56	14	469	19	94	29	19	24	73	122
Future Volume (veh/h)	43	560	56	14	469	19	94	29	19	24	73	122
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1787	1826	1576	1773	1811	1563	1802	1841	1589	1802	1841	1589
Adj Flow Rate, veh/h	46	596	60	15	499	20	100	31	20	26	78	130
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	5	5	5	6	6	6	4	4	4	4	4	4
Cap, veh/h	536	1906	192	463	2020	81	225	240	155	359	143	238
Arrive On Green	0.60	0.60	0.60	0.60	0.60	0.60	0.23	0.23	0.23	0.23	0.23	0.23
Sat Flow, veh/h	843	3183	320	737	3372	135	1131	1045	674	1304	620	1034
Grp Volume(v), veh/h	46	324	332	15	254	265	100	0	51	26	0	208
Grp Sat Flow(s),veh/h/ln	843	1735	1768	737	1721	1787	1131	0	1719	1304	0	1655
Q Serve(g_s), s	2.2	7.4	7.4	0.8	5.6	5.6	6.8	0.0	1.9	1.3	0.0	8.9
Cycle Q Clear(g_c), s	7.8	7.4	7.4	8.2	5.6	5.6	15.7	0.0	1.9	3.2	0.0	8.9
Prop In Lane	1.00		0.18	1.00		0.08	1.00		0.39	1.00		0.63
Lane Grp Cap(c), veh/h	536	1039	1059	463	1030	1070	225	0	395	359	0	380
V/C Ratio(X)	0.09	0.31	0.31	0.03	0.25	0.25	0.45	0.00	0.13	0.07	0.00	0.55
Avail Cap(c_a), veh/h	536	1039	1059	463	1030	1070	452	0	741	622	0	714
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	9.4	7.9	7.9	10.0	7.6	7.6	34.1	0.0	24.5	25.7	0.0	27.1
Incr Delay (d2), s/veh	0.3	0.8	0.8	0.1	0.6	0.6	1.4	0.0	0.1	0.1	0.0	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	3.3	3.4	0.2	2.5	2.6	2.1	0.0	0.9	0.4	0.0	3.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	9.7	8.7	8.7	10.1	8.1	8.1	35.4	0.0	24.6	25.8	0.0	28.4
LnGrp LOS	A	A	A	B	A	A	D	A	C	C	A	C
Approach Vol, veh/h		702			534			151			234	
Approach Delay, s/veh		8.8			8.2			31.8			28.1	
Approach LOS		A			A			C			C	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		54.1		25.9		54.1		25.9				
Change Period (Y+Rc), s		* 6.2		7.5		* 6.2		7.5				
Max Green Setting (Gmax), s		* 32		34.5		* 32		34.5				
Max Q Clear Time (g_c+I1), s		9.8		17.7		10.2		10.9				
Green Ext Time (p_c), s		5.3		0.7		3.8		1.6				

Intersection Summary			
HCM 6th Ctrl Delay			13.5
HCM 6th LOS			B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	146	299	102	42	303	204	137	262	37	148	124	88
Future Volume (veh/h)	146	299	102	42	303	204	137	262	37	148	124	88
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1787	1826	1576	1802	1841	1589	1802	1841	1589	1816	1856	1602
Adj Flow Rate, veh/h	160	329	112	46	333	224	151	288	41	163	136	97
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	5	5	5	4	4	4	4	4	4	3	3	3
Cap, veh/h	466	1448	484	534	1145	754	318	846	119	279	557	371
Arrive On Green	0.57	0.57	0.57	0.57	0.57	0.57	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	814	2553	854	914	2019	1330	1105	3078	434	1021	2026	1350
Grp Volume(v), veh/h	160	222	219	46	287	270	151	162	167	163	117	116
Grp Sat Flow(s),veh/h/ln	814	1735	1672	914	1749	1601	1105	1749	1763	1021	1763	1613
Q Serve(g_s), s	12.1	6.0	6.2	2.5	8.1	8.3	11.7	7.0	7.2	14.5	4.9	5.3
Cycle Q Clear(g_c), s	20.4	6.0	6.2	8.7	8.1	8.3	17.1	7.0	7.2	21.6	4.9	5.3
Prop In Lane	1.00		0.51	1.00		0.83	1.00		0.25	1.00		0.84
Lane Grp Cap(c), veh/h	466	984	948	534	992	908	318	481	485	279	485	444
V/C Ratio(X)	0.34	0.23	0.23	0.09	0.29	0.30	0.48	0.34	0.34	0.58	0.24	0.26
Avail Cap(c_a), veh/h	466	984	948	534	992	908	497	764	770	444	770	704
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	16.0	10.2	10.2	12.4	10.7	10.7	33.6	27.5	27.6	36.2	26.7	26.9
Incr Delay (d2), s/veh	2.0	0.5	0.6	0.3	0.7	0.8	1.1	0.4	0.4	1.9	0.3	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.8	2.8	2.7	0.6	3.7	3.5	3.5	3.3	3.4	4.0	2.3	2.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	18.0	10.7	10.8	12.7	11.4	11.5	34.7	27.9	28.0	38.2	27.0	27.2
LnGrp LOS	B	B	B	B	B	B	C	C	C	D	C	C
Approach Vol, veh/h		601			603			480			396	
Approach Delay, s/veh		12.7			11.6			30.1			31.7	
Approach LOS		B			B			C			C	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		61.4		33.6		61.4		33.6				
Change Period (Y+Rc), s		7.5		7.5		7.5		7.5				
Max Green Setting (Gmax), s		38.5		41.5		38.5		41.5				
Max Q Clear Time (g_c+I1), s		22.4		19.1		10.7		23.6				
Green Ext Time (p_c), s		4.1		3.2		4.9		2.5				

Intersection Summary			
HCM 6th Ctrl Delay			20.0
HCM 6th LOS			B

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	226	60	555	57	14	434
Future Volume (veh/h)	226	60	555	57	14	434
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1802	1589	1870	1614	1802	1841
Adj Flow Rate, veh/h	248	66	610	63	15	477
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	4	4	2	2	4	4
Cap, veh/h	295	231	2248	232	533	2418
Arrive On Green	0.17	0.17	0.69	0.69	0.69	0.69
Sat Flow, veh/h	1716	1346	3345	335	737	3589
Grp Volume(v), veh/h	248	66	333	340	15	477
Grp Sat Flow(s),veh/h/ln	1716	1346	1777	1810	737	1749
Q Serve(g_s), s	13.3	4.1	6.8	6.8	0.8	4.6
Cycle Q Clear(g_c), s	13.3	4.1	6.8	6.8	7.5	4.6
Prop In Lane	1.00	1.00		0.19	1.00	
Lane Grp Cap(c), veh/h	295	231	1228	1251	533	2418
V/C Ratio(X)	0.84	0.29	0.27	0.27	0.03	0.20
Avail Cap(c_a), veh/h	479	376	1228	1251	533	2418
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	38.1	34.3	5.6	5.6	7.0	5.2
Incr Delay (d2), s/veh	7.1	0.7	0.5	0.5	0.1	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.6	1.5	3.1	3.1	0.2	2.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	45.2	34.9	6.1	6.1	7.1	5.4
LnGrp LOS	D	C	A	A	A	A
Approach Vol, veh/h	314		673			492
Approach Delay, s/veh	43.1		6.1			5.5
Approach LOS	D		A			A

Timer - Assigned Phs	2	4	6
Phs Duration (G+Y+Rc), s	72.2	22.8	72.2
Change Period (Y+Rc), s	6.5	6.5	6.5
Max Green Setting (Gmax), s	55.5	26.5	55.5
Max Q Clear Time (g_c+I1), s	9.5	15.3	8.8
Green Ext Time (p_c), s	4.5	1.0	5.9

Intersection Summary	
HCM 6th Ctrl Delay	13.7
HCM 6th LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	49	1148	32	27	759	450	23	49	70	543	51	103
Future Volume (veh/h)	49	1148	32	27	759	450	23	49	70	543	51	103
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1816	1856	1602	1816	1856	1602	1802	1841	1589	1816	1856	1602
Adj Flow Rate, veh/h	51	1184	33	28	782	464	24	51	72	560	53	106
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	3	3	3	3	3	3	4	4	4	3	3	3
Cap, veh/h	229	1869	720	188	1869	720	171	66	93	651	649	475
Arrive On Green	0.53	0.53	0.53	0.53	0.53	0.53	0.10	0.10	0.10	0.19	0.35	0.35
Sat Flow, veh/h	433	3526	1357	445	3526	1357	1182	690	975	3356	1856	1357
Grp Volume(v), veh/h	51	1184	33	28	782	464	24	0	123	560	53	106
Grp Sat Flow(s),veh/h/ln	433	1763	1357	445	1763	1357	1182	0	1665	1678	1856	1357
Q Serve(g_s), s	10.1	29.7	1.5	5.9	16.7	30.5	2.3	0.0	9.0	20.2	2.4	6.9
Cycle Q Clear(g_c), s	26.8	29.7	1.5	35.6	16.7	30.5	2.3	0.0	9.0	20.2	2.4	6.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.59	1.00		1.00
Lane Grp Cap(c), veh/h	229	1869	720	188	1869	720	171	0	159	651	649	475
V/C Ratio(X)	0.22	0.63	0.05	0.15	0.42	0.64	0.14	0.00	0.77	0.86	0.08	0.22
Avail Cap(c_a), veh/h	229	1869	720	188	1869	720	422	0	513	846	1150	842
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	25.8	20.8	14.1	33.4	17.7	21.0	52.2	0.0	55.2	48.7	27.2	28.7
Incr Delay (d2), s/veh	2.2	1.6	0.1	1.7	0.7	4.4	0.4	0.0	7.7	7.2	0.1	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.3	13.6	0.5	0.8	7.6	11.6	0.8	0.0	4.4	9.7	1.2	2.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	28.0	22.4	14.3	35.0	18.4	25.4	52.5	0.0	62.8	55.9	27.3	28.9
LnGrp LOS	C	C	B	D	B	C	D	A	E	E	C	C
Approach Vol, veh/h		1268			1274			147			719	
Approach Delay, s/veh		22.4			21.3			61.2			49.8	
Approach LOS		C			C			E			D	
Timer - Assigned Phs		2		4		6	7	8				
Phs Duration (G+Y+Rc), s		73.8		51.2		73.8	31.8	19.5				
Change Period (Y+Rc), s		7.5		7.5		7.5	7.5	7.5				
Max Green Setting (Gmax), s		32.5		77.5		32.5	31.5	38.5				
Max Q Clear Time (g_c+I1), s		31.7		8.9		37.6	22.2	11.0				
Green Ext Time (p_c), s		0.7		0.9		0.0	2.1	1.0				
Intersection Summary												
HCM 6th Ctrl Delay			29.5									
HCM 6th LOS			C									
Notes												

User approved pedestrian interval to be less than phase max green.

Intersection	
Intersection Delay, s/veh	8.4
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	27	50	1	1	176	15	3	2	0	10	10	67
Future Vol, veh/h	27	50	1	1	176	15	3	2	0	10	10	67
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Heavy Vehicles, %	3	3	3	2	2	2	0	0	0	1	1	1
Mvmt Flow	33	60	1	1	212	18	4	2	0	12	12	81
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	8.1	8.8	7.9	7.8
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	60%	35%	1%	11%
Vol Thru, %	40%	64%	92%	11%
Vol Right, %	0%	1%	8%	77%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	5	78	192	87
LT Vol	3	27	1	10
Through Vol	2	50	176	10
RT Vol	0	1	15	67
Lane Flow Rate	6	94	231	105
Geometry Grp	1	1	1	1
Degree of Util (X)	0.008	0.117	0.267	0.123
Departure Headway (Hd)	4.868	4.497	4.153	4.209
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	738	800	851	856
Service Time	2.879	2.507	2.248	2.214
HCM Lane V/C Ratio	0.008	0.117	0.271	0.123
HCM Control Delay	7.9	8.1	8.8	7.8
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0	0.4	1.1	0.4

Intersection												
Int Delay, s/veh	2.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	29	356	24	6	437	12	45	14	17	30	3	43
Future Vol, veh/h	29	356	24	6	437	12	45	14	17	30	3	43
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	300	-	-	200	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	6	6	6	5	5	5	9	9	9	1	1	1
Mvmt Flow	31	379	26	6	465	13	48	15	18	32	3	46

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	478	0	0	405	0	0	700	944	203	743	951	239
Stage 1	-	-	-	-	-	-	454	454	-	484	484	-
Stage 2	-	-	-	-	-	-	246	490	-	259	467	-
Critical Hdwy	4.22	-	-	4.2	-	-	7.68	6.68	7.08	7.52	6.52	6.92
Critical Hdwy Stg 1	-	-	-	-	-	-	6.68	5.68	-	6.52	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.68	5.68	-	6.52	5.52	-
Follow-up Hdwy	2.26	-	-	2.25	-	-	3.59	4.09	3.39	3.51	4.01	3.31
Pot Cap-1 Maneuver	1053	-	-	1129	-	-	313	249	783	305	260	765
Stage 1	-	-	-	-	-	-	537	550	-	535	553	-
Stage 2	-	-	-	-	-	-	716	530	-	726	563	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1053	-	-	1129	-	-	284	241	783	276	251	765
Mov Cap-2 Maneuver	-	-	-	-	-	-	284	241	-	276	251	-
Stage 1	-	-	-	-	-	-	521	534	-	519	550	-
Stage 2	-	-	-	-	-	-	666	527	-	669	547	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.6	0.1	20.1	15.3
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	319	1053	-	-	1129	-	-	430
HCM Lane V/C Ratio	0.253	0.029	-	-	0.006	-	-	0.188
HCM Control Delay (s)	20.1	8.5	-	-	8.2	-	-	15.3
HCM Lane LOS	C	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	1	0.1	-	-	0	-	-	0.7

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL	SWR
Lane Configurations										
Traffic Vol, veh/h	3	456	9	12	449	0	45	0	0	6
Future Vol, veh/h	3	456	9	12	449	0	45	0	0	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	-	None
Storage Length	-	-	-	150	-	-	-	0	0	-
Veh in Median Storage, #	-	0	-	-	0	-	0	-	0	-
Grade, %	-	0	-	-	0	-	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	496	10	13	488	0	49	0	0	7

Major/Minor	Major1			Major2			Minor1		Minor2	
Conflicting Flow All	488	0	0	506	0	0	777	253	768	244
Stage 1	-	-	-	-	-	-	507	-	514	-
Stage 2	-	-	-	-	-	-	270	-	254	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.94	7.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	-	6.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	-	6.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	3.32	3.52	3.32
Pot Cap-1 Maneuver	1071	-	-	1055	-	-	287	746	291	757
Stage 1	-	-	-	-	-	-	516	-	511	-
Stage 2	-	-	-	-	-	-	713	-	728	-
Platoon blocked, %		-	-		-	-				
Mov Cap-1 Maneuver	1071	-	-	1055	-	-	281	746	268	757
Mov Cap-2 Maneuver	-	-	-	-	-	-	281	-	268	-
Stage 1	-	-	-	-	-	-	514	-	509	-
Stage 2	-	-	-	-	-	-	698	-	676	-

Approach	EB	WB	NB	SW
HCM Control Delay, s	0.1	0.2	10.2	13.4
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SWLn1
Capacity (veh/h)	746	1071	-	-	1055	-	-	438
HCM Lane V/C Ratio	0.067	0.003	-	-	0.012	-	-	0.025
HCM Control Delay (s)	10.2	8.4	0	-	8.5	-	-	13.4
HCM Lane LOS	B	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	8	1	46	4	0	1	13	519	1	1	622	8
Future Vol, veh/h	8	1	46	4	0	1	13	519	1	1	622	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	500	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	4	4	4	0	0	0	3	3	3	3	3	3
Mvmt Flow	9	1	49	4	0	1	14	552	1	1	662	9

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	973	1250	336	915	1254	277	671	0	0	553	0	0
Stage 1	669	669	-	581	581	-	-	-	-	-	-	-
Stage 2	304	581	-	334	673	-	-	-	-	-	-	-
Critical Hdwy	7.58	6.58	6.98	7.5	6.5	6.9	4.16	-	-	4.16	-	-
Critical Hdwy Stg 1	6.58	5.58	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.58	5.58	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.54	4.04	3.34	3.5	4	3.3	2.23	-	-	2.23	-	-
Pot Cap-1 Maneuver	204	169	654	231	173	726	909	-	-	1006	-	-
Stage 1	409	449	-	472	503	-	-	-	-	-	-	-
Stage 2	675	493	-	659	457	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	201	166	654	210	170	726	909	-	-	1006	-	-
Mov Cap-2 Maneuver	201	166	-	210	170	-	-	-	-	-	-	-
Stage 1	403	448	-	465	495	-	-	-	-	-	-	-
Stage 2	664	486	-	607	456	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	13.7	20	0.2	0
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	909	-	-	473	245	1006	-	-
HCM Lane V/C Ratio	0.015	-	-	0.124	0.022	0.001	-	-
HCM Control Delay (s)	9	-	-	13.7	20	8.6	0	-
HCM Lane LOS	A	-	-	B	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.4	0.1	0	-	-

Intersection												
Int Delay, s/veh	2.2											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	20	0	34	46	0	17	8	451	3	6	839	5
Future Vol, veh/h	20	0	34	46	0	17	8	451	3	6	839	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	300	-	-	300	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	22	0	37	50	0	18	9	490	3	7	912	5

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1192	1440	459	980	1441	247	917	0	0	493	0	0
Stage 1	929	929	-	510	510	-	-	-	-	-	-	-
Stage 2	263	511	-	470	931	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	143	132	549	204	131	753	740	-	-	1067	-	-
Stage 1	288	344	-	514	536	-	-	-	-	-	-	-
Stage 2	719	535	-	543	344	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	138	129	549	187	129	753	740	-	-	1067	-	-
Mov Cap-2 Maneuver	138	129	-	187	129	-	-	-	-	-	-	-
Stage 1	285	342	-	508	530	-	-	-	-	-	-	-
Stage 2	693	529	-	503	342	-	-	-	-	-	-	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	22.8			26.5			0.2			0.1		
HCM LOS	C			D								

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	740	-	-	261	235	1067	-	-
HCM Lane V/C Ratio	0.012	-	-	0.225	0.291	0.006	-	-
HCM Control Delay (s)	9.9	-	-	22.8	26.5	8.4	-	-
HCM Lane LOS	A	-	-	C	D	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.8	1.2	0	-	-

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	184	499	141	618	49	1663	96	178	1050	62
v/c Ratio	0.91	0.44	0.55	0.52	0.27	0.85	0.17	0.77	0.42	0.09
Control Delay	75.4	23.5	33.5	17.6	29.3	34.8	5.7	43.3	16.9	4.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	75.4	23.5	33.5	17.6	29.3	34.8	5.7	43.3	16.9	4.7
Queue Length 50th (m)	33.5	35.3	21.7	32.1	7.3	121.9	0.0	20.1	50.0	0.0
Queue Length 95th (m)	#70.5	46.6	39.6	45.2	18.3	#158.0	11.1	#63.2	66.4	7.4
Internal Link Dist (m)		126.7		96.8		217.9			205.6	
Turn Bay Length (m)	40.0		60.0		110.0		90.0	110.0		150.0
Base Capacity (vph)	241	1340	307	1393	181	1952	571	230	2480	675
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.76	0.37	0.46	0.44	0.27	0.85	0.17	0.77	0.42	0.09

Intersection Summary

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

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	46	656	15	519	100	51	26	208
v/c Ratio	0.09	0.31	0.03	0.24	0.48	0.14	0.10	0.48
Control Delay	6.7	7.2	6.4	6.9	36.7	19.0	26.8	15.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.7	7.2	6.4	6.9	36.7	19.0	26.8	15.5
Queue Length 50th (m)	2.5	21.0	0.8	16.0	14.5	4.1	3.5	10.8
Queue Length 95th (m)	7.4	34.1	3.3	26.7	28.2	12.6	9.6	28.5
Internal Link Dist (m)		66.9		389.9		79.7		64.4
Turn Bay Length (m)	40.0		15.0		15.0		15.0	
Base Capacity (vph)	514	2147	438	2140	456	752	558	787
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.31	0.03	0.24	0.22	0.07	0.05	0.26

Intersection Summary

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	160	441	46	557	151	329	163	233
v/c Ratio	0.33	0.21	0.08	0.27	0.62	0.42	0.74	0.29
Control Delay	13.2	8.2	4.8	1.7	42.9	29.8	52.9	16.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.2	8.2	4.8	1.7	42.9	29.8	52.9	16.7
Queue Length 50th (m)	13.5	15.3	1.0	0.0	26.4	26.8	29.4	11.2
Queue Length 95th (m)	34.6	29.8	5.8	4.8	41.3	34.3	46.1	18.4
Internal Link Dist (m)		305.1		325.3		80.8		164.2
Turn Bay Length (m)	70.0		60.0		60.0		60.0	
Base Capacity (vph)	485	2065	548	2095	474	1499	428	1490
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	0.21	0.08	0.27	0.32	0.22	0.38	0.16

Intersection Summary

Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Group Flow (vph)	248	66	673	15	477
v/c Ratio	0.73	0.21	0.29	0.03	0.21
Control Delay	47.6	8.9	7.5	9.4	9.4
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	47.6	8.9	7.5	9.4	9.4
Queue Length 50th (m)	45.1	0.0	24.5	1.3	25.3
Queue Length 95th (m)	65.7	9.9	41.3	m3.8	42.8
Internal Link Dist (m)	210.5		116.0		76.9
Turn Bay Length (m)		75.0		50.0	
Base Capacity (vph)	473	421	2318	458	2299
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	0.52	0.16	0.29	0.03	0.21

Intersection Summary

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

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	51	1184	33	28	782	464	24	123	560	53	106
v/c Ratio	0.19	0.66	0.04	0.21	0.44	0.57	0.18	0.63	0.81	0.08	0.20
Control Delay	22.3	26.6	0.1	26.1	21.8	12.8	52.3	54.7	56.5	22.9	15.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.3	26.6	0.1	26.1	21.8	12.8	52.3	54.7	56.5	22.9	15.8
Queue Length 50th (m)	6.9	115.6	0.0	3.9	65.1	32.3	5.8	23.9	71.5	8.8	11.4
Queue Length 95th (m)	18.9	168.5	0.0	13.6	97.9	79.2	14.1	43.0	87.5	15.2	21.1
Internal Link Dist (m)		211.6			225.4			53.9		148.6	
Turn Bay Length (m)	50.0		35.0	40.0		40.0	30.0		40.0		
Base Capacity (vph)	272	1782	739	132	1782	817	397	532	838	1143	853
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.66	0.04	0.21	0.44	0.57	0.06	0.23	0.67	0.05	0.12

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	57	278	168	135	586	244	300	1100	197	408	2372	349
Future Volume (veh/h)	57	278	168	135	586	244	300	1100	197	408	2372	349
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	0.99		0.97	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1831	1870	1614	1831	1870	1614	1816	1856	1602	1831	1870	1614
Adj Flow Rate, veh/h	59	287	173	139	604	252	309	1134	203	421	2445	360
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	2	2	2	2	2	2	3	3	3	2	2	2
Cap, veh/h	77	606	353	200	687	286	246	2182	571	453	2495	655
Arrive On Green	0.28	0.28	0.28	0.28	0.28	0.28	0.11	0.43	0.43	0.17	0.49	0.49
Sat Flow, veh/h	629	2135	1244	901	2421	1009	1730	5066	1326	1744	5106	1340
Grp Volume(v), veh/h	59	237	223	139	443	413	309	1134	203	421	2445	360
Grp Sat Flow(s),veh/h/ln	629	1777	1602	901	1777	1653	1730	1689	1326	1744	1702	1340
Q Serve(g_s), s	6.8	16.5	17.3	22.7	35.7	35.8	17.0	24.6	15.4	22.0	70.5	28.2
Cycle Q Clear(g_c), s	42.6	16.5	17.3	40.1	35.7	35.8	17.0	24.6	15.4	22.0	70.5	28.2
Prop In Lane	1.00		0.78	1.00		0.61	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	77	505	455	200	505	469	246	2182	571	453	2495	655
V/C Ratio(X)	0.77	0.47	0.49	0.70	0.88	0.88	1.26	0.52	0.36	0.93	0.98	0.55
Avail Cap(c_a), veh/h	77	505	455	200	505	469	246	2182	571	596	2495	655
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	73.3	44.4	44.7	61.3	51.2	51.3	50.9	31.3	28.7	30.3	37.6	26.8
Incr Delay (d2), s/veh	42.0	1.5	1.7	12.7	17.0	18.3	144.3	0.9	1.7	17.9	13.9	3.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.3	8.1	7.6	6.2	19.3	18.1	19.6	11.0	5.6	18.5	34.1	10.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	115.4	45.8	46.4	74.0	68.3	69.5	195.2	32.2	30.4	48.2	51.5	30.1
LnGrp LOS	F	D	D	E	E	E	F	C	C	D	D	C
Approach Vol, veh/h		519			995			1646			3226	
Approach Delay, s/veh		54.0			69.6			62.6			48.7	
Approach LOS		D			E			E			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	20.0	80.0		50.0	28.7	71.3		50.0				
Change Period (Y+Rc), s	3.0	* 6.7		7.4	3.0	* 6.7		7.4				
Max Green Setting (Gmax), s	17.0	* 73		42.6	38.0	* 52		42.6				
Max Q Clear Time (g_c+I1), s	19.0	72.5		42.1	24.0	26.6		44.6				
Green Ext Time (p_c), s	0.0	0.8		0.4	1.7	17.8		0.0				

Intersection Summary		
HCM 6th Ctrl Delay		56.0
HCM 6th LOS		E

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	152	679	137	63	845	23	90	44	53	22	31	92
Future Volume (veh/h)	152	679	137	63	845	23	90	44	53	22	31	92
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1802	1841	1589	1816	1856	1602	1715	1752	1512	1773	1811	1563
Adj Flow Rate, veh/h	162	722	146	67	899	24	96	47	56	23	33	98
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	4	4	4	3	3	3	10	10	10	6	6	6
Cap, veh/h	389	1848	374	411	2237	60	227	139	166	255	77	228
Arrive On Green	0.64	0.64	0.64	0.64	0.64	0.64	0.19	0.19	0.19	0.19	0.19	0.19
Sat Flow, veh/h	584	2898	586	619	3508	94	1154	728	868	1224	402	1194
Grp Volume(v), veh/h	162	436	432	67	452	471	96	0	103	23	0	131
Grp Sat Flow(s),veh/h/ln	584	1749	1735	619	1763	1839	1154	0	1596	1224	0	1596
Q Serve(g_s), s	15.0	9.6	9.6	4.7	10.0	10.0	6.4	0.0	4.5	1.3	0.0	5.8
Cycle Q Clear(g_c), s	25.0	9.6	9.6	14.3	10.0	10.0	12.2	0.0	4.5	5.8	0.0	5.8
Prop In Lane	1.00		0.34	1.00		0.05	1.00		0.54	1.00		0.75
Lane Grp Cap(c), veh/h	389	1115	1107	411	1124	1173	227	0	305	255	0	305
V/C Ratio(X)	0.42	0.39	0.39	0.16	0.40	0.40	0.42	0.00	0.34	0.09	0.00	0.43
Avail Cap(c_a), veh/h	389	1115	1107	411	1124	1173	504	0	688	550	0	688
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	13.1	7.0	7.0	10.4	7.1	7.1	33.9	0.0	28.0	30.5	0.0	28.5
Incr Delay (d2), s/veh	3.3	1.0	1.0	0.9	1.1	1.0	1.3	0.0	0.7	0.2	0.0	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.5	4.3	4.3	0.8	4.5	4.7	2.0	0.0	1.9	0.4	0.0	2.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	16.4	8.0	8.0	11.3	8.1	8.1	35.1	0.0	28.6	30.6	0.0	29.5
LnGrp LOS	B	A	A	B	A	A	D	A	C	C	A	C
Approach Vol, veh/h		1030			990			199			154	
Approach Delay, s/veh		9.3			8.3			31.8			29.7	
Approach LOS		A			A			C			C	

Timer - Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		57.2		22.8		57.2		22.8
Change Period (Y+Rc), s		* 6.2		7.5		* 6.2		7.5
Max Green Setting (Gmax), s		* 32		34.5		* 32		34.5
Max Q Clear Time (g_c+I1), s		27.0		14.2		16.3		7.8
Green Ext Time (p_c), s		3.1		1.1		6.9		1.0

Intersection Summary	
HCM 6th Ctrl Delay	12.1
HCM 6th LOS	B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	88	393	66	56	635	89	74	114	70	272	302	321
Future Volume (veh/h)	88	393	66	56	635	89	74	114	70	272	302	321
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1787	1826	1576	1816	1856	1602	1816	1856	1602	1845	1885	1627
Adj Flow Rate, veh/h	98	437	73	62	706	99	82	127	78	302	336	357
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	5	5	5	3	3	3	3	3	3	1	1	1
Cap, veh/h	287	1428	237	412	1489	209	206	780	450	447	649	579
Arrive On Green	0.48	0.48	0.48	0.48	0.48	0.48	0.36	0.36	0.36	0.36	0.36	0.36
Sat Flow, veh/h	647	2977	494	864	3105	435	729	2153	1241	1161	1791	1598
Grp Volume(v), veh/h	98	253	257	62	401	404	82	102	103	302	336	357
Grp Sat Flow(s),veh/h/ln	647	1735	1737	864	1763	1777	729	1763	1632	1161	1791	1598
Q Serve(g_s), s	11.4	8.5	8.6	4.5	14.5	14.6	9.9	3.7	4.1	22.7	14.0	17.4
Cycle Q Clear(g_c), s	26.0	8.5	8.6	13.0	14.5	14.6	27.3	3.7	4.1	26.8	14.0	17.4
Prop In Lane	1.00		0.28	1.00		0.24	1.00		0.76	1.00		1.00
Lane Grp Cap(c), veh/h	287	832	833	412	846	853	206	639	591	447	649	579
V/C Ratio(X)	0.34	0.30	0.31	0.15	0.47	0.47	0.40	0.16	0.17	0.68	0.52	0.62
Avail Cap(c_a), veh/h	287	832	833	412	846	853	261	770	713	533	782	698
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	25.4	15.1	15.1	19.1	16.6	16.6	36.1	20.5	20.6	29.7	23.8	24.9
Incr Delay (d2), s/veh	3.2	0.9	1.0	0.8	1.9	1.9	1.2	0.1	0.1	2.6	0.6	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.2	3.9	4.0	1.1	7.0	7.0	2.0	1.7	1.7	7.2	6.6	7.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	28.6	16.0	16.0	19.8	18.5	18.5	37.3	20.6	20.7	32.3	24.4	26.0
LnGrp LOS	C	B	B	B	B	B	D	C	C	C	C	C
Approach Vol, veh/h		608			867			287			995	
Approach Delay, s/veh		18.1			18.6			25.4			27.4	
Approach LOS		B			B			C			C	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		53.1		41.9		53.1		41.9				
Change Period (Y+Rc), s		7.5		7.5		7.5		7.5				
Max Green Setting (Gmax), s		38.5		41.5		38.5		41.5				
Max Q Clear Time (g_c+I1), s		28.0		29.3		16.6		28.8				
Green Ext Time (p_c), s		3.4		1.6		6.9		5.7				

Intersection Summary			
HCM 6th Ctrl Delay			22.4
HCM 6th LOS			C

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	193	49	796	222	73	608
Future Volume (veh/h)	193	49	796	222	73	608
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1831	1614	1870	1614	1831	1870
Adj Flow Rate, veh/h	208	53	856	239	78	654
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	255	200	1967	549	372	2548
Arrive On Green	0.15	0.15	0.72	0.72	0.72	0.72
Sat Flow, veh/h	1744	1368	2837	766	504	3647
Grp Volume(v), veh/h	208	53	554	541	78	654
Grp Sat Flow(s),veh/h/ln	1744	1368	1777	1733	504	1777
Q Serve(g_s), s	11.0	3.3	12.2	12.2	7.2	6.1
Cycle Q Clear(g_c), s	11.0	3.3	12.2	12.2	19.4	6.1
Prop In Lane	1.00	1.00		0.44	1.00	
Lane Grp Cap(c), veh/h	255	200	1274	1242	372	2548
V/C Ratio(X)	0.82	0.26	0.43	0.44	0.21	0.26
Avail Cap(c_a), veh/h	486	382	1274	1242	372	2548
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	39.3	36.0	5.5	5.5	9.5	4.7
Incr Delay (d2), s/veh	6.3	0.7	1.1	1.1	1.3	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.5	1.2	5.4	5.3	1.0	2.6
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	45.6	36.7	6.6	6.6	10.8	4.9
LnGrp LOS	D	D	A	A	B	A
Approach Vol, veh/h	261		1095			732
Approach Delay, s/veh	43.8		6.6			5.5
Approach LOS	D		A			A

Timer - Assigned Phs	2	4	6
Phs Duration (G+Y+Rc), s	74.6	20.4	74.6
Change Period (Y+Rc), s	6.5	6.5	6.5
Max Green Setting (Gmax), s	55.5	26.5	55.5
Max Q Clear Time (g_c+I1), s	21.4	13.0	14.2
Green Ext Time (p_c), s	7.7	0.9	11.8

Intersection Summary	
HCM 6th Ctrl Delay	10.9
HCM 6th LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	72	1115	36	60	1555	869	21	63	36	626	80	96
Future Volume (veh/h)	72	1115	36	60	1555	869	21	63	36	626	80	96
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1845	1885	1627	1845	1885	1627	1845	1885	1627	1845	1885	1627
Adj Flow Rate, veh/h	76	1174	38	63	1637	915	22	66	38	659	84	101
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	72	1985	764	203	1985	1052	145	92	53	711	393	288
Arrive On Green	0.55	0.55	0.55	0.55	0.55	0.55	0.08	0.08	0.08	0.21	0.21	0.21
Sat Flow, veh/h	123	3582	1379	455	3582	1379	1758	1123	646	3410	1885	1379
Grp Volume(v), veh/h	76	1174	38	63	1637	915	22	0	104	659	84	101
Grp Sat Flow(s),veh/h/ln	123	1791	1379	455	1791	1379	1758	0	1769	1705	1885	1379
Q Serve(g_s), s	25.9	31.5	1.8	15.5	54.4	67.9	1.7	0.0	8.3	27.5	5.4	9.1
Cycle Q Clear(g_c), s	80.3	31.5	1.8	47.0	54.4	67.9	1.7	0.0	8.3	27.5	5.4	9.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.37	1.00		1.00
Lane Grp Cap(c), veh/h	72	1985	764	203	1985	1052	145	0	145	711	393	288
V/C Ratio(X)	1.06	0.59	0.05	0.31	0.82	0.87	0.15	0.00	0.71	0.93	0.21	0.35
Avail Cap(c_a), veh/h	72	1985	764	203	1985	1052	376	0	378	729	403	295
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	68.5	21.4	14.8	37.0	26.6	12.1	61.8	0.0	64.9	56.3	47.5	49.0
Incr Delay (d2), s/veh	124.1	1.3	0.1	4.0	4.1	9.8	0.5	0.0	6.4	17.7	0.3	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.2	14.7	0.7	2.1	25.9	38.3	0.8	0.0	4.2	14.3	2.7	3.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	192.7	22.8	14.9	41.0	30.6	22.0	62.3	0.0	71.3	74.0	47.8	49.7
LnGrp LOS	F	C	B	D	C	C	E	A	E	E	D	D
Approach Vol, veh/h		1288			2615			126			844	
Approach Delay, s/veh		32.5			27.8			69.7			68.5	
Approach LOS		C			C			E			E	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		87.8		19.4		87.8		37.7				
Change Period (Y+Rc), s		7.5		7.5		7.5		7.5				
Max Green Setting (Gmax), s		60.5		31.0		60.5		31.0				
Max Q Clear Time (g_c+I1), s		82.3		10.3		69.9		29.5				
Green Ext Time (p_c), s		0.0		0.7		0.0		0.7				
Intersection Summary												
HCM 6th Ctrl Delay			37.2									
HCM 6th LOS			D									

Intersection	
Intersection Delay, s/veh	8.7
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Traffic Vol, veh/h	89	159	8	1	73	3	4	0	0	8	3	58
Future Vol, veh/h	89	159	8	1	73	3	4	0	0	8	3	58
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles, %	3	3	3	4	4	4	0	0	0	1	1	1
Mvmt Flow	95	169	9	1	78	3	4	0	0	9	3	62
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	9.2	7.9	8	7.6
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	100%	35%	1%	12%
Vol Thru, %	0%	62%	95%	4%
Vol Right, %	0%	3%	4%	84%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	4	256	77	69
LT Vol	4	89	1	8
Through Vol	0	159	73	3
RT Vol	0	8	3	58
Lane Flow Rate	4	272	82	73
Geometry Grp	1	1	1	1
Degree of Util (X)	0.006	0.318	0.1	0.086
Departure Headway (Hd)	4.981	4.2	4.397	4.233
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	722	847	818	851
Service Time	2.989	2.269	2.405	2.236
HCM Lane V/C Ratio	0.006	0.321	0.1	0.086
HCM Control Delay	8	9.2	7.9	7.6
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0	1.4	0.3	0.3

Intersection	
Int Delay, s/veh	3.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	53	586	14	19	1011	29	12	6	22	25	2	64
Future Vol, veh/h	53	586	14	19	1011	29	12	6	22	25	2	64
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	300	-	-	200	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	6	6	6	6	6	6	3	3	3	3	3	3
Mvmt Flow	55	610	15	20	1053	30	13	6	23	26	2	67

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1083	0	0	625	0	0	1296	1851	313	1526	1843	542
Stage 1	-	-	-	-	-	-	728	728	-	1108	1108	-
Stage 2	-	-	-	-	-	-	568	1123	-	418	735	-
Critical Hdwy	4.22	-	-	4.22	-	-	7.56	6.56	6.96	7.56	6.56	6.96
Critical Hdwy Stg 1	-	-	-	-	-	-	6.56	5.56	-	6.56	5.56	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.56	5.56	-	6.56	5.56	-
Follow-up Hdwy	2.26	-	-	2.26	-	-	3.53	4.03	3.33	3.53	4.03	3.33
Pot Cap-1 Maneuver	617	-	-	926	-	-	118	73	680	80	73	482
Stage 1	-	-	-	-	-	-	379	424	-	222	282	-
Stage 2	-	-	-	-	-	-	472	277	-	580	421	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	617	-	-	926	-	-	91	65	680	66	65	482
Mov Cap-2 Maneuver	-	-	-	-	-	-	91	65	-	66	65	-
Stage 1	-	-	-	-	-	-	345	386	-	202	276	-
Stage 2	-	-	-	-	-	-	395	271	-	502	384	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.9	0.2	36.3	51.1
HCM LOS			E	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	156	617	-	-	926	-	-	168
HCM Lane V/C Ratio	0.267	0.089	-	-	0.021	-	-	0.564
HCM Control Delay (s)	36.3	11.4	-	-	9	-	-	51.1
HCM Lane LOS	E	B	-	-	A	-	-	F
HCM 95th %tile Q(veh)	1	0.3	-	-	0.1	-	-	2.9

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL	SWR
Lane Configurations										
Traffic Vol, veh/h	12	720	34	45	642	3	14	0	0	4
Future Vol, veh/h	12	720	34	45	642	3	14	0	0	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	-	None
Storage Length	-	-	-	150	-	-	-	0	0	-
Veh in Median Storage, #	-	0	-	-	0	-	0	-	0	-
Grade, %	-	0	-	-	0	-	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	13	783	37	49	698	3	15	0	0	4

Major/Minor	Major1			Major2			Minor1		Minor2	
Conflicting Flow All	701	0	0	820	0	0	1275	410	1216	351
Stage 1	-	-	-	-	-	-	828	-	798	-
Stage 2	-	-	-	-	-	-	447	-	418	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.94	7.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	-	6.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	-	6.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	3.32	3.52	3.32
Pot Cap-1 Maneuver	892	-	-	805	-	-	124	591	137	645
Stage 1	-	-	-	-	-	-	332	-	346	-
Stage 2	-	-	-	-	-	-	560	-	583	-
Platoon blocked, %		-	-		-	-				
Mov Cap-1 Maneuver	892	-	-	805	-	-	115	591	122	645
Mov Cap-2 Maneuver	-	-	-	-	-	-	115	-	122	-
Stage 1	-	-	-	-	-	-	323	-	337	-
Stage 2	-	-	-	-	-	-	522	-	539	-

Approach	EB	WB	NB	SW
HCM Control Delay, s	0.2	0.6	11.4	15.5
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SWLn1
Capacity (veh/h)	591	892	-	-	805	-	-	347
HCM Lane V/C Ratio	0.05	0.015	-	-	0.061	-	-	0.016
HCM Control Delay (s)	11.4	9.1	0.1	-	9.8	-	-	15.5
HCM Lane LOS	B	A	A	-	A	-	-	C
HCM 95th %tile Q(veh)	0.2	0	-	-	0.2	-	-	0

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	14	1	27	1	0	1	41	927	3	0	801	10
Future Vol, veh/h	14	1	27	1	0	1	41	927	3	0	801	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	500	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	7	7	7	0	0	0	2	2	2	1	1	1
Mvmt Flow	15	1	28	1	0	1	43	976	3	0	843	11

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1423	1914	427	1486	1918	490	854	0	0	979	0	0
Stage 1	849	849	-	1064	1064	-	-	-	-	-	-	-
Stage 2	574	1065	-	422	854	-	-	-	-	-	-	-
Critical Hdwy	7.64	6.64	7.04	7.5	6.5	6.9	4.14	-	-	4.12	-	-
Critical Hdwy Stg 1	6.64	5.64	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.64	5.64	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.57	4.07	3.37	3.5	4	3.3	2.22	-	-	2.21	-	-
Pot Cap-1 Maneuver	92	63	562	88	68	529	781	-	-	707	-	-
Stage 1	312	364	-	242	302	-	-	-	-	-	-	-
Stage 2	459	287	-	585	378	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	88	60	562	79	64	529	781	-	-	707	-	-
Mov Cap-2 Maneuver	88	60	-	79	64	-	-	-	-	-	-	-
Stage 1	295	364	-	229	285	-	-	-	-	-	-	-
Stage 2	433	271	-	554	378	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	29.9	31.7	0.4	0
HCM LOS	D	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	781	-	-	188	137	707	-	-
HCM Lane V/C Ratio	0.055	-	-	0.235	0.015	-	-	-
HCM Control Delay (s)	9.9	-	-	29.9	31.7	0	-	-
HCM Lane LOS	A	-	-	D	D	A	-	-
HCM 95th %tile Q(veh)	0.2	-	-	0.9	0	0	-	-

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	9	0	15	15	0	15	29	942	16	20	862	16
Future Vol, veh/h	9	0	15	15	0	15	29	942	16	20	862	16
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	300	-	-	300	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	10	0	16	16	0	16	32	1024	17	22	937	17

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1566	2095	477	1610	2095	521	954	0	0	1041	0	0
Stage 1	990	990	-	1097	1097	-	-	-	-	-	-	-
Stage 2	576	1105	-	513	998	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	75	52	534	70	52	500	716	-	-	664	-	-
Stage 1	264	323	-	227	287	-	-	-	-	-	-	-
Stage 2	470	285	-	512	320	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	68	48	534	64	48	500	716	-	-	664	-	-
Mov Cap-2 Maneuver	68	48	-	64	48	-	-	-	-	-	-	-
Stage 1	252	312	-	217	274	-	-	-	-	-	-	-
Stage 2	434	272	-	480	309	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	34	49.3	0.3	0.2
HCM LOS	D	E		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	716	-	-	150	113	664	-	-
HCM Lane V/C Ratio	0.044	-	-	0.174	0.289	0.033	-	-
HCM Control Delay (s)	10.3	-	-	34	49.3	10.6	-	-
HCM Lane LOS	B	-	-	D	E	B	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.6	1.1	0.1	-	-

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	59	460	139	856	309	1134	203	421	2445	360
v/c Ratio	1.05	0.46	0.71	0.87	1.26	0.57	0.32	0.88	0.98	0.55
Control Delay	187.3	37.4	69.6	59.5	184.7	38.1	5.6	49.0	52.3	26.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	187.3	37.4	69.6	59.5	184.7	38.1	5.6	49.0	52.3	26.1
Queue Length 50th (m)	~20.0	51.1	39.3	129.4	~105.0	103.0	0.0	87.1	271.1	65.6
Queue Length 95th (m)	#52.4	69.0	#73.7	#158.7	#171.7	126.0	18.3	128.2	#313.0	98.8
Internal Link Dist (m)		126.7		96.8		217.9			205.6	
Turn Bay Length (m)	40.0		60.0		110.0		90.0	110.0		150.0
Base Capacity (vph)	56	996	195	979	245	1978	628	543	2484	658
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.05	0.46	0.71	0.87	1.26	0.57	0.32	0.78	0.98	0.55

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	162	868	67	923	96	103	23	131
v/c Ratio	0.51	0.40	0.19	0.42	0.43	0.29	0.10	0.37
Control Delay	15.4	7.7	8.2	8.1	34.8	16.4	27.0	20.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	15.4	7.7	8.2	8.1	34.8	16.4	27.0	20.3
Queue Length 50th (m)	12.1	29.4	3.9	33.1	13.8	6.4	3.1	10.8
Queue Length 95th (m)	34.0	45.7	10.9	50.3	27.3	18.8	9.0	25.0
Internal Link Dist (m)		66.9		389.9		79.7		64.4
Turn Bay Length (m)	40.0		15.0		15.0		15.0	
Base Capacity (vph)	318	2156	345	2213	490	715	522	716
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	0.51	0.40	0.19	0.42	0.20	0.14	0.04	0.18

Intersection Summary

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	98	510	62	805	82	205	302	693
v/c Ratio	0.36	0.29	0.15	0.46	0.49	0.18	0.80	0.60
Control Delay	22.3	14.8	10.9	11.9	33.4	12.3	43.5	23.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.3	14.8	10.9	11.9	33.4	12.3	43.5	23.3
Queue Length 50th (m)	11.1	27.6	4.2	49.6	12.3	8.7	51.5	47.8
Queue Length 95th (m)	30.1	47.0	13.7	80.5	24.0	14.2	72.6	55.7
Internal Link Dist (m)		305.1		325.3		80.8		164.2
Turn Bay Length (m)	70.0		60.0		60.0		60.0	
Base Capacity (vph)	271	1732	422	1768	221	1487	501	1502
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	0.36	0.29	0.15	0.46	0.37	0.14	0.60	0.46

Intersection Summary

Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Group Flow (vph)	208	53	1095	78	654
v/c Ratio	0.69	0.19	0.46	0.27	0.27
Control Delay	47.8	10.3	7.6	10.6	6.8
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	47.8	10.3	7.6	10.6	6.8
Queue Length 50th (m)	38.0	0.0	41.3	5.4	24.0
Queue Length 95th (m)	57.5	9.4	67.4	m19.9	30.4
Internal Link Dist (m)	210.5		116.0		76.9
Turn Bay Length (m)		75.0		50.0	
Base Capacity (vph)	483	419	2373	289	2434
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	0.43	0.13	0.46	0.27	0.27

Intersection Summary

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

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	76	1174	38	63	1637	915	22	104	659	84	101
v/c Ratio	1.49	0.69	0.05	0.55	0.96	0.76	0.13	0.56	0.72	0.16	0.23
Control Delay	333.4	33.4	0.1	52.7	50.5	7.8	60.8	63.3	52.0	39.4	7.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	333.4	33.4	0.1	52.7	50.5	7.8	60.8	63.3	52.0	39.4	7.6
Queue Length 50th (m)	~31.3	139.8	0.0	13.0	241.7	39.3	6.3	25.4	93.2	19.5	0.0
Queue Length 95th (m)	#56.1	189.9	0.0	#40.8	#338.6	108.8	15.0	44.7	110.3	32.6	14.1
Internal Link Dist (m)		211.6			225.4			53.9		148.6	
Turn Bay Length (m)	50.0		35.0	40.0		40.0	30.0		40.0		
Base Capacity (vph)	51	1710	707	114	1710	1196	374	394	924	512	449
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.49	0.69	0.05	0.55	0.96	0.77	0.06	0.26	0.71	0.16	0.22

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

APPENDIX E

SYNCHRO REPORT FOR FUTURE (2031) CONDITIONS - SCENARIO 2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	162	243	195	125	177	367	43	1465	84	156	925	55
Future Volume (veh/h)	162	243	195	125	177	367	43	1465	84	156	925	55
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.97	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1802	1841	1589	1816	1856	1602	1802	1841	1589	1744	1781	1538
Adj Flow Rate, veh/h	180	270	217	139	197	408	48	1628	93	173	1028	61
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	4	4	4	3	3	3	4	4	4	8	8	8
Cap, veh/h	226	761	589	340	723	630	222	1709	444	209	2184	570
Arrive On Green	0.41	0.41	0.41	0.41	0.41	0.41	0.34	0.34	0.34	0.08	0.45	0.45
Sat Flow, veh/h	783	1857	1435	879	1763	1537	497	5025	1305	1661	4863	1269
Grp Volume(v), veh/h	180	254	233	139	197	408	48	1628	93	173	1028	61
Grp Sat Flow(s),veh/h/ln	783	1749	1543	879	1763	1537	497	1675	1305	1661	1621	1269
Q Serve(g_s), s	19.7	10.0	10.5	13.1	7.4	21.3	7.5	31.6	5.1	6.5	14.8	2.8
Cycle Q Clear(g_c), s	41.0	10.0	10.5	23.6	7.4	21.3	11.3	31.6	5.1	6.5	14.8	2.8
Prop In Lane	1.00		0.93	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	226	717	633	340	723	630	222	1709	444	209	2184	570
V/C Ratio(X)	0.80	0.35	0.37	0.41	0.27	0.65	0.22	0.95	0.21	0.83	0.47	0.11
Avail Cap(c_a), veh/h	226	717	633	340	723	630	222	1709	444	209	2184	570
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	41.6	20.4	20.5	28.7	19.6	23.7	27.0	32.2	23.5	24.0	19.2	15.9
Incr Delay (d2), s/veh	20.0	0.6	0.8	1.7	0.4	3.2	2.2	13.1	1.1	22.9	0.7	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.0	4.6	4.3	3.2	3.5	9.0	1.1	15.5	1.8	4.0	6.1	0.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	61.6	21.0	21.3	30.4	20.0	26.9	29.2	45.4	24.5	46.9	20.0	16.3
LnGrp LOS	E	C	C	C	C	C	C	D	C	D	B	B
Approach Vol, veh/h		667			744			1769			1262	
Approach Delay, s/veh		32.0			25.7			43.8			23.5	
Approach LOS		C			C			D			C	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		51.6		48.4	10.9	40.7		48.4				
Change Period (Y+Rc), s		* 6.7		7.4	3.0	* 6.7		7.4				
Max Green Setting (Gmax), s		* 45		41.0	7.9	* 34		41.0				
Max Q Clear Time (g_c+I1), s		16.8		25.6	8.5	33.6		43.0				
Green Ext Time (p_c), s		16.0		7.9	0.0	0.4		0.0				

Intersection Summary			
HCM 6th Ctrl Delay			33.3
HCM 6th LOS			C

Notes

User approved pedestrian interval to be less than phase max green.

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	43	548	56	14	459	19	94	29	19	24	73	122
Future Volume (veh/h)	43	548	56	14	459	19	94	29	19	24	73	122
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1787	1826	1576	1773	1811	1563	1802	1841	1589	1802	1841	1589
Adj Flow Rate, veh/h	46	583	60	15	488	20	100	31	20	26	78	130
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	5	5	5	6	6	6	4	4	4	4	4	4
Cap, veh/h	542	1902	195	469	2018	83	225	240	155	359	143	238
Arrive On Green	0.60	0.60	0.60	0.60	0.60	0.60	0.23	0.23	0.23	0.23	0.23	0.23
Sat Flow, veh/h	852	3176	326	746	3369	138	1131	1045	674	1304	620	1034
Grp Volume(v), veh/h	46	318	325	15	249	259	100	0	51	26	0	208
Grp Sat Flow(s),veh/h/ln	852	1735	1767	746	1721	1786	1131	0	1719	1304	0	1655
Q Serve(g_s), s	2.1	7.2	7.2	0.8	5.4	5.4	6.8	0.0	1.9	1.3	0.0	8.9
Cycle Q Clear(g_c), s	7.6	7.2	7.2	8.0	5.4	5.4	15.7	0.0	1.9	3.2	0.0	8.9
Prop In Lane	1.00		0.18	1.00		0.08	1.00		0.39	1.00		0.63
Lane Grp Cap(c), veh/h	542	1039	1058	469	1030	1070	225	0	395	359	0	380
V/C Ratio(X)	0.08	0.31	0.31	0.03	0.24	0.24	0.45	0.00	0.13	0.07	0.00	0.55
Avail Cap(c_a), veh/h	542	1039	1058	469	1030	1070	452	0	741	622	0	714
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	9.3	7.9	7.9	9.9	7.5	7.5	34.1	0.0	24.5	25.7	0.0	27.1
Incr Delay (d2), s/veh	0.3	0.8	0.8	0.1	0.6	0.5	1.4	0.0	0.1	0.1	0.0	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	3.2	3.3	0.2	2.4	2.5	2.1	0.0	0.9	0.4	0.0	3.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	9.6	8.6	8.6	10.0	8.1	8.1	35.4	0.0	24.6	25.8	0.0	28.4
LnGrp LOS	A	A	A	A	A	A	D	A	C	C	A	C
Approach Vol, veh/h		689			523			151			234	
Approach Delay, s/veh		8.7			8.1			31.8			28.1	
Approach LOS		A			A			C			C	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		54.1		25.9		54.1		25.9				
Change Period (Y+Rc), s		* 6.2		7.5		* 6.2		7.5				
Max Green Setting (Gmax), s		* 32		34.5		* 32		34.5				
Max Q Clear Time (g_c+I1), s		9.6		17.7		10.0		10.9				
Green Ext Time (p_c), s		5.2		0.7		3.8		1.6				

Intersection Summary		
HCM 6th Ctrl Delay		13.5
HCM 6th LOS		B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	143	293	99	41	297	199	134	256	37	145	121	86
Future Volume (veh/h)	143	293	99	41	297	199	134	256	37	145	121	86
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1787	1826	1576	1802	1841	1589	1802	1841	1589	1816	1856	1602
Adj Flow Rate, veh/h	157	322	109	45	326	219	147	281	41	159	133	95
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	5	5	5	4	4	4	4	4	4	3	3	3
Cap, veh/h	478	1466	487	546	1159	762	313	825	119	275	545	363
Arrive On Green	0.57	0.57	0.57	0.57	0.57	0.57	0.27	0.27	0.27	0.27	0.27	0.27
Sat Flow, veh/h	823	2557	850	922	2022	1329	1110	3067	443	1027	2025	1350
Grp Volume(v), veh/h	157	217	214	45	281	264	147	159	163	159	115	113
Grp Sat Flow(s),veh/h/ln	823	1735	1673	922	1749	1602	1110	1749	1761	1027	1763	1613
Q Serve(g_s), s	11.4	5.8	6.0	2.4	7.8	8.0	11.4	6.9	7.1	14.0	4.8	5.3
Cycle Q Clear(g_c), s	19.4	5.8	6.0	8.3	7.8	8.0	16.7	6.9	7.1	21.1	4.8	5.3
Prop In Lane	1.00		0.51	1.00		0.83	1.00		0.25	1.00		0.84
Lane Grp Cap(c), veh/h	478	994	959	546	1002	918	313	470	474	275	474	434
V/C Ratio(X)	0.33	0.22	0.22	0.08	0.28	0.29	0.47	0.34	0.34	0.58	0.24	0.26
Avail Cap(c_a), veh/h	478	994	959	546	1002	918	499	764	769	448	770	704
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	15.3	9.9	9.9	12.0	10.3	10.4	33.9	27.9	28.0	36.5	27.2	27.3
Incr Delay (d2), s/veh	1.8	0.5	0.5	0.3	0.7	0.8	1.1	0.4	0.4	1.9	0.3	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.6	2.6	2.6	0.6	3.6	3.4	3.4	3.2	3.3	3.9	2.3	2.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.2	10.4	10.5	12.3	11.0	11.1	35.0	28.3	28.4	38.4	27.4	27.6
LnGrp LOS	B	B	B	B	B	B	C	C	C	D	C	C
Approach Vol, veh/h		588			590			469			387	
Approach Delay, s/veh		12.2			11.2			30.4			32.0	
Approach LOS		B			B			C			C	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		62.0		33.0		62.0		33.0				
Change Period (Y+Rc), s		7.5		7.5		7.5		7.5				
Max Green Setting (Gmax), s		38.5		41.5		38.5		41.5				
Max Q Clear Time (g_c+I1), s		21.4		18.7		10.3		23.1				
Green Ext Time (p_c), s		4.1		3.1		4.8		2.4				

Intersection Summary			
HCM 6th Ctrl Delay			19.9
HCM 6th LOS			B

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	226	60	544	57	14	426
Future Volume (veh/h)	226	60	544	57	14	426
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1802	1589	1870	1614	1802	1841
Adj Flow Rate, veh/h	248	66	598	63	15	468
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	4	4	2	2	4	4
Cap, veh/h	295	231	2243	236	539	2418
Arrive On Green	0.17	0.17	0.69	0.69	0.69	0.69
Sat Flow, veh/h	1716	1346	3338	341	745	3589
Grp Volume(v), veh/h	248	66	327	334	15	468
Grp Sat Flow(s),veh/h/ln	1716	1346	1777	1809	745	1749
Q Serve(g_s), s	13.3	4.1	6.6	6.6	0.7	4.5
Cycle Q Clear(g_c), s	13.3	4.1	6.6	6.6	7.4	4.5
Prop In Lane	1.00	1.00		0.19	1.00	
Lane Grp Cap(c), veh/h	295	231	1228	1250	539	2418
V/C Ratio(X)	0.84	0.29	0.27	0.27	0.03	0.19
Avail Cap(c_a), veh/h	479	376	1228	1250	539	2418
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	38.1	34.3	5.5	5.6	7.0	5.2
Incr Delay (d2), s/veh	7.1	0.7	0.5	0.5	0.1	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.6	1.5	3.0	3.0	0.1	1.9
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	45.2	34.9	6.1	6.1	7.0	5.4
LnGrp LOS	D	C	A	A	A	A
Approach Vol, veh/h	314		661			483
Approach Delay, s/veh	43.1		6.1			5.5
Approach LOS	D		A			A

Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		72.2		22.8		72.2
Change Period (Y+Rc), s		6.5		6.5		6.5
Max Green Setting (Gmax), s		55.5		26.5		55.5
Max Q Clear Time (g_c+I1), s		9.4		15.3		8.6
Green Ext Time (p_c), s		4.4		1.0		5.8

Intersection Summary			
HCM 6th Ctrl Delay			13.8
HCM 6th LOS			B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	48	1124	31	26	743	441	23	48	69	532	50	101
Future Volume (veh/h)	48	1124	31	26	743	441	23	48	69	532	50	101
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1816	1856	1602	1816	1856	1602	1802	1841	1589	1816	1856	1602
Adj Flow Rate, veh/h	49	1159	32	27	766	455	24	49	71	548	52	104
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	3	3	3	3	3	3	4	4	4	3	3	3
Cap, veh/h	238	1888	727	198	1888	727	169	64	92	640	639	468
Arrive On Green	0.54	0.54	0.54	0.54	0.54	0.54	0.09	0.09	0.09	0.19	0.34	0.34
Sat Flow, veh/h	444	3526	1357	457	3526	1357	1186	679	984	3356	1856	1357
Grp Volume(v), veh/h	49	1159	32	27	766	455	24	0	120	548	52	104
Grp Sat Flow(s),veh/h/ln	444	1763	1357	457	1763	1357	1186	0	1664	1678	1856	1357
Q Serve(g_s), s	9.2	28.4	1.4	5.4	16.1	29.3	2.3	0.0	8.8	19.7	2.4	6.8
Cycle Q Clear(g_c), s	25.3	28.4	1.4	33.9	16.1	29.3	2.3	0.0	8.8	19.7	2.4	6.8
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.59	1.00		1.00
Lane Grp Cap(c), veh/h	238	1888	727	198	1888	727	169	0	156	640	639	468
V/C Ratio(X)	0.21	0.61	0.04	0.14	0.41	0.63	0.14	0.00	0.77	0.86	0.08	0.22
Avail Cap(c_a), veh/h	238	1888	727	198	1888	727	423	0	512	846	1150	842
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	24.7	20.1	13.8	31.8	17.2	20.3	52.4	0.0	55.3	48.9	27.6	29.1
Incr Delay (d2), s/veh	1.9	1.5	0.1	1.4	0.6	4.0	0.4	0.0	7.7	6.8	0.1	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	13.0	0.5	0.7	7.3	11.0	0.8	0.0	4.3	9.4	1.2	2.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.7	21.6	13.9	33.2	17.9	24.3	52.8	0.0	63.0	55.8	27.7	29.3
LnGrp LOS	C	C	B	C	B	C	D	A	E	E	C	C
Approach Vol, veh/h		1240			1248			144			704	
Approach Delay, s/veh		21.6			20.6			61.3			49.8	
Approach LOS		C			C			E			D	

Timer - Assigned Phs		2		4		6	7	8				
Phs Duration (G+Y+Rc), s		74.4		50.6		74.4	31.3	19.2				
Change Period (Y+Rc), s		7.5		7.5		7.5	7.5	7.5				
Max Green Setting (Gmax), s		32.5		77.5		32.5	31.5	38.5				
Max Q Clear Time (g_c+I1), s		30.4		8.8		35.9	21.7	10.8				
Green Ext Time (p_c), s		1.6		0.9		0.0	2.1	0.9				

Intersection Summary			
HCM 6th Ctrl Delay			28.9
HCM 6th LOS			C

Notes

User approved pedestrian interval to be less than phase max green.

Intersection	
Intersection Delay, s/veh	8.4
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	27	50	1	1	176	15	3	2	0	10	10	67
Future Vol, veh/h	27	50	1	1	176	15	3	2	0	10	10	67
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Heavy Vehicles, %	3	3	3	2	2	2	0	0	0	1	1	1
Mvmt Flow	33	60	1	1	212	18	4	2	0	12	12	81
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	8.1	8.8	7.9	7.8
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	60%	35%	1%	11%
Vol Thru, %	40%	64%	92%	11%
Vol Right, %	0%	1%	8%	77%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	5	78	192	87
LT Vol	3	27	1	10
Through Vol	2	50	176	10
RT Vol	0	1	15	67
Lane Flow Rate	6	94	231	105
Geometry Grp	1	1	1	1
Degree of Util (X)	0.008	0.117	0.267	0.123
Departure Headway (Hd)	4.868	4.497	4.153	4.209
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	738	800	851	856
Service Time	2.879	2.507	2.248	2.214
HCM Lane V/C Ratio	0.008	0.117	0.271	0.123
HCM Control Delay	7.9	8.1	8.8	7.8
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0	0.4	1.1	0.4

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	29	349	24	6	428	12	45	14	17	30	3	43
Future Vol, veh/h	29	349	24	6	428	12	45	14	17	30	3	43
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	300	-	-	200	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	6	6	6	5	5	5	9	9	9	1	1	1
Mvmt Flow	31	371	26	6	455	13	48	15	18	32	3	46

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	468	0	0	397	0	0	687	926	199	729	933	234
Stage 1	-	-	-	-	-	-	446	446	-	474	474	-
Stage 2	-	-	-	-	-	-	241	480	-	255	459	-
Critical Hdwy	4.22	-	-	4.2	-	-	7.68	6.68	7.08	7.52	6.52	6.92
Critical Hdwy Stg 1	-	-	-	-	-	-	6.68	5.68	-	6.52	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.68	5.68	-	6.52	5.52	-
Follow-up Hdwy	2.26	-	-	2.25	-	-	3.59	4.09	3.39	3.51	4.01	3.31
Pot Cap-1 Maneuver	1062	-	-	1137	-	-	320	255	787	313	266	771
Stage 1	-	-	-	-	-	-	543	555	-	543	559	-
Stage 2	-	-	-	-	-	-	721	535	-	730	567	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1062	-	-	1137	-	-	290	246	787	284	257	771
Mov Cap-2 Maneuver	-	-	-	-	-	-	290	246	-	284	257	-
Stage 1	-	-	-	-	-	-	527	539	-	527	556	-
Stage 2	-	-	-	-	-	-	671	532	-	673	551	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.6	0.1	19.7	15
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	325	1062	-	-	1137	-	-	439
HCM Lane V/C Ratio	0.249	0.029	-	-	0.006	-	-	0.184
HCM Control Delay (s)	19.7	8.5	-	-	8.2	-	-	15
HCM Lane LOS	C	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	1	0.1	-	-	0	-	-	0.7

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL	SWR
Lane Configurations										
Traffic Vol, veh/h	3	446	9	12	439	0	45	0	0	6
Future Vol, veh/h	3	446	9	12	439	0	45	0	0	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	-	None
Storage Length	-	-	-	150	-	-	-	0	0	-
Veh in Median Storage, #	-	0	-	-	0	-	0	-	0	-
Grade, %	-	0	-	-	0	-	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	485	10	13	477	0	49	0	0	7

Major/Minor	Major1			Major2			Minor1		Minor2	
Conflicting Flow All	477	0	0	495	0	0	761	248	752	239
Stage 1	-	-	-	-	-	-	496	-	503	-
Stage 2	-	-	-	-	-	-	265	-	249	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.94	7.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	-	6.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	-	6.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	3.32	3.52	3.32
Pot Cap-1 Maneuver	1082	-	-	1065	-	-	295	752	299	762
Stage 1	-	-	-	-	-	-	524	-	519	-
Stage 2	-	-	-	-	-	-	717	-	733	-
Platoon blocked, %		-	-		-	-				
Mov Cap-1 Maneuver	1082	-	-	1065	-	-	289	752	276	762
Mov Cap-2 Maneuver	-	-	-	-	-	-	289	-	276	-
Stage 1	-	-	-	-	-	-	522	-	517	-
Stage 2	-	-	-	-	-	-	702	-	682	-

Approach	EB	WB	NB	SW
HCM Control Delay, s	0.1	0.2	10.1	13.3
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SWLn1
Capacity (veh/h)	752	1082	-	-	1065	-	-	447
HCM Lane V/C Ratio	0.066	0.003	-	-	0.012	-	-	0.024
HCM Control Delay (s)	10.1	8.3	0	-	8.4	-	-	13.3
HCM Lane LOS	B	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	8	1	46	4	0	1	13	508	1	1	610	8
Future Vol, veh/h	8	1	46	4	0	1	13	508	1	1	610	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	500	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	4	4	4	0	0	0	3	3	3	3	3	3
Mvmt Flow	9	1	49	4	0	1	14	540	1	1	649	9

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	954	1225	329	896	1229	271	658	0	0	541	0	0
Stage 1	656	656	-	569	569	-	-	-	-	-	-	-
Stage 2	298	569	-	327	660	-	-	-	-	-	-	-
Critical Hdwy	7.58	6.58	6.98	7.5	6.5	6.9	4.16	-	-	4.16	-	-
Critical Hdwy Stg 1	6.58	5.58	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.58	5.58	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.54	4.04	3.34	3.5	4	3.3	2.23	-	-	2.23	-	-
Pot Cap-1 Maneuver	210	175	661	238	179	733	919	-	-	1017	-	-
Stage 1	416	455	-	479	509	-	-	-	-	-	-	-
Stage 2	680	499	-	665	463	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	207	172	661	217	176	733	919	-	-	1017	-	-
Mov Cap-2 Maneuver	207	172	-	217	176	-	-	-	-	-	-	-
Stage 1	410	454	-	472	501	-	-	-	-	-	-	-
Stage 2	669	492	-	613	462	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	13.5	19.5	0.2	0
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	919	-	-	482	253	1017	-	-
HCM Lane V/C Ratio	0.015	-	-	0.121	0.021	0.001	-	-
HCM Control Delay (s)	9	-	-	13.5	19.5	8.5	0	-
HCM Lane LOS	A	-	-	B	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.4	0.1	0	-	-

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	20	0	34	46	0	17	8	442	3	6	822	5
Future Vol, veh/h	20	0	34	46	0	17	8	442	3	6	822	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	300	-	-	300	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	22	0	37	50	0	18	9	480	3	7	893	5

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1168	1411	449	961	1412	242	898	0	0	483	0	0
Stage 1	910	910	-	500	500	-	-	-	-	-	-	-
Stage 2	258	501	-	461	912	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	149	137	557	211	137	759	752	-	-	1076	-	-
Stage 1	296	352	-	521	541	-	-	-	-	-	-	-
Stage 2	724	541	-	550	351	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	143	134	557	194	134	759	752	-	-	1076	-	-
Mov Cap-2 Maneuver	143	134	-	194	134	-	-	-	-	-	-	-
Stage 1	292	350	-	515	535	-	-	-	-	-	-	-
Stage 2	698	535	-	510	349	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	22.1	25.5	0.2	0.1
HCM LOS	C	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	752	-	-	269	243	1076	-	-
HCM Lane V/C Ratio	0.012	-	-	0.218	0.282	0.006	-	-
HCM Control Delay (s)	9.8	-	-	22.1	25.5	8.4	-	-
HCM Lane LOS	A	-	-	C	D	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.8	1.1	0	-	-

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	180	487	139	605	48	1628	93	173	1028	61
v/c Ratio	0.90	0.44	0.55	0.51	0.25	0.82	0.16	0.75	0.41	0.09
Control Delay	73.2	23.6	33.7	17.6	28.5	32.9	5.7	41.0	16.4	4.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	73.2	23.6	33.7	17.6	28.5	32.9	5.7	41.0	16.4	4.7
Queue Length 50th (m)	33.0	34.8	21.8	31.5	7.1	118.0	0.0	18.8	47.3	0.0
Queue Length 95th (m)	#67.6	45.2	38.8	43.8	17.8	#152.4	10.8	#61.3	64.6	7.3
Internal Link Dist (m)		126.7		96.8		217.9			205.6	
Turn Bay Length (m)	40.0		60.0		110.0		90.0	110.0		150.0
Base Capacity (vph)	245	1342	312	1394	189	1989	579	230	2517	684
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.73	0.36	0.45	0.43	0.25	0.82	0.16	0.75	0.41	0.09

Intersection Summary

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

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	46	643	15	508	100	51	26	208
v/c Ratio	0.09	0.30	0.03	0.24	0.48	0.14	0.10	0.48
Control Delay	6.7	7.1	6.4	6.8	36.7	19.0	26.8	15.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.7	7.1	6.4	6.8	36.7	19.0	26.8	15.5
Queue Length 50th (m)	2.5	20.4	0.8	15.7	14.5	4.1	3.5	10.8
Queue Length 95th (m)	7.4	33.3	3.3	26.1	28.2	12.6	9.6	28.5
Internal Link Dist (m)		66.9		389.9		79.7		64.4
Turn Bay Length (m)	40.0		15.0		15.0		15.0	
Base Capacity (vph)	520	2147	446	2140	456	752	558	787
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.30	0.03	0.24	0.22	0.07	0.05	0.26

Intersection Summary

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	157	431	45	545	147	322	159	228
v/c Ratio	0.32	0.21	0.08	0.26	0.62	0.42	0.73	0.29
Control Delay	12.6	8.0	4.6	1.5	43.3	30.0	52.6	17.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.6	8.0	4.6	1.5	43.3	30.0	52.6	17.0
Queue Length 50th (m)	12.9	14.5	1.0	0.0	25.8	26.3	28.7	11.1
Queue Length 95th (m)	33.3	28.6	5.0	0.0	40.6	33.8	45.2	18.3
Internal Link Dist (m)		305.1		325.3		80.8		164.2
Turn Bay Length (m)	70.0		60.0		60.0		60.0	
Base Capacity (vph)	495	2083	558	2111	476	1499	434	1488
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	0.21	0.08	0.26	0.31	0.21	0.37	0.15

Intersection Summary

Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Group Flow (vph)	248	66	661	15	468
v/c Ratio	0.73	0.21	0.29	0.03	0.20
Control Delay	47.6	8.9	7.4	9.6	9.4
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	47.6	8.9	7.4	9.6	9.4
Queue Length 50th (m)	45.1	0.0	23.9	1.4	24.4
Queue Length 95th (m)	65.7	9.9	40.4	m4.1	41.7
Internal Link Dist (m)	210.5		116.0		76.9
Turn Bay Length (m)		75.0		50.0	
Base Capacity (vph)	473	421	2318	465	2299
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	0.52	0.16	0.29	0.03	0.20

Intersection Summary

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

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	49	1159	32	27	766	455	24	120	548	52	104
v/c Ratio	0.17	0.64	0.04	0.19	0.43	0.55	0.18	0.62	0.80	0.08	0.20
Control Delay	21.6	25.6	0.1	24.6	21.1	12.1	52.9	53.5	56.4	23.3	15.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.6	25.6	0.1	24.6	21.1	12.1	52.9	53.5	56.4	23.3	15.9
Queue Length 50th (m)	6.5	110.6	0.0	3.6	62.5	29.6	5.8	22.6	70.0	8.7	11.1
Queue Length 95th (m)	17.9	162.3	0.0	12.7	94.7	74.8	14.1	41.5	85.7	15.2	20.9
Internal Link Dist (m)		211.6			225.4			53.9		148.6	
Turn Bay Length (m)	50.0		35.0	40.0		40.0	30.0		40.0		
Base Capacity (vph)	283	1800	746	142	1800	823	398	533	838	1143	853
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.17	0.64	0.04	0.19	0.43	0.55	0.06	0.23	0.65	0.05	0.12

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	53	260	157	127	548	228	280	1028	185	382	2216	326
Future Volume (veh/h)	53	260	157	127	548	228	280	1028	185	382	2216	326
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.97	0.99		0.97	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1831	1870	1614	1831	1870	1614	1816	1856	1602	1831	1870	1614
Adj Flow Rate, veh/h	55	268	162	131	565	235	289	1060	191	394	2285	336
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	2	2	2	2	2	2	3	3	3	2	2	2
Cap, veh/h	91	607	353	212	689	286	252	2356	618	427	2495	655
Arrive On Green	0.28	0.28	0.28	0.28	0.28	0.28	0.11	0.47	0.47	0.14	0.49	0.49
Sat Flow, veh/h	662	2136	1243	926	2424	1006	1730	5066	1328	1744	5106	1340
Grp Volume(v), veh/h	55	221	209	131	414	386	289	1060	191	394	2285	336
Grp Sat Flow(s),veh/h/ln	662	1777	1602	926	1777	1653	1730	1689	1328	1744	1702	1340
Q Serve(g_s), s	9.8	15.3	16.1	20.4	32.6	32.8	17.0	21.2	13.5	16.8	62.1	25.7
Cycle Q Clear(g_c), s	42.6	15.3	16.1	36.5	32.6	32.8	17.0	21.2	13.5	16.8	62.1	25.7
Prop In Lane	1.00		0.78	1.00		0.61	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	91	505	455	212	505	470	252	2356	618	427	2495	655
V/C Ratio(X)	0.60	0.44	0.46	0.62	0.82	0.82	1.14	0.45	0.31	0.92	0.92	0.51
Avail Cap(c_a), veh/h	91	505	455	212	505	470	252	2356	618	630	2495	655
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	71.1	43.9	44.2	59.2	50.1	50.2	50.3	27.1	25.1	22.9	35.5	26.2
Incr Delay (d2), s/veh	15.6	1.3	1.5	7.8	11.5	12.5	101.3	0.6	1.3	14.5	6.7	2.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.6	7.4	7.1	5.5	17.1	16.1	17.2	9.4	4.8	9.1	28.7	9.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	86.7	45.2	45.8	67.0	61.6	62.6	151.6	27.8	26.4	37.4	42.2	29.0
LnGrp LOS	F	D	D	E	E	E	F	C	C	D	D	C
Approach Vol, veh/h		485			931			1540			3015	
Approach Delay, s/veh		50.1			62.8			50.8			40.1	
Approach LOS		D			E			D			D	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	20.0	80.0		50.0	23.5	76.5		50.0
Change Period (Y+Rc), s	3.0	* 6.7		7.4	3.0	* 6.7		7.4
Max Green Setting (Gmax), s	17.0	* 73		42.6	38.0	* 52		42.6
Max Q Clear Time (g_c+I1), s	19.0	64.1		38.5	18.8	23.2		44.6
Green Ext Time (p_c), s	0.0	9.1		3.1	1.7	18.3		0.0

Intersection Summary	
HCM 6th Ctrl Delay	47.2
HCM 6th LOS	D

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	152	636	137	63	790	23	90	44	53	22	31	92
Future Volume (veh/h)	152	636	137	63	790	23	90	44	53	22	31	92
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1802	1841	1589	1816	1856	1602	1715	1752	1512	1773	1811	1563
Adj Flow Rate, veh/h	162	677	146	67	840	24	96	47	56	23	33	98
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	4	4	4	3	3	3	10	10	10	6	6	6
Cap, veh/h	413	1825	393	429	2233	64	227	139	166	255	77	228
Arrive On Green	0.64	0.64	0.64	0.64	0.64	0.64	0.19	0.19	0.19	0.19	0.19	0.19
Sat Flow, veh/h	617	2862	617	646	3500	100	1154	728	868	1224	402	1194
Grp Volume(v), veh/h	162	413	410	67	423	441	96	0	103	23	0	131
Grp Sat Flow(s),veh/h/ln	617	1749	1730	646	1763	1838	1154	0	1596	1224	0	1596
Q Serve(g_s), s	13.6	9.0	9.0	4.4	9.1	9.1	6.4	0.0	4.5	1.3	0.0	5.8
Cycle Q Clear(g_c), s	22.7	9.0	9.0	13.4	9.1	9.1	12.2	0.0	4.5	5.8	0.0	5.8
Prop In Lane	1.00		0.36	1.00		0.05	1.00		0.54	1.00		0.75
Lane Grp Cap(c), veh/h	413	1115	1103	429	1124	1172	227	0	305	255	0	305
V/C Ratio(X)	0.39	0.37	0.37	0.16	0.38	0.38	0.42	0.00	0.34	0.09	0.00	0.43
Avail Cap(c_a), veh/h	413	1115	1103	429	1124	1172	504	0	688	550	0	688
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	12.3	6.9	6.9	10.0	6.9	6.9	33.9	0.0	28.0	30.5	0.0	28.5
Incr Delay (d2), s/veh	2.8	0.9	1.0	0.8	1.0	0.9	1.3	0.0	0.7	0.2	0.0	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.4	4.0	4.0	0.8	4.1	4.3	2.0	0.0	1.9	0.4	0.0	2.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.1	7.8	7.8	10.8	7.9	7.8	35.1	0.0	28.6	30.6	0.0	29.5
LnGrp LOS	B	A	A	B	A	A	D	A	C	C	A	C
Approach Vol, veh/h		985			931			199			154	
Approach Delay, s/veh		9.0			8.1			31.8			29.7	
Approach LOS		A			A			C			C	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		57.2		22.8		57.2		22.8				
Change Period (Y+Rc), s		* 6.2		7.5		* 6.2		7.5				
Max Green Setting (Gmax), s		* 32		34.5		* 32		34.5				
Max Q Clear Time (g_c+I1), s		24.7		14.2		15.4		7.8				
Green Ext Time (p_c), s		4.1		1.1		6.6		1.0				

Intersection Summary		
HCM 6th Ctrl Delay		12.0
HCM 6th LOS		B

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	82	369	62	52	595	83	69	106	65	254	282	300
Future Volume (veh/h)	82	369	62	52	595	83	69	106	65	254	282	300
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1787	1826	1576	1816	1856	1602	1816	1856	1602	1845	1885	1627
Adj Flow Rate, veh/h	91	410	69	58	661	92	77	118	72	282	313	333
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	5	5	5	3	3	3	3	3	3	1	1	1
Cap, veh/h	324	1488	249	449	1555	216	204	739	422	430	612	546
Arrive On Green	0.50	0.50	0.50	0.50	0.50	0.50	0.34	0.34	0.34	0.34	0.34	0.34
Sat Flow, veh/h	679	2974	497	889	3108	432	762	2161	1235	1177	1791	1598
Grp Volume(v), veh/h	91	238	241	58	375	378	77	95	95	282	313	333
Grp Sat Flow(s),veh/h/ln	679	1735	1736	889	1763	1778	762	1763	1633	1177	1791	1598
Q Serve(g_s), s	9.3	7.5	7.7	3.8	12.8	12.8	8.9	3.6	3.9	20.9	13.2	16.5
Cycle Q Clear(g_c), s	22.2	7.5	7.7	11.5	12.8	12.8	25.3	3.6	3.9	24.8	13.2	16.5
Prop In Lane	1.00		0.29	1.00		0.24	1.00		0.76	1.00		1.00
Lane Grp Cap(c), veh/h	324	868	869	449	882	889	204	603	558	430	612	546
V/C Ratio(X)	0.28	0.27	0.28	0.13	0.42	0.43	0.38	0.16	0.17	0.66	0.51	0.61
Avail Cap(c_a), veh/h	324	868	869	449	882	889	277	770	713	542	782	698
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	22.1	13.8	13.8	17.1	15.1	15.1	36.5	21.7	21.8	30.5	24.9	26.0
Incr Delay (d2), s/veh	2.2	0.8	0.8	0.6	1.5	1.5	1.1	0.1	0.1	1.9	0.7	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.8	3.5	3.6	1.0	6.1	6.2	1.8	1.6	1.7	6.6	6.3	7.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.3	14.5	14.6	17.7	16.6	16.6	37.7	21.9	22.0	32.4	25.6	27.1
LnGrp LOS	C	B	B	B	B	B	D	C	C	C	C	C
Approach Vol, veh/h		570			811			267			928	
Approach Delay, s/veh		16.1			16.6			26.5			28.2	
Approach LOS		B			B			C			C	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		55.0		40.0		55.0		40.0				
Change Period (Y+Rc), s		7.5		7.5		7.5		7.5				
Max Green Setting (Gmax), s		38.5		41.5		38.5		41.5				
Max Q Clear Time (g_c+I1), s		24.2		27.3		14.8		26.8				
Green Ext Time (p_c), s		3.7		1.6		6.5		5.7				

Intersection Summary		
HCM 6th Ctrl Delay		21.7
HCM 6th LOS		C

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	193	49	745	222	73	570
Future Volume (veh/h)	193	49	745	222	73	570
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No			No
Adj Sat Flow, veh/h/ln	1831	1614	1870	1614	1831	1870
Adj Flow Rate, veh/h	208	53	801	239	78	613
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	255	200	1934	577	393	2548
Arrive On Green	0.15	0.15	0.72	0.72	0.72	0.72
Sat Flow, veh/h	1744	1368	2791	805	531	3647
Grp Volume(v), veh/h	208	53	528	512	78	613
Grp Sat Flow(s),veh/h/ln	1744	1368	1777	1726	531	1777
Q Serve(g_s), s	11.0	3.3	11.4	11.4	6.6	5.6
Cycle Q Clear(g_c), s	11.0	3.3	11.4	11.4	17.9	5.6
Prop In Lane	1.00	1.00		0.47	1.00	
Lane Grp Cap(c), veh/h	255	200	1274	1237	393	2548
V/C Ratio(X)	0.82	0.26	0.41	0.41	0.20	0.24
Avail Cap(c_a), veh/h	486	382	1274	1237	393	2548
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	39.3	36.0	5.4	5.4	9.0	4.6
Incr Delay (d2), s/veh	6.3	0.7	1.0	1.0	1.1	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.5	1.2	5.1	4.9	1.0	2.4
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	45.6	36.7	6.4	6.4	10.2	4.8
LnGrp LOS	D	D	A	A	B	A
Approach Vol, veh/h	261		1040			691
Approach Delay, s/veh	43.8		6.4			5.4
Approach LOS	D		A			A

Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		74.6		20.4		74.6
Change Period (Y+Rc), s		6.5		6.5		6.5
Max Green Setting (Gmax), s		55.5		26.5		55.5
Max Q Clear Time (g_c+I1), s		19.9		13.0		13.4
Green Ext Time (p_c), s		7.2		0.9		11.0

Intersection Summary		
HCM 6th Ctrl Delay		11.0
HCM 6th LOS		B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	68	1042	34	56	1453	815	19	59	34	586	75	90
Future Volume (veh/h)	68	1042	34	56	1453	815	19	59	34	586	75	90
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1845	1885	1627	1845	1885	1627	1845	1885	1627	1845	1885	1627
Adj Flow Rate, veh/h	72	1097	36	59	1529	858	20	62	36	617	79	95
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	1	1	1
Cap, veh/h	84	2014	776	231	2014	1052	144	92	53	683	378	276
Arrive On Green	0.56	0.56	0.56	0.56	0.56	0.56	0.08	0.08	0.08	0.20	0.20	0.20
Sat Flow, veh/h	145	3582	1379	490	3582	1379	1758	1119	650	3410	1885	1379
Grp Volume(v), veh/h	72	1097	36	59	1529	858	20	0	98	617	79	95
Grp Sat Flow(s),veh/h/ln	145	1791	1379	490	1791	1379	1758	0	1768	1705	1885	1379
Q Serve(g_s), s	34.3	28.0	1.7	12.5	47.3	56.6	1.5	0.0	7.8	25.6	5.1	8.6
Cycle Q Clear(g_c), s	81.6	28.0	1.7	40.5	47.3	56.6	1.5	0.0	7.8	25.6	5.1	8.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.37	1.00		1.00
Lane Grp Cap(c), veh/h	84	2014	776	231	2014	1052	144	0	145	683	378	276
V/C Ratio(X)	0.86	0.54	0.05	0.26	0.76	0.82	0.14	0.00	0.68	0.90	0.21	0.34
Avail Cap(c_a), veh/h	84	2014	776	231	2014	1052	376	0	378	729	403	295
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	64.3	20.0	14.3	32.8	24.2	10.8	61.8	0.0	64.7	56.6	48.4	49.8
Incr Delay (d2), s/veh	64.5	1.1	0.1	2.7	2.7	7.0	0.4	0.0	5.4	14.1	0.3	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.3	13.0	0.6	1.8	22.2	35.3	0.7	0.0	3.9	13.0	2.6	3.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	128.8	21.1	14.4	35.5	27.0	17.8	62.2	0.0	70.1	70.7	48.7	50.5
LnGrp LOS	F	C	B	D	C	B	E	A	E	E	D	D
Approach Vol, veh/h		1205			2446			118			791	
Approach Delay, s/veh		27.3			24.0			68.7			66.1	
Approach LOS		C			C			E			E	

Timer - Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		89.1		19.4		89.1		36.6
Change Period (Y+Rc), s		7.5		7.5		7.5		7.5
Max Green Setting (Gmax), s		60.5		31.0		60.5		31.0
Max Q Clear Time (g_c+I1), s		83.6		9.8		58.6		27.6
Green Ext Time (p_c), s		0.0		0.6		1.8		1.4

Intersection Summary	
HCM 6th Ctrl Delay	33.3
HCM 6th LOS	C

Intersection	
Intersection Delay, s/veh	8.7
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	89	159	8	1	73	3	4	0	0	8	3	58
Future Vol, veh/h	89	159	8	1	73	3	4	0	0	8	3	58
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles, %	3	3	3	4	4	4	0	0	0	1	1	1
Mvmt Flow	95	169	9	1	78	3	4	0	0	9	3	62
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	9.2	7.9	8	7.6
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	100%	35%	1%	12%
Vol Thru, %	0%	62%	95%	4%
Vol Right, %	0%	3%	4%	84%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	4	256	77	69
LT Vol	4	89	1	8
Through Vol	0	159	73	3
RT Vol	0	8	3	58
Lane Flow Rate	4	272	82	73
Geometry Grp	1	1	1	1
Degree of Util (X)	0.006	0.318	0.1	0.086
Departure Headway (Hd)	4.981	4.2	4.397	4.233
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	722	847	818	851
Service Time	2.989	2.269	2.405	2.236
HCM Lane V/C Ratio	0.006	0.321	0.1	0.086
HCM Control Delay	8	9.2	7.9	7.6
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0	1.4	0.3	0.3

Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	53	549	14	19	945	29	12	6	22	25	2	64
Future Vol, veh/h	53	549	14	19	945	29	12	6	22	25	2	64
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	300	-	-	200	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	6	6	6	6	6	6	3	3	3	3	3	3
Mvmt Flow	55	572	15	20	984	30	13	6	23	26	2	67

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1014	0	0	587	0	0	1223	1744	294	1438	1736	507
Stage 1	-	-	-	-	-	-	690	690	-	1039	1039	-
Stage 2	-	-	-	-	-	-	533	1054	-	399	697	-
Critical Hdwy	4.22	-	-	4.22	-	-	7.56	6.56	6.96	7.56	6.56	6.96
Critical Hdwy Stg 1	-	-	-	-	-	-	6.56	5.56	-	6.56	5.56	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.56	5.56	-	6.56	5.56	-
Follow-up Hdwy	2.26	-	-	2.26	-	-	3.53	4.03	3.33	3.53	4.03	3.33
Pot Cap-1 Maneuver	656	-	-	957	-	-	134	85	699	93	86	508
Stage 1	-	-	-	-	-	-	399	442	-	245	304	-
Stage 2	-	-	-	-	-	-	496	299	-	596	438	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	656	-	-	957	-	-	105	76	699	78	77	508
Mov Cap-2 Maneuver	-	-	-	-	-	-	105	76	-	78	77	-
Stage 1	-	-	-	-	-	-	365	405	-	224	298	-
Stage 2	-	-	-	-	-	-	419	293	-	520	401	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.9	0.2	31.3	40.4
HCM LOS			D	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	178	656	-	-	957	-	-	193
HCM Lane V/C Ratio	0.234	0.084	-	-	0.021	-	-	0.491
HCM Control Delay (s)	31.3	11	-	-	8.8	-	-	40.4
HCM Lane LOS	D	B	-	-	A	-	-	E
HCM 95th %tile Q(veh)	0.9	0.3	-	-	0.1	-	-	2.4

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL	SWR
Lane Configurations										
Traffic Vol, veh/h	12	674	34	45	600	3	14	0	0	4
Future Vol, veh/h	12	674	34	45	600	3	14	0	0	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	-	None
Storage Length	-	-	-	150	-	-	-	0	0	-
Veh in Median Storage, #	-	0	-	-	0	-	0	-	0	-
Grade, %	-	0	-	-	0	-	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	13	733	37	49	652	3	15	0	0	4

Major/Minor	Major1			Major2			Minor1		Minor2	
Conflicting Flow All	655	0	0	770	0	0	1202	385	1145	328
Stage 1	-	-	-	-	-	-	778	-	752	-
Stage 2	-	-	-	-	-	-	424	-	393	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.94	7.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	-	6.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	-	6.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	3.32	3.52	3.32
Pot Cap-1 Maneuver	928	-	-	840	-	-	140	613	154	668
Stage 1	-	-	-	-	-	-	355	-	368	-
Stage 2	-	-	-	-	-	-	578	-	603	-
Platoon blocked, %		-	-		-	-				
Mov Cap-1 Maneuver	928	-	-	840	-	-	130	613	137	668
Mov Cap-2 Maneuver	-	-	-	-	-	-	130	-	137	-
Stage 1	-	-	-	-	-	-	346	-	359	-
Stage 2	-	-	-	-	-	-	541	-	560	-

Approach	EB	WB	NB	SW
HCM Control Delay, s	0.2	0.7	11.2	14.7
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SWLn1
Capacity (veh/h)	613	928	-	-	840	-	-	376
HCM Lane V/C Ratio	0.048	0.014	-	-	0.058	-	-	0.014
HCM Control Delay (s)	11.2	8.9	0.1	-	9.6	-	-	14.7
HCM Lane LOS	B	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	0.2	0	-	-	0.2	-	-	0

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	14	1	27	1	0	1	41	869	3	0	750	10
Future Vol, veh/h	14	1	27	1	0	1	41	869	3	0	750	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	500	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	7	7	7	0	0	0	2	2	2	1	1	1
Mvmt Flow	15	1	28	1	0	1	43	915	3	0	789	11

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1339	1799	400	1398	1803	459	800	0	0	918	0	0
Stage 1	795	795	-	1003	1003	-	-	-	-	-	-	-
Stage 2	544	1004	-	395	800	-	-	-	-	-	-	-
Critical Hdwy	7.64	6.64	7.04	7.5	6.5	6.9	4.14	-	-	4.12	-	-
Critical Hdwy Stg 1	6.64	5.64	-	6.5	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.64	5.64	-	6.5	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.57	4.07	3.37	3.5	4	3.3	2.22	-	-	2.21	-	-
Pot Cap-1 Maneuver	106	75	586	102	80	554	819	-	-	745	-	-
Stage 1	336	386	-	263	322	-	-	-	-	-	-	-
Stage 2	478	307	-	607	400	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	102	71	586	92	76	554	819	-	-	745	-	-
Mov Cap-2 Maneuver	102	71	-	92	76	-	-	-	-	-	-	-
Stage 1	318	386	-	249	305	-	-	-	-	-	-	-
Stage 2	452	291	-	576	400	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	26.3	28.1	0.4	0
HCM LOS	D	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	819	-	-	213	158	745	-	-
HCM Lane V/C Ratio	0.053	-	-	0.208	0.013	-	-	-
HCM Control Delay (s)	9.6	-	-	26.3	28.1	0	-	-
HCM Lane LOS	A	-	-	D	D	A	-	-
HCM 95th %tile Q(veh)	0.2	-	-	0.8	0	0	-	-

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	9	0	15	15	0	15	29	881	16	20	806	16
Future Vol, veh/h	9	0	15	15	0	15	29	881	16	20	806	16
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	300	-	-	300	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	10	0	16	16	0	16	32	958	17	22	876	17

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1472	1968	447	1513	1968	488	893	0	0	975	0	0
Stage 1	929	929	-	1031	1031	-	-	-	-	-	-	-
Stage 2	543	1039	-	482	937	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	88	62	559	82	62	526	755	-	-	703	-	-
Stage 1	288	344	-	249	309	-	-	-	-	-	-	-
Stage 2	492	306	-	534	342	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	81	58	559	75	58	526	755	-	-	703	-	-
Mov Cap-2 Maneuver	81	58	-	75	58	-	-	-	-	-	-	-
Stage 1	276	333	-	239	296	-	-	-	-	-	-	-
Stage 2	457	293	-	502	331	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	29.3	41.4	0.3	0.2
HCM LOS	D	E		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	755	-	-	174	131	703	-	-
HCM Lane V/C Ratio	0.042	-	-	0.15	0.249	0.031	-	-
HCM Control Delay (s)	10	-	-	29.3	41.4	10.3	-	-
HCM Lane LOS	A	-	-	D	E	B	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.5	0.9	0.1	-	-

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	55	430	131	800	289	1060	191	394	2285	336
v/c Ratio	0.90	0.45	0.67	0.85	1.09	0.49	0.29	0.84	0.92	0.51
Control Delay	140.7	37.2	66.6	58.7	124.3	33.4	5.4	37.0	42.8	24.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	140.7	37.2	66.6	58.7	124.3	33.4	5.4	37.0	42.8	24.1
Queue Length 50th (m)	16.3	46.3	36.1	117.7	~92.3	89.0	0.0	66.0	238.9	57.3
Queue Length 95th (m)	#46.5	63.3	62.9	144.4	#159.3	116.3	17.7	104.4	262.4	87.8
Internal Link Dist (m)		126.7		96.8		217.9			205.6	
Turn Bay Length (m)	40.0		60.0		110.0		90.0	110.0		150.0
Base Capacity (vph)	64	996	204	979	266	2167	662	572	2484	662
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.86	0.43	0.64	0.82	1.09	0.49	0.29	0.69	0.92	0.51

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	162	823	67	864	96	103	23	131
v/c Ratio	0.47	0.38	0.18	0.39	0.43	0.29	0.10	0.36
Control Delay	13.7	7.5	8.0	7.9	34.8	16.4	27.0	17.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.7	7.5	8.0	7.9	34.8	16.4	27.0	17.9
Queue Length 50th (m)	11.7	27.2	3.8	30.3	13.8	6.4	3.1	9.0
Queue Length 95th (m)	31.2	42.4	10.7	46.3	27.3	18.8	9.0	23.1
Internal Link Dist (m)		66.9		389.9		79.7		64.4
Turn Bay Length (m)	40.0		15.0		15.0		15.0	
Base Capacity (vph)	344	2153	367	2213	490	715	522	723
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	0.47	0.38	0.18	0.39	0.20	0.14	0.04	0.18

Intersection Summary

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	91	479	58	753	77	190	282	646
v/c Ratio	0.30	0.27	0.13	0.41	0.45	0.18	0.77	0.58
Control Delay	19.2	13.7	10.0	10.7	32.3	12.9	42.9	22.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.2	13.7	10.0	10.7	32.3	12.9	42.9	22.7
Queue Length 50th (m)	9.5	24.3	3.1	40.7	11.7	8.3	48.4	43.0
Queue Length 95th (m)	26.3	43.1	12.2	73.1	22.1	13.6	67.3	50.4
Internal Link Dist (m)		305.1		325.3		80.8		164.2
Turn Bay Length (m)	70.0		60.0		60.0		60.0	
Base Capacity (vph)	306	1787	455	1827	238	1484	508	1512
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	0.13	0.41	0.32	0.13	0.56	0.43

Intersection Summary

Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Group Flow (vph)	208	53	1040	78	613
v/c Ratio	0.69	0.19	0.44	0.25	0.25
Control Delay	47.8	10.3	7.3	10.1	6.8
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	47.8	10.3	7.3	10.1	6.8
Queue Length 50th (m)	38.0	0.0	37.8	7.4	30.3
Queue Length 95th (m)	57.5	9.4	62.4	m19.6	30.2
Internal Link Dist (m)	210.5		116.0		76.9
Turn Bay Length (m)		75.0		50.0	
Base Capacity (vph)	483	419	2373	310	2434
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	0.43	0.13	0.44	0.25	0.25

Intersection Summary

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

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	SBR
Lane Group Flow (vph)	72	1097	36	59	1529	858	20	98	617	79	95
v/c Ratio	1.44	0.61	0.05	0.39	0.85	0.71	0.12	0.54	0.72	0.17	0.23
Control Delay	310.1	29.4	0.1	35.9	38.4	6.1	61.1	62.2	54.3	41.3	8.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	310.1	29.4	0.1	35.9	38.4	6.1	61.1	62.2	54.3	41.3	8.0
Queue Length 50th (m)	~29.0	120.1	0.0	10.6	203.0	26.9	5.7	23.7	88.6	18.8	0.0
Queue Length 95th (m)	#55.1	172.4	0.0	30.1	#303.3	76.7	14.2	42.4	101.9	30.9	13.8
Internal Link Dist (m)		211.6			225.4			53.9		148.6	
Turn Bay Length (m)	50.0		35.0	40.0		40.0	30.0		40.0		
Base Capacity (vph)	50	1789	735	152	1789	1202	374	394	868	481	423
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.44	0.61	0.05	0.39	0.85	0.71	0.05	0.25	0.71	0.16	0.22

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

APPENDIX

D DRAINAGE AND STORMWATER MANAGEMENT REPORT

Technical Memorandum

To:	Rory O'Sullivan, P.Eng.	**Date:**	April 23, 2021
From:	Shahrzad Samani, P.Eng.	**Project No:**	19M-00836-03
	Ray Zhao, E.I.T.		
Subject:	**Rathburn Road. & Ponytrail Drive Storm Sewer Capacity Analysis - FINAL**		

1 Introduction

The City of Mississauga (the City) retained WSP Canada Inc. to build a cycle track in the boulevard along Ponytrail Drive and Rathburn Road East between Dixie Road and Ponytrail Drive and a bike lane (on-street) along Rathburn Road East, east of Ponytrail Drive. The work is part of the City's 2021 and 2022 Annual Resurfacing program which provides an opportunity to implement the identified cycling facilities on these segments.

This technical memorandum documents the drainage and stormwater (SWM) requirements review and design for the proposed roadway improvements and outlines the required standards / guidelines to be followed to ensure the appropriate quality and quantity stormwater management controls are adhered to during detail design. The assessment will incorporate the recommendations of the storm sewer inspection and LID assessment. The analysis includes a review of background information / related studies, internal and external drainage catchment delineations, quantity control, quality control, erosion control, water balance, existing storm sewer capacity analysis and proposed storm sewer replacement recommendations.

1.1 Background Information

The relevant background information includes:

- City of Mississauga Storm Drainage Plan (Storm File 2-26)
- Mississauga STM_Key Map_Fieldgate Drive Plan & Profile Drawing Set (Drawing No. C13684, C13685, C13688, C13690, C13691, C13692, C13697, C13698, C13699, C13713, C13737, C15279, C13684, C13685, C13686, C13687, C13688, C13690, C13693, C13697, C13698, C13699, C13700, C13701, C13702, C13703, C13704, C13716, C13729, C13737, C16712, C16735, C16907, C16908, C18591, C18592, C18593, C18594, C18595, C18596, C19244, C19932, C19933, C20817, C26978, C26979)
- Geotechnical Investigation for the Proposed Rockwood Village Development in Mississauga by Golder Associates for Marshall Macklin Monaghan Limited (73-122, 226)

- Springbrook Tertiary Plan Area Stormwater Management Report prepared by WSP Canada Inc. in September, 2020
- City of Mississauga Development Requirements Manual, Transportation and Works Department September 2016
- Toronto and Region Conservation Authority Stormwater Management Criteria August 2012
- Ministry of Environment, Conservation and Parks Stormwater Management Planning and Design Manual 2003
- Aerial Imagery (Bing Maps)
- As-built drawings
- Topographic Map

2 City of Mississauga Stormwater Management and Storm Sewer Design Criteria

The City of Mississauga Development Manual outlines the stormwater management criteria and storm sewer design requirements. The SWM criteria are summarized below:

- **Water Quantity Control:** Control post-development peak flows to pre-development levels for all return period storms (i.e. 2, 5, 10, 25, 50 & 100 year).
- **Water Quality Control:** Enhanced Level of Protection (80% TSS removal) as per the latest MECP SWMPD Manual is required for all new paved areas.
- **Stormwater Runoff Volume Reduction (Erosion Control & Water Balance):** A minimum on-site retention of 5 mm is required by way of infiltration, evapotranspiration or re-use for new paved area in accordance to the City of Mississauga guidelines.

The guidelines specify that the design flow is to be calculated using the Rational Method. Runoff coefficients are listed below in **Table 2-1**. Runoff coefficients for existing areas within the site as well as external areas are taken from the "City of Mississauga Storm Drainage Plan (Storm File 2-26)". A coefficient of 0.90 has been used for the proposed new cycle track areas.

Table 2-1: Coefficient of Imperviousness Table

Land Use	Recommended Coefficient
Residential – single family, semi-detached	0.55
Compact or dense housing (e.g. townhouses)	0.65
High-rise residential	0.90
Industrial and Commercial	0.90
Neighbourhood Park	0.30
Permeable Pavements	0.50
Sodded Area	0.25
All Other Surfaces	0.90

The rainfall intensity is based on an Initial Time of Concentration (T_c) of 15 minutes from the City of Mississauga design guidelines. The City's rainfall intensity parameters for all storm events are shown in **Table 2-2** below.

Table 2-2: Design Storms IDF Parameters

Event	A	B	C
2-yr	610	4.6	0.78
5-yr	820	4.6	0.78
10-yr	1010	4.6	0.78
25-yr	1160	4.6	0.78
50-yr	1300	4.7	0.78
100-yr	1450	4.9	0.78

Manning's formula is used to determine the capacity of the storm sewers. The guidelines recommend a Manning's n of 0.013 for concrete and PVC pipes. Using the Manning's formula, all storm sewers were evaluated under the following criteria:

- Maximum capacity of pipe flowing full (90% is considered in this memo)
- Minimum velocity of 0.75 m/s
- Maximum design velocity of 4.0 m/s
- Minimum size of 300 mm (for an on-street storm sewer)

3 Water Quantity Control

Post development peak runoff flows are required to be controlled to pre-development conditions for all return period storms (i.e. 2 year to 100 year event). The Modified Rational method has been used to calculate the required storage volume needed for each of the catchments. Four catchments (Catchment 100, 200, 300 and 400) have been delineated as shown in **Exhibit 1** based on storm sewer outlets and overland flow patterns for the study limits. Note that under proposed condition, no overland flow pattern will be changed. The only difference is the added impervious area from the additional bike lanes throughout the project limits. The overall runoff coefficients for catchment 100 and 200 have increased slightly due to the additional impervious area. The existing land use break down, proposed land use break down as well as a comparison between existing and proposed area breakdowns are shown below in **Table 3-1**, **Table 3-2** and **Table 3-3**.

Table 3-1: Existing Land-Use Area Breakdown

Catchment	Land-Use	Area (ha)	% Coverage	C Value
100	Impervious Area	1.63	72%	0.90
	Grassed Area	0.64	28%	0.25
	Total	2.27	100%	0.72
200	Impervious Area	2.98	77%	0.90
	Grassed Area	0.87	23%	0.25
	Total	3.85	100%	0.75
300	Impervious Area	0.66	78%	0.90
	Grassed Area	0.18	22%	0.25
	Total	0.84	100%	0.76
400	Impervious Area	0.52	87%	0.90
	Grassed Area	0.08	13%	0.25
	Total	0.60	100%	0.81

Table 3-2: Proposed Land-Use Area Breakdown

Catchment ID	Land-Use	Area (ha)	% Coverage	C Value
100	Impervious Area	1.89	83%	0.90
	Grassed Area	0.38	17%	0.25
	Total	2.27	100%	0.79
200	Impervious Area	3.30	86%	0.90
	Grassed Area	0.56	14%	0.25
	Total	3.85	100%	0.81
300	Impervious Area	0.66	78%	0.90
	Grassed Area	0.18	22%	0.25
	Total	0.84	100%	0.76
400	Impervious Area	0.52	87%	0.90
	Grassed Area	0.08	13%	0.25
	Total	0.60	100%	0.81

Table 3-3: Existing and Proposed Area Breakdown Comparison

Catchment ID	Land-Use	Existing Area (ha)	Proposed Area (ha)	% Changes
100	Impervious Area	1.63	1.89	16%
	Grassed Area	0.64	0.38	-41%
	Total	2.27	2.27	0%
200	Impervious Area	2.98	3.30	11%
	Grassed Area	0.87	0.56	-36%
	Total	3.85	3.85	0%
300	Impervious Area	0.66	0.66	0%
	Grassed Area	0.18	0.18	0%
	Total	0.84	0.84	0%
400	Impervious Area	0.52	0.52	0%
	Grassed Area	0.08	0.08	0%
	Total	0.60	0.60	0%

Various external catchments have been delineated where the surrounding residential communities contribute flow to the municipal roadway storm sewer branches. However, the proposed water quantity control measures should only be responsible for controlling the flows generated by the roadway (added track lanes impervious area) within the study limits. Therefore, the external area flows are not included in the total catchment flows. Modified rational method has been used to calculate the pre-development flows, post-development flows as well as storage volume required to match post-development condition to pre-development conditions. The pre-development and post-development flow rates are shown in **Table 3-4**. The design sheets can be found in **Appendix A**.

Table 3-4: Pre-Development and Post-Development Peak Flow Rates

Catchment ID	Storm Event	Pre-Development Flow (m^3/s)	Post-Development Flow (m^3/s)
100	2 year	0.27	0.30
	5 year	0.36	0.40
	10 year	0.45	0.49
	25 year	0.57	0.62
	50 year	0.69	0.76
	100 year	0.79	0.88
200	2 year	0.48	0.52
	5 year	0.65	0.69
	10 year	0.80	0.86
	25 year	1.01	1.08
	50 year	1.23	1.32
	100 year	1.42	1.52
300	2 year	0.11	0.11
	5 year	0.14	0.14
	10 year	0.18	0.18
	25 year	0.22	0.22
	50 year	0.27	0.27
	100 year	0.31	0.31
400	2 year	0.08	0.08
	5 year	0.11	0.11
	10 year	0.13	0.13
	25 year	0.17	0.17
	50 year	0.21	0.21
	100 year	0.24	0.24

The required maximum storage (for 100 year storm event) for each catchment is listed below:

- Catchment 100: 62 m^3
- Catchment 200: 76 m^3
- Catchment 300: 0 m^3
- Catchment 400: 0 m^3

Catchment 100 and 200 require 62 and 76 m^3 of storage volume respectively. Since there is no imperviousness area increase or any other changes to catchment 300 and 400, no quantity control measures are required.

4 Water Quality Control

The MOECC (now MECP) Stormwater Management Planning and Design Manual (SWMPDM) provides technical and procedural guidance for the planning, design and review of SWM practices. In particular, the manual regulates water quality treatment levels corresponding to the removal of a percentage of total suspended solids (TSS) from the runoff prior to discharging to the receiving water body.

The stormwater management criterion stipulates that all watercourses and water bodies within TRCA's jurisdiction are classified as requiring an Enhanced level of protection (Level 1). Level 1 water quality protection is equivalent to 80% TSS removal on an average annual basis shall be provided through stand-alone measures or treatment trains. To minimize thermal impacts, preventative measures (i.e. LID practices) and mitigation measures should be applied.

Water quality control calculations conducted assume that all water quality treatment for all the newly added paved area is to be provided by infiltration facilities (i.e. LID features). CB Shields (catch basin baffle), Oil and grit separator (OGS units) and level spreaders / inlet sumps should be considered as options available as water quality control at places where LID features aren't feasible and to be explored further as part of the detail design.

As per Table 3.2 of the MOECC SWMPDM, an infiltration volume of 10.1 m^3 is required to provide 80% TSS removal for the newly added impervious area of 0.26 ha for Catchment 100 and an infiltration volume of 12.5 m^3 is required to provide 80% TSS removal for the newly added impervious area of 0.31 ha for Catchment 200. There is no proposed changes to the roadway for Catchments 300 and 400 with no new impervious area added. Therefore, no water quality treatment is needed for Catchments 300 and 400. The design sheets are included in **Appendix A**.

5 Erosion Control and Water Balance (Stormwater Runoff Volume Reduction)

Stormwater runoff from developed sites impacts streams and watercourses by introducing erosive forces during frequent storms. In addition, the alteration of the hydrologic regime from raw land reduces the amount of water that would naturally evaporate, transpire or infiltrate, essentially generating more runoff volume. These impacts are the target of the requirement outlined within this section with the goal being to reduce stormwater runoff volume from developing sites. Practices implemented to address this criterion may assist in mitigating erosion and water balance to address the City of Mississauga and Conservation Authority requirements.

The first 5 mm of runoff shall be retained on-site and managed by way of infiltration, evapotranspiration or re-use. It is assumed that all landscaped areas will retain at least 5 mm of rainwater prior to runoff generation due to shallow depression storage and wetting, with consequent evaporation. The volume of runoff during a 5 mm storm event are listed below for each catchment:

- Catchment 100: 12.8 m^3
- Catchment 200: 15.6 m^3
- Catchment 300: 0 m^3
- Catchment 400: 0 m^3

There are no proposed changes to the roadway for catchments 300 and 400 with no new impervious area added. Therefore, no stormwater runoff volume reduction is needed for catchments 300 and 400. Note that these volumes are greater than the water quality treatment volume requirements and are the governing factor of the stormwater retention on site for catchments 100 and 200. **Table 5-1** provides a summary of all SWM criteria and requirements for the project site with the recommended measures. Note that more information regarding the LID feasibilities can be found in the "Rathburn Road & Ponytrail Drive Low Impact Development Assessment" memo.

Table 5-1: Summary of all stormwater management criteria and recommended measures

Catchment ID	Increase in Impervious area under Proposed Condition (m^2)	Water Quantity Required Storage (m^3)	Water Quality Required Treatment Volume (m^3)	Stormwater volume runoff reduction (m^3)	Recommended Measures
100	0.26	62	10.1	12.8	Surface and/or underground storage options to be further explored during detail design.
200	0.32	76	12.5	15.6	Infiltration gallery, infiltration chamber or bioretention units can provide up to 400 m^3 of storage which satisfies all criteria.
300	0	0	0	0	N/A
400	0	0	0	0	N/A

6 Storm Sewer Capacity Analysis

There are multiple storm sewer systems in the study area that discharge to various locations as shown in **Exhibit 2**. There are five main outlets for the study area, as summarized below:

1 Outfall MH-31 located at the intersection of Rathburn Rd. E and Fieldgate Dr.
2 Outfall MH-50 located at the intersection of Ponytrail Dr. and Maple Ridge Dr.
3 Outfall MH-122 located around 65 m north of the intersection of Ponytrail Dr. and Maple Ridge Dr.
4 Outfall MH-169 located at the intersection of Rathburn Rd. E and south exit of Garnetwood Chase.
5 Outfall MH-181 located at the intersection of Rathburn Rd. E and north exit of Garnetwood Chase.

The calculations are created based on the available as-built drawing sets which contains the catchment delineations along with runoff coefficients. Note that the coefficients taken from the as-built drawings are slightly different compare to the City of Mississauga guideline values, but the difference is minimal and won't affect the overall results. The capacity of the storm sewer system was computed using the standard City of Mississauga storm sewer design sheet, following the methodology outlined in **Section 2**.

Sewer lengths, sizes, and slopes were obtained from the as-built drawing records. Information regarding the storm sewer material isn't available and concrete has been used as an assumption with a Manning's n of 0.013. The rainfall intensity values were taken from as-built design sheets. 63.5 mm/hr (approximate 2-year storm event) has been assumed for the segments with missing data as it is an average intensity for the runoff calculations.

A SewerGems model was built to analyze the existing storm system and information was then entered into the storm sewer design sheet showing input parameters and detailed calculations. The design sheet can be found in Appendix B and storm sewer profiles showing the HGL and EGL are shown in **Appendix C**. **Table 6-1** shows a summary of the results of the storm sewer capacity assessment. Pipes that exceed a maximum capacity of 90% were replaced with a larger diameter pipe.

Table 6-1: Storm Sewer System Assessment

Catchment	MH U/S	MH D/S	Ex. Size (mm)	Length (m)	Slope (m/m)	Ext. Capacity	Meets Criteria (Y / N)	Size which meets the 90% Cap. Req. (mm)	Prop. Capacity
MH31 Outfall									
CM-1	MH-17	MH-18	1350	100	0.005	98%	N	1500	74%
CM-2	MH-18	MH-30	1350	103.6	0.005	99%	N	1500	75%
CM-3	MH-30	MH-29	1200	109.7	0.011	91%	N	1500	50%
CM-4	MH-29	MH-12	1350	91.4	0.007	83%	Y	1500	63%
CM-5	MH-12	MH-13	1350	91.1	0.008	106%	N	1500	80%
CM-6	MH-13	MH-14	1350	91.4	0.008	106%	N	1500	80%
CM-7	MH-14	MH-29 EX	1350	24.7	0.008	113%	N	1500	86%
CM-8	MH-29 EX	MH-31	1350	135.3	0.011	99%	N	1500	75%
Junction at MH 70									
N/A	MH-65	MH-66	375	80.2	0.009	45%	Y	N/A	N/A
N/A	MH-66	MH-67	750	90.2	0.006	83%	Y	N/A	N/A
N/A	MH-67	MH-68	825	91.4	0.006	87%	Y	N/A	N/A
CM-21	MH-68	MH-70	975	95.4	0.007	81%	Y	N/A	N/A
MH122 Outfall									
CM-9	MH-48	MH-49	600	85.3	0.006	78%	Y	N/A	N/A
CM-10	MH-49	MH-50	675	90.2	0.007	80%	Y	N/A	N/A
CM-11	MH-50	MH-61	750	44.5	0.012	46%	Y	N/A	N/A
CM-12	MH-61	MH-61A	825	69.8	0.011	69%	Y	N/A	N/A
CM-12	MH-61A	MH-63	825	25.9	0.011	87%	Y	N/A	N/A
CM-13/14	MH-63	MH-64	825	82.3	0.013	79%	Y	N/A	N/A
CM-15/16	MH-64	MH-70	825	89.3	0.015	84%	Y	N/A	N/A
CM-17	MH-70	MH-71	1350	80.8	0.006	70%	Y	N/A	N/A
CM-18	MH-71	MH-95	1350	76.8	0.006	71%	Y	N/A	N/A
N/A	MH-95	MH-122	2700	162.5	0.002	17%	Y	N/A	N/A
MH 50 Outfall									
CM-19	MH-110	MH-112	375	94.5	0.004	103%	N	450	63%
CM-20	MH-112	MH-50	675	47.2	0.006	47%	Y	N/A	N/A
MH 169 Outfall									
N/A	MH-154	MH-169	1050	55.5	0.012	90%	Y	N/A	N/A
N/A	MH-166	MH-167	300	50.9	0.032	47%	Y	N/A	N/A
N/A	MH-167	MH-169	450	52.1	0.025	128%	N	525	85%
MH 181 Outfall									
N/A	MH-179	MH-180	525	89.9	0.008	102%	N	600	90%
N/A	MH-180	MH-181	525	91.4	0.01	92%	N	600	64%

7 Conclusions and Recommendations

This memo has been prepared to outline the appropriate drainage design, stormwater management and storm sewer capacity analysis for the Rathburn Road and Ponytrail Drive Integrated Roadway Project. Water quantity, water quality as well as stormwater runoff volume reduction (erosion control and water balance) calculations have been conducted based on the catchment delineation and land use breakdown. As part of the storm sewer analysis, appropriate sizes were recommended for existing storm sewers that do not meet all the hydraulic criteria outlined in the City's guidelines. The calculations are created based on the available as-built drawing sets which contains the catchment delineations along with runoff coefficients. Note that the coefficients taken from the as-built drawings are slightly different compared to the City of Mississauga guideline values, but the difference is minimal and won't affect the overall results. Additional downstream analysis should be carried out during detail design in order to assess the downstream impacts on the storm sewers within the project limits.

Exhibits

MODIFIED: Feb. 08, 2021 11:19 AM

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wsp

STORMWATER MANAGEMENT, DRAINAGE MOSAIC

19M-00836-03 Rathburn Road & Ponytrail Drive

EXHIBIT

1

MODIFIED: Feb. 08, 2021 11:18 AM

STORM SEWER ASSESSMENT	EXHIBIT
19M-00836-03 Rathburn Road & Ponytrail Drive	2

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APPENDIX

A

Stormwater Management Calculations

1.0 Area Take-off (Catchment 100)

1.1 Pre-development conditions

Land Cover	Area (ha)	% Area Cover	Runoff C
External	113.56	N/A	0.55
At-Grade Impervious	1.63	72%	0.90
Landscaping	0.64	28%	0.25
Total	**2.27**	**100%**	**0.72**
Total (including External)	**115.82**	**100%**	**0.55**

1.2 Post-development conditions

Land Cover	Area (ha)	% Area Cover	Runoff C
External	113.56	N/A	0.55
At-Grade Impervious	1.89	83%	0.90
Landscaping	0.38	17%	0.25
Total	**2.27**	**100%**	**0.79**
Total (including External)	**115.82**	**100%**	**0.55**

1.0 Area Take-off (Catchment 200)

1.1 Pre-development conditions

Land Cover	Area (ha)	% Area Cover	Runoff C
External	19.41	N/A	0.55
At-Grade Impervious	2.98	77%	0.90
Landscaping	0.87	23%	0.25
Total	**3.85**	**100%**	**0.75**
Total (including External)	**23.26**	**100%**	**0.58**

1.2 Post-development conditions

Land Cover	Area (ha)	% Area Cover	Runoff C
External	19.41	N/A	0.55
At-Grade Impervious	3.30	86%	0.90
Landscaping	0.56	14%	0.25
Total	**3.85**	**100%**	**0.81**
Total (including External)	**23.26**	**100%**	**0.59**

1.0 Area Take-off (Catchment 300)

1.1 Pre-development conditions

Land Cover	Area (ha)	% Area Cover	Runoff C
External	22.17	N/A	0.55
At-Grade Impervious	0.66	78%	0.90
Landscaping	0.18	22%	0.25
Total	**0.84**	**100%**	**0.76**
Total (including External)	**23.01**	**100%**	**0.56**

1.2 Post-development conditions

Land Cover	Area (ha)	% Area Cover	Runoff C
External	22.17	N/A	0.55
At-Grade Impervious	0.66	78%	0.90
Landscaping	0.18	22%	0.25
Total	**0.84**	**100%**	**0.76**
Total (including External)	**23.01**	**100%**	**0.56**

1.0 Area Take-off (Catchment 400)

1.1 Pre-development conditions

Land Cover	Area (ha)	% Area Cover	Runoff C
External	4.92	N/A	0.55
At-Grade Impervious	0.52	87%	0.90
Landscaping	0.08	13%	0.25
Total	**0.60**	**100%**	**0.81**
Total (including External)	**5.52**	**100%**	**0.58**

1.2 Post-development conditions

Land Cover	Area (ha)	% Area Cover	Runoff C
External	4.92	N/A	0.55
At-Grade Impervious	0.52	87%	0.90
Landscaping	0.08	13%	0.25
Total	**0.60**	**100%**	**0.81**
Total (including External)	**5.52**	**100%**	**0.58**

2.0 Pre-development Conditions (Catchment 100)

2.1 Pre-development Area Breakdown

Land Cover	Area (ha)	% Area Cover	Runoff C
External	113.56	N/A	0.55
At-Grade Impervious	1.63	72%	0.90
Landscaping	0.64	28%	0.25
Total	**2.27**	**100%**	**0.72**

2.2 Pre-development Peak Flow Rates

The allowable runoff rate is calculated using the Rational Method:

$$Q = 2.78CIAR$$

Where:

Q = Peak flow rate (Litres/second)

C = Runoff Coefficient

I = Rainfall Intensity (mm/hour)

A = Catchment Area (hectares)

R = Return Period Factor

According to the City of Mississauga Guidelines: In order to account for the increase in runoff due to saturation of the catchment surface that would occur for larger, less frequenet storms, the adjustment factor should be used

The rainfall intensity is calculated with the IDF Curve, using parameters from the City of Mississauga

Where:

$$I = \frac{A}{(T+B)^C}$$

A, B, and C Parameters defined for the City of Mississauga

I = Rainfall Intensity (mm/hour)

T = Time of Concentration, the recommended minimum value is 15 minutes.

Return Period (Years)	2	5	10	25	50	100
A	610	820	1010	1160	1300	1450
B	4.6	4.6	4.6	4.6	4.7	4.9
C	0.78	0.78	0.78	0.78	0.78	0.78
T (mins)	15	15	15	15	15	15
I (mm/hour)	59.9	80.5	99.2	113.9	127.1	140.7
Catchment Area (ha)	2.267	2.267	2.267	2.267	2.267	2.267
Runoff Coefficient	0.72	0.72	0.72	0.72	0.72	0.72
Return Period Factor	1.00	1.00	1.00	1.10	1.20	1.25
Q (Liters/second)	270.6	363.7	448.0	566.0	689.2	794.5
Q (m^3/second)	0.27	0.36	0.45	0.57	0.69	0.79

2.0 Pre-development Conditions (Catchment 200)

2.1 Pre-development Area Breakdown

Land Cover	Area (ha)	% Area Cover	Runoff C
External	19.41	N/A	0.55
At-Grade Impervious	2.98	77%	0.90
Landscaping	0.87	23%	0.25
Total	**3.85**	**100%**	**0.75**

2.2 Pre-development Peak Flow Rates

The allowable runoff rate is calculated using the Rational Method:

$$Q = 2.78CIAR$$

Where:

Q = Peak flow rate (Litres/second)

C = Runoff Coefficient

I = Rainfall Intensity (mm/hour)

A = Catchment Area (hectares)

R = Return Period Factor

According to the City of Mississauga Guidelines: In order to account for the increase in runoff due to saturation of the catchment surface that would occur for larger, less frequenet storms, the adjustment factor should be used

The rainfall intensity is calculated with the IDF Curve, using parameters from the City of Mississauga

Where:

$$I = \frac{A}{(T+B)^C}$$

A, B, and C Parameters defined for the City of Mississauga

I = Rainfall Intensity (mm/hour)

T = Time of Concentration, the recommended minimum value is 15 minutes.

Return Period (Years)	2	5	10	25	50	100
A	610	820	1010	1160	1300	1450
B	4.6	4.6	4.6	4.6	4.7	4.9
C	0.78	0.78	0.78	0.78	0.78	0.78
T (mins)	15	15	15	15	15	15
I (mm/hour)	59.9	80.5	99.2	113.9	127.1	140.7
Catchment Area (ha)	3.852	3.852	3.852	3.852	3.852	3.852
Runoff Coefficient	0.75	0.75	0.75	0.75	0.75	0.75
Return Period Factor	1.00	1.00	1.00	1.10	1.20	1.25
Q (Liters/second)	483.2	649.5	800.0	1010.7	1230.8	1418.8
Q (m^3/second)	0.48	0.65	0.80	1.01	1.23	1.42

2.0 Pre-development Conditions (Catchment 300)

2.1 Pre-development Area Breakdown

Land Cover	Area (ha)	% Area Cover	Runoff C
External	22.17	N/A	0.55
At-Grade Impervious	0.66	78%	0.90
Landscaping	0.18	22%	0.25
Total	**0.84**	**100%**	**0.76**

2.2 Pre-development Peak Flow Rates

The allowable runoff rate is calculated using the Rational Method:

$$Q = 2.78CIAR$$

Where:

Q = Peak flow rate (Litres/second)

C = Runoff Coefficient

I = Rainfall Intensity (mm/hour)

A = Catchment Area (hectares)

R = Return Period Factor

According to the City of Mississauga Guidelines: In order to account for the increase in runoff due to saturation of the catchment surface that would occur for larger, less frequenet storms, the adjustment factor should be used

The rainfall intensity is calculated with the IDF Curve, using parameters from the City of Mississauga

Where:

$$I = \frac{A}{(T+B)^C}$$

A, B, and C Parameters defined for the City of Mississauga

I = Rainfall Intensity (mm/hour)

T = Time of Concentration, the recommended minimum value is 15 minutes.

Return Period (Years)	2	5	10	25	50	100
A	610	820	1010	1160	1300	1450
B	4.6	4.6	4.6	4.6	4.7	4.9
C	0.78	0.78	0.78	0.78	0.78	0.78
T (mins)	15	15	15	15	15	15
I (mm/hour)	59.9	80.5	99.2	113.9	127.1	140.7
Catchment Area (ha)	0.840	0.840	0.840	0.840	0.840	0.840
Runoff Coefficient	0.76	0.76	0.76	0.76	0.76	0.76
Return Period Factor	1.00	1.00	1.00	1.10	1.20	1.25
Q (Liters/second)	106.1	142.6	175.6	221.9	270.2	311.5
Q (m^3/second)	0.11	0.14	0.18	0.22	0.27	0.31

2.0 Pre-development Conditions (Catchment 400)

2.1 Pre-development Area Breakdown

Land Cover	Area (ha)	% Area Cover	Runoff C
External	4.92	N/A	0.55
At-Grade Impervious	0.52	87%	0.90
Landscaping	0.08	13%	0.25
Total	**0.60**	**100%**	**0.81**

2.2 Pre-development Peak Flow Rates

The allowable runoff rate is calculated using the Rational Method:

$$Q = 2.78CIAR$$

Where:

Q = Peak flow rate (Litres/second)
C = Runoff Coefficient
I = Rainfall Intensity (mm/hour)
A = Catchment Area (hectares)
R = Return Period Factor
According to the City of Mississauga Guidelines: In order to account for the increase in runoff due to saturation of the catchment surface that would occur for larger, less frequenet storms, the adjustment factor should be used

The rainfall intensity is calculated with the IDF Curve, using parameters from the City of Mississauga

Where:

$$I = \frac{A}{(T+B)^C}$$

A, B, and C Parameters defined for the City of Mississauga
I = Rainfall Intensity (mm/hour)
T = Time of Concentration, the recommended minimum value is 15 minutes.

Return Period (Years)	2	5	10	25	50	100
A	610	820	1010	1160	1300	1450
B	4.6	4.6	4.6	4.6	4.7	4.9
C	0.78	0.78	0.78	0.78	0.78	0.78
T (mins)	15	15	15	15	15	15
I (mm/hour)	59.9	80.5	99.2	113.9	127.1	140.7
Catchment Area (ha)	0.599	0.599	0.599	0.599	0.599	0.599
Runoff Coefficient	0.81	0.81	0.81	0.81	0.81	0.81
Return Period Factor	1.00	1.00	1.00	1.10	1.20	1.25
Q (Liters/second)	81.1	109.0	134.2	169.6	206.5	238.0
Q (m^3/second)	0.08	0.11	0.13	0.17	0.21	0.24

3.0 Post-development Conditions (Catchment 100)

3.1 Post-development Area Breakdown

Land Cover	Area (ha)	% Area Cover	Runoff C
External	113.56	N/A	0.55
At-Grade Impervious	1.89	83%	0.90
Landscaping	0.38	17%	0.25
Total	**2.27**	**100%**	**0.79**

3.1 Post-development Peak Flow Rates

The allowable runoff rate is calculated using the Rational Method:

$$Q= 2.78CIAR$$

Where:

Q = Peak flow rate (Litres/second)

C = Runoff Coefficient

I = Rainfall Intensity (mm/hour)

A = Catchment Area (hectares)

R = Return Period Factor

According to the City of Mississauga Guidelines: In order to account for the increase in runoff due to saturation of the catchment surface that would occur for larger, less frequenet storms, the adjustment factor should be used

The rainfall intensity is calculated with the IDF Curve, using parameters from the City of Mississauga

Where:

$$I = \frac{A}{(T+B)^C}$$

A, B, and C Parameters defined for the City of Mississauga

I = Rainfall Intensity (mm/hour)

T = Time of Concentration, the recommended minimum value is 15 minutes.

Return Period (Years)	2	5	10	25	50	100
A	610	820	1010	1160	1300	1450
B	4.6	4.6	4.6	4.6	4.7	4.9
C	0.78	0.78	0.78	0.78	0.78	0.78
T (mins)	15	15	15	15	15	15
I (mm/hour)	59.9	80.5	99.2	113.9	127.1	140.7
Catchment Area (ha)	2.267	2.267	2.267	2.267	2.267	2.267
Runoff Coefficient	0.79	0.79	0.79	0.79	0.79	0.79
Return Period Factor	1.00	1.00	1.00	1.10	1.20	1.25
Q (Liters/second)	298.4	401.1	494.0	624.1	760.0	876.1
Q (m^3/second)	0.30	0.40	0.49	0.62	0.76	0.88

3.0 Post-development Conditions (Catchment 200)

3.1 Post-development Area Breakdown

Land Cover	Area (ha)	% Area Cover	Runoff C
External	19.41	N/A	0.55
At-Grade Impervious	3.30	86%	0.90
Landscaping	0.56	14%	0.25
Total	**3.85**	**100%**	**0.81**

3.1 Post-development Peak Flow Rates

The allowable runoff rate is calculated using the Rational Method:

$$Q = 2.78CIAR$$

Where:

Q = Peak flow rate (Litres/second)

C = Runoff Coefficient

I = Rainfall Intensity (mm/hour)

A = Catchment Area (hectares)

R = Return Period Factor

According to the City of Mississauga Guidelines: In order to account for the increase in runoff due to saturation of the catchment surface that would occur for larger, less frequenet storms, the adjustment factor should be used

The rainfall intensity is calculated with the IDF Curve, using parameters from the City of Mississauga

Where:

$$I = \frac{A}{(T+B)^C}$$

A, B, and C Parameters defined for the City of Mississauga

I = Rainfall Intensity (mm/hour)

T = Time of Concentration, the recommended minimum value is 15 minutes.

Return Period (Years)	2	5	10	25	50	100
A	610	820	1010	1160	1300	1450
B	4.6	4.6	4.6	4.6	4.7	4.9
C	0.78	0.78	0.78	0.78	0.78	0.78
T (mins)	15	15	15	15	15	15
I (mm/hour)	59.9	80.5	99.2	113.9	127.1	140.7
Catchment Area (ha)	3.852	3.852	3.852	3.852	3.852	3.852
Runoff Coefficient	0.81	0.81	0.81	0.81	0.81	0.81
Return Period Factor	1.00	1.00	1.00	1.10	1.20	1.25
Q (Liters/second)	517.0	694.9	856.0	1081.4	1316.9	1518.0
Q (m^3/second)	0.52	0.69	0.86	1.08	1.32	1.52

3.0 Post-development Conditions (Catchment 300)

3.1 Post-development Area Breakdown

Land Cover	Area (ha)	% Area Cover	Runoff C
External	22.17	N/A	0.55
At-Grade Impervious	0.66	78%	0.90
Landscaping	0.18	22%	0.25
Total	**0.84**	**100%**	**0.76**

3.1 Post-development Peak Flow Rates

The allowable runoff rate is calculated using the Rational Method:

$$Q = 2.78CIAR$$

Where:

Q = Peak flow rate (Litres/second)
C = Runoff Coefficient
I = Rainfall Intensity (mm/hour)
A = Catchment Area (hectares)
R = Return Period Factor
According to the City of Mississauga Guidelines: In order to account for the increase in runoff due to saturation of the catchment surface that would occur for larger, less frequenet storms, the adjustment factor should be used

The rainfall intensity is calculated with the IDF Curve, using parameters from the City of Mississauga

Where:

$$I = \frac{A}{(T+B)^C}$$

A, B, and C Parameters defined for the City of Mississauga
I = Rainfall Intensity (mm/hour)
T = Time of Concentration, the recommended minimum value is 15 minutes.

Return Period (Years)	2	5	10	25	50	100
A	610	820	1010	1160	1300	1450
B	4.6	4.6	4.6	4.6	4.7	4.9
C	0.78	0.78	0.78	0.78	0.78	0.78
T (mins)	15	15	15	15	15	15
I (mm/hour)	59.9	80.5	99.2	113.9	127.1	140.7
Catchment Area (ha)	0.840	0.840	0.840	0.840	0.840	0.840
Runoff Coefficient	0.76	0.76	0.76	0.76	0.76	0.76
Return Period Factor	1.00	1.00	1.00	1.10	1.20	1.25
Q (Liters/second)	106.1	142.6	175.6	221.9	270.2	311.5
Q (m^3/second)	0.11	0.14	0.18	0.22	0.27	0.31

3.0 Post-development Conditions (Catchment 400)

3.1 Post-development Area Breakdown

Land Cover	Area (ha)	% Area Cover	Runoff C
External	4.92	N/A	0.55
At-Grade Impervious	0.52	87%	0.90
Landscaping	0.08	13%	0.25
Total	**0.60**	**100%**	**0.81**

3.1 Post-development Peak Flow Rates

The allowable runoff rate is calculated using the Rational Method:

$$Q = 2.78CIAR$$

Where:

Q = Peak flow rate (Litres/second)

C = Runoff Coefficient

I = Rainfall Intensity (mm/hour)

A = Catchment Area (hectares)

R = Return Period Factor

According to the City of Mississauga Guidelines: In order to account for the increase in runoff due to saturation of the catchment surface that would occur for larger, less frequenet storms, the adjustment factor should be used

The rainfall intensity is calculated with the IDF Curve, using parameters from the City of Mississauga

Where:

$$I = \frac{A}{(T+B)^C}$$

A, B, and C Parameters defined for the City of Mississauga

I = Rainfall Intensity (mm/hour)

T = Time of Concentration, the recommended minimum value is 15 minutes.

Return Period (Years)	2	5	10	25	50	100
A	610	820	1010	1160	1300	1450
B	4.6	4.6	4.6	4.6	4.7	4.9
C	0.78	0.78	0.78	0.78	0.78	0.78
T (mins)	15	15	15	15	15	15
I (mm/hour)	59.9	80.5	99.2	113.9	127.1	140.7
Catchment Area (ha)	0.599	0.599	0.599	0.599	0.599	0.599
Runoff Coefficient	0.81	0.81	0.81	0.81	0.81	0.81
Return Period Factor	1.00	1.00	1.00	1.10	1.20	1.25
Q (Liters/second)	81.1	109.0	134.2	169.6	206.5	238.0
Q (m^3/second)	0.08	0.11	0.13	0.17	0.21	0.24

	SWM Calculations	Project:	Rathburn Road & Ponytrail Drive	No.:	19M-00836-03	
	Post-Development Condition	By:	RZ	Date:	2021-04-19	Page:
		Checked:	SS	Checked:	2021-04-19	10

Catchment 100

100-Yr Rainfall IDF		Site Parameters			
a	1450.0	C :	0.79		Averaged runoff coefficient
b	4.90	$Q_{pre:}$	0.79	m^3/s	Target flow rate
c	0.78	A:	2.2666	ha	
CA	1.25	T_c:	15	min	

$$I = \frac{A}{(T+B)^C}$$

Time, t_d (min)	Intensity, i (mm/hr)	Peak Discharge (m^3/s)	Trapezoidal Area Vol. (m^3)	Triangular Area Vol. (m^3)	Storage Volume (m^3)
5	242.5	1.509	453	477	0
10	176.3	1.097	658	596	62
20	118.1	0.735	882	834	48
30	90.8	0.565	1017	1073	0
40	74.6	0.464	1114	1311	0
50	63.8	0.397	1190	1549	0
60	56.0	0.348	1253	1788	0
70	50.0	0.311	1308	2026	0
80	45.4	0.282	1355	2264	0
90	41.6	0.259	1398	2503	0
100	38.5	0.239	1436	2741	0
110	35.8	0.223	1472	2979	0
120	33.6	0.209	1504	3218	0
130	31.6	0.197	1535	3456	0
140	29.9	0.186	1563	3694	0
150	28.4	0.177	1590	3933	0
160	27.0	0.168	1615	4171	0
170	25.8	0.161	1639	4409	0
180	24.7	0.154	1662	4648	0
190	23.7	0.148	1683	4886	0
200	22.8	0.142	1704	5124	0
210	22.0	0.137	1724	5363	0
220	21.2	0.132	1743	5601	0
230	20.5	0.128	1762	5840	0
240	19.9	0.124	1779	6078	0
250	19.2	0.120	1796	6316	0
260	18.7	0.116	1813	6555	0
270	18.1	0.113	1829	6793	0
280	17.6	0.110	1845	7031	0
290	17.2	0.107	1860	7270	0
300	16.7	0.104	1875	7508	0
310	16.3	0.102	1889	7746	0

Max. Required Storage: 62 m^3

Catchment 200

100-Yr Rainfall IDF		Site Parameters			
a	1450.0	C :	0.81		Averaged runoff coefficient
b	4.90	$Q_{pre:}$	1.42	m^3/s	Target flow rate
c	0.78	A:	3.8517	ha	
CA	1.25	T_c:	15	min	

$$I = \frac{A}{(T+B)^C}$$

Time, t_d (min)	Intensity, i (mm/hr)	Peak Discharge (m^3/s)	Trapezoidal Area Vol. (m^3)	Triangular Area Vol. (m^3)	Storage Volume (m^3)
5	242.5	2.615	784	851	0
10	176.3	1.901	1140	1064	76
20	118.1	1.273	1528	1490	38
30	90.8	0.979	1762	1915	0
40	74.6	0.804	1930	2341	0
50	63.8	0.687	2062	2767	0
60	56.0	0.603	2172	3192	0
70	50.0	0.539	2266	3618	0
80	45.4	0.489	2348	4044	0
90	41.6	0.448	2422	4469	0
100	38.5	0.415	2489	4895	0
110	35.8	0.386	2550	5320	0
120	33.6	0.362	2606	5746	0
130	31.6	0.341	2659	6172	0
140	29.9	0.322	2708	6597	0
150	28.4	0.306	2754	7023	0
160	27.0	0.291	2798	7449	0
170	25.8	0.278	2840	7874	0
180	24.7	0.267	2879	8300	0
190	23.7	0.256	2917	8725	0
200	22.8	0.246	2953	9151	0
210	22.0	0.237	2987	9577	0
220	21.2	0.229	3020	10002	0
230	20.5	0.221	3052	10428	0
240	19.9	0.214	3083	10854	0
250	19.2	0.208	3113	11279	0
260	18.7	0.201	3142	11705	0
270	18.1	0.196	3169	12131	0
280	17.6	0.190	3197	12556	0
290	17.2	0.185	3223	12982	0
300	16.7	0.180	3248	13407	0
310	16.3	0.176	3273	13833	0

Max. Required Storage: 76 m^3

Catchment 300

100-Yr Rainfall IDF		Site Parameters			
a	1450.0	C :	0.76		Averaged runoff coefficient
b	4.90	$Q_{pre:}$	0.31	m^3/s	Target flow rate
c	0.78	A:	0.8400	ha	
CA	1.25	T_c:	15	min	

$$I = \frac{A}{(T+B)^C}$$

Time, t_d (min)	Intensity, i (mm/hr)	Peak Discharge (m^3/s)	Trapezoidal Area Vol. (m^3)	Triangular Area Vol. (m^3)	Storage Volume (m^3)
5	242.5	0.536	161	187	0
10	176.3	0.390	234	234	0
20	118.1	0.261	314	327	0
30	90.8	0.201	361	420	0
40	74.6	0.165	396	514	0
50	63.8	0.141	423	607	0
60	56.0	0.124	446	701	0
70	50.0	0.111	465	794	0
80	45.4	0.100	482	888	0
90	41.6	0.092	497	981	0
100	38.5	0.085	511	1075	0
110	35.8	0.079	523	1168	0
120	33.6	0.074	535	1261	0
130	31.6	0.070	546	1355	0
140	29.9	0.066	556	1448	0
150	28.4	0.063	565	1542	0
160	27.0	0.060	574	1635	0
170	25.8	0.057	583	1729	0
180	24.7	0.055	591	1822	0
190	23.7	0.052	598	1915	0
200	22.8	0.050	606	2009	0
210	22.0	0.049	613	2102	0
220	21.2	0.047	620	2196	0
230	20.5	0.045	626	2289	0
240	19.9	0.044	633	2383	0
250	19.2	0.043	639	2476	0
260	18.7	0.041	645	2570	0
270	18.1	0.040	650	2663	0
280	17.6	0.039	656	2756	0
290	17.2	0.038	661	2850	0
300	16.7	0.037	666	2943	0
310	16.3	0.036	672	3037	0

Max. Required Storage: 0 m^3

Note: since there is no changes under the proposed condition under this catchment, no additional flows are generated

Catchment 400

100-Yr Rainfall IDF		Site Parameters			
a	1450.0	C :	0.81		Averaged runoff coefficient
b	4.90	$Q_{pre:}$	0.24	m^3/s	Target flow rate
c	0.78	A:	0.5990	ha	
CA	1.25	T_c:	15	min	

$$I = \frac{A}{(T + B)^C}$$

Time, t_d (min)	Intensity, i (mm/hr)	Peak Discharge (m^3/s)	Trapezoidal Area Vol. (m^3)	Triangular Area Vol. (m^3)	Storage Volume (m^3)
5	242.5	0.410	123	143	0
10	176.3	0.298	179	179	0
20	118.1	0.200	240	250	0
30	90.8	0.153	276	321	0
40	74.6	0.126	303	393	0
50	63.8	0.108	323	464	0
60	56.0	0.095	340	536	0
70	50.0	0.085	355	607	0
80	45.4	0.077	368	678	0
90	41.6	0.070	380	750	0
100	38.5	0.065	390	821	0
110	35.8	0.061	400	893	0
120	33.6	0.057	409	964	0
130	31.6	0.053	417	1035	0
140	29.9	0.051	425	1107	0
150	28.4	0.048	432	1178	0
160	27.0	0.046	439	1250	0
170	25.8	0.044	445	1321	0
180	24.7	0.042	451	1392	0
190	23.7	0.040	457	1464	0
200	22.8	0.039	463	1535	0
210	22.0	0.037	468	1607	0
220	21.2	0.036	474	1678	0
230	20.5	0.035	479	1749	0
240	19.9	0.034	483	1821	0
250	19.2	0.033	488	1892	0
260	18.7	0.032	493	1964	0
270	18.1	0.031	497	2035	0
280	17.6	0.030	501	2106	0
290	17.2	0.029	505	2178	0
300	16.7	0.028	509	2249	0
310	16.3	0.028	513	2321	0

Max. Required Storage: 0 m^3

Note: since there is no changes under the proposed condition under this catchment, no additional flows are generated

3.0 Post-development Condition (Catchment 100)

3.1 Post-development Condition Area Breakdown

The current area measurements and land use types for the site are as follows:

Land Use	Area (ha)	% Area Cover	Runoff C
External	113.56	N/A	0.55
At-Grade Impervious	1.89	83%	0.90
Landscaping	0.38	17%	0.25
Total	**2.27**	**100%**	**0.79**

3.2 Water Balance Design

3.2.1 Water Balance Design Criteria

The TRCA requires “best efforts” be made to maintain the existing water balance for the site. (Refer to SWM TRCA 2012)
The City of Mississauga requires that the first 5mm of stormwater runoff volume from developing sites shall be retained on-site and managed by way of infiltration, evapotranspiration or re-use.

3.2.2 Water Balance Volume Calculations

As per TRCA Criteria dated 2012, the minimum 5 mm retention volume requirement should be above the initial abstraction.
The external area is an existing subvision and hence subject to its own water balance criteria at the time when it is developed,
So it is not considered here. Note only the newly paved area are considered here as part of the water quality treatment criteria.

Surface Type	Area (m^2)	5 mm Volume (m^3)
New At-Grade Impervious	2567.4	12.84
New Landscaping	0.0	0.00
Total	**2567.4**	**12.84**

Therefore, volume of runoff during a 5 mm storm event is **12.8** m^3

4.0 Required Water Quality Treatment Volume

4.0.1 Water Quality Control Criteria

The site is required to provide an enhanced level protection or 80% TSS Removal.

4.0.2 Water Quality Control Strategy

CB Shield and/or OGS Units should be placed before the last branch of the storm sewer system before discharging to the receiving sewer (which discharges into the creek eventually). Sizing of such units should be conducted during detail design.

4.0.3 Water Quality Storage Sizing

Refer to Table 3.2 of 2003 MOECC Stormwater Management Planning and Design Manual.

Protection Level	SWMP Type	Storage Volume (m^3/ha) for Impervious Level			
		35%	55%	70%	85%
Enhanced 80% long-term S.S. removal	Infiltration	25	30	35	40
	Wetlands	80	105	120	140
	Hybrid Wet Pond/Wetland	110	150	175	195
	Wet Pond	140	190	225	250

Catchment 100 has a 83% Imperviousness Level:

Storage Volume for 83% Impervious Level: 39.4 m^3/ha

Required Treatment Volume: **10.1** m^3 **<** **12.8** m^3

3.0 Post-development Condition (Catchment 200)

3.1 Post-development Condition Area Breakdown

The current area measurements and land use types for the site are as follows:

Land Use	Area (ha)	% Area Cover	Runoff C
External	19.41	N/A	0.55
At-Grade Impervious	3.30	86%	0.90
Landscaping	0.56	14%	0.25
Total	**3.85**	**100%**	**0.81**

3.2 Water Balance Design

3.2.1 Water Balance Design Criteria

The TRCA requires “best efforts” be made to maintain the existing water balance for the site. (Refer to SWM TRCA 2012)
The City of Mississauga requires that the first 5mm of stormwater runoff volume from developing sites shall be retained on-site and managed by way of infiltration, evapotranspiration or re-use.

3.2.2 Water Balance Volume Calculations

As per TRCA Criteria dated 2012, the minimum 5 mm retention volume requirement should be above the initial abstraction.
The external area is an existing subvision and hence subject to its own water balance criteria at the time when it is developed,
So it is not considered here. Note only the newly paved area are considered here as part of the water quality treatment criteria.

Surface Type	Area (m^2)	5 mm Volume (m^3)
New At-Grade Impervious	3122.2	15.61
New Landscaping	0.0	0.00
Total	**3122.2**	**15.61**

Therefore, volume of runoff during a 5 mm storm event is **15.6** m^3

4.0 Required Water Quality Treatment Volume

4.0.1 Water Quality Control Criteria

The site is required to provide an enhanced level protection or 80% TSS Removal.

4.0.2 Water Quality Control Strategy

CB Shield and/or OGS Units should be placed before the last branch of the storm sewer system before discharging to the receiving sewer (which discharges into the creek eventually). Sizing of such units should be conducted during detail design.

4.0.3 Water Quality Storage Sizing

Refer to Table 3.2 of 2003 MOECC Stormwater Management Planning and Design Manual.

Protection Level	SWMP Type	Storage Volume (m^3/ha) for Impervious Level			
		35%	55%	70%	85%
Enhanced 80% long-term S.S. removal	Infiltration	25	30	35	40
	Wetlands	80	105	120	140
	Hybrid Wet Pond/Wetland	110	150	175	195
	Wet Pond	140	190	225	250

Catchment 100 has a 86% Imperviousness Level:

Storage Volume for 86% Impervious Level:	40.0	m^3/ha			
Required Treatment Volume:	**12.5**	m^3	**<**	**15.6**	m^3

3.0 Post-development Condition (Catchment 300)

3.1 Post-development Condition Area Breakdown

The current area measurements and land use types for the site are as follows:

Land Use	Area (ha)	% Area Cover	Runoff C
External	22.17	N/A	0.55
At-Grade Impervious	0.66	78%	0.90
Landscaping	0.18	22%	0.25
Total	**0.84**	**100%**	**0.76**

3.2 Water Balance Design

3.2.1 Water Balance Design Criteria

The TRCA requires “best efforts” be made to maintain the existing water balance for the site. (Refer to SWM TRCA 2012)
The City of Mississauga requires that the first 5mm of stormwater runoff volume from developing sites shall be retained on-site and managed by way of infiltration, evapotranspiration or re-use.

3.2.2 Water Balance Volume Calculations

As per TRCA Criteria dated 2012, the minimum 5 mm retention volume requirement should be above the initial abstraction.
The external area is an existing subvision and hence subject to its own water balance criteria at the time when it is developed,
So it is not considered here. Note only the newly paved area are considered here as part of the water quality treatment criteria.

Surface Type	Area (m^2)	5 mm Volume (m^3)
New At-Grade Impervious	0.0	0.00
New Landscaping	0.0	0.00
Total	**0.0**	**0.00**

Therefore, volume of runoff during a 5 mm storm event is **0.0** m^3

4.0 Required Water Quality Treatment Volume

4.0.1 Water Quality Control Criteria

The site is required to provide an enhanced level protection or 80% TSS Removal.

4.0.2 Water Quality Control Strategy

CB Shield and/or OGS Units should be placed before the last branch of the storm sewer system before discharging to the receiving sewer (which discharges into the creek eventually). Sizing of such units should be conducted during detail design.

4.0.3 Water Quality Storage Sizing

Refer to Table 3.2 of 2003 MOECC Stormwater Management Planning and Design Manual.

Protection Level	SWMP Type	Storage Volume (m^3/ha) for Impervious Level			
		35%	55%	70%	85%
Enhanced 80% long-term S.S. removal	Infiltration	25	30	35	40
	Wetlands	80	105	120	140
	Hybrid Wet Pond/Wetland	110	150	175	195
	Wet Pond	140	190	225	250

Catchment 100 has a 78% Imperviousness Level:					
Storage Volume for 78% Impervious Level:	37.7	m^3/ha			
Required Treatment Volume:	**0.0**	m^3	**<**	**0.0**	m^3

3.0 Post-development Condition (Catchment 400)

3.1 Post-development Condition Area Breakdown

The current area measurements and land use types for the site are as follows:

Land Use	Area (ha)	% Area Cover	Runoff C
External	4.92	N/A	0.55
At-Grade Impervious	0.52	87%	0.90
Landscaping	0.08	13%	0.25
Total	**0.60**	**100%**	**0.81**

3.2 Water Balance Design

3.2.1 Water Balance Design Criteria

The TRCA requires “best efforts” be made to maintain the existing water balance for the site. (Refer to SWM TRCA 2012)
The City of Mississauga requires that the first 5mm of stormwater runoff volume from developing sites shall be retained on-site and managed by way of infiltration, evapotranspiration or re-use.

3.2.2 Water Balance Volume Calculations

As per TRCA Criteria dated 2012, the minimum 5 mm retention volume requirement should be above the initial abstraction.
The external area is an existing subvision and hence subject to its own water balance criteria at the time when it is developed,
So it is not considered here. Note only the newly paved area are considered here as part of the water quality treatment criteria.

Surface Type	Area (m^2)	5 mm Volume (m^3)
New At-Grade Impervious	0.0	0.00
New Landscaping	0.0	0.00
Total	**0.0**	**0.00**

Therefore, volume of runoff during a 5 mm storm event is **0.0** m^3

4.0 Required Water Quality Treatment Volume

4.0.1 Water Quality Control Criteria

The site is required to provide an enhanced level protection or 80% TSS Removal.

4.0.2 Water Quality Control Strategy

CB Shield and/or OGS Units should be placed before the last branch of the storm sewer system before discharging to the receiving sewer (which discharges into the creek eventually). Sizing of such units should be conducted during detail design.

4.0.3 Water Quality Storage Sizing

Refer to Table 3.2 of 2003 MOECC Stormwater Management Planning and Design Manual.

Protection Level	SWMP Type	Storage Volume (m^3/ha) for Impervious Level			
		35%	55%	70%	85%
Enhanced 80% long-term S.S. removal	Infiltration	25	30	35	40
	Wetlands	80	105	120	140
	Hybrid Wet Pond/Wetland	110	150	175	195
	Wet Pond	140	190	225	250

Catchment 100 has a 87% Imperviousness Level:					
Storage Volume for 87% Impervious Level:	40.0	m^3/ha			
Required Treatment Volume:	**0.0**	m^3	**<**	**0.0**	m^3

APPENDIX

B

Storm Sewer Design Sheet

19M-00836-03-Mississauga_Rathburn Rd E and Ponytrail Dr Storm Existing Condition Sewer Design Sheet
Rational Method Hydrology

Prepared by: MN
Reviewed by: SH

Date: 4/20/2021

Outfall MH 31

From U/s MH	To D/s MH	Area(Ha)	Runoff,C	AxC	I, mm/hr	Flow, (m^3/s)	Cum Flow, (m^3/s)	Length (m)	Slope (%)	Diameter (mm)	Manning's n	Velocity, m/s	Capacity (Full Flow) (m^3/s)	Flow / Capacity (Design) (%)	Depth (Normal) / Rise (%)	Remarks
		Flow from external Area obtained from as built drawings				3.50	3.50									Flow obtained from As built drawing
MH-17	MH-18	0.62	0.7	0.44	50.8	0.06	3.56	100	0.5	1,350.00	0.013	3.06	3.85	92.3	75.8	
MH-18	MH-30	0.71	0.7	0.50	49.784	0.07	3.63	103.6	0.5	1,350.00	0.013	3.06	3.85	94.1	77.1	
MH-30	MH-29	0.32	0.75	0.24	49.022	0.03	3.66	109.7	1.1	1,200.00	0.013	4.15	4.16	87.9	72.7	
MH-29	MH-12	0.24	0.75	0.18	48.514	0.02	3.69	91.4	0.7	1,350.00	0.013	2.58	4.4	83.8	70.1	
		Flow from external Area obtained from as built drawings														
Flow from MH 9 to MH 12				1.90	85.09	0.45	4.14									
Flow from MH 11 to MH 12																
				3.38	92.71	0.87	5.01									
MH-12	MH-13	0.40	0.75	0.30	47.752	0.04	5.05	91.1	0.8	1,350.00	0.013	3.53	4.64	108.9	NA	
MH-13	MH-14	0.49	0.75	0.36	47.752	0.05	5.10	91.4	0.8	1350	0.013	3.56	4.73	107.9	NA	
		Flow from external Area obtained from as built drawings														
Flow from MH 22 to MH 14				0.52	96.012	0.14	5.24									Flow obtained from As built drawing
Flow from MH 18 to MH 14																
				1.06	91.44	0.27	5.51									Flow obtained from As built drawing
MH-14	MH-29 EX	0.162	0.75	0.12	46.99	0.02	5.52	24.7	0.8	1,350.00	0.013	3.86	4.78	115.5	NA	
MH-29 EX	MH-31	1.679	0.45	0.76	63.5	0.13	5.65	135.3	1.1	1,350.00	0.013	4.48	5.63	100.5	82.4	

Outfall MH-122

From U/s MH	To D/s MH	Area(Ha)	Runoff,C	AxC	I, mm/hr	Flow, (m^3/s)	Cum Flow, (m^3/s)	Length (m)	Slope (%)	Diameter (mm)	Manning's n	Velocity, m/s	Capacity (Full Flow) (m^3/s)	Flow / Capacity (Design) (%)	Depth (Normal) / Rise (%)	Remarks
MH-48	MH-49	2.92	0.45	1.31	63.50	0.23	0.23	85.3	0.6	600	0.013	1.65	0.47	48.9	49.3	Inensity Assumed
MH-49	MH-50	1.68	0.45	0.76	63.50	0.13	0.36	90.2	0.6	675	0.013	1.90	0.67	54.3	52.5	Inensity Assumed
MH-50	EX MH-61	0.13	0.50	0.07	63.50	0.01	0.38	44.5	1.2	750	0.013	2.43	1.24	29.3	37.1	Inensity Assumed
EX MH-61	MH-61A	1.91	0.70	1.34	63.50	0.24	0.61	69.8	1.0	825	0.013	2.68	1.47	45.6	47.4	Inensity Assumed
		0.42	0.25	0.11	63.50	0.02	0.63									Inensity Assumed
		0.95	0.25	0.24	63.50	0.04	0.67									Inensity Assumed
MH-61A	MH-63	2.26	0.30	0.68	63.50	0.12	0.79	25.9	1.0	825	0.013	2.87	1.46	60.9	56.4	Inensity Assumed
		0.99	0.40	0.39	63.50	0.07	0.86									Inensity Assumed
		0.39	0.50	0.19	63.50	0.03	0.90									Inensity Assumed
MH-63	MH-64	0.36	0.75	0.27	63.50	0.05	0.94	82.3	1.3	825	0.013	3.21	1.66	58	54.7	Inensity Assumed
		0.27	0.50	0.14	63.50	0.02	0.97									Inensity Assumed
MH-64	MH-70	0.24	0.75	0.18	63.50	0.03	1.00	89.3	1.3	825.00	0.013	3.25	1.65	61.6	56.8	Inensity Assumed
		0.31	0.50	0.16	63.50	0.03	1.03									
MH-70	MH-71	0.39	0.50	0.20	63.50	0.03	1.06	80.8	0.6	1,350.00	0.013	2.83	4.04	50.1	50.1	Inensity Assumed
			Flow from MH 68													Inensity Assumed
						0.95	2.01									Inensity Assumed
MH-71	MH-95	0.53	0.50	0.27	63.50	0.05	2.06	76.8	0.7	1,350.00	0.013	3.19	4.57	49.6	49.7	Inensity Assumed
		1.84	0.60	1.10	63.50	0.19	2.25									Inensity Assumed
MH-95	MH-122							162.5	0.3	2700	0.013	2.13	17.74	12.8	24.1	

Outfall MH-70

From U/s MH	To D/s MH	Area(Ha)	Runoff,C	AxC	I, mm/hr	Flow, (m^3/s)	Cum Flow, (m^3/s)	Length (m)	Slope (%)	Diameter (mm)	Manning's n	Velocity, m/s	Capacity (Full Flow) (m^3/s)	Flow / Capacity (Design) (%)	Depth (Normal) / Rise (%)	Remarks
MH-65	MH-66	0.54	0.5	0.27	63.5	0.05	0.05	80.2	0.9	375	0.013	1.32	0.17	28	36.2	Inensity Assumed
MH-66	MH-67	5.39	0.45	2.43	63.5	0.43	0.48	90.2	0.6	750	0.013	1.94	0.83	56.8	53.9	Inensity Assumed
MH-67	MH-68	1.51	0.6	0.91	63.5	0.16	0.64	91.4	0.6	825	0.013	2.23	1.15	56.9	54	Inensity Assumed
		0.30	0.5	0.15	63.5	0.03	0.66									
MH-68	MH-70	2.18	0.75	1.64	63.5	0.29	0.95	95.4	0.6	975	0.013	2.38	1.72	56.5	53.8	Inensity Assumed
			0.5	0.00	63.5	0.00	0.95									

Outfall MH-169

From U/s MH	To D/s MH	Area(Ha)	Runoff,C	AxC	I, mm/hr	Flow, (m^3/s)	Cum Flow, (m^3/s)	Length (m)	Slope (%)	Diameter (mm)	Manning's n	Velocity, m/s	Capacity (Full Flow) (m^3/s)	Flow / Capacity (Design) (%)	Depth (Normal) / Rise (%)	Remarks
MH-154	MH-169	21.02	0.4	8.41	63.5	1.48	1.48	55.5	1.1	1,050.00	0.013	3.45	2.88	57.5	54.4	Inensity Assumed
		2.03	0.45	0.91	63.5	0.16	1.64									Inensity Assumed
		0.40	0.4	0.16	63.5	0.03	1.67									
MH-166	MH-167	0.73	0.4	0.29	63.5	0.05	1.72	50.9	3.1	300	0.013	2.10	0.17	30	37.6	Inensity Assumed
MH-167	MH-169	3.20	0.4	1.28	63.5	0.23	1.95	52.1	1.9	450	0.013	2.72	0.39	74.9	64.6	Inensity Assumed
		0.30	0.4	0.12	63.5	0.02	1.97									

Outfall MH-181

From U/s MH	To D/s MH	Area(Ha)	Runoff,C	AxC	I, mm/hr	Flow, (m^3/s)	Cum Flow, (m^3/s)	Length (m)	Slope (%)	Diameter (mm)	Manning's n	Velocity, m/s	Capacity (Full Flow) (m^3/s)	Flow / Capacity (Design) (%)	Depth (Normal) / Rise (%)	Remarks
MH-179	MH-180	3.16	0.45	1.42	63.5	0.25	0.25	89.9	0.5	525	0.013	1.61	0.31	79.1	67.1	Inensity Assumed
MH-180	MH-181	0.15	0.4	0.06	63.5	0.01	0.26	91.4	1.0	525	0.013	2.11	0.44	59	55.2	Inensity Assumed

Outfall MH-50

From U/s MH	To D/s MH	Area(Ha)	Runoff,C	AxC	I, mm/hr	Flow, (m^3/s)	Cum Flow, (m^3/s)	Length (m)	Slope (%)	Diameter (mm)	Manning's n	Velocity, m/s	Capacity (Full Flow) (m^3/s)	Flow / Capacity (Design) (%)	Depth (Normal) / Rise (%)	Remarks
MH-110	MH-112	0.97	0.4	0.39	63.5	0.07	0.07	94.5	0.4	375	0.013	1.09	0.12	58.5	55	Inensity Assumed
MH-112	MH-50	0.13	0.5	0.06	63.5	0.01	0.08	47.2	0.1	675	0.013	0.70	0.29	26.9	35.4	Inensity Assumed

19M-00836-03-Mississauga_Rathburn Rd E and Ponytrail Dr Storm Sewer Design Sheet
Rational Method Hydrology

Prepared by: MN
Reviewed by: SH

Date: 4/20/2021

Peak Flow Frequency:
Qp (m^3/s) = 0.00278 A I C
A= area (ha) *converted to ha in design calc*
I= rainfall intensity (mm/hr), (City of Mississauga)
C= runoff coefficient

IDF Parameters	2 yr	5 yr	10 yr	25 yr	50 yr	100 yr***
a	610	820	1010	1160	1300	1450
b	4.60	4.60	4.60	4.60	4.70	4.90
c	0.780	0.780	0.780	0.780	0.780	0.780

Design Flo = 10 Year Storm
= 10 Year Storrm + Additional Storage for quantity control (For the Storage Sewers where noted)
or = Controlled Flow (Downstream of Orifice Plates where noted)

From	To	Catchment ID	Total Area (m^2)	Slope (%)	As built C factors: C (0.7 / 0.75 / 0.6 / 0.9)	Area (m^2)	As built C factors: C (0.3 / 0.4 / Proposed C factors / 0.9)	Area (m^2)	As built C factors: C (0.5 / 0.45 / 0.25)	Area (m^2)	Weighted C	CA	Cumulative CA	Tc* min	Hydrology: I (mm/hr) i_2	i_5	i_{10}	i_{25}	i_{50}	i_{100}	Peak Flow Values (m^3/s) 2-yr (cms)	5-yr (cms)	10-yr (cms)	25-yr (cms)	50-yr (cms)	100-yr (cms)	Hydraulics: Dia. (mm)	n	Slope (m/m)	Length (m)	Capacity (m^3/s)	Velocity (m/s)	Aarea (m^2)	Flow Time (min)	$Q_{10}/Q_{capacity}$ %	Comment
FLOW FROM EXTERNAL AREA			362287	0.00	-	362287	-	0	-	0	0.36	12.93	12.93	15.00	59.89	80.51	99.17	113.89	127.13	140.69	2.153	2.895	3.566	4.095	4.571	5.059										External Flow to MH 17 added
MH-17	MH-18	CM-1	6232	0.50	-	5909	-	324	-	0	0.71	0.44	13.38	15.00	59.89	80.51	99.17	113.89	127.13	140.69	2.227	2.994	3.688	4.235	4.728	5.232	1500	0.013	0.005	100	4.998	2.829	1.767	0.589	74%	Diameter upsized from existing 1350mm to 1500mm
MH-18	MH-30	CM-2	7123	0.50	-	6718	-	405	-	0	0.71	0.51	13.88	15.59	58.52	78.67	96.90	111.29	124.24	137.52	2.259	3.036	3.740	4.295	4.795	5.308	1500	0.013	0.005	103.6	4.998	2.829	1.767	0.610	75%	Diameter upsized from existing 1350mm to 1500mm
MH-30	MH-29	CM-3	3197	1.10	-	2792	-	405	-	0	0.77	0.25	14.13	16.20	57.18	76.87	94.68	108.74	121.40	134.41	2.246	3.019	3.719	4.271	4.769	5.279	1500	0.013	0.011	109.7	7.414	4.195	1.767	0.436	50%	Diameter upsized from existing 1200mm to 1500mm
MH-29	MH-12	CM-4	2428	0.70	-	2145	-	283	-	0	0.77	0.19	14.32	16.64	56.26	75.63	93.16	106.99	119.47	132.28	2.239	3.010	3.707	4.258	4.754	5.264	1500	0.013	0.007	91.4	5.914	3.347	1.767	0.455	63%	Diameter upsized from existing 1350mm to 1500mm
MH-12	MH-13	CM-5	4047	0.80	-	3764	-	283	-	0	0.76	0.31	19.91	17.09	55.34	74.39	91.63	105.24	117.51	130.14	3.064	4.118	5.072	5.826	6.505	7.205	1500	0.013	0.008	91.1	6.323	3.578	1.767	0.424	80%	External Flow to MH 12 added,Diameter upsized from existing 1350mm to 1500mm
MH-13	MH-14	CM-6	4856	0.80	-	4533	-	324	-	0	0.76	0.37	20.28	17.52	54.51	73.28	90.25	103.66	115.76	128.22	3.073	4.132	5.089	5.845	6.527	7.229	1500	0.013	0.008	91.4	6.323	3.578	1.767	0.426	80%	Diameter upsized from existing 1350mm to 1500mm
MH-14	MH-29 EX	CM-7	1619	0.80	-	1538	-	81	-	0	0.76	0.12	22.08	17.94	53.70	72.19	88.92	102.13	114.06	126.35	3.297	4.432	5.459	6.270	7.003	7.757	1500	0.013	0.008	24.7	6.323	3.578	1.767	0.115	86%	External Flow to MH 14 added,Diameter upsized from existing 1350mm to 1500mm
MH-29 EX	MH-31	CM-8	16795	1.10	-	0	-	405	-	16390	0.46	0.77	22.86	18.37	52.93	71.15	87.63	100.65	112.41	124.54	3.363	4.521	5.569	6.396	7.144	7.914	1500	0.013	0.011	135.3	7.414	4.195	1.767	0.537	75%	Diameter upsized from existing 1350mm to 1500mm
MH-48	MH-49	CM-9	29179	0.60	-		-	607	-	28572	0.46	1.34	1.34	15.00	59.89	80.51	99.17	113.89	127.13	140.69	0.223	0.300	0.370	0.424	0.474	0.524	600	0.013	0.006	85.3	0.476	1.682	0.283	0.845	78%	
MH-49	MH-50	CM-10	16795	0.70	-		-	324	-	16471	0.46	0.77	2.11	15.85	57.95	77.90	95.95	110.20	123.04	136.20	0.340	0.457	0.563	0.647	0.722	0.799	675	0.013	0.007	90.2	0.703	1.965	0.358	0.765	80%	
MH-50	MH-61	CM-11	1336	1.20	-		-	162	-	1174	0.55	0.07	2.18	16.61	56.32	75.70	93.24	107.09	119.58	132.41	0.342	0.460	0.566	0.650	0.726	0.804	750	0.013	0.012	44.5	1.220	2.760	0.442	0.269	46%	
MH-61	MH-61A	CM-12	32862	1.00	-	19142	-	283	-	13436	0.52	1.70	3.89	16.88	55.77	74.96	92.33	106.05	118.41	131.13	0.602	0.810	0.997	1.145	1.279	1.416	825	0.013	0.010	69.8	1.435	2.685	0.535	0.433	69%	
MH-61A	MH-63	CM-12	32497	1.00	-	22623	-	0	-	9875	0.33	1.07	4.96	17.31	54.90	73.80	90.91	104.41	116.59	129.13	0.757	1.017	1.253	1.439	1.607	1.780	825	0.013	0.010	25.9	1.435	2.685	0.535	0.161	87%	
MH-63	MH-64	CM-13 & CM-14	3885	1.30	-		-	364	-	3521	0.54	0.21	5.17	17.47	54.59	73.38	90.39	103.81	115.93	128.41	0.784	1.054	1.299	1.491	1.666	1.845	825	0.013	0.013	82.3	1.637	3.062	0.535	0.448	79%	
MH-64	MH-70	CM-15 & CM-16	6313	1.30	-	3413	-	377	-	2523	0.66	0.42	5.58	17.92	53.74	72.24	88.98	102.20	114.14	126.44	0.834	1.121	1.381	1.586	1.772	1.963	825	0.013	0.013	89.3	1.637	3.062	0.535	0.486	84%	
MH-70	MH-71	CM-17	9430	0.60	-	2266	-	283	-	6880	0.57	0.54	11.90	18.41	52.85	71.05	87.51	100.51	112.26	124.37	1.748	2.350	2.895	3.325	3.713	4.114	1350	0.013	0.006	80.8	4.134	2.888	1.431	0.466	70%	Flow from branch MH 68 added
MH-71	MH-95	CM-18	23648	0.70	-	18171	-	283	-	5221	0.58	1.38	13.28	18.87	52.03	69.95	86.15	98.95	110.52	122.47	1.920	2.581	3.180	3.652	4.079	4.520	1350	0.013	0.007	76.8	4.466	3.120	1.431	0.410	71%	
MH-95	MH-122			0.30	-	0	-	0	-	0	0.00	0.00	13.28	19.28	51.34	69.01	85.00	97.62	109.05	120.84	1.895	2.547	3.137	3.603	4.024	4.460	2700	0.013	0.003	162.5	18.563	3.242	5.726	0.835	17%	
MH-65	MH-66		5423	0.90	-		-	0	-	5423	0.50	0.27	0.27	15.00	59.89	80.51	99.17	113.89	127.13	140.69	0.045	0.061	0.075	0.086	0.096	0.106	375	0.013	0.009	80.2	0.166	1.506	0.110	0.888	45%	
MH-66	MH-67		53906		-		-	0	-	53906	0.45	2.43	2.70	15.89	57.86	77.78	95.80	110.03	122.84	135.98	0.434	0.583	0.718	0.825	0.921	1.020	750	0.013	0.006	90.2	0.862	1.952	0.442	0.770	83%	
MH-67	MH-68		18131	0.60	-	15136	-	0	-	2995	0.58	1.06	3.75	16.66	56.22	75.57	93.08	106.90	119.37	132.18	0.587	0.789	0.972	1.116	1.246	1.380	825	0.013	0.006	91.4	1.112	2.080	0.535	0.732	87%	
MH-68	MH-70	CM-21	25253	0.60	-	21813	-	345	-	3095	0.72	1.82	5.58	17.39	54.75	73.60	90.65	104.12	116.27	128.78	0.849	1.141	1.405	1.614	1.803	1.996	975	0.013	0.006	95.4	1.736	2.325	0.747	0.684	81%	
MH-154	MH-169		230477	1.10	-		-	210161	-	20316	0.40	9.32	9.32	15.00	59.89	80.51	99.17	113.89	127.13	140.69	1.552	2.086	2.570	2.951	3.294	3.645	1050	0.013	0.011	55.5	2.864	3.308	0.866	0.280	90%	
MH-166	MH-167		7285	3.10	-		-	7285	-		0.40	0.29	0.29	15.00	59.89	80.51	99.17	113.89	127.13	140.69	0.049	0.065	0.080	0.092	0.103	0.114	300	0.013	0.031	50.9	0.170	2.409	0.071	0.352	47%	
MH-167	MH-169		38932	1.90	-		-	38932	-		0.40	1.56	1.85	15.35	59.07	79.40	97.80	112.32	125.39	138.78	0.304	0.408	0.503	0.577	0.644	0.713	525	0.013	0.019	52.1	0.593	2.738	0.216	0.317	85%	Diameter upsized from existing 450mm to 525mm
MH-179	MH-180		31607	0.50	-		-		-	31607	0.45	1.42	1.42	15.00	59.89	80.51	99.17	113.89	127.13	140.69	0.237	0.318	0.392	0.450	0.503	0.556	600	0.013	0.005	89.9	0.434	1.536	0.283	0.976	90%	Diameter upsized from existing 525mm to 600mm
MH-180	MH-181		1457	1.00	-		-	1457	-		0.40	0.06	1.48	15.98	57.67	77.52	95.48	109.66	122.43	135.53	0.237	0.319	0.393	0.451	0.504	0.558	600	0.013	0.010	91.4	0.614	2.172	0.283	0.701	64%	Diameter upsized from existing 525mm to 600mm
MH-110	MH-112	CM-19	9713	0.40	-		-	9227	-	486	0.43	0.41	0.41	15.00	59.89	80.51	99.17	113.89	127.13	140.69	0.069	0.092	0.114	0.131	0.146	0.161	450	0.013	0.004	94.5	0.180	1.134	0.159	1.389	63%	Diameter upsized from existing 375mm to 450mm
MH-112	MH-50	CM-20	1255	0.10	-		-	81	-	1174	0.53	0.07	0.48	16.39	56.78	76.32	94.01	107.97	120.55	133.48	0.076	0.102	0.125	0.144	0.160	0.178	675	0.013	0.001	47.2	0.266	0.743	0.358	1.059	47%	

APPENDIX

C

Storm Sewer Profile

Hydraulic Model Inventory: Rathburn Road V416.04.2021.stsw

Title	
Engineer	
Company	
Date	12/9/2020
Notes	

Scenario Summary

ID	1
Label	Base
Notes	
Active Topology	Base Active Topology
User Data Extensions	Base User Data Extensions
Physical	Base Physical
Boundary Condition	Base Boundary Condition
Initial Settings	Base Initial Settings
Hydrology	Base Hydrology
Output	Base Output
Infiltration and Inflow	Base Infiltration and Inflow
Rainfall Runoff	Base Rainfall Runoff
Water Quality	Base Water Quality
Sanitary Loading	Base Sanitary Loading
Headloss	Base Headloss
Operational	Base Operational
Design	Base Design
System Flows	Base System Flows
SCADA	Base SCADA
Energy Cost	Base Energy Cost
Solver Calculation Options	Base Calculation Options

Network Inventory

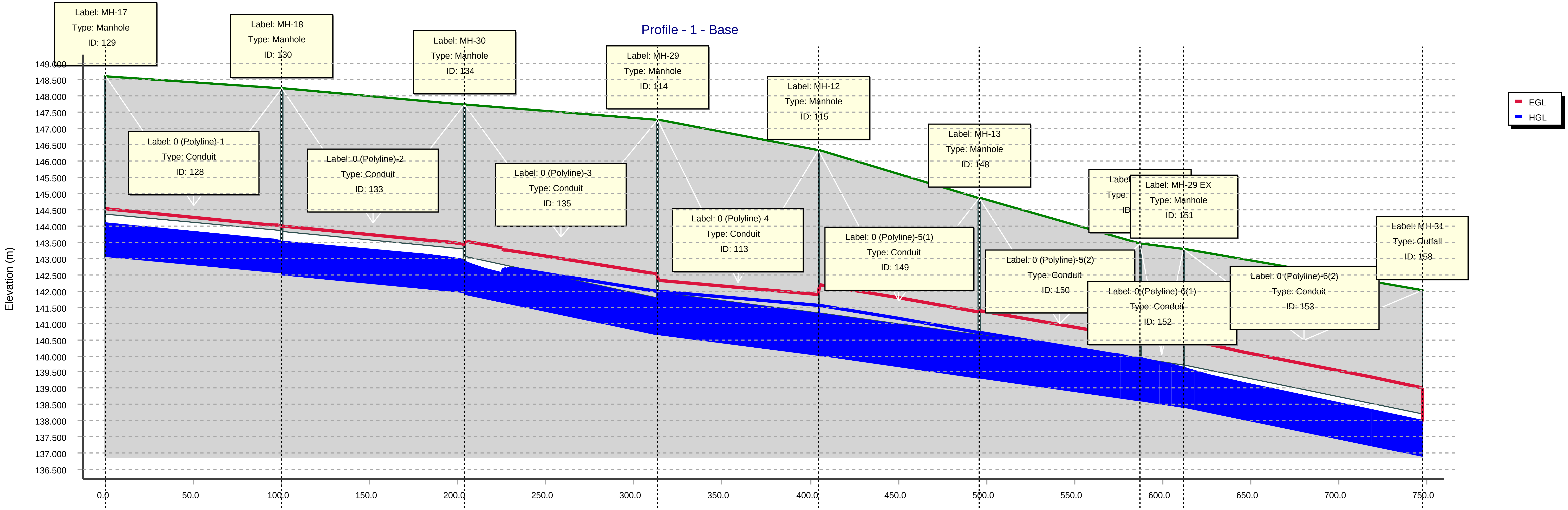
Conduits	29	Taps	0
-Circle	29	Transitions	0
-Box	0	Cross Sections	0
-Ellipse	0	Outfalls	5
-Virtual	0	Catchments	0
-Irregular Channel	0	Low Impact Development Controls	0
-Trapezoidal Channel	0	Ponds	0
-Triangular Channel	0	Pond Outlet Structures	0
-Rectangular Channel	0	Headwalls	0
-Pipe-Arch	0	Pumps	0
Laterals	0	Wet Wells	0
Channels	0	Pressure Junctions	0
Gutters	0	SCADA Elements	0
Pressure Pipes	0	Pump Stations	0
Catch Basins	0	Variable Speed Pump Batteries	0
Manholes	29	Air Valves	0
Property Connections	0		

Circle Inventory

Hydraulic Model Inventory: Rathburn Road V416.04.2021.stsw

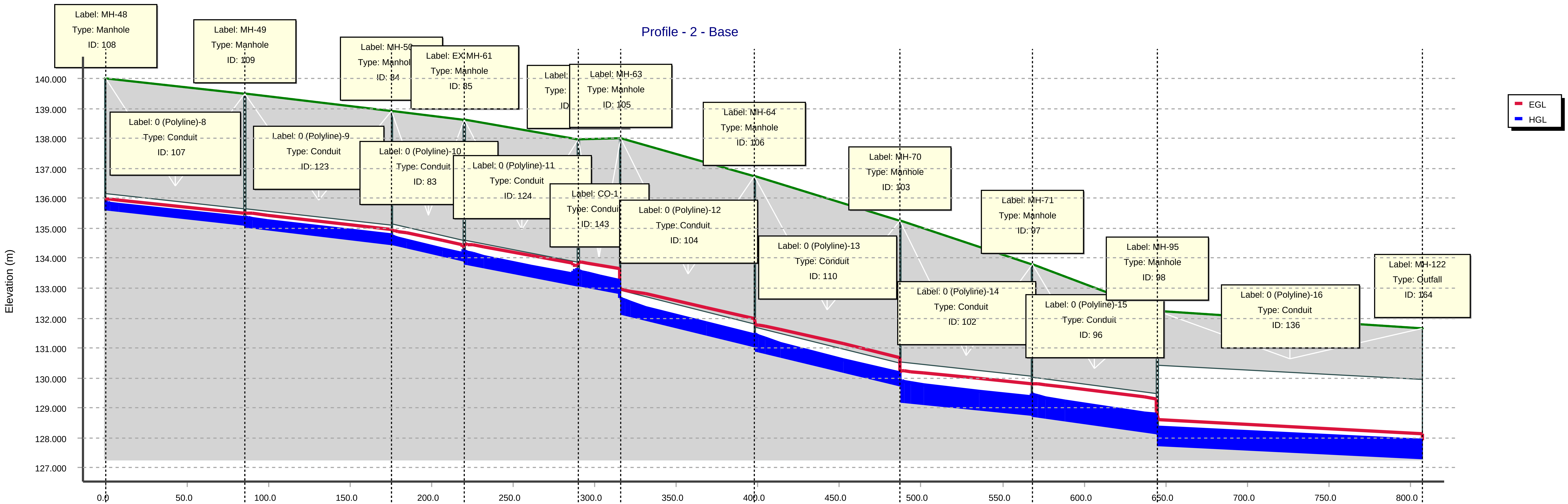
Circle Inventory

Circle - 1,050.0 mm	55.5 m	Circle - 525.0 mm	181.3 m
Circle - 1,200.0 mm	109.7 m	Circle - 600.0 mm	85.3 m
Circle - 1,350 mm	91.1 m	Circle - 675.0 mm	137.5 m
Circle - 1,350.0 mm	704.1 m	Circle - 750.0 mm	134.7 m
Circle - 2,700.0 mm	162.5 m	Circle - 825.0 mm	358.7 m
Circle - 300.0 mm	50.9 m	Circle - 975.0 mm	95.4 m
Circle - 375.0 mm	174.7 m	Total Length	2,393.5 m
Circle - 450.0 mm	52.1 m		



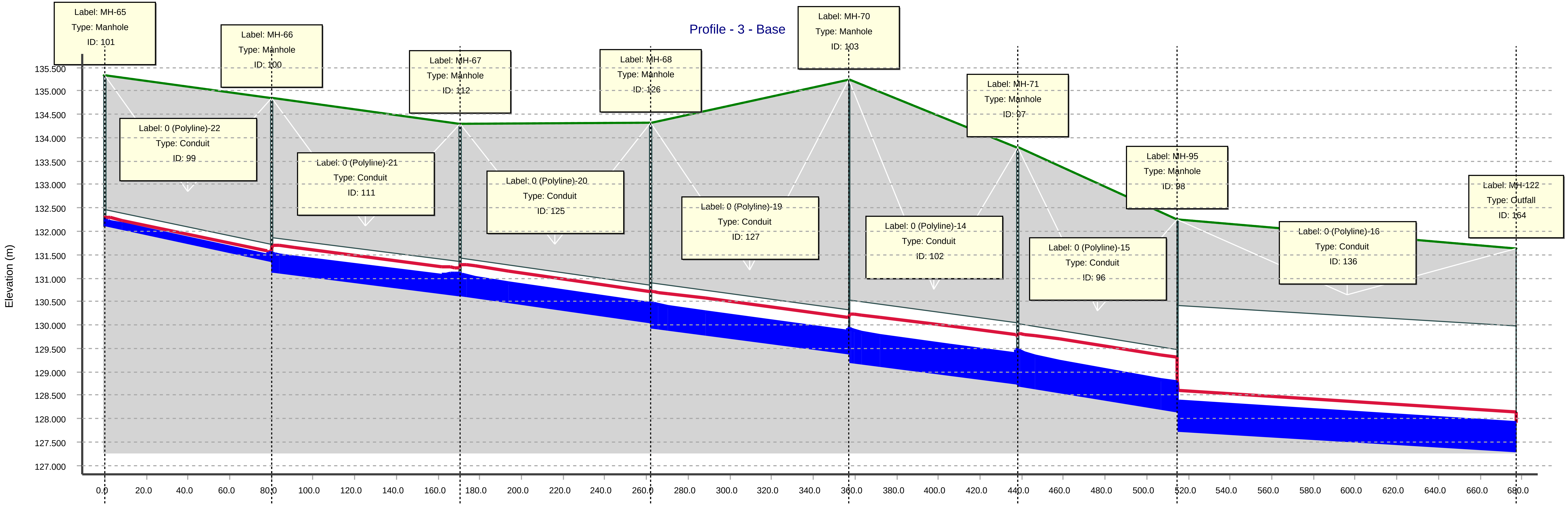
ID\Label	128 \ 0 (Polyline)-1	133 \ 0 (Polyline)-2	135 \ 0 (Polyline)-3	113 \ 0 (Polyline)-4	149 \ 0 (Polyline)-5(1)	150 \ 0 (Polyline)-5(2)	152 \ 0 (Polyline)-6(1)	153 \ 0 (Polyline)-6(2)
Link Length (m)	100.0	103.6	109.7	91.4	91.1	91.4	24.7	135.3
Rise (mm)\Material	1350.0 \ Concrete	1350.0 \ Concrete	1200.0 \ Concrete	1350.0 \ Concrete	1350.0 \ Concrete	1350.0 \ Concrete	1350.0 \ Concrete	1350.0 \ Concrete
Flow (m³/s)	3.56	3.62	3.66	3.69	5.05	5.10	5.53	5.66
Slope (%)	0.521	0.521	1.139	0.680	0.755	0.784	0.803	1.113

ID\Label	129 \ MH-17	130 \ MH-18	134 \ MH-30	114 \ MH-29	115 \ MH-12	148 \ MH-13	139 \ MH-14	151 \ MH-29 EX	158 \ MH-31
Ground (m)	148.613	148.250	147.750	147.292	146.340	144.859	143.454	143.310	142.039
Invert (m)	143.030	142.470	141.854	140.604	139.982	139.294	138.577	138.379	136.873
Station (m)	0.0	100.0	203.6	313.3	404.8	495.9	587.3	612.0	747.4



ID\Label	Link Length (m)	Rise (mm)\Material	Flow (m³/s)	Slope (%)
107 \ 0 (Polyline)-8	85.3	600.0 \ Concrete	0.23	0.586
123 \ 0 (Polyline)-9	90.2	675.0 \ Concrete	0.36	0.628
83 \ 0 (Polyline)-10	44.5	750.0 \ Concrete	0.36	1.233
124 \ 0 (Polyline)-11	69.8	825.0 \ Concrete	0.67	1.044
143 \ CO-1	25.9	825.0 \ Concrete	0.89	1.036
104 \ 0 (Polyline)-12	82.3	825.0 \ Concrete	0.96	1.330
110 \ 0 (Polyline)-13	89.3	825.0 \ Concrete	1.02	1.328
102 \ 0 (Polyline)-14	80.8	1350.0 \ Concrete	2.03	0.574
96 \ 0 (Polyline)-15	76.8	1350.0 \ Concrete	2.27	0.734
136 \ 0 (Polyline)-16	162.5	2700.0 \ Concrete	2.27	0.274

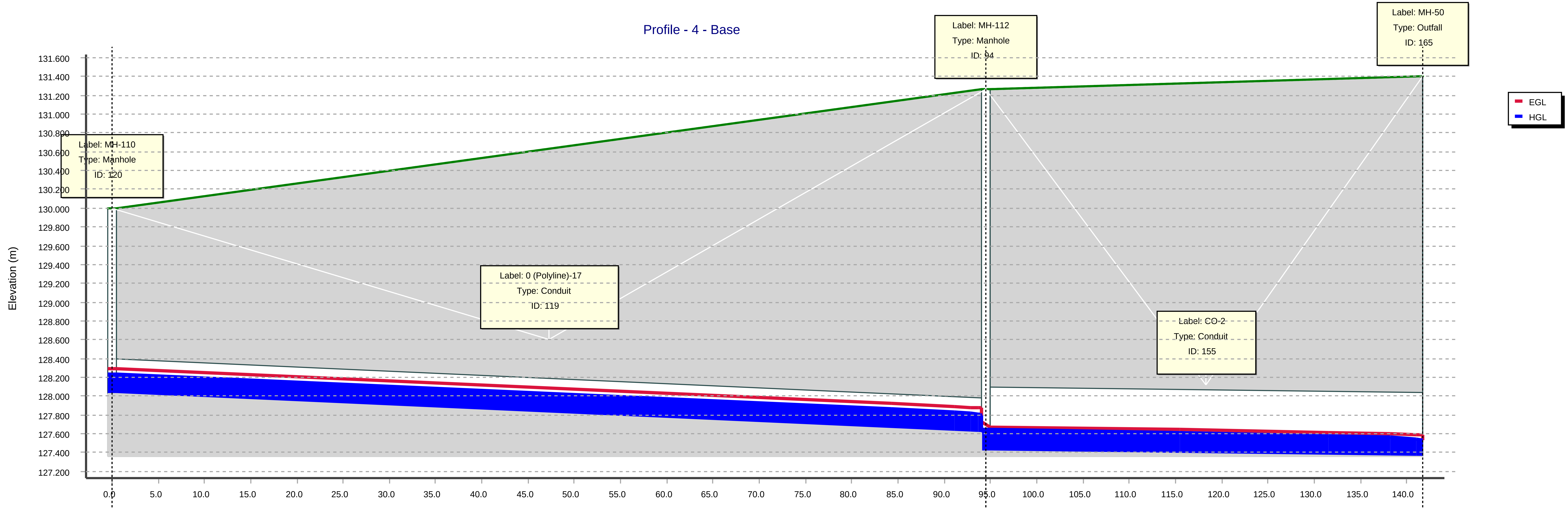
ID\Label	Ground (m)	Invert (m)	Station (m)
108 \ MH-48	140.000	135.557	0.0
109 \ MH-49	139.500	134.987	85.3
84 \ MH-50	138.923	134.402	175.6
85 \ EX MH-61	138.627	133.774	220.1
142 \ MH-61A	137.982	133.042	289.9
105 \ MH-63	137.997	132.085	315.8
106 \ MH-64	136.750	130.872	398.1
103 \ MH-70	135.250	129.171	487.4
97 \ MH-71	133.795	128.677	568.1
98 \ MH-95	132.250	127.714	644.9
164 \ MH-122	131.644	127.269	807.4



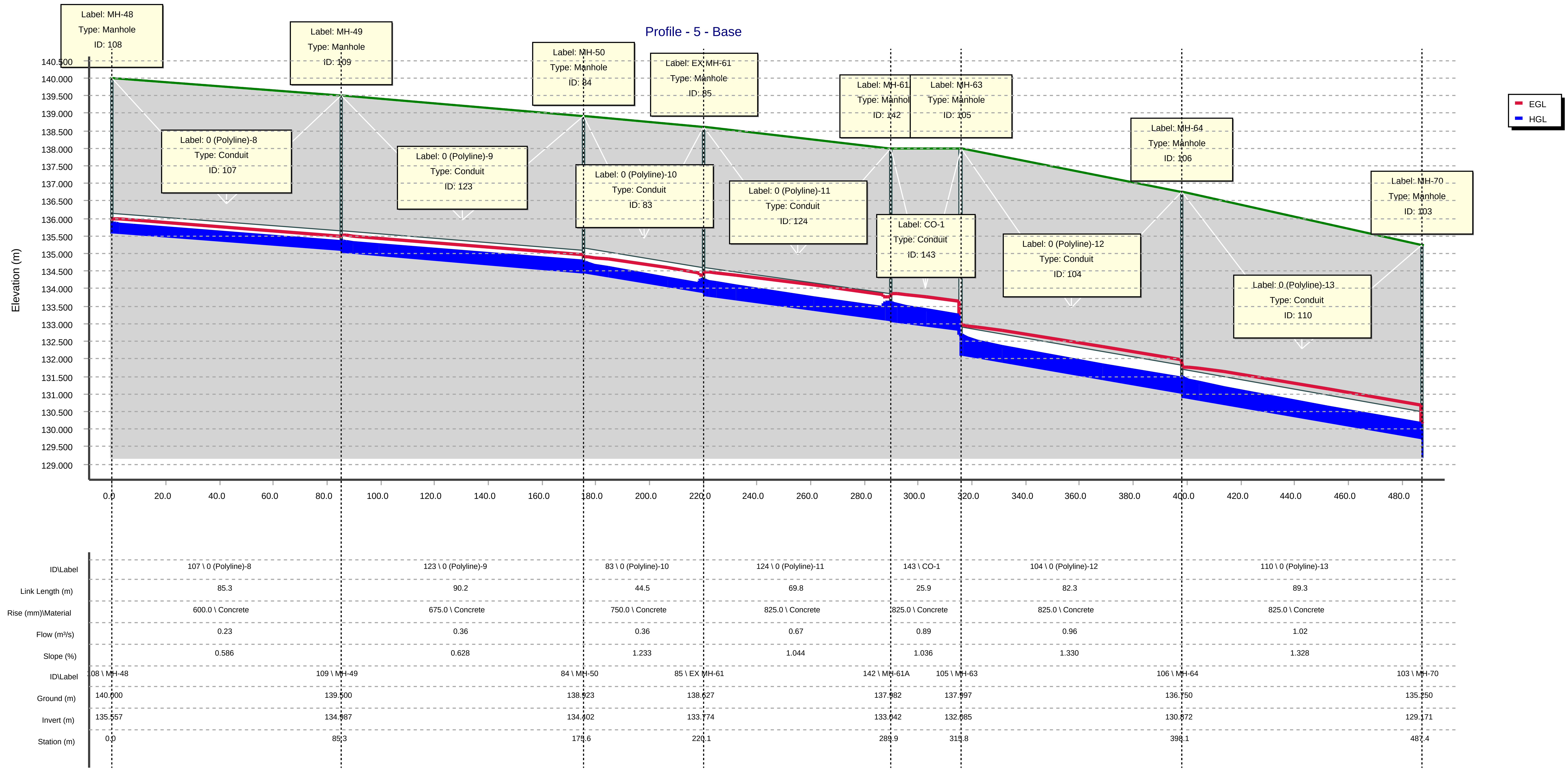
ID\Label	99 \ 0 (Polyline)-22	111 \ 0 (Polyline)-21	125 \ 0 (Polyline)-20	127 \ 0 (Polyline)-19	102 \ 0 (Polyline)-14	96 \ 0 (Polyline)-15	136 \ 0 (Polyline)-16
Link Length (m)	80.2	90.2	91.4	95.4	80.8	76.8	162.5
Rise (mm)\Material	375.0 \ Concrete	750.0 \ Concrete	825.0 \ Concrete	975.0 \ Concrete	1350.0 \ Concrete	1350.0 \ Concrete	2700.0 \ Concrete
Flow (m³/s)	0.05	0.47	0.66	0.97	2.03	2.27	2.27
Slope (%)	0.935	0.557	0.647	0.591	0.574	0.734	0.274

ID\Label	101 \ MH-65	100 \ MH-66	112 \ MH-67	126 \ MH-68	103 \ MH-70	97 \ MH-71	98 \ MH-95	164 \ MH-122
Ground (m)	135.331	134.847	134.298	134.319	135.250	133.795	132.250	131.644
Invert (m)	132.091	131.113	130.610	129.912	129.171	128.677	127.714	127.269
Station (m)	0.0	80.2	170.4	261.8	357.2	438.0	514.8	677.3

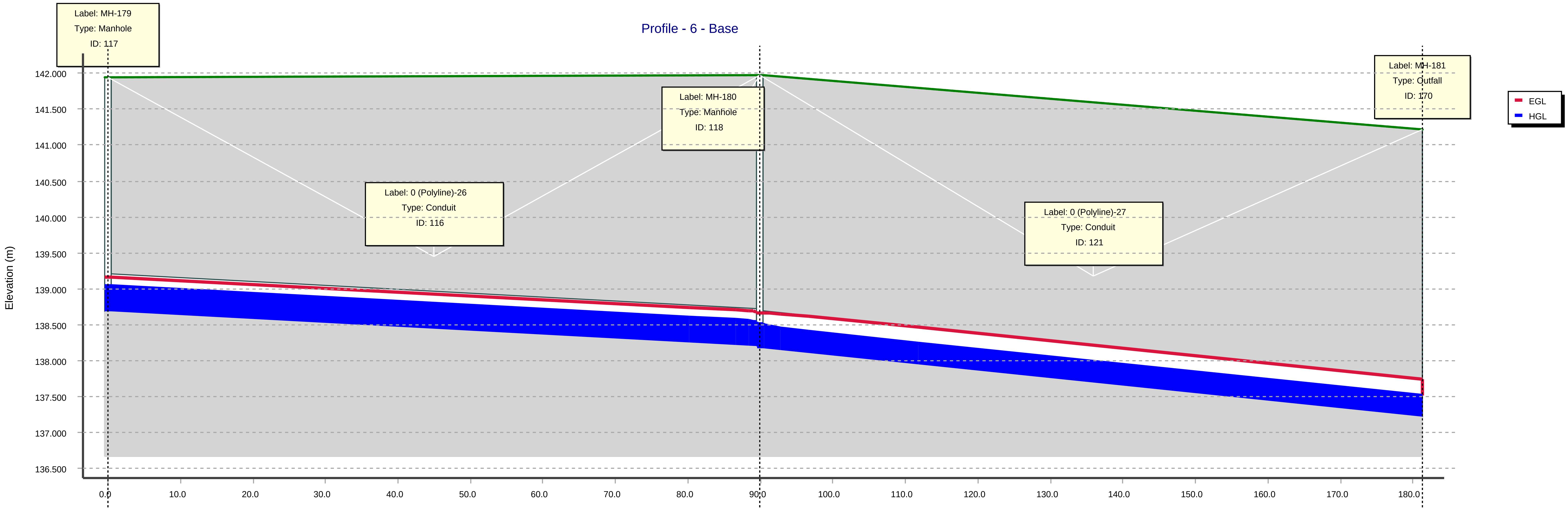
Profile - 4 - Base



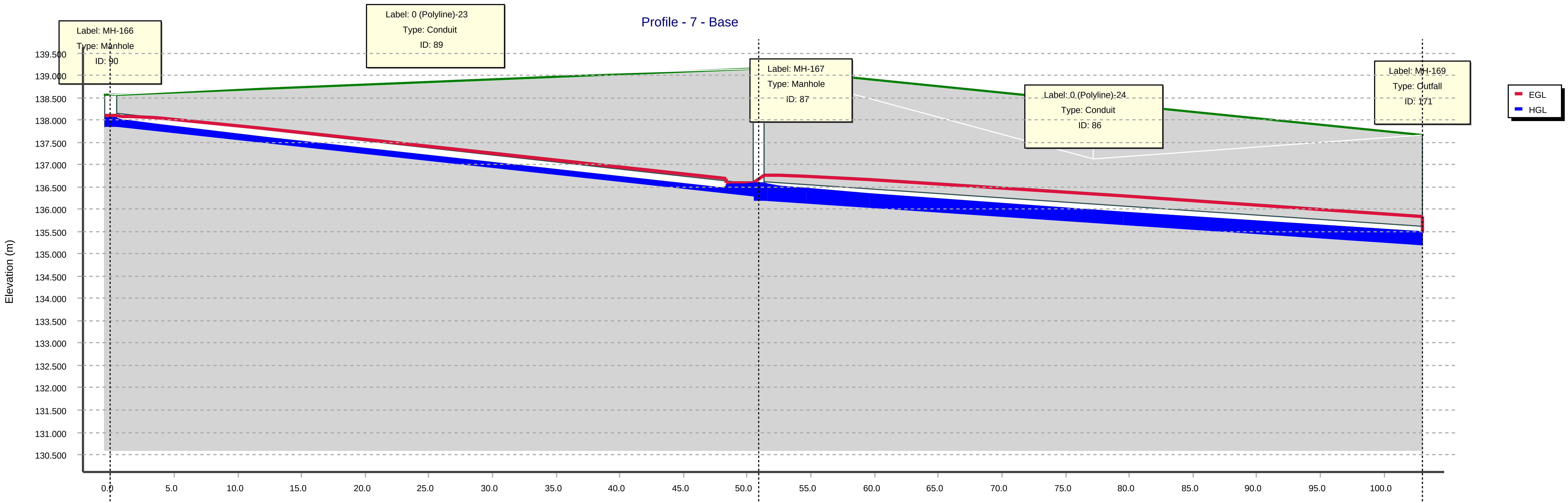
ID\Label		119 \ 0 (Polyline)-17		155 \ CO-2	
Link Length (m)		94.5		47.2	
Rise (mm)\Material		375.0 \ Concrete		675.0 \ Concrete	
Flow (m³/s)		0.07		0.08	
Slope (%)		0.439		0.122	
ID\Label	120 \ MH-110		94 \ MH-112		165 \ MH-50
Ground (m)	130.000		131.263		131.404
Invert (m)	128.025		127.416		127.358
Station (m)	0.0		94.5		141.7


Profile - 5 - Base
Label: MH-48
Type: Manhole
ID: 108
Label: MH-49
Type: Manhole
ID: 109
Label: MH-50
Type: Manhole
ID: 84
Label: EX MH-61
Type: Manhole
ID: 85
Label: MH-61
Type: Manhol
ID: 142
Label: MH-63
Type: Manhole
ID: 105
Label: MH-64
Type: Manhole
ID: 106
Label: MH-70
Type: Manhole
ID: 103
Label: 0 (Polyline)-8
Type: Conduit
ID: 107
Label: 0 (Polyline)-9
Type: Conduit
ID: 123
Label: 0 (Polyline)-10
Type: Conduit
ID: 83
Label: 0 (Polyline)-11
Type: Conduit
ID: 124
Label: CO-1
Type: Conduit
ID: 143
Label: 0 (Polyline)-12
Type: Conduit
ID: 104
Label: 0 (Polyline)-13
Type: Conduit
ID: 110
EGL
HGL
Elevation (m)
140.500
140.000
139.500
139.000
138.500
138.000
137.500
137.000
136.500
136.000
135.500
135.000
134.500
134.000
133.500
133.000
132.500
132.000
131.500
131.000
130.500
130.000
129.500
129.000
0.0
20.0
40.0
60.0
80.0
100.0
120.0
140.0
160.0
180.0
200.0
220.0
240.0
260.0
280.0
300.0
320.0
340.0
360.0
380.0
400.0
420.0
440.0
460.0
480.0
ID\Label
107 \ 0 (Polyline)-8
123 \ 0 (Polyline)-9
83 \ 0 (Polyline)-10
124 \ 0 (Polyline)-11
143 \ CO-1
104 \ 0 (Polyline)-12
110 \ 0 (Polyline)-13
Link Length (m)
85.3
90.2
44.5
69.8
25.9
82.3
89.3
Rise (mm)\Material
600.0 \ Concrete
675.0 \ Concrete
750.0 \ Concrete
825.0 \ Concrete
825.0 \ Concrete
825.0 \ Concrete
825.0 \ Concrete
Flow (m³/s)
0.23
0.36
0.36
0.67
0.89
0.96
1.02
Slope (%)
0.586
0.628
1.233
1.044
1.036
1.330
1.328
ID\Label
108 \ MH-48
109 \ MH-49
84 \ MH-50
85 \ EX MH-61
142 \ MH-61A
105 \ MH-63
106 \ MH-64
103 \ MH-70
Ground (m)
140.000
139.500
138.923
138.627
137.982
137.997
136.750
135.250
Invert (m)
135.557
134.987
134.402
133.774
133.042
132.085
130.872
129.171
Station (m)
0.0
85.3
175.6
220.1
289.9
315.8
398.1
487.4

Profile - 6 - Base

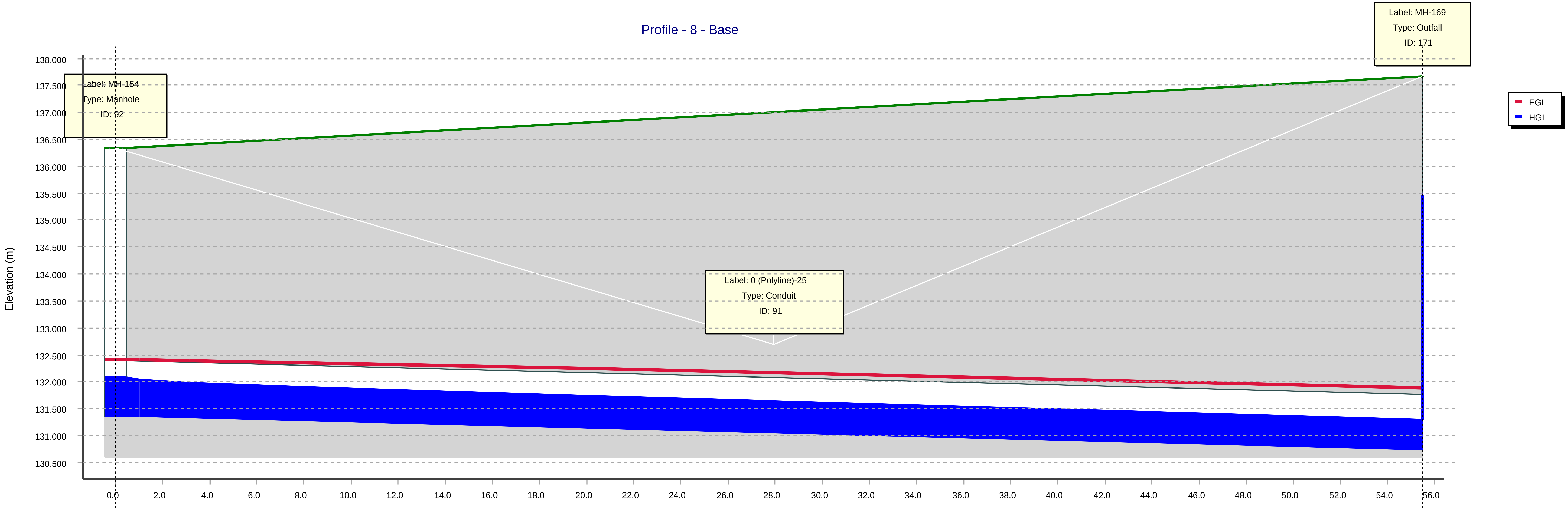


ID\Label		116 \ 0 (Polyline)-26		121 \ 0 (Polyline)-27	
Link Length (m)		89.9		91.4	
Rise (mm)\Material		525.0 \ Concrete		525.0 \ Concrete	
Flow (m³/s)		0.25		0.26	
Slope (%)		0.536		1.044	
ID\Label	117 \ MH-179		118 \ MH-180		170 \ MH-181
Ground (m)	141.942		141.974		141.222
Invert (m)	138.684		138.172		136.669
Station (m)	0.0		89.9		181.3



ID\Label		89 \ 0 (Polyline)-23		86 \ 0 (Polyline)-24	
Link Length (m)		50.9		52.1	
Rise (mm)\Material		300.0 \ Concrete		450.0 \ Concrete	
Flow (m³/s)		0.05		0.30	
Slope (%)		3.078		1.918	
ID\Label	90 \ MH-166		87 \ MH-167		171 \ MH-169
Ground (m)	138.575		139.152		137.668
Invert (m)	137.846		136.179		130.598
Station (m)	0.0		50.9		103.0

Profile - 8 - Base



ID\Label	91 \ 0 (Polyline)-25	
Link Length (m)	55.5	
Rise (mm)\Material	1050.0 \ Concrete	
Flow (m³/s)	1.66	
Slope (%)	1.115	
ID\Label	92 \ MH-154	171 \ MH-169
Ground (m)	136.340	137.668
Invert (m)	131.335	130.598
Station (m)	0.0	55.5

APPENDIX

E LOW IMPACT DEVELOPMENT ASSESSMENT

Technical Memorandum

To: Rory O'Sullivan, P.Eng.

Date: April 23, 2021

From: Shahrzad Samani, P.Eng.
Ray Zhao, E.I.T.

Project No: 19M-00836-03

Subject: **Rathburn Road. & Ponytrail Drive Low Impact Development Assessment - FINAL**

1 Introduction

The City of Mississauga (the City) retained WSP Canada Inc. to build a cycle track in the boulevard along Ponytrail Drive and Rathburn Road East between Dixie Road and Ponytrail Drive and a bike lane (on-street) along Rathburn Road East, east of Ponytrail Drive. The work is part of the City's 2021 and 2022 Annual Resurfacing program which provides an opportunity to implement the identified cycling facilities on these segments. The City has identified two potential LID locations within the study area to be reviewed for prospective LID opportunities as part of the roadway improvements as follows:

- Potential LID to enhance an existing drainage feature within the boulevard at the Rathburn Road East cul-de-sac.
- Potential LID within the centre medians and traffic islands on Poneytrail Drive, between Rathburn Road East and Maple Ridge Drive.

This technical memorandum documents the feasibility of these locations in providing stormwater management through the implementation of LID practices and recommended LID alternatives to meet the City's stormwater objectives and meeting the Low Impact Development Stormwater Management Planning and Design Guide from Credit Valley Conservation and Toronto and Region Conservation Authority requirements. The analysis includes a review of background information, related studies and LID feasibility assessments. The results of the LID assessment shall, in consultation with City staff, be used to confirm the final scope and cost of the LID improvements for the detailed design portion of the Integrated Road Project.

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F: +1 905 882-0055
wsp.com

1.1 Background Information

The relevant background information referenced and cited in the memo includes:

- City of Mississauga Storm Drainage Plan (Storm File 2-26)
- Mississauga STM_Key Map_Fieldgate Drive Plan & Profile Drawing Set (Drawing No. C13684, C13685, C13688, C13690, C13691, C13692, C13697, C13698, C13699, C13713, C13737, C15279)
- Geotechnical Investigation for the Proposed Rockwood Village Development in Mississauga by Golder Associates for Marshall Macklin Monaghan Limited (73-122, 226)
- Springbrook Tertiary Plan Area Stormwater Management Report prepared by WSP Canada Inc. in September, 2020
- City of Mississauga Development Requirements Manual, Transportation and Works Department September 2016
- Toronto and Region Conservation Authority Stormwater Management Criteria August 2012
- Credit Valley Conservation, Toronto and Region Conservation Authority Low Impact Development Stormwater Management Planning and Design Guide 2010
- Ministry of Environment, Conservation and Parks Stormwater Management Planning and Design Manual 2003

1.2 Site Visit

WSP staff conducted a field investigation of the existing drainage features, overland flow patterns and potential LID locations outlined in the scope of work on November.19, 2020. The photographs from the site visit can be found in **Appendix A**.

2 Stormwater Management Low Impact Development (LID) and City of Mississauga Design Criteria

The Toronto and Region Conservation Authority (TRCA) document (August 2012) includes stormwater management criteria that development must adhere to within the TRCA regulated areas. This site is within the Etobicoke sub-watershed area, and specific criteria are applicable in conjunction with the City of Mississauga guidelines to this watershed area as summarized below:

- **Water Quantity Control:** Control post-development peak flows to pre-development levels for all return period storms (i.e. 2, 5, 10, 25, 50 & 100 year).
- **Water Quality Control:** Enhanced Level of Protection (80% TSS removal) as per the latest MECP SWMPD Manual is required for all new paved areas.
- **Stormwater Runoff Volume Reduction (Erosion Control & Water Balance):** A minimum on-site retention of 5 mm is required by way of infiltration, evapotranspiration or re-use for new paved areas in accordance to the City of Mississauga guidelines.

City of Mississauga guidelines listed the following run-off coefficients to be applied for:

- Residential (single family, semi-detached): 0.55
- Compact or dense housing (e.g. townhouses): 0.65
- High-rise residential: 0.90
- Industrial and Commercial:0.90

- Neighbourhood Park: 0.30
- Permeable Pavements: 0.50
- Sodded Area: 0.25
- All Other Surfaces: 0.90

The City of Mississauga guidelines also specifies that in order to account for the increase in runoff due to saturation of the catchment surface that would occur for large, less frequent storms, the adjustment factor below shall be used:

- 10 year: 1.00
- 25 year: 1.10
- 50 year: 1.20
- 100 year: 1.25

The intensity of rainfall is to be determined from the most recent City of Mississauga standard "INTENSITY – DURATION – FREQUENCY RAINFALL CURVES". These curves were originally derived from rainfall data taken from the Pearson International Airport (City Standard Drawing No. 2111.010). The equations for these curves are as follows:

- 2 year storm: $I = 610 / (T.C. + 4.6)^{0.78}$
- 5 year storm: $I = 820 / (T.C. + 4.6)^{0.78}$
- 10 year storm: $I = 1010 / (T.C. + 4.6)^{0.78}$
- 25 year storm: $I = 1160 / (T.C. + 4.6)^{0.78}$
- 50 year storm: $I = 1300 / (T.C. + 4.7)^{0.78}$
- 100 year storm: $I = 1450 / (T.C. + 4.9)^{0.78}$

3 Water Quantity Control

Post development peak runoff flows are required to be controlled to pre-development conditions for all return period storms as part of the Etobicoke sub-watershed (i.e. 2 year to 100 year event). The Modified rational method has been used to calculate the required storage volume needed for each of the catchments. Four catchments (Catchment 100, 200, 300 and 400) have been delineated as shown in **Exhibit 1** and **2** based on storm sewer outlets and overland flow patterns for the study limits. Note that under proposed condition, no overland flow pattern will be changed. The only difference is the added impervious area from the additional bike lanes throughout the project limits. The overall runoff coefficients for catchments 100 and 200 have increased slightly due to the additional impervious area. The existing land use break down, proposed land use break down as well as a comparison between existing and proposed area breakdowns are shown below in **Table** 3-1, **Table 3-2** and **Table 3-3**.

Table 3-1: Existing Land-Use Area Breakdown

Catchment	Land-Use	Area (ha)	% Coverage	C Value
100	Impervious Area	1.63	72%	0.90
	Grassed Area	0.64	28%	0.25
	Total	2.27	100%	0.72
200	Impervious Area	2.98	77%	0.90
	Grassed Area	0.87	23%	0.25
	Total	3.85	100%	0.75
300	Impervious Area	0.66	78%	0.90
	Grassed Area	0.18	22%	0.25
	Total	0.84	100%	0.76
400	Impervious Area	0.52	87%	0.90
	Grassed Area	0.08	13%	0.25
	Total	0.60	100%	0.81

Table 3-2: Proposed Land-Use Area Breakdown

Catchment ID	Land-Use	Area (ha)	% Coverage	C Value
100	Impervious Area	1.89	83%	0.90
	Grassed Area	0.38	17%	0.25
	Total	2.27	100%	0.79
200	Impervious Area	3.30	86%	0.90
	Grassed Area	0.56	14%	0.25
	Total	3.85	100%	0.81
300	Impervious Area	0.66	78%	0.90
	Grassed Area	0.18	22%	0.25
	Total	0.84	100%	0.76
400	Impervious Area	0.52	87%	0.90
	Grassed Area	0.08	13%	0.25
	Total	0.60	100%	0.81

Table 3-3: Existing and Proposed Area Breakdown Comparison

Catchment ID	Land-Use	Existing Area (ha)	Proposed Area (ha)	% Changes
100	Impervious Area	1.63	1.89	16%
	Grassed Area	0.64	0.38	-41%
	Total	2.27	2.27	0%
200	Impervious Area	2.98	3.30	11%
	Grassed Area	0.87	0.56	-36%
	Total	3.85	3.85	0%
300	Impervious Area	0.66	0.66	0%
	Grassed Area	0.18	0.18	0%
	Total	0.84	0.84	0%
400	Impervious Area	0.52	0.52	0%
	Grassed Area	0.08	0.08	0%
	Total	0.60	0.60	0%

Various external catchments have been delineated where the surrounding residential communities contribute flow to the municipal roadway storm sewer branches. However, for LID calculation purposes, the proposed LID features should only be responsible for controlling the flows generated by the roadway within the study limits. Therefore, the external area flows are not included in the total catchment flows. Modified rational method has been used to calculate the pre-development flows, post-development flows as well as storage volume required to match post-development condition to pre-development conditions. The pre-development and post-development flow rates are shown in **Table 3-4.** The design sheets can be found in **Appendix B**.

Table 3-4: Pre-Development and Post-Development Peak Flow Rates

Catchment ID	Storm Event	Pre-Development Flow (m^3/s)	Post-Development Flow (m^3/s)
100	2 year	0.27	0.30
	5 year	0.36	0.40
	10 year	0.45	0.49
	25 year	0.57	0.62
	50 year	0.69	0.76
	100 year	0.79	0.88
200	2 year	0.48	0.52
	5 year	0.65	0.69
	10 year	0.80	0.86
	25 year	1.01	1.08
	50 year	1.23	1.32
	100 year	1.42	1.52
300	2 year	0.11	0.11
	5 year	0.14	0.14
	10 year	0.18	0.18
	25 year	0.22	0.22
	50 year	0.27	0.27
	100 year	0.31	0.31
400	2 year	0.08	0.08
	5 year	0.11	0.11
	10 year	0.13	0.13
	25 year	0.17	0.17
	50 year	0.21	0.21
	100 year	0.24	0.24

The required maximum storage (for 100 year storm event) for each catchment is listed below:

- Catchment 100: 62 m^3
- Catchment 200: 76 m^3
- Catchment 300: 0 m^3
- Catchment 400: 0 m^3

Catchments 100 and 200 require 62 and 76 m^3 of storage volume respectively. Since there is no imperviousness area increase or any other changes to catchments 300 and 400, no quantity control measures are required.

4 Water Quality Control

The MOECC (now MECP) Stormwater Management Planning and Design Manual (SWMPDM) provides technical and procedural guidance for the planning, design and review of SWM practices. In particular, the manual regulates water quality treatment levels corresponding to the removal of a percentage of total suspended solids (TSS) from the runoff prior to discharging to the receiving water body.

The stormwater management criterion stipulates that all watercourses and water bodies (e.g. Lake Ontario) within TRCA's jurisdiction are classified as requiring an Enhanced level of protection (Level 1). Level 1 water quality protection is equivalent to 80% TSS removal on an average annual basis shall be provided through stand-alone measures or treatment trains. To minimize thermal impacts, preventative measures (i.e. LID practices) and mitigation measures should be applied.

Water quality control calculations conducted assumes that all water quality treatment for all the newly added paved area is to be provided by infiltration facilities (i.e. LID features). CB Shields (catch basin baffle), Oil and grit separator (OGS units) and level spreaders / inlet sumps should be considered as options available for water quality control at places where LID features aren't feasible and to be explored further as part of the detail design.

As per Table 3.2 of the MOECC SWMPDM, an infiltration volume of 10.1 m^3 is required to provide 80% TSS removal for the newly added impervious area of 0.26 ha for Catchment 100 and an infiltration volume of 12.5 m^3 is required to provide 80% TSS removal for the newly added impervious area of 0.31 ha for Catchment 200. There is no proposed changes to the roadway for catchments 300 and 400 with no new impervious area added. Therefore, no water quality treatment is needed for catchments 300 and 400. The design sheets are included in **Appendix B**.

5 Erosion Control and Water Balance (Stormwater Runoff Volume Reduction)

Stormwater runoff from developed sites impacts streams and watercourses by introducing erosive forces during frequent storms. In addition, the alteration of the hydrologic regime from raw land reduces the amount of water that would naturally evaporate, transpire or infiltrate essentially generating more runoff volume. These impacts are the target of the requirement outlined within this section with the goal being to reduce stormwater runoff volume from developing sites. Practices implemented to address this criterion may assist in mitigating erosion and water balance to address the City of Mississauga and Conservation Authority requirements.

The first 5 mm of runoff shall be retained on-site and managed by way of infiltration, evapotranspiration or re-use. It is assumed that all landscaped areas will retain at least 5 mm of rainwater prior to runoff generation due to shallow depression storage and wetting, with consequent evaporation. The volume of runoff during a 5 mm storm event are listed below for each catchment:

- Catchment 100: 12.8 m^3
- Catchment 200: 15.6 m^3
- Catchment 300: 0 m^3
- Catchment 400: 0 m^3

There are no proposed changes to the roadway for catchments 300 and 400 with no new impervious area added. Therefore, no stormwater runoff volume reduction is needed for catchments 300 and 400. Note that these volumes are greater than the water quality treatment volume requirements and are the governing factor of the stormwater retention on site for catchments 100 and 200. **Table 5-1** provides a summary of all SWM criteria and requirements for the project site with the recommended measures.

Table 5-1: Summary of all stormwater management criteria

Catchment ID	Increase in Impervious area under Proposed Condition (ha)	Water Quantity Required Storage (m^3)	Water Quality Required Treatment Volume (m^3)	Stormwater volume runoff reduction (m^3)
100	0.26	62	10.1	12.8
200	0.32	76	12.5	15.6
300	0	0	0	0
400	0	0	0	0

6 Low Impact Development Assessment

There are two potential LID locations identified in the scope of work:

- Potential LID to enhance existing drainage feature within the boulevard at the Rathburn Road East cul-de-sac.
- Potential LID within the centre medians and traffic islands on Ponytrail Drive, between Rathburn Road East and Maple Ridge Drive.

The centre medians and traffic islands on Ponytrail Drive, between Rathburn Road East and Maple Ridge Drive are the crown of the roadway as shown in the cross-sections in **Exhibit 3**. The centre medians and traffic islands also have curbs on either side. These observations make implementing LID features at that location not feasible as stormwater flows away from the crown during a storm event, therefore not capturing any stormwater to meet any of the criteria. However, converting the centre medians and traffic islands from paved to grassed areas promote the best stormwater management practices as it reduces the amount of runoff generated from the site, but it's not considered a LID feature.

Different LID options were assessed to enhance existing drainage feature within the boulevard at the Rathburn Road East cul-de-sac. Please find **Table 6-1** below outlining different LID alternatives and their feasibilities in accordance to the overall site condition. Note that the "Geotechnical Investigation for the Proposed Rockwood Village Development in Mississauga by Golder Associates for Marshall Macklin Monaghan Limited (73-122, 226)" has been reviewed and was taken into consideration during the process of assessing different LID alternatives. However, the geotechnical investigation was conducted prior to the subdivisions' construction (subdivisions surrounding Rathburn Road and Ponytrail Drive). The geotechnical nature of the soil can change significantly due to earth work and settling movement caused by the subdivision construction. Additional geotechnical investigations should be conducted in order to better assess the LID feasibilities during detail design.

Table 6-1: LID Alternatives Assessments

LID OPTIONS	Overview and General Use	Feasibility
Rainwater Harvesting	Rainwater harvesting is the process of intercepting, conveying and storing rainfall for future use. The rain that falls upon a catchment surface, such as a roof, is collected and conveyed into a storage tank. The captured rainwater can be used for outdoor non-potable water uses such as irrigation and pressure washing, or in building to flush toilets or urinals.	Not feasible – No water reuse needs for this site as it is a municipal roadway (no irrigation, pressure washing or flushing toilets).
Green Roofs	Green roofs consist of a thin layer of vegetation and growing medium installed on top of a conventional flat or slope roof. Green roofs can carry beneficial impacts for water quality, water balance and peak flow control measures.	Not feasible – Not a building system.
Roof Downspout Disconnection	Simple downspout disconnection involves directing flow from roof downspouts to a pervious area that drains away from the building. This prevents stormwater from directly entering the storm sewer system or flowing across a "connected' impervious surface, such as a driveway, that drains to a storm sewer.	Not feasible – Not a building system (no roofs).
Infiltration Gallery	Infiltration galleries are rectangular trenches lined with geotextile fabric and filled with clean granular stone or other void forming material. Infiltration galleries allow stormwater to be infiltrated given desirable groundwater elevations.	Can be further explored during detail design – additional geotechnical investigation (native soil infiltration rate / groundwater levels etc.) required to assess feasibilities of infiltration gallery.

LID OPTIONS	Overview and General Use	Feasibility
Infiltration Chamber	Infiltration chamber include a range of proprietary manufactured modular structures installed underground. Structures typically have open bottoms, perforated side walls and optional underlying granular stone reservoirs.	Can be further explored during detail design – additional geotechnical investigation (native soil infiltration rate / groundwater levels etc.) required to assess feasibilities of infiltration chamber.
Bioretention	Bioretention temporarily stores, treats and infiltrates runoff as a stormwater filter and infiltration practice. The primary component of a bioretention practice is the filter bed which is a mixture of sand, fines and organic material. Other important elements of bioretention include a mulch ground cover and plants adapted to the conditions of a stormwater practice. Bioretention is designed to capture small storm events or the water quality storage requirement. An overflow or bypass is necessary to pass large storm event flows.	Can be further explored during detail design – additional geotechnical investigation (native soil infiltration rate / groundwater levels etc.) required to assess feasibilities of bioretention units.
Vegetated Filter Strips	Vegetated filter strips are gently sloping, densely vegetated areas that treat runoff as sheet flow from adjacent impervious areas. They function by slowing runoff velocity and filtering out suspended sediments and associated pollutants, and by providing some infiltration into underlying soils.	Not feasible – Vegetated filter strips are generally used as pre-treatment practices to other best management practices. It provides limited results in filtering out suspended sediments and only some infiltration.
Permeable Pavement	Permeable pavements allow stormwater to drain through them and into a stone reservoir where it is infiltrated into the underlying native soil or temporarily detained.	Not feasible – Winter operations and high clogging potential make permeable pavement a very high maintenance best management practice at the boulevard location.
Enhanced Grass Swales	Enhanced grass swales are vegetated open channels designed to convey, treat and attenuate stormwater runoff. Check dams and vegetation in the swales slows the water to allow sedimentation, filtration through the root zone and soil matric, evapotranspiration, and infiltration into the underlying native soil.	Not feasible – pedestrian and biking safety concerns with rock check dams and swales in close proximity of the pedestrian sidewalk and biking lanes

Potential LID's locations are shown in **Exhibit 3**. There are three possible LID options selected out of all LID alternatives. The advantages and disadvantages with how each alternative aims to meet the criteria is shown below in **Table 6-2**.

Table 6-2: Different LID alternatives comparison

LID Type	Advantage	Disadvantage	Criteria Assessment
Infiltration Gallery	Well suited where available space for infiltration is limited to narrow strips of land along road rights-of-way.	Risk of ground water and soil contamination (low to moderate possibility)	Achieves water balance benefit, water quality improvement benefits and partial stream channel erosion control benefit (depending on soil infiltration rate). There is 3320 m^2 of space available within the boulevard to be used for LID features (does not have to utilize all of it). Assuming a 300 mm depth and 40% void ratio, around 400 m^3 of storage is available which satisfies all criteria.
Infiltration Chamber	Due to the large volume of underground void space an infiltration chamber creates in comparison to a soakaway of the same dimensions, and the modular nature of the design, infiltration chambers are well suited to sites where available space for other LIDs are limited, or where it's desirable for the facility to have little or no surface footprint.	Risk of ground water and soil contamination (low to moderate possibility)	Achieves water balance benefit, water quality improvement benefits and partial stream channel erosion control benefit (depending on soil infiltration rate). There is 3320 m^2 of space available within the boulevard to be used for LID features (does not have to utilize all of it). Assuming a 300 mm depth for the infiltration tank, around 500 m^3 of storage is available which satisfies all criteria.
Bioretention	Bioretention can be adapted to fit into many different development contexts and provides a convenient area for snow storage and treatment. It meets the local stormwater requirements while using space that would be landscaped anyway.	Risk of ground water and soil contamination (low to moderate possibility)	Provides partial water balance benefits (based on available storage volume beneath the underdrain and soil infiltration rate), satisfies water quality improvement and partial stream channel erosion control benefits (based on available storage volume beneath the underdrain and soil infiltration rate). There is 3320 m^2 of space available within the boulevard to be used for LID features (does not have to utilize all of it). Assuming a 300 mm depth and 40% void ratio, around 400 m^3 of storage is available which satisfies all criteria.

As shown in **Table 6-2**, there are different options that can be explored further and even though all three possible alternatives provide similar disadvantages, each provides an unique advantage. However, all of the three options listed satisfies the infiltration volume required. More design details of the LID features listed in this memo should be further explored in the detail design. Other considerations such as utility conflicts should also be considered.

7 Conclusions and Recommendations

This memo has been prepared to review potential LID options for the Rathburn Road and Ponytrail Drive Integrated Roadway Project. Water quantity, water quality as well as stormwater runoff volume reduction (erosion control and water balance) calculations have been conducted based on the catchment delineation and land use breakdown. Three preliminary LID options have been assessed: infiltration gallery, infiltration chamber and bioretention.

Infiltration gallery achieves water balance benefit, water quality improvement benefits and partial stream channel erosion control benefit (depending on soil infiltration rate). There is 3320 m^2 of space available within the boulevard to be used for LID features (does not have to utilize all of it). Assuming a 300 mm depth and 40% void ratio, around 400 m^3 of storage is available which satisfies all criteria. **Infiltration chamber** achieves water balance benefit, water quality improvement benefits and partial stream channel erosion control benefit (depending on soil infiltration rate). There is 3320 m^2 of space available within the boulevard to be used for LID features (does not have to utilize all of it). Assuming a 300 mm depth for the infiltration tank, around 500 m^3 of storage is available which satisfies all criteria. **Bioretention** provides partial water balance benefits (based on available storage volume beneath the underdrain and soil infiltration rate), satisfies water quality improvement and partial stream channel erosion control benefits (based on available storage volume beneath the underdrain and soil infiltration rate). There is 3320 m^2 of space available within the boulevard to be used for LID features (does not have to utilize all of it). Assuming a 300 mm depth and 40% void ratio, around 400 m^3 of storage is available which satisfies all criteria. More design details of the LID features listed in this memo should be further explored in the detail design.

Exhibits

DRAWING NAME: \\CORP.PBWAN.NET\CA\CAKTC100\COMMON.MIS\KITCHENER\WRC\DRAWINGS\2020\19M-00836-03-MISSISSAUGA_RATHBURN RD E AND PONYTRAIL DR\2_DESIGN\3_DRAINAGE DESIGN\DRAWINGS\DRAINAGE DESIGN.DWG

wsp

EXISTING CONDITIONS DRAINAGE MOSAIC

19M-00836-03 Rathburn Road & Ponytrail Drive

EXHIBIT

1

DRAWING NAME: \\CORP.PBWAN.NET\CA\CAKTC100\COMMON.MIS\KITCHENER\MRC\DRAWINGS\2020\19M-00836-03-MISSISSAUGA_RATHBURN RD E AND PONYTRAIL DR\2_DESIGN\3_DRAINAGE DESIGN\DRAWINGS\DRAINAGE DESIGN.DWG

wsp

PROPOSED CONDITIONS DRAINAGE MOSAIC

19M-00836-03 Rathburn Road & Ponytrail Drive

EXHIBIT

2

DRAWING NAME: \\CORP.PBWAN.NET\CA\CAKTC100\COMMON\MIS\KITCHENER\MRC\DRAWINGS\2020\19M-00836-03-MISSISSAUGA_RATHBURN RD E AND PONYTRAIL DR\2_DESIGN\3_DRAINAGE DESIGN\DRAWINGS\DRAINAGE DESIGN.DWG

POTENTIAL LID LOCATIONS

19M-00836-03 Rathburn Road & Ponytrail Drive

EXHIBIT

3

APPENDIX

A

Field Visit Photos

APPENDIX

Ponytrail Dr x Burhamthrope Rd E – North Side

Ponytrail Dr – North Side Facing West 1

Ponytrail Dr – North Side Facing West 2

Ponytrail Dr – North Side Facing West 3

Ponytrail Dr – North Side Facing West 4

Ponytrail Dr x Rathburn Rd E – N Side Facing W

Ponytrail Dr x Rathburn Rd E – S Side Facing E

Ponytrail Dr – South Side Facing East 1

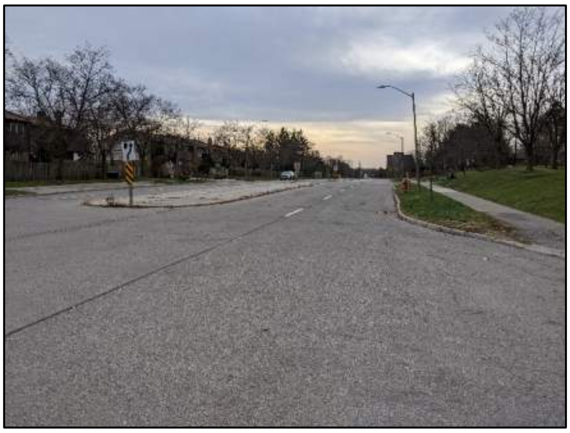
Ponytrail Dr – South Side Facing East 2

Ponytrail Dr – South Side Facing East 3

Ponytrail Dr – South Side Facing East 4

Ponytrail Dr x Burnhamthrope Rd E – S Side

APPENDIX



Rathburn Rd E x Cul-de-Sac – North Side Facing West 1

Rathburn Rd E – North Side Facing West 2

Rathburn Rd E – North Side Facing West 3

Rathburn Rd E – North Side Facing West 4

Rathburn Rd E – North Side Facing West 5

Rathburn Rd E – North Side Facing West 6

Rathburn Rd E – North Side Facing West 7

Rathburn Rd E x Ponytrail Dr– North Side Facing West 8

Rathburn Rd E – North Side Facing West 9

Rathburn Rd E – North Side Facing West 10

Rathburn Rd E – North Side Facing West 11

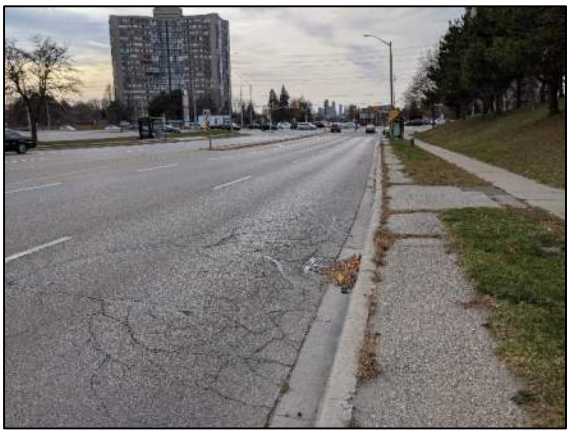
Rathburn Rd E – North Side Facing West 12

Rathburn Rd E – North Side Facing West 13

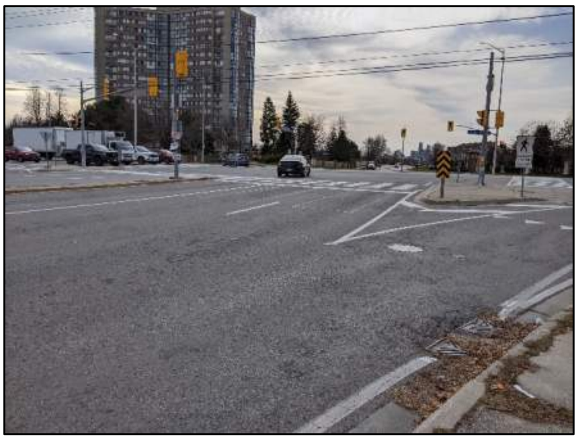
Rathburn Rd E – North Side Facing West 14

Rathburn Rd E – North Side Facing West 15

Rathburn Rd E – North Side Facing West 16



Rathburn Rd E – North Side Facing West 17



Rathburn Rd E x Dixie Rd – North Side Facing West 18

Rathburn Rd E x Dixie Rd – South Side Facing East 1

Rathburn Rd E – South Side Facing East 2

Rathburn Rd E – South Side Facing East 3

Rathburn Rd E – South Side Facing East 4

Rathburn Rd E – South Side Facing East 5

Rathburn Rd E – South Side Facing East 6

Rathburn Rd E – South Side Facing East 7

Rathburn Rd E – South Side Facing East 8

Rathburn Rd E – South Side Facing East 9

Rathburn Rd E x Ponytrail Dr– South Side Facing East 10

Rathburn Rd E – South Side Facing East 11

Rathburn Rd E – South Side Facing East 12

Rathburn Rd E – South Side Facing East 13

Rathburn Rd E – South Side Facing East 14

Rathburn Rd E – South Side Facing East 15

Rathburn Rd E – South Side Facing East 16

Rathburn Rd E x Cul-de-Sac – South Side Facing East 17

Rathburn Rd E x Cul-de-Sac – South Side Facing East 18

APPENDIX

B

Stormwater Management Calculations

	SWM Calculations	Project:	Rathburn Road & Ponytrail Drive	No.:	19M-00836-03
	Land Use Calculation	By:	RZ	Date:	2021-04-19	Page:
		Checked:	SS	Checked:	2021-04-19	1

1.0 Area Take-off (Catchment 100)

1.1 Pre-development conditions

Land Cover	Area (ha)	% Area Cover	Runoff C
External	113.56	N/A	0.55
At-Grade Impervious	1.63	72%	0.90
Landscaping	0.64	28%	0.25
Total	**2.27**	**100%**	**0.72**
Total (including External)	**115.82**	**100%**	**0.55**

1.2 Post-development conditions

Land Cover	Area (ha)	% Area Cover	Runoff C
External	113.56	N/A	0.55
At-Grade Impervious	1.89	83%	0.90
Landscaping	0.38	17%	0.25
Total	**2.27**	**100%**	**0.79**
Total (including External)	**115.82**	**100%**	**0.55**

1.0 Area Take-off (Catchment 200)

1.1 Pre-development conditions

Land Cover	Area (ha)	% Area Cover	Runoff C
External	19.41	N/A	0.55
At-Grade Impervious	2.98	77%	0.90
Landscaping	0.87	23%	0.25
Total	**3.85**	**100%**	**0.75**
Total (including External)	**23.26**	**100%**	**0.58**

1.2 Post-development conditions

Land Cover	Area (ha)	% Area Cover	Runoff C
External	19.41	N/A	0.55
At-Grade Impervious	3.30	86%	0.90
Landscaping	0.56	14%	0.25
Total	**3.85**	**100%**	**0.81**
Total (including External)	**23.26**	**100%**	**0.59**

1.0 Area Take-off (Catchment 300)

1.1 Pre-development conditions

Land Cover	Area (ha)	% Area Cover	Runoff C
External	22.17	N/A	0.55
At-Grade Impervious	0.66	78%	0.90
Landscaping	0.18	22%	0.25
Total	**0.84**	**100%**	**0.76**
Total (including External)	**23.01**	**100%**	**0.56**

1.2 Post-development conditions

Land Cover	Area (ha)	% Area Cover	Runoff C
External	22.17	N/A	0.55
At-Grade Impervious	0.66	78%	0.90
Landscaping	0.18	22%	0.25
Total	**0.84**	**100%**	**0.76**
Total (including External)	**23.01**	**100%**	**0.56**

1.0 Area Take-off (Catchment 400)

1.1 Pre-development conditions

Land Cover	Area (ha)	% Area Cover	Runoff C
External	4.92	N/A	0.55
At-Grade Impervious	0.52	87%	0.90
Landscaping	0.08	13%	0.25
Total	**0.60**	**100%**	**0.81**
Total (including External)	**5.52**	**100%**	**0.58**

1.2 Post-development conditions

Land Cover	Area (ha)	% Area Cover	Runoff C
External	4.92	N/A	0.55
At-Grade Impervious	0.52	87%	0.90
Landscaping	0.08	13%	0.25
Total	**0.60**	**100%**	**0.81**
Total (including External)	**5.52**	**100%**	**0.58**

2.0 Pre-development Conditions (Catchment 100)

2.1 Pre-development Area Breakdown

Land Cover	Area (ha)	% Area Cover	Runoff C
External	113.56	N/A	0.55
At-Grade Impervious	1.63	72%	0.90
Landscaping	0.64	28%	0.25
Total	**2.27**	**100%**	**0.72**

2.2 Pre-development Peak Flow Rates

The allowable runoff rate is calculated using the Rational Method:

$$Q = 2.78CIAR$$

Where:

Q = Peak flow rate (Litres/second)

C = Runoff Coefficient

I = Rainfall Intensity (mm/hour)

A = Catchment Area (hectares)

R = Return Period Factor

According to the City of Mississauga Guidelines: In order to account for the increase in runoff due to saturation of the catchment surface that would occur for larger, less frequenet storms, the adjustment factor should be used

The rainfall intensity is calculated with the IDF Curve, using parameters from the City of Mississauga

Where:

$$I = \frac{A}{(T+B)^C}$$

A, B, and C Parameters defined for the City of Mississauga

I = Rainfall Intensity (mm/hour)

T = Time of Concentration, the recommended minimum value is 15 minutes.

Return Period (Years)	2	5	10	25	50	100
A	610	820	1010	1160	1300	1450
B	4.6	4.6	4.6	4.6	4.7	4.9
C	0.78	0.78	0.78	0.78	0.78	0.78
T (mins)	15	15	15	15	15	15
I (mm/hour)	59.9	80.5	99.2	113.9	127.1	140.7
Catchment Area (ha)	2.267	2.267	2.267	2.267	2.267	2.267
Runoff Coefficient	0.72	0.72	0.72	0.72	0.72	0.72
Return Period Factor	1.00	1.00	1.00	1.10	1.20	1.25
Q (Liters/second)	270.6	363.7	448.0	566.0	689.2	794.5
Q (m^3/second)	0.27	0.36	0.45	0.57	0.69	0.79

2.0 Pre-development Conditions (Catchment 200)

2.1 Pre-development Area Breakdown

Land Cover	Area (ha)	% Area Cover	Runoff C
External	19.41	N/A	0.55
At-Grade Impervious	2.98	77%	0.90
Landscaping	0.87	23%	0.25
Total	**3.85**	**100%**	**0.75**

2.2 Pre-development Peak Flow Rates

The allowable runoff rate is calculated using the Rational Method:

$$Q = 2.78CIAR$$

Where:

Q = Peak flow rate (Litres/second)

C = Runoff Coefficient

I = Rainfall Intensity (mm/hour)

A = Catchment Area (hectares)

R = Return Period Factor

According to the City of Mississauga Guidelines: In order to account for the increase in runoff due to saturation of the catchment surface that would occur for larger, less frequenet storms, the adjustment factor should be used

The rainfall intensity is calculated with the IDF Curve, using parameters from the City of Mississauga

Where:

$$I = \frac{A}{(T+B)^C}$$

A, B, and C Parameters defined for the City of Mississauga

I = Rainfall Intensity (mm/hour)

T = Time of Concentration, the recommended minimum value is 15 minutes.

Return Period (Years)	2	5	10	25	50	100
A	610	820	1010	1160	1300	1450
B	4.6	4.6	4.6	4.6	4.7	4.9
C	0.78	0.78	0.78	0.78	0.78	0.78
T (mins)	15	15	15	15	15	15
I (mm/hour)	59.9	80.5	99.2	113.9	127.1	140.7
Catchment Area (ha)	3.852	3.852	3.852	3.852	3.852	3.852
Runoff Coefficient	0.75	0.75	0.75	0.75	0.75	0.75
Return Period Factor	1.00	1.00	1.00	1.10	1.20	1.25
Q (Liters/second)	483.2	649.5	800.0	1010.7	1230.8	1418.8
Q (m^3/second)	0.48	0.65	0.80	1.01	1.23	1.42

2.0 Pre-development Conditions (Catchment 300)

2.1 Pre-development Area Breakdown

Land Cover	Area (ha)	% Area Cover	Runoff C
External	22.17	N/A	0.55
At-Grade Impervious	0.66	78%	0.90
Landscaping	0.18	22%	0.25
Total	**0.84**	**100%**	**0.76**

2.2 Pre-development Peak Flow Rates

The allowable runoff rate is calculated using the Rational Method:

$$Q = 2.78CIAR$$

Where:

Q = Peak flow rate (Litres/second)

C = Runoff Coefficient

I = Rainfall Intensity (mm/hour)

A = Catchment Area (hectares)

R = Return Period Factor

According to the City of Mississauga Guidelines: In order to account for the increase in runoff due to saturation of the catchment surface that would occur for larger, less frequenet storms, the adjustment factor should be used

The rainfall intensity is calculated with the IDF Curve, using parameters from the City of Mississauga

$$I = \frac{A}{(T+B)^C}$$

Where:

A, B, and C Parameters defined for the City of Mississauga

I = Rainfall Intensity (mm/hour)

T = Time of Concentration, the recommended minimum value is 15 minutes.

Return Period (Years)	2	5	10	25	50	100
A	610	820	1010	1160	1300	1450
B	4.6	4.6	4.6	4.6	4.7	4.9
C	0.78	0.78	0.78	0.78	0.78	0.78
T (mins)	15	15	15	15	15	15
I (mm/hour)	59.9	80.5	99.2	113.9	127.1	140.7
Catchment Area (ha)	0.840	0.840	0.840	0.840	0.840	0.840
Runoff Coefficient	0.76	0.76	0.76	0.76	0.76	0.76
Return Period Factor	1.00	1.00	1.00	1.10	1.20	1.25
Q (Liters/second)	106.1	142.6	175.6	221.9	270.2	311.5
Q (m^3/second)	0.11	0.14	0.18	0.22	0.27	0.31

2.0 Pre-development Conditions (Catchment 400)

2.1 Pre-development Area Breakdown

Land Cover	Area (ha)	% Area Cover	Runoff C
External	4.92	N/A	0.55
At-Grade Impervious	0.52	87%	0.90
Landscaping	0.08	13%	0.25
Total	**0.60**	**100%**	**0.81**

2.2 Pre-development Peak Flow Rates

The allowable runoff rate is calculated using the Rational Method:

$$Q = 2.78CIAR$$

Where:

Q = Peak flow rate (Litres/second)

C = Runoff Coefficient

I = Rainfall Intensity (mm/hour)

A = Catchment Area (hectares)

R = Return Period Factor

According to the City of Mississauga Guidelines: In order to account for the increase in runoff due to saturation of the catchment surface that would occur for larger, less frequenet storms, the adjustment factor should be used

The rainfall intensity is calculated with the IDF Curve, using parameters from the City of Mississauga

Where:

$$I = \frac{A}{(T+B)^C}$$

A, B, and C Parameters defined for the City of Mississauga

I = Rainfall Intensity (mm/hour)

T = Time of Concentration, the recommended minimum value is 15 minutes.

Return Period (Years)	2	5	10	25	50	100
A	610	820	1010	1160	1300	1450
B	4.6	4.6	4.6	4.6	4.7	4.9
C	0.78	0.78	0.78	0.78	0.78	0.78
T (mins)	15	15	15	15	15	15
I (mm/hour)	59.9	80.5	99.2	113.9	127.1	140.7
Catchment Area (ha)	0.599	0.599	0.599	0.599	0.599	0.599
Runoff Coefficient	0.81	0.81	0.81	0.81	0.81	0.81
Return Period Factor	1.00	1.00	1.00	1.10	1.20	1.25
Q (Liters/second)	81.1	109.0	134.2	169.6	206.5	238.0
Q (m^3/second)	0.08	0.11	0.13	0.17	0.21	0.24

3.0 Post-development Conditions (Catchment 100)

3.1 Post-development Area Breakdown

Land Cover	Area (ha)	% Area Cover	Runoff C
External	113.56	N/A	0.55
At-Grade Impervious	1.89	83%	0.90
Landscaping	0.38	17%	0.25
Total	**2.27**	**100%**	**0.79**

3.1 Post-development Peak Flow Rates

The allowable runoff rate is calculated using the Rational Method:

$$Q = 2.78CIAR$$

Where:

Q = Peak flow rate (Litres/second)

C = Runoff Coefficient

I = Rainfall Intensity (mm/hour)

A = Catchment Area (hectares)

R = Return Period Factor

According to the City of Mississauga Guidelines: In order to account for the increase in runoff due to saturation of the catchment surface that would occur for larger, less frequenet storms, the adjustment factor should be used

The rainfall intensity is calculated with the IDF Curve, using parameters from the City of Mississauga

Where:

$$I = \frac{A}{(T+B)^C}$$

A, B, and C Parameters defined for the City of Mississauga

I = Rainfall Intensity (mm/hour)

T = Time of Concentration, the recommended minimum value is 15 minutes.

Return Period (Years)	2	5	10	25	50	100
A	610	820	1010	1160	1300	1450
B	4.6	4.6	4.6	4.6	4.7	4.9
C	0.78	0.78	0.78	0.78	0.78	0.78
T (mins)	15	15	15	15	15	15
I (mm/hour)	59.9	80.5	99.2	113.9	127.1	140.7
Catchment Area (ha)	2.267	2.267	2.267	2.267	2.267	2.267
Runoff Coefficient	0.79	0.79	0.79	0.79	0.79	0.79
Return Period Factor	1.00	1.00	1.00	1.10	1.20	1.25
Q (Liters/second)	298.4	401.1	494.0	624.1	760.0	876.1
Q (m^3/second)	0.30	0.40	0.49	0.62	0.76	0.88

3.0 Post-development Conditions (Catchment 200)

3.1 Post-development Area Breakdown

Land Cover	Area (ha)	% Area Cover	Runoff C
External	19.41	N/A	0.55
At-Grade Impervious	3.30	86%	0.90
Landscaping	0.56	14%	0.25
Total	**3.85**	**100%**	**0.81**

3.1 Post-development Peak Flow Rates

The allowable runoff rate is calculated using the Rational Method:

$$Q = 2.78CIAR$$

Where:

Q = Peak flow rate (Litres/second)
C = Runoff Coefficient
I = Rainfall Intensity (mm/hour)
A = Catchment Area (hectares)
R = Return Period Factor

According to the City of Mississauga Guidelines: In order to account for the increase in runoff due to saturation of the catchment surface that would occur for larger, less frequenet storms, the adjustment factor should be used

The rainfall intensity is calculated with the IDF Curve, using parameters from the City of Mississauga

Where:

$$I = \frac{A}{(T+B)^C}$$

A, B, and C Parameters defined for the City of Mississauga
I = Rainfall Intensity (mm/hour)
T = Time of Concentration, the recommended minimum value is 15 minutes.

Return Period (Years)	2	5	10	25	50	100
A	610	820	1010	1160	1300	1450
B	4.6	4.6	4.6	4.6	4.7	4.9
C	0.78	0.78	0.78	0.78	0.78	0.78
T (mins)	15	15	15	15	15	15
I (mm/hour)	59.9	80.5	99.2	113.9	127.1	140.7
Catchment Area (ha)	3.852	3.852	3.852	3.852	3.852	3.852
Runoff Coefficient	0.81	0.81	0.81	0.81	0.81	0.81
Return Period Factor	1.00	1.00	1.00	1.10	1.20	1.25
Q (Liters/second)	517.0	694.9	856.0	1081.4	1316.9	1518.0
Q (m^3/second)	0.52	0.69	0.86	1.08	1.32	1.52

3.0 Post-development Conditions (Catchment 300)

3.1 Post-development Area Breakdown

Land Cover	Area (ha)	% Area Cover	Runoff C
External	22.17	N/A	0.55
At-Grade Impervious	0.66	78%	0.90
Landscaping	0.18	22%	0.25
Total	**0.84**	**100%**	**0.76**

3.1 Post-development Peak Flow Rates

The allowable runoff rate is calculated using the Rational Method:

$$Q = 2.78CIAR$$

Where:

Q = Peak flow rate (Litres/second)

C = Runoff Coefficient

I = Rainfall Intensity (mm/hour)

A = Catchment Area (hectares)

R = Return Period Factor

According to the City of Mississauga Guidelines: In order to account for the increase in runoff due to saturation of the catchment surface that would occur for larger, less frequenet storms, the adjustment factor should be used

The rainfall intensity is calculated with the IDF Curve, using parameters from the City of Mississauga

$$I = \frac{A}{(T+B)^C}$$

Where:

A, B, and C Parameters defined for the City of Mississauga

I = Rainfall Intensity (mm/hour)

T = Time of Concentration, the recommended minimum value is 15 minutes.

Return Period (Years)	2	5	10	25	50	100
A	610	820	1010	1160	1300	1450
B	4.6	4.6	4.6	4.6	4.7	4.9
C	0.78	0.78	0.78	0.78	0.78	0.78
T (mins)	15	15	15	15	15	15
I (mm/hour)	59.9	80.5	99.2	113.9	127.1	140.7
Catchment Area (ha)	0.840	0.840	0.840	0.840	0.840	0.840
Runoff Coefficient	0.76	0.76	0.76	0.76	0.76	0.76
Return Period Factor	1.00	1.00	1.00	1.10	1.20	1.25
Q (Liters/second)	106.1	142.6	175.6	221.9	270.2	311.5
Q (m^3/second)	0.11	0.14	0.18	0.22	0.27	0.31

3.0 Post-development Conditions (Catchment 400)

3.1 Post-development Area Breakdown

Land Cover	Area (ha)	% Area Cover	Runoff C
External	4.92	N/A	0.55
At-Grade Impervious	0.52	87%	0.90
Landscaping	0.08	13%	0.25
Total	**0.60**	**100%**	**0.81**

3.1 Post-development Peak Flow Rates

The allowable runoff rate is calculated using the Rational Method:

$$Q = 2.78CIAR$$

Where:

Q = Peak flow rate (Litres/second)

C = Runoff Coefficient

I = Rainfall Intensity (mm/hour)

A = Catchment Area (hectares)

R = Return Period Factor

According to the City of Mississauga Guidelines: In order to account for the increase in runoff due to saturation of the catchment surface that would occur for larger, less frequenet storms, the adjustment factor should be used

The rainfall intensity is calculated with the IDF Curve, using parameters from the City of Mississauga

Where:

$$I = \frac{A}{(T+B)^C}$$

A, B, and C Parameters defined for the City of Mississauga

I = Rainfall Intensity (mm/hour)

T = Time of Concentration, the recommended minimum value is 15 minutes.

Return Period (Years)	2	5	10	25	50	100
A	610	820	1010	1160	1300	1450
B	4.6	4.6	4.6	4.6	4.7	4.9
C	0.78	0.78	0.78	0.78	0.78	0.78
T (mins)	15	15	15	15	15	15
I (mm/hour)	59.9	80.5	99.2	113.9	127.1	140.7
Catchment Area (ha)	0.599	0.599	0.599	0.599	0.599	0.599
Runoff Coefficient	0.81	0.81	0.81	0.81	0.81	0.81
Return Period Factor	1.00	1.00	1.00	1.10	1.20	1.25
Q (Liters/second)	81.1	109.0	134.2	169.6	206.5	238.0
Q (m^3/second)	0.08	0.11	0.13	0.17	0.21	0.24

Catchment 100

100-Yr Rainfall IDF		Site Parameters			
a	1450.0	C :	0.79		Averaged runoff coefficient
b	4.90	$Q_{pre:}$	0.79	m^3/s	Target flow rate
c	0.78	A:	2.2666	ha	
CA	1.25	T_c:	15	min	

$$I = \frac{A}{(T+B)^C}$$

Time, t_d (min)	Intensity, i (mm/hr)	Peak Discharge (m^3/s)	Trapezoidal Area Vol. (m^3)	Triangular Area Vol. (m^3)	Storage Volume (m^3)
5	242.5	1.509	453	477	0
10	176.3	1.097	658	596	62
20	118.1	0.735	882	834	48
30	90.8	0.565	1017	1073	0
40	74.6	0.464	1114	1311	0
50	63.8	0.397	1190	1549	0
60	56.0	0.348	1253	1788	0
70	50.0	0.311	1308	2026	0
80	45.4	0.282	1355	2264	0
90	41.6	0.259	1398	2503	0
100	38.5	0.239	1436	2741	0
110	35.8	0.223	1472	2979	0
120	33.6	0.209	1504	3218	0
130	31.6	0.197	1535	3456	0
140	29.9	0.186	1563	3694	0
150	28.4	0.177	1590	3933	0
160	27.0	0.168	1615	4171	0
170	25.8	0.161	1639	4409	0
180	24.7	0.154	1662	4648	0
190	23.7	0.148	1683	4886	0
200	22.8	0.142	1704	5124	0
210	22.0	0.137	1724	5363	0
220	21.2	0.132	1743	5601	0
230	20.5	0.128	1762	5840	0
240	19.9	0.124	1779	6078	0
250	19.2	0.120	1796	6316	0
260	18.7	0.116	1813	6555	0
270	18.1	0.113	1829	6793	0
280	17.6	0.110	1845	7031	0
290	17.2	0.107	1860	7270	0
300	16.7	0.104	1875	7508	0
310	16.3	0.102	1889	7746	0

Max. Required Storage: 62 m^3

Catchment 200

100-Yr Rainfall IDF		Site Parameters			
a	1450.0	C :	0.81		Averaged runoff coefficient
b	4.90	$Q_{pre:}$	1.42	m^3/s	Target flow rate
c	0.78	A:	3.8517	ha	
CA	1.25	T_c:	15	min	

$$I = \frac{A}{(T + B)^C}$$

Time, t_d (min)	Intensity, i (mm/hr)	Peak Discharge (m^3/s)	Trapezoidal Area Vol. (m^3)	Triangular Area Vol. (m^3)	Storage Volume (m^3)
5	242.5	2.615	784	851	0
10	176.3	1.901	1140	1064	76
20	118.1	1.273	1528	1490	38
30	90.8	0.979	1762	1915	0
40	74.6	0.804	1930	2341	0
50	63.8	0.687	2062	2767	0
60	56.0	0.603	2172	3192	0
70	50.0	0.539	2266	3618	0
80	45.4	0.489	2348	4044	0
90	41.6	0.448	2422	4469	0
100	38.5	0.415	2489	4895	0
110	35.8	0.386	2550	5320	0
120	33.6	0.362	2606	5746	0
130	31.6	0.341	2659	6172	0
140	29.9	0.322	2708	6597	0
150	28.4	0.306	2754	7023	0
160	27.0	0.291	2798	7449	0
170	25.8	0.278	2840	7874	0
180	24.7	0.267	2879	8300	0
190	23.7	0.256	2917	8725	0
200	22.8	0.246	2953	9151	0
210	22.0	0.237	2987	9577	0
220	21.2	0.229	3020	10002	0
230	20.5	0.221	3052	10428	0
240	19.9	0.214	3083	10854	0
250	19.2	0.208	3113	11279	0
260	18.7	0.201	3142	11705	0
270	18.1	0.196	3169	12131	0
280	17.6	0.190	3197	12556	0
290	17.2	0.185	3223	12982	0
300	16.7	0.180	3248	13407	0
310	16.3	0.176	3273	13833	0

Max. Required Storage: 76 m^3

	SWM Calculations	Project: Rathburn Road & Ponytrail Drive	No.: 19M-00836-03	
	Post-Development Condition	By: RZ	Date: 2021-04-19	Page:
		Checked: SS	Checked: 2021-04-19	12

Catchment 300

100-Yr Rainfall IDF		Site Parameters			
a	1450.0	C :	0.76		Averaged runoff coefficient
b	4.90	$Q_{pre:}$	0.31	m^3/s	Target flow rate
c	0.78	A:	0.8400	ha	
CA	1.25	T_c:	15	min	

$$I = \frac{A}{(T+B)^C}$$

Time, t_d	Intensity, i	Peak Discharge	Trapezoidal Area Vol.	Triangular Area Vol.	Storage Volume
(min)	(mm/hr)	(m^3/s)	(m^3)	(m^3)	(m^3)
5	242.5	0.536	161	187	0
10	176.3	0.390	234	234	0
20	118.1	0.261	314	327	0
30	90.8	0.201	361	420	0
40	74.6	0.165	396	514	0
50	63.8	0.141	423	607	0
60	56.0	0.124	446	701	0
70	50.0	0.111	465	794	0
80	45.4	0.100	482	888	0
90	41.6	0.092	497	981	0
100	38.5	0.085	511	1075	0
110	35.8	0.079	523	1168	0
120	33.6	0.074	535	1261	0
130	31.6	0.070	546	1355	0
140	29.9	0.066	556	1448	0
150	28.4	0.063	565	1542	0
160	27.0	0.060	574	1635	0
170	25.8	0.057	583	1729	0
180	24.7	0.055	591	1822	0
190	23.7	0.052	598	1915	0
200	22.8	0.050	606	2009	0
210	22.0	0.049	613	2102	0
220	21.2	0.047	620	2196	0
230	20.5	0.045	626	2289	0
240	19.9	0.044	633	2383	0
250	19.2	0.043	639	2476	0
260	18.7	0.041	645	2570	0
270	18.1	0.040	650	2663	0
280	17.6	0.039	656	2756	0
290	17.2	0.038	661	2850	0
300	16.7	0.037	666	2943	0
310	16.3	0.036	672	3037	0

Max. Required Storage: 0 m^3

Note: since there is no changes under the proposed condition under this catchment, no additional flows are generated

Catchment 400

100-Yr Rainfall IDF		Site Parameters			
a	1450.0	C :	0.81		Averaged runoff coefficient
b	4.90	$Q_{pre:}$	0.24	m^3/s	Target flow rate
c	0.78	A:	0.5990	ha	
CA	1.25	T_c:	15	min	

$$I = \frac{A}{(T + B)^C}$$

Time, t_d (min)	Intensity, i (mm/hr)	Peak Discharge (m^3/s)	Trapezoidal Area Vol. (m^3)	Triangular Area Vol. (m^3)	Storage Volume (m^3)
5	242.5	0.410	123	143	0
10	176.3	0.298	179	179	0
20	118.1	0.200	240	250	0
30	90.8	0.153	276	321	0
40	74.6	0.126	303	393	0
50	63.8	0.108	323	464	0
60	56.0	0.095	340	536	0
70	50.0	0.085	355	607	0
80	45.4	0.077	368	678	0
90	41.6	0.070	380	750	0
100	38.5	0.065	390	821	0
110	35.8	0.061	400	893	0
120	33.6	0.057	409	964	0
130	31.6	0.053	417	1035	0
140	29.9	0.051	425	1107	0
150	28.4	0.048	432	1178	0
160	27.0	0.046	439	1250	0
170	25.8	0.044	445	1321	0
180	24.7	0.042	451	1392	0
190	23.7	0.040	457	1464	0
200	22.8	0.039	463	1535	0
210	22.0	0.037	468	1607	0
220	21.2	0.036	474	1678	0
230	20.5	0.035	479	1749	0
240	19.9	0.034	483	1821	0
250	19.2	0.033	488	1892	0
260	18.7	0.032	493	1964	0
270	18.1	0.031	497	2035	0
280	17.6	0.030	501	2106	0
290	17.2	0.029	505	2178	0
300	16.7	0.028	509	2249	0
310	16.3	0.028	513	2321	0

Max. Required Storage: 0 m^3

Note: since there is no changes under the proposed condition under this catchment, no additional flows are generated

3.0 Post-development Condition (Catchment 100)

3.1 Post-development Condition Area Breakdown

The current area measurements and land use types for the site are as follows:

Land Use	Area (ha)	% Area Cover	Runoff C
External	113.56	N/A	0.55
At-Grade Impervious	1.89	83%	0.90
Landscaping	0.38	17%	0.25
Total	**2.27**	**100%**	**0.79**

3.2 Water Balance Design

3.2.1 Water Balance Design Criteria

The TRCA requires “best efforts” be made to maintain the existing water balance for the site. (Refer to SWM TRCA 2012)
The City of Mississauga requires that the first 5mm of stormwater runoff volume from developing sites shall be retained on-site and managed by way of infiltration, evapotranspiration or re-use.

3.2.2 Water Balance Volume Calculations

As per TRCA Criteria dated 2012, the minimum 5 mm retention volume requirement should be above the initial abstraction.
The external area is an existing subvision and hence subject to its own water balance criteria at the time when it is developed, So it is not considered here. Note only the newly paved area are considered here as part of the water quality treatment criteria.

Surface Type	Area (m^2)	5 mm Volume (m^3)
New At-Grade Impervious	2567.4	12.84
New Landscaping	0.0	0.00
Total	**2567.4**	**12.84**

Therefore, volume of runoff during a 5 mm storm event is **12.8** m^3

4.0 Required Water Quality Treatment Volume

4.0.1 Water Quality Control Criteria

The site is required to provide an enhanced level protection or 80% TSS Removal.

4.0.2 Water Quality Control Strategy

CB Shield and/or OGS Units should be placed before the last branch of the storm sewer system before discharging to the receiving sewer (which discharges into the creek eventually). Sizing of such units should be conducted during detail design.

4.0.3 Water Quality Storage Sizing

Refer to Table 3.2 of 2003 MOECC Stormwater Management Planning and Design Manual.

Protection Level	SWMP Type	Storage Volume (m^3/ha) for Impervious Level			
		35%	55%	70%	85%
Enhanced 80% long-term S.S. removal	Infiltration	25	30	35	40
	Wetlands	80	105	120	140
	Hybrid Wet Pond/Wetland	110	150	175	195
	Wet Pond	140	190	225	250

Catchment 100 has a 83% Imperviousness Level:					
Storage Volume for 83% Impervious Level:	39.4	m^3/ha			
Required Treatment Volume:	**10.1**	m^3	**<**	**12.8**	m^3

3.0 Post-development Condition (Catchment 200)

3.1 Post-development Condition Area Breakdown

The current area measurements and land use types for the site are as follows:

Land Use	Area (ha)	% Area Cover	Runoff C
External	19.41	N/A	0.55
At-Grade Impervious	3.30	86%	0.90
Landscaping	0.56	14%	0.25
Total	**3.85**	**100%**	**0.81**

3.2 Water Balance Design

3.2.1 Water Balance Design Criteria

The TRCA requires “best efforts” be made to maintain the existing water balance for the site. (Refer to SWM TRCA 2012)
The City of Mississauga requires that the first 5mm of stormwater runoff volume from developing sites shall be retained on-site and managed by way of infiltration, evapotranspiration or re-use.

3.2.2 Water Balance Volume Calculations

As per TRCA Criteria dated 2012, the minimum 5 mm retention volume requirement should be above the initial abstraction.
The external area is an existing subvision and hence subject to its own water balance criteria at the time when it is developed,
So it is not considered here. Note only the newly paved area are considered here as part of the water quality treatment criteria.

Surface Type	Area (m^2)	5 mm Volume (m^3)
New At-Grade Impervious	3122.2	15.61
New Landscaping	0.0	0.00
Total	**3122.2**	**15.61**

Therefore, volume of runoff during a 5 mm storm event is **15.6** m^3

4.0 Required Water Quality Treatment Volume

4.0.1 Water Quality Control Criteria

The site is required to provide an enhanced level protection or 80% TSS Removal.

4.0.2 Water Quality Control Strategy

CB Shield and/or OGS Units should be placed before the last branch of the storm sewer system before discharging to the receiving sewer (which discharges into the creek eventually). Sizing of such units should be conducted during detail design.

4.0.3 Water Quality Storage Sizing

Refer to Table 3.2 of 2003 MOECC Stormwater Management Planning and Design Manual.

Protection Level	SWMP Type	Storage Volume (m^3/ha) for Impervious Level			
		35%	55%	70%	85%
Enhanced 80% long-term S.S. removal	Infiltration	25	30	35	40
	Wetlands	80	105	120	140
	Hybrid Wet Pond/Wetland	110	150	175	195
	Wet Pond	140	190	225	250

Catchment 100 has a 86% Imperviousness Level:

Storage Volume for 86% Impervious Level:	40.0	m^3/ha			
Required Treatment Volume:	**12.5**	m^3	**<**	**15.6**	m^3

3.0 Post-development Condition (Catchment 300)

3.1 Post-development Condition Area Breakdown

The current area measurements and land use types for the site are as follows:

Land Use	Area (ha)	% Area Cover	Runoff C
External	22.17	N/A	0.55
At-Grade Impervious	0.66	78%	0.90
Landscaping	0.18	22%	0.25
Total	**0.84**	**100%**	**0.76**

3.2 Water Balance Design

3.2.1 Water Balance Design Criteria

The TRCA requires “best efforts” be made to maintain the existing water balance for the site. (Refer to SWM TRCA 2012)
The City of Mississauga requires that the first 5mm of stormwater runoff volume from developing sites shall be retained on-site and managed by way of infiltration, evapotranspiration or re-use.

3.2.2 Water Balance Volume Calculations

As per TRCA Criteria dated 2012, the minimum 5 mm retention volume requirement should be above the initial abstraction.
The external area is an existing subvision and hence subject to its own water balance criteria at the time when it is developed,
So it is not considered here. Note only the newly paved area are considered here as part of the water quality treatment criteria.

Surface Type	Area (m^2)	5 mm Volume (m^3)
New At-Grade Impervious	0.0	0.00
New Landscaping	0.0	0.00
Total	**0.0**	**0.00**

Therefore, volume of runoff during a 5 mm storm event is **0.0** m^3

4.0 Required Water Quality Treatment Volume

4.0.1 Water Quality Control Criteria

The site is required to provide an enhanced level protection or 80% TSS Removal.

4.0.2 Water Quality Control Strategy

CB Shield and/or OGS Units should be placed before the last branch of the storm sewer system before discharging to the receiving sewer (which discharges into the creek eventually). Sizing of such units should be conducted during detail design.

4.0.3 Water Quality Storage Sizing

Refer to Table 3.2 of 2003 MOECC Stormwater Management Planning and Design Manual.

Protection Level	SWMP Type	Storage Volume (m^3/ha) for Impervious Level			
		35%	55%	70%	85%
Enhanced 80% long-term S.S. removal	Infiltration	25	30	35	40
	Wetlands	80	105	120	140
	Hybrid Wet Pond/Wetland	110	150	175	195
	Wet Pond	140	190	225	250

Catchment 100 has a 78% Imperviousness Level:

Storage Volume for 78% Impervious Level: 37.7 m^3/ha

Required Treatment Volume: **0.0** m^3 **<** **0.0** m^3

3.0 Post-development Condition (Catchment 400)

3.1 Post-development Condition Area Breakdown

The current area measurements and land use types for the site are as follows:

Land Use	Area (ha)	% Area Cover	Runoff C
External	4.92	N/A	0.55
At-Grade Impervious	0.52	87%	0.90
Landscaping	0.08	13%	0.25
Total	**0.60**	**100%**	**0.81**

3.2 Water Balance Design

3.2.1 Water Balance Design Criteria

The TRCA requires “best efforts” be made to maintain the existing water balance for the site. (Refer to SWM TRCA 2012)
The City of Mississauga requires that the first 5mm of stormwater runoff volume from developing sites shall be retained on-site and managed by way of infiltration, evapotranspiration or re-use.

3.2.2 Water Balance Volume Calculations

As per TRCA Criteria dated 2012, the minimum 5 mm retention volume requirement should be above the initial abstraction.
The external area is an existing subvision and hence subject to its own water balance criteria at the time when it is developed,
So it is not considered here. Note only the newly paved area are considered here as part of the water quality treatment criteria.

Surface Type	Area (m^2)	5 mm Volume (m^3)
New At-Grade Impervious	0.0	0.00
New Landscaping	0.0	0.00
Total	**0.0**	**0.00**

Therefore, volume of runoff during a 5 mm storm event is **0.0** m^3

4.0 Required Water Quality Treatment Volume

4.0.1 Water Quality Control Criteria

The site is required to provide an enhanced level protection or 80% TSS Removal.

4.0.2 Water Quality Control Strategy

CB Shield and/or OGS Units should be placed before the last branch of the storm sewer system before discharging to the receiving sewer (which discharges into the creek eventually). Sizing of such units should be conducted during detail design.

4.0.3 Water Quality Storage Sizing

Refer to Table 3.2 of 2003 MOECC Stormwater Management Planning and Design Manual.

Protection Level	SWMP Type	Storage Volume (m^3/ha) for Impervious Level			
		35%	55%	70%	85%
Enhanced 80% long-term S.S. removal	Infiltration	25	30	35	40
	Wetlands	80	105	120	140
	Hybrid Wet Pond/Wetland	110	150	175	195
	Wet Pond	140	190	225	250

Catchment 100 has a 87% Imperviousness Level:					
Storage Volume for 87% Impervious Level:	40.0	m^3/ha			
Required Treatment Volume:	**0.0**	m^3	**<**	**0.0**	m^3

APPENDIX

F

CULVERT ASSESSMENT

Technical Memorandum

To: Rory O'Sullivan, Project Manager **Date:** May 20, 2021

From: Shahrzad Samani., P.Eng. **Project No:** 19M-00836-03

Subject: **Rathburn Rd. and Ponytrail Drive Culvert Capacity Analysis – DRAFT**

1 INTRODUCTION

1.1 Project Description and Purpose

The City of Mississauga (the City) retained WSP Canada Inc. to build a cycle track in the boulevard along Ponytrail Drive and Rathburn Road East between Dixie Road and Ponytrail Drive and a bike lane (on-street) along Rathburn Road East, east of Ponytrail Drive. The work is part of the City's 2021 and 2022 Annual Resurfacing program which provides an opportunity to implement the identified cycling facilities on these segments. The proposed improvements include additional scope of assessing the existing 1800 mm diameter culvert located at Ponytrail Drive.

The purpose of this memorandum is to document the detailed drainage assessment of the existing 1800 mm diameter culvert at Ponytrail Drive. The study area is shown in **Exhibit 1** (located at the end of the memorandum).

1.2 Background Information

The relevant background information includes:

- City of Mississauga Storm Drainage Plan (Storm File 2-26)
- Mississauga STM_Key Map_Fieldgate Drive Plan & Profile Drawing Set (Drawing No. C13684, C13685, C13688, C13690, C13691, C13692, C13697, C13698, C13699, C13713, C13737, C15279)
- Geotechnical Investigation for the Proposed Rockwood Village Development in Mississauga by Golder Associates for Marshall Macklin Monaghan Limited (73-122, 226)
- Springbrook Tertiary Plan Area Stormwater Management Report prepared by WSP Canada Inc. in September 2020
- City of Mississauga Development Requirements Manual, Transportation and Works Department September 2016
- Toronto and Region Conservation Authority Stormwater Management Criteria August 2012
- Ministry of Environment, Conservation and Parks Stormwater Management Planning and Design Manual 2003
- Aerial Imagery (Bing Maps)

100 Commerce Valley Drive West
Thornhill, ON
Canada L3T 0A1

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wsp.com

- As-built drawings
- Topographic Map

1.3 Objectives and Design Criteria

The City of Mississauga's Development Requirements Manual, Transportation & Works Department effective November 2020 provides the design flood frequency to be used for various road classifications as shown in **Table 1-1**.

Table 1-1: Road Classification Design Flood Frequency

Road Classification	Design Flood Frequency
Arterial	1:100 Year to Regional
Compact or dense housing (e.g. townhouses)	1:50 Year
Collector	1:50 Year
Urban Local	1:25 Year
Rural Local	1:10 Year
Temporary Detour	1:10 Year
Driveway	1:10 Year

MTO has prepared a number of directives and manuals that outline the approach and guidelines to be used in the assessment of drainage systems for Roads. The relevant guidelines and policies used in this report for the assessment of Ponytrail culvert is the "MTO Highway Drainage Design Standards (HDDS) (2008)".

The MTO's HDDS prescribe standards for designing Surface Drainage Systems (SD) and Water Crossings (WC). The standards that are relevant to this study are found below and in **Table 1-2**.

Table 1-2: Relevant Standards from HDDS

Standard	Description
SD-1: Design Flows for Surface Drainage Systems	Minimum design flows
SD-3: Flow Spread on to Travel Lanes	Maximum distance flow spread on to travel lanes of a highway 4.0 m
SD-12: Freeboard above Adjacent Watercourse or Water Bodies	Minimum required freeboard ≥ 1.0 m
WC-1: Design Flows (Bridges and Culverts)	- 25-Year Design Storm - 100-Year Check Storm
WC-7: Culvert Crossings on a Watercourse	- Top of Road Freeboard (Min.): >1.0 m (Design Flow Water Surface / Hydraulic Grade Line (HGL) Elevation – top of road low point) - Top of Road Freeboard (Desired): >1.0 m (Design Flow Energy Grade Line (EGL) Elevation – top of road low point)
WC-8: Minimum Culvert Size	Minimum culvert sizes for various road types based on maintenance considerations - 600 mm for circular culverts - 900 mm rise for box culverts

2 EXISTING DRAINAGE CONDITIONS

2.1 Existing Condition Hydrologic Modelling

This section summarizes the existing drainage conditions and the results of the hydrologic modelling.

2.1.1 Design Storms

The rainfall Intensity-Duration-Frequency (IDF) parameters and storm distributions used for the hydrologic analysis are summarized below.

Rainfall IDF Parameters

IDF parameters for various return period design storms were obtained from the City of Mississauga Transportation and Works Department Design Criteria. The rainfall intensity is based on an Initial Time of Concentration (Tc) of 15 minutes. The City's rainfall intensity parameters for the all storm events are shown in **Table 2-1** below.

Table 2-1: Design Storms IDF Parameters

Event	A	B	C
2-yr	610	4.6	0.78
5-yr	820	4.6	0.78
10-yr	1010	4.6	0.78
25-yr	1160	4.6	0.78
50-yr	1300	4.7	0.78
100-yr	1450	4.9	0.78

Storm Distribution

Hyetographs for the SCS 12-hour and Chicago 4-hour storm distribution duration storms have been generated for each return period rainfall event. Comparing peak flows estimated using the two different storm durations, the peak flows for the Chicago 4-hour storm(highlighted) are typically higher at the various points of interest and have been used in the hydraulic modelling presented in Section 2.2.

Catchment ID	Hyd. Routine	Area (ha)	SCS 25-Year (m^3/s)	Chi 25-Year (m^3/s)
100	Nash	4.94	0.324	0.296
200	Standard	2.89	0.448	0.802
300	Standard	3.28	0.508	0.907
400	Nash	0.96	0.100	0.105
500	Standard	1.15	0.180	0.325

2.1.2 Surface Soil, Land Use, and Drainage

The study area falls within the jurisdiction of the Toronto and Region Conservation Authority (TRCA). Based on the Soil Survey Report No.18 (Soils Survey of Peel County) of the Ontario Soil Survey, the predominant soils within the study area are clay loam. Land use within the study area is residential with some vegetated and park area. The majority of the study area has a smooth gently sloping topography. According to the Ontario Soil Mapping, the soils are classified by the hydrologic soil Type C. The catchment areas for Ponytrail Drive culverts are shown on **Exhibit 2**. The drainage systems consist primarily of storm sewer system, open ditches and swales.

2.1.3 Hydrologic Modelling

The purpose of the hydrologic modelling was to simulate the hydrologic responses of the drainage areas during the design storms. The hydrologic event simulation model VISUAL OTTHYMO was used to quantify runoff characteristics during various return period design storms for the sub-catchment areas contributing storm runoff to the highway culverts.

The methodology used to develop the hydrologic model can be summarized as follow:

- The catchments draining to the culvert were delineated using the as-built drawings "City of Mississauga Storm Drainage Plan (Storm File 2-26)"
- Hydrologic parameters were estimated for each drainage area based on, sub-catchment area, land use distribution (confirmed with an aerial photograph), soils distribution, and slope of the overland and channel portions of the sub-catchment
- The hydrologic response for drainage areas with a directly connected impervious land use greater than 20 percent was obtained using the STANDHYD instantaneous unit hydrograph
- The hydrologic response for drainage areas with a directly connected impervious land use less than 20 percent was obtained using the NASH instantaneous unit hydrograph (NASHYD)
- Runoff hydrographs were generated at the inlet of the culvert crossing

The hydrologic input parameters and summary of output files for each drainage area are included in **Appendix A**.

Table 2-2 gives a summary of the hydrologic parameters used in the modelling including the Curve Number (CN), Initial Abstraction (I_a), and the Time to Peak (T_p). The SCS Upland Method, SCS Curve Number and the Airport Method were used to calculate the average time to peak for each rural sub-catchment. For each sub-catchment, modelling parameters were selected based on soil type, land use and topography.

Table 2-2: Summary of Existing Conditions Hydrologic Modelling Results

Catchment ID	Hyd. Routine	Area (ha)	CN	I_a (mm)	T_P (hrs)	Flow Length (m)	Chi 5-Year (m^3/s)	Chi 10-Year (m^3/s)	Chi 25-Year (m^3/s)	Chi 100-Year (m^3/s)
100	Nash	4.94	79	5.1	0.42	n/a	0.156	0.231	0.296	0.431
200	Standard	2.89	83	5	n/a	138.81	0.478	0.672	0.802	1.061
300	Standard	3.28	83	5	n/a	147.82	0.541	0.695	0.907	1.201
400	Nash	0.96	79	5	0.17	n/a	0.055	0.081	0.105	0.153
500	Standard	1.15	83	5	n/a	87.42	0.194	0.273	0.325	0.430

Catchments 200, 300 and 500 have storm sewer outlets as shown on “City of Mississauga Storm Drainage Plan (Storm File 2-26)” to capture the flows generated from the respective catchments, the present assessment considered deducting the 5-year return period flows (Minor flows) generated from these catchments and capturing the excessive runoff generated beyond 5-year return period and 100-year peak flow have been used in the hydraulic modelling presented in **Section 2.2.1.**

2.2 Existing Conditions Hydraulic Assessment

The design standards for the hydraulic assessment of culverts are based on the MTO HDDS (February 2008), discussed in Section 1. The HY-8 hydraulic modelling tool was used to estimate the headwater depth and to assess the hydraulic capacity of the culvert within the study area. The HY-8 modelling software was selected because it has the following capabilities:

- Evaluates inlet and outlet-controlled headwater depths
- Implements the procedures recommended by the City of Mississauga
- Simulates the hydraulic performance of culverts based on user-specified flows
- Considers variable tailwater depths based on either outlet channel geometry or user specified depth discharge rating curves
- Incorporates an extensive database of standard culvert sizes, shapes and materials, and allows for the addition of custom culvert types and sizes.

HY-8 requires the peak design flow, culvert shape and material (Manning’s ‘n’), the upstream and downstream culvert invert elevations, the inlet conditions (e.g. headwall, projecting), and the tailwater conditions. When this input is provided, HY-8 generates the water elevation at the inlet of the culvert (i.e. headwater), detailed in the following subsections.

2.2.1 Result of Existing Conditions Hydraulic Assessment

“City of Mississauga Storm Drainage Plan (Storm File 2-26)” was used to provide input data for culvert shape, material, and inlet conditions. Bottom elevation of the channel was set to the culvert’s downstream invert elevation.

In accordance with City’s Standard the 100-year storm was used as an additional check storm for the culvert. The HY-8 model input includes the design and check flows, which were calculated in the hydrological assessment in Section 2.1. The hydraulic analysis involves comparing the headwater elevation to the elevation at which water would spill onto the roadway to determine if the existing culvert meets the applicable freeboard and flood depth criterion.

The proposed road improvement did not have any impact on the culvert. **Table 2-3** shows the hydraulic assessment result for the culvert. The HY-8 output files for the existing culvert is included in **Appendix B**.

Table 2-3: Summary of Existing Culvert Hydraulic Analysis

Existing Culvert			Inverts		Length (m)	Slope (m/m)	25-yr Peak Flow (m^3/s)	100-yr Peak Flow (m^3/s)	Spill Elev. (m)	Cover (m)	Headwater Elev. (m)		Velocity (m/s)		Energy Grade Line Elev. (m)		Headwater Depth (m)		Headwater Depth / Culv. Height (HW/D)		Freeboard from Energy Grade Line (m)		Freeboard from Hydraulic Grade Line (m)		Meets HW/D <1.5 Criterion: Yes / No	Meets Desirable Freeboard Criterion: Yes / No	Meets Minimum Freeboard Criterion: Yes / No	Meets Highway Overtopping Criterion: Yes / No
Span (mm)	Height (mm)	Type	U/S	D/S							25-yr	100-yr	25-yr	100-yr	25-yr	100-yr	25-yr	100-yr	25-yr	100-yr	25-yr	100-yr	25-yr	100-yr	25-yr	25-yr	25-yr	100-yr
1800	1800	CMP	128.47	128.11	58.0	0.006	1.43	2.18	131.75	1.5	129.42	129.67	1.05	1.21	129.47	129.74	0.95	1.20	0.53	0.66	2.28	2.01	2.33	2.08	Y	Y	Y	Y

MODIFIED: Feb. 08, 2021 11:18 AM

DRAWING NAME: C:\USERS\INRH02894\DOWNLOADS\PROJECT DETAILS\OTHERS\19M-00836-03-EXHIBIT-DWG (1)\29.01.2021\19M-00836-03-EXHIBIT-02.DWG

STORM SEWER ASSESSMENT

19M-00836-03 Rathburn Road & Ponytrail Drive

EXHIBIT

2

2.2.2 Replacement Strategy

WSP notes that the options to repair or replace the existing culvert comes down to an open cut excavation across Ponytrail Drive for a full replacement with a new concrete culvert or lining the existing culvert.

The current construction activities proposed within the area of the culvert are limited to full depth asphalt replacement, new curbs, sidewalks and cycle tracks which does not require any deep excavation work.

Cost

Typically, depending on the situation open cut excavation operations are marginally less expensive than a lining operation. If the proposed culvert replacement / repair discussion was a stand alone project the costs would be more comparable. However, due to this projects circumstance, which is that there will be other excavation activities, the cost comparison becomes farther apart since the excavation for the road and other works will happen in each alternative. This takes a good part of the excavation and replacement costs (i.e. asphalt, granulars, sidewalk, curbs and boulevard) out of the comparison. With that it is estimated that the lining operation would be significantly higher than an open cut.

Environmental Impacts

As noted above, the culvert to be replaced falls within the TRCA regulated area and is subject to approvals prior to any construction activities.

There is a boulevard tree on the north side of Ponytrail Drive west of Lookout Drive that would require removal if the culvert was replaced with open cut construction. A photo of the tree is noted below.

Existing Boulevard Tree

At each end of the existing culvert, there are several mature trees and bush / shrubs as noted in the photos below.

During an open cut excavation operation these trees would be protected as much as possible to allow for installation of the culvert. The excavation equipment can situate itself on the roadside of the proposed trench on both ends of the culvert to minimize as much as possible disturbance to the existing vegetation.

The lining operation requires an open excavation beyond the limits of the proposed culvert known as a launching and receiving pit and likely would create significant disturbance to the vegetation in and around both ends of the culvert. A laydown area is required for the lining operation which requires the liner to be prepared prior to being inserted into the existing culvert and there is no obvious location for this without potential impacts to existing vegetation and creek.

Vegetation at South End of Culvert

Vegetation at North End of Culvert

Staging

The cross section at the location of the culvert consist of two westbound lanes, two eastbound through lanes, an east bound right turn lane and a wide median. The asphalt (including full depth granulars) are being replaced in this area and the median is being removed and replaced. For staging purposes, it would be recommended that the centre median between Tapestry Trail and Burnhamthorpe Road be removed at the onset of construction and be brought level with the existing asphalt. This would provide a wide enough vehicular platform to allow two lanes in each direction and allow for transformation through the Maple Ridge Drive intersection. The staging concept would not alter due to the construction activities of replacing the culvert, however it may require some flipping back and forth if the culvert is to be constructed in advance of the remaining work in the area. This would be required to maintain flow through the culvert.

The staging would not be altered from the expected staging for the road work if the culvert was re-lined.

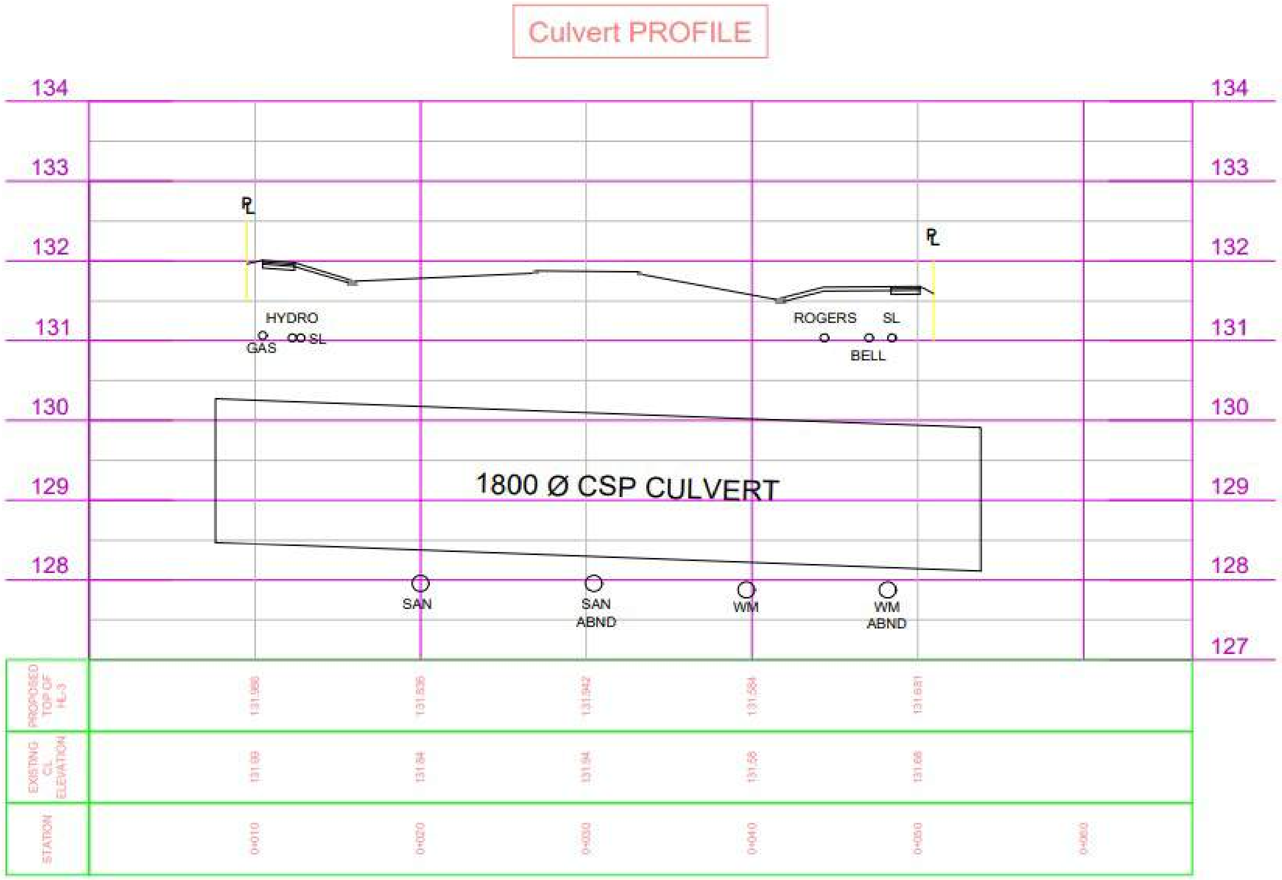
Table 2.4 outlines the challenges and / or opportunities faced with the two options for repair or replace.

Table 2-4: Summary for Replacing / Repairing Culvert

Option 1 – Open Cut Excavation Replacement	Option 2 – Lining Existing Culvert (Repair)
• Full excavation across existing Ponytrail Drive (4 lanes, plus median) to install new culvert. • Additional traffic control and/or staging steps. • Utilities to cross include, gasmain, underground hydro, streetlight cable, sanitary sewer, watermain, cable and bell • Tree removal	• Access to end of existing culvert for launching / receiving pit. • Significant impact to natural environment at both ends of the proposed lining operation. • Significant tree removals • More expensive.

Notwithstanding the additional excavation required to open cut and replace the existing CSP culvert with a new concrete culvert, WSP is recommending an open cut replacement. Largely due to the added expense and the certain impacts to the natural environment at both ends of the existing culvert and that construction activities will already be undertaken in the area.

Figure 2-1: Road Cross Section at Culvert



Depth of utilities shown in Figure 2-1 are assumed

It is recommended that the culvert is to be replaced as part of future construction activities to alleviate the construction fatigue the local residents would need to endure. The culvert replacement shall be staged to maintain traffic in both directions during construction.

3 Conclusion

The City of Mississauga (the City) retained WSP Canada Inc. to assess the existing 1800 mm diameter culvert located at Ponytrail Drive.

This memorandum outlines the required performance standards, documents design flows, and details the development of the hydrologic methodology and hydraulic model used to evaluate the drainage system. This assessment assumed that the minor flows from catchments 200, 300, 400 and 500 will be captured by the existing stormwater network system and the flows beyond the 5-year return period will be diverted through the culvert.

The following summarizes the report findings:

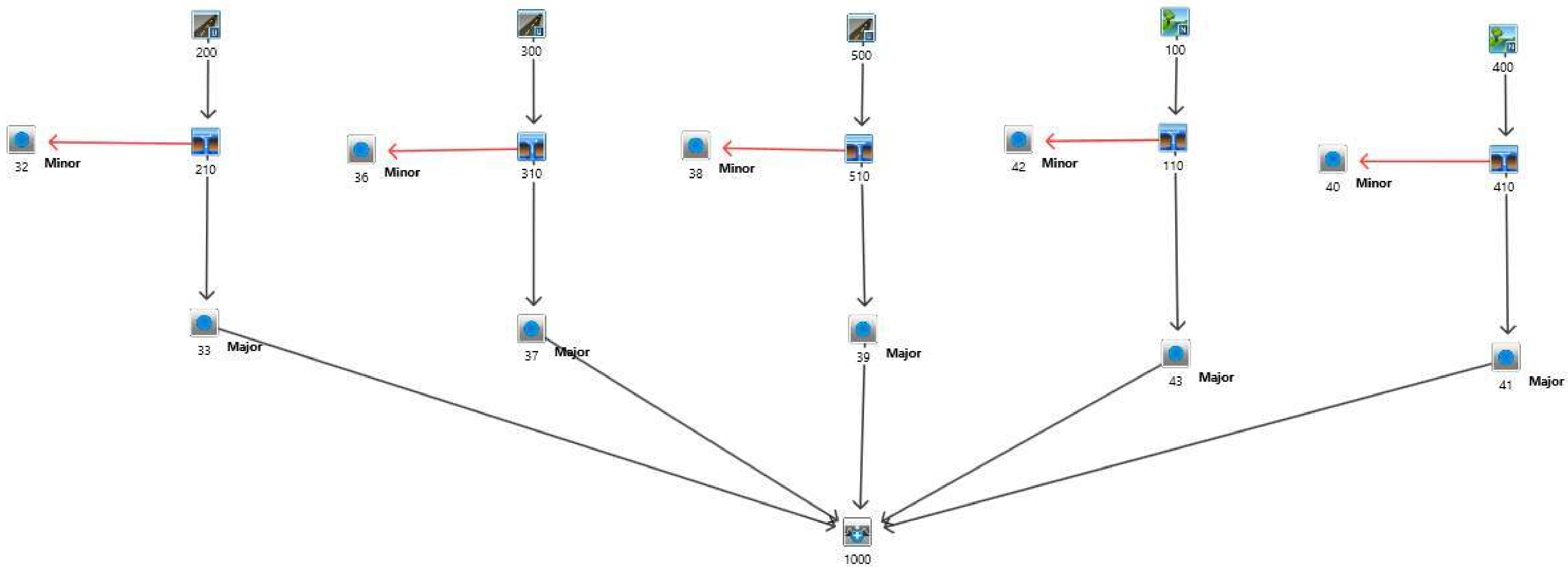
- The existing Culvert meets desirable and minimum freeboard criteria and achieves the minimum 0.6 m cover above the culvert.
- For the replacement option like for like is recommended
- Recommended replacement strategy is open cut excavation concurrent with the proposed road improvement construction activities.

Exhibits

APPENDIX

A

VO2 Hydrologic Model Output


200
300
500
100
400
32
Minor
210
36
Minor
310
38
Minor
510
42
Minor
110
40
Minor
410
33
Major
37
Major
39
Major
43
Major
41
Major
1000

```
================================================================================================

       V    V   I    SSSSS  U   U    A    L              (v 6.1.2002)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
```



```
                   *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
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188e8d
  Summary filename:
C:\Users\shahrzad.samani\AppData\Local\Civica\VH5\5e38ad16-99a2-41a3-a6d1-fd92652c9e8f\3f0a747d-a0a1-432c-ae09-56a
188e8d


DATE: 03/09/2021                          TIME: 04:14:59

USER:



COMMENTS: ____________________________________________________________


------------------------------------------------------------------------------------------------
  ************************************************
  ** SIMULATION : 12SCS005                      **
  ************************************************


--------------------
|    READ STORM    |    Filename: C:\Users\shahrzad.samani\AppD
|                  |              ata\Local\Temp\
|                  |              4d6a0629-9c3f-4bb8-a55b-48312e7da1e6\607cf913
| Ptotal= 57.83 mm |    Comments: 12SCS005
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.17	1.73	3.17	2.31	6.17	12.61	9.17	1.73
0.33	1.73	3.33	2.31	6.33	12.61	9.33	1.73
0.50	1.73	3.50	2.31	6.50	12.61	9.50	1.73
0.67	0.81	3.67	2.31	6.67	5.55	9.67	1.39
0.83	0.81	3.83	2.31	6.83	5.55	9.83	1.39
1.00	0.81	4.00	2.31	7.00	5.55	10.00	1.39
1.17	1.50	4.17	3.12	7.17	3.70	10.17	1.97
1.33	1.50	4.33	3.12	7.33	3.70	10.33	1.97
1.50	1.50	4.50	3.12	7.50	3.70	10.50	1.97
1.67	1.50	4.67	3.93	7.67	3.24	10.67	1.27
1.83	1.50	4.83	3.93	7.83	3.24	10.83	1.27
2.00	1.50	5.00	3.93	8.00	3.24	11.00	1.27
2.17	1.97	5.17	6.25	8.17	2.54	11.17	1.16
2.33	1.97	5.33	6.25	8.33	2.54	11.33	1.16
2.50	1.97	5.50	6.25	8.50	2.54	11.50	1.16
2.67	1.73	5.67	49.50	8.67	2.66	11.67	1.16
2.83	1.73	5.83	49.50	8.83	2.66	11.83	1.16
3.00	1.73	6.00	49.50	9.00	2.66	12.00	1.16

```
-------------------------------------------------------------------------------

--------------------
| CALIB            |
| STANDHYD (  0200)|   Area    (ha)=   2.89
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  48.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.73         1.16
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     138.81        40.00
```

```
     Mannings n           =      0.013       0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                             ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    1.73 | 3.083    2.31 | 6.083   12.61 |  9.08    1.73
               0.167    1.73 | 3.167    2.31 | 6.167   12.61 |  9.17    1.73
               0.250    1.73 | 3.250    2.31 | 6.250   12.61 |  9.25    1.73
               0.333    1.73 | 3.333    2.31 | 6.333   12.61 |  9.33    1.73
               0.417    1.73 | 3.417    2.31 | 6.417   12.61 |  9.42    1.73
               0.500    1.73 | 3.500    2.31 | 6.500   12.61 |  9.50    1.73
               0.583    0.81 | 3.583    2.31 | 6.583    5.55 |  9.58    1.39
               0.667    0.81 | 3.667    2.31 | 6.667    5.55 |  9.67    1.39
               0.750    0.81 | 3.750    2.31 | 6.750    5.55 |  9.75    1.39
               0.833    0.81 | 3.833    2.31 | 6.833    5.55 |  9.83    1.39
               0.917    0.81 | 3.917    2.31 | 6.917    5.55 |  9.92    1.39
               1.000    0.81 | 4.000    2.31 | 7.000    5.55 | 10.00    1.39
               1.083    1.50 | 4.083    3.12 | 7.083    3.70 | 10.08    1.97
               1.167    1.50 | 4.167    3.12 | 7.167    3.70 | 10.17    1.97
               1.250    1.50 | 4.250    3.12 | 7.250    3.70 | 10.25    1.97
               1.333    1.50 | 4.333    3.12 | 7.333    3.70 | 10.33    1.97
               1.417    1.50 | 4.417    3.12 | 7.417    3.70 | 10.42    1.97
               1.500    1.50 | 4.500    3.12 | 7.500    3.70 | 10.50    1.97
               1.583    1.50 | 4.583    3.93 | 7.583    3.24 | 10.58    1.27
               1.667    1.50 | 4.667    3.93 | 7.667    3.24 | 10.67    1.27
               1.750    1.50 | 4.750    3.93 | 7.750    3.24 | 10.75    1.27
               1.833    1.50 | 4.833    3.93 | 7.833    3.24 | 10.83    1.27
               1.917    1.50 | 4.917    3.93 | 7.917    3.24 | 10.92    1.27
               2.000    1.50 | 5.000    3.93 | 8.000    3.24 | 11.00    1.27
               2.083    1.97 | 5.083    6.25 | 8.083    2.54 | 11.08    1.16
               2.167    1.97 | 5.167    6.25 | 8.167    2.54 | 11.17    1.16
               2.250    1.97 | 5.250    6.25 | 8.250    2.54 | 11.25    1.16
               2.333    1.97 | 5.333    6.25 | 8.333    2.54 | 11.33    1.16
               2.417    1.97 | 5.417    6.25 | 8.417    2.54 | 11.42    1.16
               2.500    1.97 | 5.500    6.25 | 8.500    2.54 | 11.50    1.16
               2.583    1.73 | 5.583   49.50 | 8.583    2.66 | 11.58    1.16
               2.667    1.73 | 5.667   49.50 | 8.667    2.66 | 11.67    1.16
               2.750    1.73 | 5.750   49.50 | 8.750    2.66 | 11.75    1.16
               2.833    1.73 | 5.833   49.50 | 8.833    2.66 | 11.83    1.16
               2.917    1.73 | 5.917   49.50 | 8.917    2.66 | 11.92    1.16
               3.000    1.73 | 6.000   49.50 | 9.000    2.66 | 12.00    1.16

     Max.Eff.Inten.(mm/hr)=      49.50       43.48
                over (min)        5.00       15.00
     Storage Coeff.  (min)=       4.12 (ii)   13.97 (ii)
     Unit Hyd. Tpeak (min)=       5.00       15.00
     Unit Hyd. peak  (cms)=       0.24        0.08
                                                           *TOTALS*
     PEAK FLOW       (cms)=       0.19        0.10           0.290 (iii)
     TIME TO PEAK    (hrs)=       6.00        6.08            6.00
     RUNOFF VOLUME    (mm)=      56.83       31.00           43.40
     TOTAL RAINFALL   (mm)=      57.83       57.83           57.83
     RUNOFF COEFFICIENT   =       0.98        0.54            0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  83.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DUHYD    (  0210)|
| Inlet Cap.= 0.304|
| #of Inlets=     1|
| Total(cms)=   0.3|      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):   2.89      0.29      6.00   43.40
     ==================================================
     MAJOR SYS.(ID= 2):   0.00      0.00      0.00    0.00
     MINOR SYS.(ID= 3):   2.89      0.29      6.00   43.40

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  --------------------------
  | Junction Command(0032) |
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                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0210)    2.89     0.29    6.00    43.40
  OUTFLOW: ID= 2(  0032)    2.89     0.29    6.00    43.40

  ----------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0100)|   Area    (ha)=   4.94   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.42

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                              ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    1.73 | 3.083    2.31 | 6.083   12.61 |  9.08    1.73
               0.167    1.73 | 3.167    2.31 | 6.167   12.61 |  9.17    1.73
               0.250    1.73 | 3.250    2.31 | 6.250   12.61 |  9.25    1.73
               0.333    1.73 | 3.333    2.31 | 6.333   12.61 |  9.33    1.73
               0.417    1.73 | 3.417    2.31 | 6.417   12.61 |  9.42    1.73
               0.500    1.73 | 3.500    2.31 | 6.500   12.61 |  9.50    1.73
               0.583    0.81 | 3.583    2.31 | 6.583    5.55 |  9.58    1.39
               0.667    0.81 | 3.667    2.31 | 6.667    5.55 |  9.67    1.39
               0.750    0.81 | 3.750    2.31 | 6.750    5.55 |  9.75    1.39
               0.833    0.81 | 3.833    2.31 | 6.833    5.55 |  9.83    1.39
               0.917    0.81 | 3.917    2.31 | 6.917    5.55 |  9.92    1.39
               1.000    0.81 | 4.000    2.31 | 7.000    5.55 | 10.00    1.39
               1.083    1.50 | 4.083    3.12 | 7.083    3.70 | 10.08    1.97
               1.167    1.50 | 4.167    3.12 | 7.167    3.70 | 10.17    1.97
               1.250    1.50 | 4.250    3.12 | 7.250    3.70 | 10.25    1.97
               1.333    1.50 | 4.333    3.12 | 7.333    3.70 | 10.33    1.97
               1.417    1.50 | 4.417    3.12 | 7.417    3.70 | 10.42    1.97
               1.500    1.50 | 4.500    3.12 | 7.500    3.70 | 10.50    1.97
               1.583    1.50 | 4.583    3.93 | 7.583    3.24 | 10.58    1.27
               1.667    1.50 | 4.667    3.93 | 7.667    3.24 | 10.67    1.27
               1.750    1.50 | 4.750    3.93 | 7.750    3.24 | 10.75    1.27
               1.833    1.50 | 4.833    3.93 | 7.833    3.24 | 10.83    1.27
               1.917    1.50 | 4.917    3.93 | 7.917    3.24 | 10.92    1.27
               2.000    1.50 | 5.000    3.93 | 8.000    3.24 | 11.00    1.27
               2.083    1.97 | 5.083    6.25 | 8.083    2.54 | 11.08    1.16
               2.167    1.97 | 5.167    6.25 | 8.167    2.54 | 11.17    1.16
               2.250    1.97 | 5.250    6.25 | 8.250    2.54 | 11.25    1.16
               2.333    1.97 | 5.333    6.25 | 8.333    2.54 | 11.33    1.16
               2.417    1.97 | 5.417    6.25 | 8.417    2.54 | 11.42    1.16
               2.500    1.97 | 5.500    6.25 | 8.500    2.54 | 11.50    1.16
               2.583    1.73 | 5.583   49.50 | 8.583    2.66 | 11.58    1.16
               2.667    1.73 | 5.667   49.50 | 8.667    2.66 | 11.67    1.16
               2.750    1.73 | 5.750   49.50 | 8.750    2.66 | 11.75    1.16
               2.833    1.73 | 5.833   49.50 | 8.833    2.66 | 11.83    1.16
               2.917    1.73 | 5.917   49.50 | 8.917    2.66 | 11.92    1.16
               3.000    1.73 | 6.000   49.50 | 9.000    2.66 | 12.00    1.16

     Unit Hyd Qpeak  (cms)=   0.449

     PEAK FLOW       (cms)=   0.179 (i)
     TIME TO PEAK    (hrs)=   6.250
     RUNOFF VOLUME    (mm)=  23.120
     TOTAL RAINFALL   (mm)=  57.830
     RUNOFF COEFFICIENT   =   0.400

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| DUHYD    (  0110)|
| Inlet Cap.= 0.000|
| #of Inlets=     1|
| Total(cms)=   0.0|      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):   4.94      0.18      6.25   23.12
     ===================================================
     MAJOR SYS.(ID= 2):   4.94      0.18      6.25   23.12
     MINOR SYS.(ID= 3):   0.00      0.00      0.00    0.00

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  | Junction Command(0043) |
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                         AREA     QPEAK   TPEAK     R.V.
                         (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0110)    4.94     0.18    6.25    23.12
  OUTFLOW: ID= 2(  0043)    4.94     0.18    6.25    23.12

  -------------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0400)|   Area    (ha)=   0.96   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.17

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                              ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    1.73 | 3.083    2.31 | 6.083   12.61 |   9.08    1.73
               0.167    1.73 | 3.167    2.31 | 6.167   12.61 |   9.17    1.73
               0.250    1.73 | 3.250    2.31 | 6.250   12.61 |   9.25    1.73
               0.333    1.73 | 3.333    2.31 | 6.333   12.61 |   9.33    1.73
               0.417    1.73 | 3.417    2.31 | 6.417   12.61 |   9.42    1.73
               0.500    1.73 | 3.500    2.31 | 6.500   12.61 |   9.50    1.73
               0.583    0.81 | 3.583    2.31 | 6.583    5.55 |   9.58    1.39
               0.667    0.81 | 3.667    2.31 | 6.667    5.55 |   9.67    1.39
               0.750    0.81 | 3.750    2.31 | 6.750    5.55 |   9.75    1.39
               0.833    0.81 | 3.833    2.31 | 6.833    5.55 |   9.83    1.39
               0.917    0.81 | 3.917    2.31 | 6.917    5.55 |   9.92    1.39
               1.000    0.81 | 4.000    2.31 | 7.000    5.55 |  10.00    1.39
               1.083    1.50 | 4.083    3.12 | 7.083    3.70 |  10.08    1.97
               1.167    1.50 | 4.167    3.12 | 7.167    3.70 |  10.17    1.97
               1.250    1.50 | 4.250    3.12 | 7.250    3.70 |  10.25    1.97
               1.333    1.50 | 4.333    3.12 | 7.333    3.70 |  10.33    1.97
               1.417    1.50 | 4.417    3.12 | 7.417    3.70 |  10.42    1.97
               1.500    1.50 | 4.500    3.12 | 7.500    3.70 |  10.50    1.97
               1.583    1.50 | 4.583    3.93 | 7.583    3.24 |  10.58    1.27
               1.667    1.50 | 4.667    3.93 | 7.667    3.24 |  10.67    1.27
               1.750    1.50 | 4.750    3.93 | 7.750    3.24 |  10.75    1.27
               1.833    1.50 | 4.833    3.93 | 7.833    3.24 |  10.83    1.27
               1.917    1.50 | 4.917    3.93 | 7.917    3.24 |  10.92    1.27
               2.000    1.50 | 5.000    3.93 | 8.000    3.24 |  11.00    1.27
               2.083    1.97 | 5.083    6.25 | 8.083    2.54 |  11.08    1.16
               2.167    1.97 | 5.167    6.25 | 8.167    2.54 |  11.17    1.16
               2.250    1.97 | 5.250    6.25 | 8.250    2.54 |  11.25    1.16
               2.333    1.97 | 5.333    6.25 | 8.333    2.54 |  11.33    1.16
               2.417    1.97 | 5.417    6.25 | 8.417    2.54 |  11.42    1.16
               2.500    1.97 | 5.500    6.25 | 8.500    2.54 |  11.50    1.16
               2.583    1.73 | 5.583   49.50 | 8.583    2.66 |  11.58    1.16
               2.667    1.73 | 5.667   49.50 | 8.667    2.66 |  11.67    1.16
               2.750    1.73 | 5.750   49.50 | 8.750    2.66 |  11.75    1.16
               2.833    1.73 | 5.833   49.50 | 8.833    2.66 |  11.83    1.16
               2.917    1.73 | 5.917   49.50 | 8.917    2.66 |  11.92    1.16
               3.000    1.73 | 6.000   49.50 | 9.000    2.66 |  12.00    1.16

     Unit Hyd Qpeak  (cms)=   0.216

     PEAK FLOW       (cms)=   0.056 (i)
     TIME TO PEAK    (hrs)=   6.000
     RUNOFF VOLUME    (mm)=  23.108
     TOTAL RAINFALL   (mm)=  57.830
     RUNOFF COEFFICIENT   =   0.400

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| DUHYD    (  0410)|
| Inlet Cap.= 0.056|
| #of Inlets=     1|
| Total(cms)=   0.1|      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):   0.96      0.06      6.00   23.11
     ==================================================
     MAJOR SYS.(ID= 2):   0.00      0.00      0.00    0.00
     MINOR SYS.(ID= 3):   0.96      0.06      6.00   23.11

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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 | Junction Command(0041) |
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                         AREA     QPEAK   TPEAK     R.V.
                         (ha)     (cms)    (hrs)    (mm)
 INFLOW : ID= 1(  0410)    0.00     0.00    0.00     0.00
 OUTFLOW: ID= 2(  0041)    0.00     0.00    0.00     0.00

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 | Junction Command(0033) |
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                         AREA     QPEAK   TPEAK     R.V.
                         (ha)     (cms)    (hrs)    (mm)
 INFLOW : ID= 1(  0210)    0.00     0.00    0.00     0.00
 OUTFLOW: ID= 2(  0033)    0.00     0.00    0.00     0.00

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--------------------
| CALIB              |
| STANDHYD (  0300)|   Area    (ha)=   3.28
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  48.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       1.97         1.31
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       1.00         2.00
    Length            (m)=     147.82        40.00
    Mannings n           =      0.013        0.250

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                      ---- TRANSFORMED HYETOGRAPH ----
            TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
             hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
           0.083    1.73 | 3.083    2.31 | 6.083   12.61 |   9.08    1.73
           0.167    1.73 | 3.167    2.31 | 6.167   12.61 |   9.17    1.73
           0.250    1.73 | 3.250    2.31 | 6.250   12.61 |   9.25    1.73
           0.333    1.73 | 3.333    2.31 | 6.333   12.61 |   9.33    1.73
           0.417    1.73 | 3.417    2.31 | 6.417   12.61 |   9.42    1.73
           0.500    1.73 | 3.500    2.31 | 6.500   12.61 |   9.50    1.73
           0.583    0.81 | 3.583    2.31 | 6.583    5.55 |   9.58    1.39
           0.667    0.81 | 3.667    2.31 | 6.667    5.55 |   9.67    1.39
           0.750    0.81 | 3.750    2.31 | 6.750    5.55 |   9.75    1.39
           0.833    0.81 | 3.833    2.31 | 6.833    5.55 |   9.83    1.39
           0.917    0.81 | 3.917    2.31 | 6.917    5.55 |   9.92    1.39
           1.000    0.81 | 4.000    2.31 | 7.000    5.55 |  10.00    1.39
           1.083    1.50 | 4.083    3.12 | 7.083    3.70 |  10.08    1.97
           1.167    1.50 | 4.167    3.12 | 7.167    3.70 |  10.17    1.97
           1.250    1.50 | 4.250    3.12 | 7.250    3.70 |  10.25    1.97
           1.333    1.50 | 4.333    3.12 | 7.333    3.70 |  10.33    1.97
           1.417    1.50 | 4.417    3.12 | 7.417    3.70 |  10.42    1.97
           1.500    1.50 | 4.500    3.12 | 7.500    3.70 |  10.50    1.97
           1.583    1.50 | 4.583    3.93 | 7.583    3.24 |  10.58    1.27
           1.667    1.50 | 4.667    3.93 | 7.667    3.24 |  10.67    1.27
           1.750    1.50 | 4.750    3.93 | 7.750    3.24 |  10.75    1.27
           1.833    1.50 | 4.833    3.93 | 7.833    3.24 |  10.83    1.27
           1.917    1.50 | 4.917    3.93 | 7.917    3.24 |  10.92    1.27
           2.000    1.50 | 5.000    3.93 | 8.000    3.24 |  11.00    1.27
           2.083    1.97 | 5.083    6.25 | 8.083    2.54 |  11.08    1.16
           2.167    1.97 | 5.167    6.25 | 8.167    2.54 |  11.17    1.16
           2.250    1.97 | 5.250    6.25 | 8.250    2.54 |  11.25    1.16
           2.333    1.97 | 5.333    6.25 | 8.333    2.54 |  11.33    1.16
           2.417    1.97 | 5.417    6.25 | 8.417    2.54 |  11.42    1.16
           2.500    1.97 | 5.500    6.25 | 8.500    2.54 |  11.50    1.16
           2.583    1.73 | 5.583   49.50 | 8.583    2.66 |  11.58    1.16
           2.667    1.73 | 5.667   49.50 | 8.667    2.66 |  11.67    1.16
           2.750    1.73 | 5.750   49.50 | 8.750    2.66 |  11.75    1.16
           2.833    1.73 | 5.833   49.50 | 8.833    2.66 |  11.83    1.16
           2.917    1.73 | 5.917   49.50 | 8.917    2.66 |  11.92    1.16
           3.000    1.73 | 6.000   49.50 | 9.000    2.66 |  12.00    1.16

    Max.Eff.Inten.(mm/hr)=      49.50        43.48
               over (min)        5.00        15.00
    Storage Coeff.  (min)=       4.28 (ii)   14.13 (ii)
    Unit Hyd. Tpeak (min)=       5.00        15.00
    Unit Hyd. peak  (cms)=       0.23         0.08
                                                            *TOTALS*
    PEAK FLOW       (cms)=       0.22         0.12          0.328 (iii)
    TIME TO PEAK    (hrs)=       6.00         6.08           6.00
    RUNOFF VOLUME    (mm)=      56.83        31.00          43.40
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     TOTAL RAINFALL   (mm)=      57.83        57.83          57.83
     RUNOFF COEFFICIENT   =       0.98         0.54           0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  83.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| DUHYD    (  0310)|
| Inlet Cap.= 0.345|
| #of Inlets=     1|
| Total(cms)=   0.3|      AREA     QPEAK     TPEAK    R.V.
--------------------       (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):   3.28      0.33      6.00   43.40
     ==================================================
     MAJOR SYS.(ID= 2):   0.00      0.00      0.00    0.00
     MINOR SYS.(ID= 3):   3.28      0.33      6.00   43.40

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  | Junction Command(0037) |
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                           AREA     QPEAK   TPEAK     R.V.
                           (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0310)    0.00     0.00    0.00     0.00
  OUTFLOW: ID= 2(  0037)    0.00     0.00    0.00     0.00

  --------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0500)|   Area    (ha)=   1.15
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  48.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.69         0.46
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      87.42        40.00
     Mannings n          =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                                 ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    1.73 | 3.083    2.31 | 6.083   12.61 |  9.08    1.73
               0.167    1.73 | 3.167    2.31 | 6.167   12.61 |  9.17    1.73
               0.250    1.73 | 3.250    2.31 | 6.250   12.61 |  9.25    1.73
               0.333    1.73 | 3.333    2.31 | 6.333   12.61 |  9.33    1.73
               0.417    1.73 | 3.417    2.31 | 6.417   12.61 |  9.42    1.73
               0.500    1.73 | 3.500    2.31 | 6.500   12.61 |  9.50    1.73
               0.583    0.81 | 3.583    2.31 | 6.583    5.55 |  9.58    1.39
               0.667    0.81 | 3.667    2.31 | 6.667    5.55 |  9.67    1.39
               0.750    0.81 | 3.750    2.31 | 6.750    5.55 |  9.75    1.39
               0.833    0.81 | 3.833    2.31 | 6.833    5.55 |  9.83    1.39
               0.917    0.81 | 3.917    2.31 | 6.917    5.55 |  9.92    1.39
               1.000    0.81 | 4.000    2.31 | 7.000    5.55 | 10.00    1.39
               1.083    1.50 | 4.083    3.12 | 7.083    3.70 | 10.08    1.97
               1.167    1.50 | 4.167    3.12 | 7.167    3.70 | 10.17    1.97
               1.250    1.50 | 4.250    3.12 | 7.250    3.70 | 10.25    1.97
               1.333    1.50 | 4.333    3.12 | 7.333    3.70 | 10.33    1.97
               1.417    1.50 | 4.417    3.12 | 7.417    3.70 | 10.42    1.97
               1.500    1.50 | 4.500    3.12 | 7.500    3.70 | 10.50    1.97
               1.583    1.50 | 4.583    3.93 | 7.583    3.24 | 10.58    1.27
               1.667    1.50 | 4.667    3.93 | 7.667    3.24 | 10.67    1.27
               1.750    1.50 | 4.750    3.93 | 7.750    3.24 | 10.75    1.27
               1.833    1.50 | 4.833    3.93 | 7.833    3.24 | 10.83    1.27
               1.917    1.50 | 4.917    3.93 | 7.917    3.24 | 10.92    1.27
               2.000    1.50 | 5.000    3.93 | 8.000    3.24 | 11.00    1.27
               2.083    1.97 | 5.083    6.25 | 8.083    2.54 | 11.08    1.16
               2.167    1.97 | 5.167    6.25 | 8.167    2.54 | 11.17    1.16
               2.250    1.97 | 5.250    6.25 | 8.250    2.54 | 11.25    1.16
               2.333    1.97 | 5.333    6.25 | 8.333    2.54 | 11.33    1.16
               2.417    1.97 | 5.417    6.25 | 8.417    2.54 | 11.42    1.16
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              2.500    1.97 | 5.500    6.25 | 8.500    2.54 | 11.50    1.16
              2.583    1.73 | 5.583   49.50 | 8.583    2.66 | 11.58    1.16
              2.667    1.73 | 5.667   49.50 | 8.667    2.66 | 11.67    1.16
              2.750    1.73 | 5.750   49.50 | 8.750    2.66 | 11.75    1.16
              2.833    1.73 | 5.833   49.50 | 8.833    2.66 | 11.83    1.16
              2.917    1.73 | 5.917   49.50 | 8.917    2.66 | 11.92    1.16
              3.000    1.73 | 6.000   49.50 | 9.000    2.66 | 12.00    1.16

     Max.Eff.Inten.(mm/hr)=      49.50        43.48
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       3.12 (ii)   12.97 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.27         0.08
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.08         0.04          0.116 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.08           6.00
     RUNOFF VOLUME    (mm)=      56.83        31.00          43.39
     TOTAL RAINFALL   (mm)=      57.83        57.83          57.83
     RUNOFF COEFFICIENT   =       0.98         0.54           0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  83.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| DUHYD    (  0510)|
| Inlet Cap.= 0.122|
| #of Inlets=     1|
| Total(cms)=   0.1|      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):   1.15      0.12      6.00   43.39
     ====================================================
     MAJOR SYS.(ID= 2):   0.00      0.00      0.00    0.00
     MINOR SYS.(ID= 3):   1.15      0.12      6.00   43.39

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  --------------------------
  | Junction Command(0039) |
  --------------------------

                           AREA     QPEAK   TPEAK     R.V.
                           (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0510)    0.00     0.00    0.00     0.00
  OUTFLOW: ID= 2(  0039)    0.00     0.00    0.00     0.00

  --------------------------------------------------------------------------------

--------------------
| ADD HYD  (  1000)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH   0033 &lt;ID= 1&gt; IS DRY.
*** W A R N I N G :  HYDROGRAPH   0037 &lt;ID= 2&gt; IS DRY.
*** W A R N I N G :  HYDROGRAPH   1000 &lt;ID= 3&gt; IS ALSO DRY
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  1000)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH   1000 &lt;ID= 3&gt; IS DRY.
*** W A R N I N G :  HYDROGRAPH   0039 &lt;ID= 2&gt; IS DRY.
*** W A R N I N G :  HYDROGRAPH   1000 &lt;ID= 1&gt; IS ALSO DRY
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  1000)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH   1000 &lt;ID= 1&gt; IS DRY.
*** W A R N I N G :  HYDROGRAPH   0041 &lt;ID= 2&gt; IS DRY.
*** W A R N I N G :  HYDROGRAPH   1000 &lt;ID= 3&gt; IS ALSO DRY
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  1000)|
```

```
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH   1000 <ID= 3> IS DRY.
*** W A R N I N G :  HYDROGRAPH   1000 = HYDROGRAPH 0043
        ID1= 3 (  1000):     0.00   0.000     0.00    43.39
      + ID2= 2 (  0043):     4.94   0.179     6.25    23.12
        ================================================
        ID = 1 (  1000):     4.94   0.179     6.25    23.12

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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  -------------------------
  | Junction Command(0036) |
  -------------------------

                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0310)    3.28     0.33    6.00    43.40
  OUTFLOW: ID= 2(  0036)    3.28     0.33    6.00    43.40

  -------------------------------------------------------------------------------

  -------------------------
  | Junction Command(0038) |
  -------------------------

                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0510)    1.15     0.12    6.00    43.39
  OUTFLOW: ID= 2(  0038)    1.15     0.12    6.00    43.39

  -------------------------------------------------------------------------------

  -------------------------
  | Junction Command(0040) |
  -------------------------

                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0410)    0.96     0.06    6.00    23.11
  OUTFLOW: ID= 2(  0040)    0.96     0.06    6.00    23.11

  -------------------------------------------------------------------------------

  -------------------------
  | Junction Command(0042) |
  -------------------------

                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0110)    0.00     0.00    0.00     0.00
  OUTFLOW: ID= 2(  0042)    0.00     0.00    0.00     0.00

  -------------------------------------------------------------------------------
=============================================================================================================

       V    V   I    SSSSS  U   U    A    L              (v 6.1.2002)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
```

```
                   *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\shahrzad.samani\AppData\Local\Civica\VH5\5e38ad16-99a2-41a3-a6d1-fd92652c9e8f\ba264c82-c6d0-4a3e-8d06-64b
af1ea2
  Summary filename:
C:\Users\shahrzad.samani\AppData\Local\Civica\VH5\5e38ad16-99a2-41a3-a6d1-fd92652c9e8f\ba264c82-c6d0-4a3e-8d06-64b
af1ea2
```

DATE: 03/09/2021 TIME: 04:15:00

USER:

COMMENTS: ____

```
-----------------------------------------------------------------------------------------------------------------
  ************************************************
  ** SIMULATION : 12SCS010                      **
  ************************************************


--------------------
|    READ STORM    |    Filename: C:\Users\shahrzad.samani\AppD
|                  |              ata\Local\Temp\
|                  |              4d6a0629-9c3f-4bb8-a55b-48312e7da1e6\ed57617f
| Ptotal= 71.22 mm |    Comments: 12SCS010
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.17	2.14	3.17	2.85	6.17	15.53	9.17	2.14
0.33	2.14	3.33	2.85	6.33	15.53	9.33	2.14
0.50	2.14	3.50	2.85	6.50	15.53	9.50	2.14
0.67	1.00	3.67	2.85	6.67	6.84	9.67	1.71
0.83	1.00	3.83	2.85	6.83	6.84	9.83	1.71
1.00	1.00	4.00	2.85	7.00	6.84	10.00	1.71
1.17	1.85	4.17	3.85	7.17	4.56	10.17	2.42
1.33	1.85	4.33	3.85	7.33	4.56	10.33	2.42
1.50	1.85	4.50	3.85	7.50	4.56	10.50	2.42
1.67	1.85	4.67	4.84	7.67	3.99	10.67	1.57
1.83	1.85	4.83	4.84	7.83	3.99	10.83	1.57
2.00	1.85	5.00	4.84	8.00	3.99	11.00	1.57
2.17	2.42	5.17	7.69	8.17	3.13	11.17	1.42
2.33	2.42	5.33	7.69	8.33	3.13	11.33	1.42
2.50	2.42	5.50	7.69	8.50	3.13	11.50	1.42
2.67	2.14	5.67	60.97	8.67	3.28	11.67	1.42
2.83	2.14	5.83	60.97	8.83	3.28	11.83	1.42
3.00	2.14	6.00	60.97	9.00	3.28	12.00	1.42

```
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--------------------
| CALIB            |
| STANDHYD (  0200)|   Area    (ha)=   2.89
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  48.00
--------------------
```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.73	1.16
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	138.81	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.14	3.083	2.85	6.083	15.53	9.08	2.14
0.167	2.14	3.167	2.85	6.167	15.53	9.17	2.14
0.250	2.14	3.250	2.85	6.250	15.53	9.25	2.14
0.333	2.14	3.333	2.85	6.333	15.53	9.33	2.14
0.417	2.14	3.417	2.85	6.417	15.53	9.42	2.14
0.500	2.14	3.500	2.85	6.500	15.53	9.50	2.14
0.583	1.00	3.583	2.85	6.583	6.84	9.58	1.71
0.667	1.00	3.667	2.85	6.667	6.84	9.67	1.71
0.750	1.00	3.750	2.85	6.750	6.84	9.75	1.71
0.833	1.00	3.833	2.85	6.833	6.84	9.83	1.71
0.917	1.00	3.917	2.85	6.917	6.84	9.92	1.71
1.000	1.00	4.000	2.85	7.000	6.84	10.00	1.71
1.083	1.85	4.083	3.85	7.083	4.56	10.08	2.42
1.167	1.85	4.167	3.85	7.167	4.56	10.17	2.42
1.250	1.85	4.250	3.85	7.250	4.56	10.25	2.42
1.333	1.85	4.333	3.85	7.333	4.56	10.33	2.42
1.417	1.85	4.417	3.85	7.417	4.56	10.42	2.42
1.500	1.85	4.500	3.85	7.500	4.56	10.50	2.42
1.583	1.85	4.583	4.84	7.583	3.99	10.58	1.57
1.667	1.85	4.667	4.84	7.667	3.99	10.67	1.57
1.750	1.85	4.750	4.84	7.750	3.99	10.75	1.57

```
                1.833    1.85 | 4.833    4.84 | 7.833    3.99 | 10.83    1.57
                1.917    1.85 | 4.917    4.84 | 7.917    3.99 | 10.92    1.57
                2.000    1.85 | 5.000    4.84 | 8.000    3.99 | 11.00    1.57
                2.083    2.42 | 5.083    7.69 | 8.083    3.13 | 11.08    1.42
                2.167    2.42 | 5.167    7.69 | 8.167    3.13 | 11.17    1.42
                2.250    2.42 | 5.250    7.69 | 8.250    3.13 | 11.25    1.42
                2.333    2.42 | 5.333    7.69 | 8.333    3.13 | 11.33    1.42
                2.417    2.42 | 5.417    7.69 | 8.417    3.13 | 11.42    1.42
                2.500    2.42 | 5.500    7.69 | 8.500    3.13 | 11.50    1.42
                2.583    2.14 | 5.583   60.97 | 8.583    3.28 | 11.58    1.42
                2.667    2.14 | 5.667   60.97 | 8.667    3.28 | 11.67    1.42
                2.750    2.14 | 5.750   60.97 | 8.750    3.28 | 11.75    1.42
                2.833    2.14 | 5.833   60.97 | 8.833    3.28 | 11.83    1.42
                2.917    2.14 | 5.917   60.97 | 8.917    3.28 | 11.92    1.42
                3.000    2.14 | 6.000   60.97 | 9.000    3.28 | 12.00    1.42

     Max.Eff.Inten.(mm/hr)=      60.97        58.47
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       3.79 (ii)   12.54 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.25         0.08
                                                            *TOTALS*
     PEAK FLOW       (cms)=       0.23         0.15          0.377 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.08           6.00
     RUNOFF VOLUME    (mm)=      70.22        42.27          55.69
     TOTAL RAINFALL   (mm)=      71.22        71.22          71.22
     RUNOFF COEFFICIENT   =       0.99         0.59           0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  83.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
--------------------
| DUHYD    (  0210)|
| Inlet Cap.= 0.304|
| #of Inlets=     1|
| Total(cms)=   0.3|      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):   2.89      0.38      6.00   55.69
     ==================================================
     MAJOR SYS.(ID= 2):   0.08      0.07      6.00   55.69
     MINOR SYS.(ID= 3):   2.81      0.30      5.75   55.69

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  -------------------------
  | Junction Command(0032) |
  -------------------------

                           AREA     QPEAK   TPEAK     R.V.
                           (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0210)    2.81     0.30    5.75    55.69
  OUTFLOW: ID= 2(  0032)    2.81     0.30    5.75    55.69

  ------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0100)|   Area    (ha)=   4.94   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.42

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                                        ---- TRANSFORMED HYETOGRAPH ----
                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.083    2.14 | 3.083    2.85 | 6.083   15.53 |  9.08    2.14
                0.167    2.14 | 3.167    2.85 | 6.167   15.53 |  9.17    2.14
                0.250    2.14 | 3.250    2.85 | 6.250   15.53 |  9.25    2.14
                0.333    2.14 | 3.333    2.85 | 6.333   15.53 |  9.33    2.14
                0.417    2.14 | 3.417    2.85 | 6.417   15.53 |  9.42    2.14
                0.500    2.14 | 3.500    2.85 | 6.500   15.53 |  9.50    2.14
                0.583    1.00 | 3.583    2.85 | 6.583    6.84 |  9.58    1.71
                0.667    1.00 | 3.667    2.85 | 6.667    6.84 |  9.67    1.71
                0.750    1.00 | 3.750    2.85 | 6.750    6.84 |  9.75    1.71
                0.833    1.00 | 3.833    2.85 | 6.833    6.84 |  9.83    1.71
```

```
                0.917    1.00 | 3.917    2.85 | 6.917    6.84 |  9.92    1.71
                1.000    1.00 | 4.000    2.85 | 7.000    6.84 | 10.00    1.71
                1.083    1.85 | 4.083    3.85 | 7.083    4.56 | 10.08    2.42
                1.167    1.85 | 4.167    3.85 | 7.167    4.56 | 10.17    2.42
                1.250    1.85 | 4.250    3.85 | 7.250    4.56 | 10.25    2.42
                1.333    1.85 | 4.333    3.85 | 7.333    4.56 | 10.33    2.42
                1.417    1.85 | 4.417    3.85 | 7.417    4.56 | 10.42    2.42
                1.500    1.85 | 4.500    3.85 | 7.500    4.56 | 10.50    2.42
                1.583    1.85 | 4.583    4.84 | 7.583    3.99 | 10.58    1.57
                1.667    1.85 | 4.667    4.84 | 7.667    3.99 | 10.67    1.57
                1.750    1.85 | 4.750    4.84 | 7.750    3.99 | 10.75    1.57
                1.833    1.85 | 4.833    4.84 | 7.833    3.99 | 10.83    1.57
                1.917    1.85 | 4.917    4.84 | 7.917    3.99 | 10.92    1.57
                2.000    1.85 | 5.000    4.84 | 8.000    3.99 | 11.00    1.57
                2.083    2.42 | 5.083    7.69 | 8.083    3.13 | 11.08    1.42
                2.167    2.42 | 5.167    7.69 | 8.167    3.13 | 11.17    1.42
                2.250    2.42 | 5.250    7.69 | 8.250    3.13 | 11.25    1.42
                2.333    2.42 | 5.333    7.69 | 8.333    3.13 | 11.33    1.42
                2.417    2.42 | 5.417    7.69 | 8.417    3.13 | 11.42    1.42
                2.500    2.42 | 5.500    7.69 | 8.500    3.13 | 11.50    1.42
                2.583    2.14 | 5.583   60.97 | 8.583    3.28 | 11.58    1.42
                2.667    2.14 | 5.667   60.97 | 8.667    3.28 | 11.67    1.42
                2.750    2.14 | 5.750   60.97 | 8.750    3.28 | 11.75    1.42
                2.833    2.14 | 5.833   60.97 | 8.833    3.28 | 11.83    1.42
                2.917    2.14 | 5.917   60.97 | 8.917    3.28 | 11.92    1.42
                3.000    2.14 | 6.000   60.97 | 9.000    3.28 | 12.00    1.42

     Unit Hyd Qpeak  (cms)=   0.449

     PEAK FLOW       (cms)=   0.258 (i)
     TIME TO PEAK    (hrs)=   6.250
     RUNOFF VOLUME    (mm)=  32.713
     TOTAL RAINFALL   (mm)=  71.224
     RUNOFF COEFFICIENT   =   0.459

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
--------------------
| DUHYD    (  0110)|
| Inlet Cap.= 0.000|
| #of Inlets=     1|
| Total(cms)=   0.0|      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):   4.94      0.26      6.25   32.71
     ==================================================
     MAJOR SYS.(ID= 2):   4.94      0.26      6.25   32.71
     MINOR SYS.(ID= 3):   0.00      0.00      0.00    0.00

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  --------------------------
  | Junction Command(0043) |
  --------------------------

                           AREA     QPEAK   TPEAK     R.V.
                           (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0110)    4.94     0.26    6.25    32.71
  OUTFLOW: ID= 2(  0043)    4.94     0.26    6.25    32.71

  -------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0400)|   Area    (ha)=   0.96   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.17

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                             ---- TRANSFORMED HYETOGRAPH ----
                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.083    2.14 | 3.083    2.85 | 6.083   15.53 |  9.08    2.14
                0.167    2.14 | 3.167    2.85 | 6.167   15.53 |  9.17    2.14
                0.250    2.14 | 3.250    2.85 | 6.250   15.53 |  9.25    2.14
                0.333    2.14 | 3.333    2.85 | 6.333   15.53 |  9.33    2.14
                0.417    2.14 | 3.417    2.85 | 6.417   15.53 |  9.42    2.14
                0.500    2.14 | 3.500    2.85 | 6.500   15.53 |  9.50    2.14
                0.583    1.00 | 3.583    2.85 | 6.583    6.84 |  9.58    1.71
                0.667    1.00 | 3.667    2.85 | 6.667    6.84 |  9.67    1.71
                0.750    1.00 | 3.750    2.85 | 6.750    6.84 |  9.75    1.71
```

```
              0.833    1.00 | 3.833    2.85 | 6.833    6.84 |  9.83    1.71
              0.917    1.00 | 3.917    2.85 | 6.917    6.84 |  9.92    1.71
              1.000    1.00 | 4.000    2.85 | 7.000    6.84 | 10.00    1.71
              1.083    1.85 | 4.083    3.85 | 7.083    4.56 | 10.08    2.42
              1.167    1.85 | 4.167    3.85 | 7.167    4.56 | 10.17    2.42
              1.250    1.85 | 4.250    3.85 | 7.250    4.56 | 10.25    2.42
              1.333    1.85 | 4.333    3.85 | 7.333    4.56 | 10.33    2.42
              1.417    1.85 | 4.417    3.85 | 7.417    4.56 | 10.42    2.42
              1.500    1.85 | 4.500    3.85 | 7.500    4.56 | 10.50    2.42
              1.583    1.85 | 4.583    4.84 | 7.583    3.99 | 10.58    1.57
              1.667    1.85 | 4.667    4.84 | 7.667    3.99 | 10.67    1.57
              1.750    1.85 | 4.750    4.84 | 7.750    3.99 | 10.75    1.57
              1.833    1.85 | 4.833    4.84 | 7.833    3.99 | 10.83    1.57
              1.917    1.85 | 4.917    4.84 | 7.917    3.99 | 10.92    1.57
              2.000    1.85 | 5.000    4.84 | 8.000    3.99 | 11.00    1.57
              2.083    2.42 | 5.083    7.69 | 8.083    3.13 | 11.08    1.42
              2.167    2.42 | 5.167    7.69 | 8.167    3.13 | 11.17    1.42
              2.250    2.42 | 5.250    7.69 | 8.250    3.13 | 11.25    1.42
              2.333    2.42 | 5.333    7.69 | 8.333    3.13 | 11.33    1.42
              2.417    2.42 | 5.417    7.69 | 8.417    3.13 | 11.42    1.42
              2.500    2.42 | 5.500    7.69 | 8.500    3.13 | 11.50    1.42
              2.583    2.14 | 5.583   60.97 | 8.583    3.28 | 11.58    1.42
              2.667    2.14 | 5.667   60.97 | 8.667    3.28 | 11.67    1.42
              2.750    2.14 | 5.750   60.97 | 8.750    3.28 | 11.75    1.42
              2.833    2.14 | 5.833   60.97 | 8.833    3.28 | 11.83    1.42
              2.917    2.14 | 5.917   60.97 | 8.917    3.28 | 11.92    1.42
              3.000    2.14 | 6.000   60.97 | 9.000    3.28 | 12.00    1.42

     Unit Hyd Qpeak  (cms)=   0.216

     PEAK FLOW       (cms)=   0.080 (i)
     TIME TO PEAK    (hrs)=   6.000
     RUNOFF VOLUME    (mm)=  32.674
     TOTAL RAINFALL   (mm)=  71.224
     RUNOFF COEFFICIENT   =   0.459

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| DUHYD    (  0410)|
| Inlet Cap.= 0.056|
| #of Inlets=     1|
| Total(cms)=   0.1|      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):   0.96      0.08      6.00   32.67
     ==================================================
     MAJOR SYS.(ID= 2):   0.06      0.02      6.00   32.67
     MINOR SYS.(ID= 3):   0.90      0.06      5.83   32.67

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  --------------------------
  | Junction Command(0041) |
  --------------------------

                         AREA     QPEAK   TPEAK     R.V.
                         (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0410)    0.06     0.02    6.00    32.67
  OUTFLOW: ID= 2(  0041)    0.06     0.02    6.00    32.67

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  --------------------------
  | Junction Command(0033) |
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                         AREA     QPEAK   TPEAK     R.V.
                         (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0210)    0.08     0.07    6.00    55.69
  OUTFLOW: ID= 2(  0033)    0.08     0.07    6.00    55.69

  --------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0300)|   Area    (ha)=    3.28
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  48.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.97         1.31
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
```

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     Length            (m)=     147.82        40.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                                ---- TRANSFORMED HYETOGRAPH ----
                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.083    2.14 | 3.083    2.85 | 6.083   15.53 |  9.08    2.14
                0.167    2.14 | 3.167    2.85 | 6.167   15.53 |  9.17    2.14
                0.250    2.14 | 3.250    2.85 | 6.250   15.53 |  9.25    2.14
                0.333    2.14 | 3.333    2.85 | 6.333   15.53 |  9.33    2.14
                0.417    2.14 | 3.417    2.85 | 6.417   15.53 |  9.42    2.14
                0.500    2.14 | 3.500    2.85 | 6.500   15.53 |  9.50    2.14
                0.583    1.00 | 3.583    2.85 | 6.583    6.84 |  9.58    1.71
                0.667    1.00 | 3.667    2.85 | 6.667    6.84 |  9.67    1.71
                0.750    1.00 | 3.750    2.85 | 6.750    6.84 |  9.75    1.71
                0.833    1.00 | 3.833    2.85 | 6.833    6.84 |  9.83    1.71
                0.917    1.00 | 3.917    2.85 | 6.917    6.84 |  9.92    1.71
                1.000    1.00 | 4.000    2.85 | 7.000    6.84 | 10.00    1.71
                1.083    1.85 | 4.083    3.85 | 7.083    4.56 | 10.08    2.42
                1.167    1.85 | 4.167    3.85 | 7.167    4.56 | 10.17    2.42
                1.250    1.85 | 4.250    3.85 | 7.250    4.56 | 10.25    2.42
                1.333    1.85 | 4.333    3.85 | 7.333    4.56 | 10.33    2.42
                1.417    1.85 | 4.417    3.85 | 7.417    4.56 | 10.42    2.42
                1.500    1.85 | 4.500    3.85 | 7.500    4.56 | 10.50    2.42
                1.583    1.85 | 4.583    4.84 | 7.583    3.99 | 10.58    1.57
                1.667    1.85 | 4.667    4.84 | 7.667    3.99 | 10.67    1.57
                1.750    1.85 | 4.750    4.84 | 7.750    3.99 | 10.75    1.57
                1.833    1.85 | 4.833    4.84 | 7.833    3.99 | 10.83    1.57
                1.917    1.85 | 4.917    4.84 | 7.917    3.99 | 10.92    1.57
                2.000    1.85 | 5.000    4.84 | 8.000    3.99 | 11.00    1.57
                2.083    2.42 | 5.083    7.69 | 8.083    3.13 | 11.08    1.42
                2.167    2.42 | 5.167    7.69 | 8.167    3.13 | 11.17    1.42
                2.250    2.42 | 5.250    7.69 | 8.250    3.13 | 11.25    1.42
                2.333    2.42 | 5.333    7.69 | 8.333    3.13 | 11.33    1.42
                2.417    2.42 | 5.417    7.69 | 8.417    3.13 | 11.42    1.42
                2.500    2.42 | 5.500    7.69 | 8.500    3.13 | 11.50    1.42
                2.583    2.14 | 5.583   60.97 | 8.583    3.28 | 11.58    1.42
                2.667    2.14 | 5.667   60.97 | 8.667    3.28 | 11.67    1.42
                2.750    2.14 | 5.750   60.97 | 8.750    3.28 | 11.75    1.42
                2.833    2.14 | 5.833   60.97 | 8.833    3.28 | 11.83    1.42
                2.917    2.14 | 5.917   60.97 | 8.917    3.28 | 11.92    1.42
                3.000    2.14 | 6.000   60.97 | 9.000    3.28 | 12.00    1.42

     Max.Eff.Inten.(mm/hr)=      60.97        58.47
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       3.94 (ii)   12.68 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.24         0.08
                                                             *TOTALS*
     PEAK FLOW       (cms)=       0.27         0.16          0.427 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.08           6.00
     RUNOFF VOLUME    (mm)=      70.22        42.27          55.69
     TOTAL RAINFALL   (mm)=      71.22        71.22          71.22
     RUNOFF COEFFICIENT   =       0.99         0.59           0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  83.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DUHYD    (  0310)|
| Inlet Cap.= 0.345|
| #of Inlets=     1|
| Total(cms)=   0.3|      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):   3.28      0.43      6.00   55.69
     ==================================================
     MAJOR SYS.(ID= 2):   0.10      0.08      6.00   55.69
     MINOR SYS.(ID= 3):   3.18      0.34      5.83   55.69

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  | Junction Command(0037) |
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                         AREA     QPEAK   TPEAK     R.V.
                         (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0310)    0.10     0.08    6.00    55.69
  OUTFLOW: ID= 2(  0037)    0.10     0.08    6.00    55.69

  --------------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD (  0500)|   Area    (ha)=   1.15
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  48.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.69         0.46
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      87.42        40.00
     Mannings n          =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                               ---- TRANSFORMED HYETOGRAPH ----
              TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
               hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
             0.083    2.14 | 3.083    2.85 | 6.083   15.53 |  9.08    2.14
             0.167    2.14 | 3.167    2.85 | 6.167   15.53 |  9.17    2.14
             0.250    2.14 | 3.250    2.85 | 6.250   15.53 |  9.25    2.14
             0.333    2.14 | 3.333    2.85 | 6.333   15.53 |  9.33    2.14
             0.417    2.14 | 3.417    2.85 | 6.417   15.53 |  9.42    2.14
             0.500    2.14 | 3.500    2.85 | 6.500   15.53 |  9.50    2.14
             0.583    1.00 | 3.583    2.85 | 6.583    6.84 |  9.58    1.71
             0.667    1.00 | 3.667    2.85 | 6.667    6.84 |  9.67    1.71
             0.750    1.00 | 3.750    2.85 | 6.750    6.84 |  9.75    1.71
             0.833    1.00 | 3.833    2.85 | 6.833    6.84 |  9.83    1.71
             0.917    1.00 | 3.917    2.85 | 6.917    6.84 |  9.92    1.71
             1.000    1.00 | 4.000    2.85 | 7.000    6.84 | 10.00    1.71
             1.083    1.85 | 4.083    3.85 | 7.083    4.56 | 10.08    2.42
             1.167    1.85 | 4.167    3.85 | 7.167    4.56 | 10.17    2.42
             1.250    1.85 | 4.250    3.85 | 7.250    4.56 | 10.25    2.42
             1.333    1.85 | 4.333    3.85 | 7.333    4.56 | 10.33    2.42
             1.417    1.85 | 4.417    3.85 | 7.417    4.56 | 10.42    2.42
             1.500    1.85 | 4.500    3.85 | 7.500    4.56 | 10.50    2.42
             1.583    1.85 | 4.583    4.84 | 7.583    3.99 | 10.58    1.57
             1.667    1.85 | 4.667    4.84 | 7.667    3.99 | 10.67    1.57
             1.750    1.85 | 4.750    4.84 | 7.750    3.99 | 10.75    1.57
             1.833    1.85 | 4.833    4.84 | 7.833    3.99 | 10.83    1.57
             1.917    1.85 | 4.917    4.84 | 7.917    3.99 | 10.92    1.57
             2.000    1.85 | 5.000    4.84 | 8.000    3.99 | 11.00    1.57
             2.083    2.42 | 5.083    7.69 | 8.083    3.13 | 11.08    1.42
             2.167    2.42 | 5.167    7.69 | 8.167    3.13 | 11.17    1.42
             2.250    2.42 | 5.250    7.69 | 8.250    3.13 | 11.25    1.42
             2.333    2.42 | 5.333    7.69 | 8.333    3.13 | 11.33    1.42
             2.417    2.42 | 5.417    7.69 | 8.417    3.13 | 11.42    1.42
             2.500    2.42 | 5.500    7.69 | 8.500    3.13 | 11.50    1.42
             2.583    2.14 | 5.583   60.97 | 8.583    3.28 | 11.58    1.42
             2.667    2.14 | 5.667   60.97 | 8.667    3.28 | 11.67    1.42
             2.750    2.14 | 5.750   60.97 | 8.750    3.28 | 11.75    1.42
             2.833    2.14 | 5.833   60.97 | 8.833    3.28 | 11.83    1.42
             2.917    2.14 | 5.917   60.97 | 8.917    3.28 | 11.92    1.42
             3.000    2.14 | 6.000   60.97 | 9.000    3.28 | 12.00    1.42

     Max.Eff.Inten.(mm/hr)=      60.97        58.47
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       2.87 (ii)   11.62 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.28         0.09
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.09         0.06         0.152 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.08          6.00
     RUNOFF VOLUME    (mm)=      70.22        42.27         55.68
     TOTAL RAINFALL   (mm)=      71.22        71.22         71.22
     RUNOFF COEFFICIENT   =       0.99         0.59          0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  83.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| DUHYD    (  0510)|
| Inlet Cap.= 0.122|
| #of Inlets=     1|
| Total(cms)=   0.1|      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):   1.15      0.15      6.00   55.68
     ==================================================
     MAJOR SYS.(ID= 2):   0.04      0.03      6.00   55.68
     MINOR SYS.(ID= 3):   1.11      0.12      5.75   55.68

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------

  --------------------------
  | Junction Command(0039) |
  --------------------------

                           AREA     QPEAK   TPEAK     R.V.
                           (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0510)    0.04     0.03    6.00    55.68
  OUTFLOW: ID= 2(  0039)    0.04     0.03    6.00    55.68

  -------------------------------------------------------------------------------

--------------------
| ADD HYD  (  1000)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0033):     0.08   0.073     6.00    55.69
      + ID2= 2 (  0037):     0.10   0.082     6.00    55.69
        ===================================================
        ID = 3 (  1000):     0.18   0.156     6.00    55.69

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
-------------------------------------------------------------------------------

--------------------
| ADD HYD  (  1000)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  1000):     0.18   0.156     6.00    55.69
      + ID2= 2 (  0039):     0.04   0.030     6.00    55.68
        ===================================================
        ID = 1 (  1000):     0.22   0.185     6.00    55.69

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
-------------------------------------------------------------------------------

--------------------
| ADD HYD  (  1000)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  1000):     0.22   0.185     6.00    55.69
      + ID2= 2 (  0041):     0.06   0.024     6.00    32.67
        ===================================================
        ID = 3 (  1000):     0.27   0.209     6.00    50.86

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
-------------------------------------------------------------------------------

--------------------
| ADD HYD  (  1000)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  1000):     0.27   0.209     6.00    50.86
      + ID2= 2 (  0043):     4.94   0.258     6.25    32.71
        ===================================================
        ID = 1 (  1000):     5.21   0.397     6.00    33.66

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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  --------------------------
  | Junction Command(0036) |
  --------------------------

                           AREA     QPEAK   TPEAK     R.V.
                           (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0310)    3.18     0.35    5.83    55.69
  OUTFLOW: ID= 2(  0036)    3.18     0.35    5.83    55.69

  -------------------------------------------------------------------------------
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  | Junction Command(0038) |
  -------------------------

                         AREA     QPEAK   TPEAK     R.V.
                         (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0510)    1.11     0.12    5.75    55.68
  OUTFLOW: ID= 2(  0038)    1.11     0.12    5.75    55.68

  ------------------------------------------------------------------------------

  -------------------------
  | Junction Command(0040) |
  -------------------------

                         AREA     QPEAK   TPEAK     R.V.
                         (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0410)    0.90     0.06    5.83    32.67
  OUTFLOW: ID= 2(  0040)    0.90     0.06    5.83    32.67

  ------------------------------------------------------------------------------

  -------------------------
  | Junction Command(0042) |
  -------------------------

                         AREA     QPEAK   TPEAK     R.V.
                         (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0110)    0.00     0.00    0.00     0.00
  OUTFLOW: ID= 2(  0042)    0.00     0.00    0.00     0.00

  ------------------------------------------------------------------------------
================================================================================================

      V    V   I    SSSSS  U   U    A    L             (v 6.1.2002)
      V    V   I    SS     U   U   A A   L
       V  V    I     SS    U   U  AAAAA  L
       V  V    I      SS   U   U  A   A  L
        VV     I    SSSSS  UUUUU  A   A  LLLLL

       OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
      O   O    T      T    H   H   Y Y   MM MM  O   O
      O   O    T      T    H   H    Y    M   M  O   O
       OOO     T      T    H   H    Y    M   M   OOO
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                   *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\shahrzad.samani\AppData\Local\Civica\VH5\5e38ad16-99a2-41a3-a6d1-fd92652c9e8f\0a416204-3a61-4d3b-9537-24d
a7b820
  Summary filename:
C:\Users\shahrzad.samani\AppData\Local\Civica\VH5\5e38ad16-99a2-41a3-a6d1-fd92652c9e8f\0a416204-3a61-4d3b-9537-24d
a7b820


DATE: 03/09/2021                           TIME: 04:15:01

USER:


COMMENTS: ____________________________________________________________


------------------------------------------------------------------------------------------------
  ************************************************
  ** SIMULATION : 12SCS025                     **
  ************************************************


--------------------
|    READ STORM    |    Filename: C:\Users\shahrzad.samani\AppD
|                  |              ata\Local\Temp\
|                  |              4d6a0629-9c3f-4bb8-a55b-48312e7da1e6\fcd06d89
| Ptotal= 81.80 mm |    Comments: 12SCS025
--------------------
```

```
                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                 0.17    2.45 |  3.17    3.27 |  6.17   17.83 |  9.17    2.45
                 0.33    2.45 |  3.33    3.27 |  6.33   17.83 |  9.33    2.45
                 0.50    2.45 |  3.50    3.27 |  6.50   17.83 |  9.50    2.45
                 0.67    1.15 |  3.67    3.27 |  6.67    7.85 |  9.67    1.96
                 0.83    1.15 |  3.83    3.27 |  6.83    7.85 |  9.83    1.96
                 1.00    1.15 |  4.00    3.27 |  7.00    7.85 | 10.00    1.96
                 1.17    2.13 |  4.17    4.42 |  7.17    5.24 | 10.17    2.78
                 1.33    2.13 |  4.33    4.42 |  7.33    5.24 | 10.33    2.78
                 1.50    2.13 |  4.50    4.42 |  7.50    5.24 | 10.50    2.78
                 1.67    2.13 |  4.67    5.56 |  7.67    4.58 | 10.67    1.80
                 1.83    2.13 |  4.83    5.56 |  7.83    4.58 | 10.83    1.80
                 2.00    2.13 |  5.00    5.56 |  8.00    4.58 | 11.00    1.80
                 2.17    2.78 |  5.17    8.83 |  8.17    3.60 | 11.17    1.64
                 2.33    2.78 |  5.33    8.83 |  8.33    3.60 | 11.33    1.64
                 2.50    2.78 |  5.50    8.83 |  8.50    3.60 | 11.50    1.64
                 2.67    2.45 |  5.67   70.02 |  8.67    3.76 | 11.67    1.64
                 2.83    2.45 |  5.83   70.02 |  8.83    3.76 | 11.83    1.64
                 3.00    2.45 |  6.00   70.02 |  9.00    3.76 | 12.00    1.64

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--------------------
| CALIB            |
| STANDHYD (  0200)|   Area    (ha)=   2.89
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  48.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.73         1.16
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     138.81        40.00
     Mannings n          =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                               ---- TRANSFORMED HYETOGRAPH ----
                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.083    2.45 | 3.083    3.27 | 6.083   17.83 |  9.08    2.45
                0.167    2.45 | 3.167    3.27 | 6.167   17.83 |  9.17    2.45
                0.250    2.45 | 3.250    3.27 | 6.250   17.83 |  9.25    2.45
                0.333    2.45 | 3.333    3.27 | 6.333   17.83 |  9.33    2.45
                0.417    2.45 | 3.417    3.27 | 6.417   17.83 |  9.42    2.45
                0.500    2.45 | 3.500    3.27 | 6.500   17.83 |  9.50    2.45
                0.583    1.15 | 3.583    3.27 | 6.583    7.85 |  9.58    1.96
                0.667    1.15 | 3.667    3.27 | 6.667    7.85 |  9.67    1.96
                0.750    1.15 | 3.750    3.27 | 6.750    7.85 |  9.75    1.96
                0.833    1.15 | 3.833    3.27 | 6.833    7.85 |  9.83    1.96
                0.917    1.15 | 3.917    3.27 | 6.917    7.85 |  9.92    1.96
                1.000    1.15 | 4.000    3.27 | 7.000    7.85 | 10.00    1.96
                1.083    2.13 | 4.083    4.42 | 7.083    5.24 | 10.08    2.78
                1.167    2.13 | 4.167    4.42 | 7.167    5.24 | 10.17    2.78
                1.250    2.13 | 4.250    4.42 | 7.250    5.24 | 10.25    2.78
                1.333    2.13 | 4.333    4.42 | 7.333    5.24 | 10.33    2.78
                1.417    2.13 | 4.417    4.42 | 7.417    5.24 | 10.42    2.78
                1.500    2.13 | 4.500    4.42 | 7.500    5.24 | 10.50    2.78
                1.583    2.13 | 4.583    5.56 | 7.583    4.58 | 10.58    1.80
                1.667    2.13 | 4.667    5.56 | 7.667    4.58 | 10.67    1.80
                1.750    2.13 | 4.750    5.56 | 7.750    4.58 | 10.75    1.80
                1.833    2.13 | 4.833    5.56 | 7.833    4.58 | 10.83    1.80
                1.917    2.13 | 4.917    5.56 | 7.917    4.58 | 10.92    1.80
                2.000    2.13 | 5.000    5.56 | 8.000    4.58 | 11.00    1.80
                2.083    2.78 | 5.083    8.83 | 8.083    3.60 | 11.08    1.64
                2.167    2.78 | 5.167    8.83 | 8.167    3.60 | 11.17    1.64
                2.250    2.78 | 5.250    8.83 | 8.250    3.60 | 11.25    1.64
                2.333    2.78 | 5.333    8.83 | 8.333    3.60 | 11.33    1.64
                2.417    2.78 | 5.417    8.83 | 8.417    3.60 | 11.42    1.64
                2.500    2.78 | 5.500    8.84 | 8.500    3.60 | 11.50    1.64
                2.583    2.45 | 5.583   70.02 | 8.583    3.76 | 11.58    1.64
                2.667    2.45 | 5.667   70.02 | 8.667    3.76 | 11.67    1.64
                2.750    2.45 | 5.750   70.02 | 8.750    3.76 | 11.75    1.64
                2.833    2.45 | 5.833   70.02 | 8.833    3.76 | 11.83    1.64
                2.917    2.45 | 5.917   70.02 | 8.917    3.76 | 11.92    1.64
                3.000    2.45 | 6.000   70.02 | 9.000    3.76 | 12.00    1.64

     Max.Eff.Inten.(mm/hr)=      70.02        70.55
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       3.59 (ii)   11.70 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.26         0.09
                                                             *TOTALS*
```

```
     PEAK FLOW       (cms)=       0.27         0.18          0.448 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.08           6.00
     RUNOFF VOLUME    (mm)=      80.80        51.51          65.57
     TOTAL RAINFALL   (mm)=      81.80        81.80          81.80
     RUNOFF COEFFICIENT   =       0.99         0.63           0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  83.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| DUHYD    (  0210)|
| Inlet Cap.= 0.304|
| #of Inlets=     1|
| Total(cms)=   0.3|      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):   2.89      0.45      6.00   65.57
     ==================================================
     MAJOR SYS.(ID= 2):   0.19      0.14      6.00   65.57
     MINOR SYS.(ID= 3):   2.70      0.30      5.67   65.57

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  | Junction Command(0032) |
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                           AREA     QPEAK   TPEAK     R.V.
                           (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0210)    2.70     0.30    5.67    65.57
  OUTFLOW: ID= 2(  0032)    2.70     0.30    5.67    65.57

  --------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0100)|   Area    (ha)=   4.94   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.42

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                                        ---- TRANSFORMED HYETOGRAPH ----
                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.083    2.45 | 3.083    3.27 | 6.083   17.83 |  9.08    2.45
                0.167    2.45 | 3.167    3.27 | 6.167   17.83 |  9.17    2.45
                0.250    2.45 | 3.250    3.27 | 6.250   17.83 |  9.25    2.45
                0.333    2.45 | 3.333    3.27 | 6.333   17.83 |  9.33    2.45
                0.417    2.45 | 3.417    3.27 | 6.417   17.83 |  9.42    2.45
                0.500    2.45 | 3.500    3.27 | 6.500   17.83 |  9.50    2.45
                0.583    1.15 | 3.583    3.27 | 6.583    7.85 |  9.58    1.96
                0.667    1.15 | 3.667    3.27 | 6.667    7.85 |  9.67    1.96
                0.750    1.15 | 3.750    3.27 | 6.750    7.85 |  9.75    1.96
                0.833    1.15 | 3.833    3.27 | 6.833    7.85 |  9.83    1.96
                0.917    1.15 | 3.917    3.27 | 6.917    7.85 |  9.92    1.96
                1.000    1.15 | 4.000    3.27 | 7.000    7.85 | 10.00    1.96
                1.083    2.13 | 4.083    4.42 | 7.083    5.24 | 10.08    2.78
                1.167    2.13 | 4.167    4.42 | 7.167    5.24 | 10.17    2.78
                1.250    2.13 | 4.250    4.42 | 7.250    5.24 | 10.25    2.78
                1.333    2.13 | 4.333    4.42 | 7.333    5.24 | 10.33    2.78
                1.417    2.13 | 4.417    4.42 | 7.417    5.24 | 10.42    2.78
                1.500    2.13 | 4.500    4.42 | 7.500    5.24 | 10.50    2.78
                1.583    2.13 | 4.583    5.56 | 7.583    4.58 | 10.58    1.80
                1.667    2.13 | 4.667    5.56 | 7.667    4.58 | 10.67    1.80
                1.750    2.13 | 4.750    5.56 | 7.750    4.58 | 10.75    1.80
                1.833    2.13 | 4.833    5.56 | 7.833    4.58 | 10.83    1.80
                1.917    2.13 | 4.917    5.56 | 7.917    4.58 | 10.92    1.80
                2.000    2.13 | 5.000    5.56 | 8.000    4.58 | 11.00    1.80
                2.083    2.78 | 5.083    8.83 | 8.083    3.60 | 11.08    1.64
                2.167    2.78 | 5.167    8.83 | 8.167    3.60 | 11.17    1.64
                2.250    2.78 | 5.250    8.83 | 8.250    3.60 | 11.25    1.64
                2.333    2.78 | 5.333    8.83 | 8.333    3.60 | 11.33    1.64
                2.417    2.78 | 5.417    8.83 | 8.417    3.60 | 11.42    1.64
                2.500    2.78 | 5.500    8.84 | 8.500    3.60 | 11.50    1.64
                2.583    2.45 | 5.583   70.02 | 8.583    3.76 | 11.58    1.64
                2.667    2.45 | 5.667   70.02 | 8.667    3.76 | 11.67    1.64
```

2.750	2.45	5.750	70.02	8.750	3.76	11.75	1.64
2.833	2.45	5.833	70.02	8.833	3.76	11.83	1.64
2.917	2.45	5.917	70.02	8.917	3.76	11.92	1.64
3.000	2.45	6.000	70.02	9.000	3.76	12.00	1.64

```
    Unit Hyd Qpeak  (cms)=   0.449

    PEAK FLOW       (cms)=   0.324 (i)
    TIME TO PEAK    (hrs)=   6.250
    RUNOFF VOLUME    (mm)=  40.788
    TOTAL RAINFALL   (mm)=  81.802
    RUNOFF COEFFICIENT   =   0.499

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| DUHYD    (  0110)|
| Inlet Cap.= 0.000|
| #of Inlets=     1|
| Total(cms)=   0.0|      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
    TOTAL HYD.(ID= 1):   4.94      0.32      6.25   40.79
    ==================================================
    MAJOR SYS.(ID= 2):   4.94      0.32      6.25   40.79
    MINOR SYS.(ID= 3):   0.00      0.00      0.00    0.00

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  | Junction Command(0043) |
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                           AREA     QPEAK   TPEAK     R.V.
                           (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0110)    4.94     0.32    6.25    40.79
  OUTFLOW: ID= 2(  0043)    4.94     0.32    6.25    40.79

  --------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0400)|   Area    (ha)=   0.96   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.17

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	' TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.45	3.083	3.27	6.083	17.83	9.08	2.45
0.167	2.45	3.167	3.27	6.167	17.83	9.17	2.45
0.250	2.45	3.250	3.27	6.250	17.83	9.25	2.45
0.333	2.45	3.333	3.27	6.333	17.83	9.33	2.45
0.417	2.45	3.417	3.27	6.417	17.83	9.42	2.45
0.500	2.45	3.500	3.27	6.500	17.83	9.50	2.45
0.583	1.15	3.583	3.27	6.583	7.85	9.58	1.96
0.667	1.15	3.667	3.27	6.667	7.85	9.67	1.96
0.750	1.15	3.750	3.27	6.750	7.85	9.75	1.96
0.833	1.15	3.833	3.27	6.833	7.85	9.83	1.96
0.917	1.15	3.917	3.27	6.917	7.85	9.92	1.96
1.000	1.15	4.000	3.27	7.000	7.85	10.00	1.96
1.083	2.13	4.083	4.42	7.083	5.24	10.08	2.78
1.167	2.13	4.167	4.42	7.167	5.24	10.17	2.78
1.250	2.13	4.250	4.42	7.250	5.24	10.25	2.78
1.333	2.13	4.333	4.42	7.333	5.24	10.33	2.78
1.417	2.13	4.417	4.42	7.417	5.24	10.42	2.78
1.500	2.13	4.500	4.42	7.500	5.24	10.50	2.78
1.583	2.13	4.583	5.56	7.583	4.58	10.58	1.80
1.667	2.13	4.667	5.56	7.667	4.58	10.67	1.80
1.750	2.13	4.750	5.56	7.750	4.58	10.75	1.80
1.833	2.13	4.833	5.56	7.833	4.58	10.83	1.80
1.917	2.13	4.917	5.56	7.917	4.58	10.92	1.80
2.000	2.13	5.000	5.56	8.000	4.58	11.00	1.80
2.083	2.78	5.083	8.83	8.083	3.60	11.08	1.64
2.167	2.78	5.167	8.83	8.167	3.60	11.17	1.64
2.250	2.78	5.250	8.83	8.250	3.60	11.25	1.64
2.333	2.78	5.333	8.83	8.333	3.60	11.33	1.64
2.417	2.78	5.417	8.83	8.417	3.60	11.42	1.64
2.500	2.78	5.500	8.84	8.500	3.60	11.50	1.64
2.583	2.45	5.583	70.02	8.583	3.76	11.58	1.64

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              2.667    2.45 | 5.667   70.02 | 8.667    3.76 | 11.67    1.64
              2.750    2.45 | 5.750   70.02 | 8.750    3.76 | 11.75    1.64
              2.833    2.45 | 5.833   70.02 | 8.833    3.76 | 11.83    1.64
              2.917    2.45 | 5.917   70.02 | 8.917    3.76 | 11.92    1.64
              3.000    2.45 | 6.000   70.02 | 9.000    3.76 | 12.00    1.64

     Unit Hyd Qpeak  (cms)=   0.216

     PEAK FLOW       (cms)=   0.100 (i)
     TIME TO PEAK    (hrs)=   6.000
     RUNOFF VOLUME    (mm)=  40.724
     TOTAL RAINFALL   (mm)=  81.802
     RUNOFF COEFFICIENT   =   0.498

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| DUHYD    (  0410)|
| Inlet Cap.= 0.056|
| #of Inlets=     1|
| Total(cms)=   0.1|      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):   0.96      0.10      6.00   40.72
     ==================================================
     MAJOR SYS.(ID= 2):   0.11      0.04      6.00   40.72
     MINOR SYS.(ID= 3):   0.85      0.06      5.75   40.72

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  | Junction Command(0041) |
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                           AREA     QPEAK   TPEAK     R.V.
                           (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0410)    0.11     0.04    6.00    40.72
  OUTFLOW: ID= 2(  0041)    0.11     0.04    6.00    40.72

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  | Junction Command(0033) |
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                           AREA     QPEAK   TPEAK     R.V.
                           (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0210)    0.19     0.14    6.00    65.57
  OUTFLOW: ID= 2(  0033)    0.19     0.14    6.00    65.57

  --------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0300)|   Area    (ha)=   3.28
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  48.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.97         1.31
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     147.82        40.00
     Mannings n          =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                               ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.083    2.45 | 3.083    3.27 | 6.083   17.83 |  9.08    2.45
              0.167    2.45 | 3.167    3.27 | 6.167   17.83 |  9.17    2.45
              0.250    2.45 | 3.250    3.27 | 6.250   17.83 |  9.25    2.45
              0.333    2.45 | 3.333    3.27 | 6.333   17.83 |  9.33    2.45
              0.417    2.45 | 3.417    3.27 | 6.417   17.83 |  9.42    2.45
              0.500    2.45 | 3.500    3.27 | 6.500   17.83 |  9.50    2.45
              0.583    1.15 | 3.583    3.27 | 6.583    7.85 |  9.58    1.96
              0.667    1.15 | 3.667    3.27 | 6.667    7.85 |  9.67    1.96
              0.750    1.15 | 3.750    3.27 | 6.750    7.85 |  9.75    1.96
              0.833    1.15 | 3.833    3.27 | 6.833    7.85 |  9.83    1.96
              0.917    1.15 | 3.917    3.27 | 6.917    7.85 |  9.92    1.96
              1.000    1.15 | 4.000    3.27 | 7.000    7.85 | 10.00    1.96
              1.083    2.13 | 4.083    4.42 | 7.083    5.24 | 10.08    2.78
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                 1.167    2.13 | 4.167    4.42 | 7.167    5.24 | 10.17    2.78
                 1.250    2.13 | 4.250    4.42 | 7.250    5.24 | 10.25    2.78
                 1.333    2.13 | 4.333    4.42 | 7.333    5.24 | 10.33    2.78
                 1.417    2.13 | 4.417    4.42 | 7.417    5.24 | 10.42    2.78
                 1.500    2.13 | 4.500    4.42 | 7.500    5.24 | 10.50    2.78
                 1.583    2.13 | 4.583    5.56 | 7.583    4.58 | 10.58    1.80
                 1.667    2.13 | 4.667    5.56 | 7.667    4.58 | 10.67    1.80
                 1.750    2.13 | 4.750    5.56 | 7.750    4.58 | 10.75    1.80
                 1.833    2.13 | 4.833    5.56 | 7.833    4.58 | 10.83    1.80
                 1.917    2.13 | 4.917    5.56 | 7.917    4.58 | 10.92    1.80
                 2.000    2.13 | 5.000    5.56 | 8.000    4.58 | 11.00    1.80
                 2.083    2.78 | 5.083    8.83 | 8.083    3.60 | 11.08    1.64
                 2.167    2.78 | 5.167    8.83 | 8.167    3.60 | 11.17    1.64
                 2.250    2.78 | 5.250    8.83 | 8.250    3.60 | 11.25    1.64
                 2.333    2.78 | 5.333    8.83 | 8.333    3.60 | 11.33    1.64
                 2.417    2.78 | 5.417    8.83 | 8.417    3.60 | 11.42    1.64
                 2.500    2.78 | 5.500    8.84 | 8.500    3.60 | 11.50    1.64
                 2.583    2.45 | 5.583   70.02 | 8.583    3.76 | 11.58    1.64
                 2.667    2.45 | 5.667   70.02 | 8.667    3.76 | 11.67    1.64
                 2.750    2.45 | 5.750   70.02 | 8.750    3.76 | 11.75    1.64
                 2.833    2.45 | 5.833   70.02 | 8.833    3.76 | 11.83    1.64
                 2.917    2.45 | 5.917   70.02 | 8.917    3.76 | 11.92    1.64
                 3.000    2.45 | 6.000   70.02 | 9.000    3.76 | 12.00    1.64

     Max.Eff.Inten.(mm/hr)=      70.02        70.55
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       3.72 (ii)   11.84 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.25         0.09
                                                       *TOTALS*
     PEAK FLOW       (cms)=       0.31         0.20         0.508 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.08          6.00
     RUNOFF VOLUME    (mm)=      80.80        51.51         65.57
     TOTAL RAINFALL   (mm)=      81.80        81.80         81.80
     RUNOFF COEFFICIENT   =       0.99         0.63          0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  83.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DUHYD    (  0310)|
| Inlet Cap.= 0.345|
| #of Inlets=     1|
| Total(cms)=   0.3|      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):   3.28      0.51      6.00   65.57
     ==================================================
     MAJOR SYS.(ID= 2):   0.22      0.16      6.00   65.57
     MINOR SYS.(ID= 3):   3.06      0.34      5.67   65.57

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  -------------------------
  | Junction Command(0037) |
  -------------------------

                           AREA     QPEAK   TPEAK     R.V.
                           (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0310)    0.22     0.16    6.00    65.57
  OUTFLOW: ID= 2(  0037)    0.22     0.16    6.00    65.57

  --------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0500)|   Area    (ha)=   1.15
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  48.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.69         0.46
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      87.42        40.00
     Mannings n          =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
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                                   ---- TRANSFORMED HYETOGRAPH ----
                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.083    2.45 | 3.083    3.27 | 6.083   17.83 |  9.08    2.45
                0.167    2.45 | 3.167    3.27 | 6.167   17.83 |  9.17    2.45
                0.250    2.45 | 3.250    3.27 | 6.250   17.83 |  9.25    2.45
                0.333    2.45 | 3.333    3.27 | 6.333   17.83 |  9.33    2.45
                0.417    2.45 | 3.417    3.27 | 6.417   17.83 |  9.42    2.45
                0.500    2.45 | 3.500    3.27 | 6.500   17.83 |  9.50    2.45
                0.583    1.15 | 3.583    3.27 | 6.583    7.85 |  9.58    1.96
                0.667    1.15 | 3.667    3.27 | 6.667    7.85 |  9.67    1.96
                0.750    1.15 | 3.750    3.27 | 6.750    7.85 |  9.75    1.96
                0.833    1.15 | 3.833    3.27 | 6.833    7.85 |  9.83    1.96
                0.917    1.15 | 3.917    3.27 | 6.917    7.85 |  9.92    1.96
                1.000    1.15 | 4.000    3.27 | 7.000    7.85 | 10.00    1.96
                1.083    2.13 | 4.083    4.42 | 7.083    5.24 | 10.08    2.78
                1.167    2.13 | 4.167    4.42 | 7.167    5.24 | 10.17    2.78
                1.250    2.13 | 4.250    4.42 | 7.250    5.24 | 10.25    2.78
                1.333    2.13 | 4.333    4.42 | 7.333    5.24 | 10.33    2.78
                1.417    2.13 | 4.417    4.42 | 7.417    5.24 | 10.42    2.78
                1.500    2.13 | 4.500    4.42 | 7.500    5.24 | 10.50    2.78
                1.583    2.13 | 4.583    5.56 | 7.583    4.58 | 10.58    1.80
                1.667    2.13 | 4.667    5.56 | 7.667    4.58 | 10.67    1.80
                1.750    2.13 | 4.750    5.56 | 7.750    4.58 | 10.75    1.80
                1.833    2.13 | 4.833    5.56 | 7.833    4.58 | 10.83    1.80
                1.917    2.13 | 4.917    5.56 | 7.917    4.58 | 10.92    1.80
                2.000    2.13 | 5.000    5.56 | 8.000    4.58 | 11.00    1.80
                2.083    2.78 | 5.083    8.83 | 8.083    3.60 | 11.08    1.64
                2.167    2.78 | 5.167    8.83 | 8.167    3.60 | 11.17    1.64
                2.250    2.78 | 5.250    8.83 | 8.250    3.60 | 11.25    1.64
                2.333    2.78 | 5.333    8.83 | 8.333    3.60 | 11.33    1.64
                2.417    2.78 | 5.417    8.83 | 8.417    3.60 | 11.42    1.64
                2.500    2.78 | 5.500    8.84 | 8.500    3.60 | 11.50    1.64
                2.583    2.45 | 5.583   70.02 | 8.583    3.76 | 11.58    1.64
                2.667    2.45 | 5.667   70.02 | 8.667    3.76 | 11.67    1.64
                2.750    2.45 | 5.750   70.02 | 8.750    3.76 | 11.75    1.64
                2.833    2.45 | 5.833   70.02 | 8.833    3.76 | 11.83    1.64
                2.917    2.45 | 5.917   70.02 | 8.917    3.76 | 11.92    1.64
                3.000    2.45 | 6.000   70.02 | 9.000    3.76 | 12.00    1.64

     Max.Eff.Inten.(mm/hr)=      70.02        70.55
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       2.72 (ii)   10.83 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.29         0.09
                                                             *TOTALS*
     PEAK FLOW       (cms)=       0.11         0.07           0.180 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.08            6.00
     RUNOFF VOLUME    (mm)=      80.80        51.51           65.57
     TOTAL RAINFALL   (mm)=      81.80        81.80           81.80
     RUNOFF COEFFICIENT   =       0.99         0.63            0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  83.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DUHYD    (  0510)|
| Inlet Cap.= 0.122|
| #of Inlets=     1|
| Total(cms)=   0.1|      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):   1.15      0.18      6.00   65.57
     ==================================================
     MAJOR SYS.(ID= 2):   0.08      0.06      6.00   65.57
     MINOR SYS.(ID= 3):   1.07      0.12      5.67   65.57

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

  --------------------------
  | Junction Command(0039) |
  --------------------------

                           AREA     QPEAK   TPEAK     R.V.
                           (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0510)    0.08     0.06    6.00    65.57
```

```
  OUTFLOW: ID= 2(  0039)    0.08     0.06    6.00    65.57

  ------------------------------------------------------------------------------

--------------------
| ADD HYD  (  1000)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0033):     0.19   0.144     6.00    65.57
      + ID2= 2 (  0037):     0.22   0.163     6.00    65.57
        ====================================================
        ID = 3 (  1000):     0.41   0.307     6.00    65.57

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
------------------------------------------------------------------------------

--------------------
| ADD HYD  (  1000)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  1000):     0.41   0.307     6.00    65.57
      + ID2= 2 (  0039):     0.08   0.058     6.00    65.57
        ====================================================
        ID = 1 (  1000):     0.49   0.365     6.00    65.57

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
------------------------------------------------------------------------------

--------------------
| ADD HYD  (  1000)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  1000):     0.49   0.365     6.00    65.57
      + ID2= 2 (  0041):     0.11   0.044     6.00    40.72
        ====================================================
        ID = 3 (  1000):     0.60   0.409     6.00    60.95

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
------------------------------------------------------------------------------

--------------------
| ADD HYD  (  1000)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  1000):     0.60   0.409     6.00    60.95
      + ID2= 2 (  0043):     4.94   0.324     6.25    40.79
        ====================================================
        ID = 1 (  1000):     5.54   0.648     6.00    42.98

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
------------------------------------------------------------------------------

  --------------------------
  | Junction Command(0036) |
  --------------------------

                         AREA     QPEAK   TPEAK     R.V.
                         (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0310)    3.06     0.35    5.67    65.57
  OUTFLOW: ID= 2(  0036)    3.06     0.35    5.67    65.57

  ------------------------------------------------------------------------------

  --------------------------
  | Junction Command(0038) |
  --------------------------

                         AREA     QPEAK   TPEAK     R.V.
                         (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0510)    1.07     0.12    5.67    65.57
  OUTFLOW: ID= 2(  0038)    1.07     0.12    5.67    65.57

  ------------------------------------------------------------------------------

  --------------------------
  | Junction Command(0040) |
  --------------------------

                         AREA     QPEAK   TPEAK     R.V.
                         (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0410)    0.85     0.06    5.75    40.72
  OUTFLOW: ID= 2(  0040)    0.85     0.06    5.75    40.72

  ------------------------------------------------------------------------------
```

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  -------------------------
  | Junction Command(0042) |
  -------------------------

                           AREA     QPEAK   TPEAK     R.V.
                           (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0110)    0.00     0.00    0.00     0.00
  OUTFLOW: ID= 2(  0042)    0.00     0.00    0.00     0.00

  -------------------------------------------------------------------------------
=========================================================================================================

      V    V   I    SSSSS  U   U    A    L             (v 6.1.2002)
      V    V   I    SS     U   U   A A   L
       V  V    I     SS    U   U  AAAAA  L
       V  V    I      SS   U   U  A   A  L
        VV     I    SSSSS  UUUUU  A   A  LLLLL

       OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
      O   O    T      T    H   H   Y Y   MM MM  O   O
      O   O    T      T    H   H    Y    M   M  O   O
       OOO     T      T    H   H    Y    M   M   OOO
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                   *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\shahrzad.samani\AppData\Local\Civica\VH5\5e38ad16-99a2-41a3-a6d1-fd92652c9e8f\4c0ad838-36eb-4057-8865-a79
680033
  Summary filename:
C:\Users\shahrzad.samani\AppData\Local\Civica\VH5\5e38ad16-99a2-41a3-a6d1-fd92652c9e8f\4c0ad838-36eb-4057-8865-a79
680033


DATE: 03/09/2021                           TIME: 04:15:02

USER:



COMMENTS: ____________________________________________________________


---------------------------------------------------------------------------------------------------------
  ************************************************
  ** SIMULATION : 12SCS050                      **
  ************************************************


--------------------
|    READ STORM    |    Filename: C:\Users\shahrzad.samani\AppD
|                  |              ata\Local\Temp\
|                  |              4d6a0629-9c3f-4bb8-a55b-48312e7da1e6\b142176e
| Ptotal= 91.66 mm |    Comments: 12SCS050
--------------------
                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                 0.17    2.75 |  3.17    3.67 |  6.17   19.98 |  9.17    2.75
                 0.33    2.75 |  3.33    3.67 |  6.33   19.98 |  9.33    2.75
                 0.50    2.75 |  3.50    3.67 |  6.50   19.98 |  9.50    2.75
                 0.67    1.28 |  3.67    3.67 |  6.67    8.80 |  9.67    2.20
                 0.83    1.28 |  3.83    3.67 |  6.83    8.80 |  9.83    2.20
                 1.00    1.28 |  4.00    3.67 |  7.00    8.80 | 10.00    2.20
                 1.17    2.38 |  4.17    4.95 |  7.17    5.87 | 10.17    3.12
                 1.33    2.38 |  4.33    4.95 |  7.33    5.87 | 10.33    3.12
                 1.50    2.38 |  4.50    4.95 |  7.50    5.87 | 10.50    3.12
                 1.67    2.38 |  4.67    6.23 |  7.67    5.13 | 10.67    2.02
                 1.83    2.38 |  4.83    6.23 |  7.83    5.13 | 10.83    2.02
                 2.00    2.38 |  5.00    6.23 |  8.00    5.13 | 11.00    2.02
                 2.17    3.12 |  5.17    9.90 |  8.17    4.03 | 11.17    1.83
                 2.33    3.12 |  5.33    9.90 |  8.33    4.03 | 11.33    1.83
                 2.50    3.12 |  5.50    9.90 |  8.50    4.03 | 11.50    1.83
                 2.67    2.75 |  5.67   78.46 |  8.67    4.22 | 11.67    1.83
                 2.83    2.75 |  5.83   78.46 |  8.83    4.22 | 11.83    1.83
                 3.00    2.75 |  6.00   78.46 |  9.00    4.22 | 12.00    1.83

-------------------------------------------------------------------------------
```

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--------------------
| CALIB             |
| STANDHYD (  0200)|   Area    (ha)=   2.89
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  48.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.73         1.16
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     138.81        40.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                               ---- TRANSFORMED HYETOGRAPH ----
                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.083    2.75 | 3.083    3.67 | 6.083   19.98 |  9.08    2.75
                0.167    2.75 | 3.167    3.67 | 6.167   19.98 |  9.17    2.75
                0.250    2.75 | 3.250    3.67 | 6.250   19.98 |  9.25    2.75
                0.333    2.75 | 3.333    3.67 | 6.333   19.98 |  9.33    2.75
                0.417    2.75 | 3.417    3.67 | 6.417   19.98 |  9.42    2.75
                0.500    2.75 | 3.500    3.67 | 6.500   19.98 |  9.50    2.75
                0.583    1.28 | 3.583    3.67 | 6.583    8.80 |  9.58    2.20
                0.667    1.28 | 3.667    3.67 | 6.667    8.80 |  9.67    2.20
                0.750    1.28 | 3.750    3.67 | 6.750    8.80 |  9.75    2.20
                0.833    1.28 | 3.833    3.67 | 6.833    8.80 |  9.83    2.20
                0.917    1.28 | 3.917    3.67 | 6.917    8.80 |  9.92    2.20
                1.000    1.28 | 4.000    3.67 | 7.000    8.80 | 10.00    2.20
                1.083    2.38 | 4.083    4.95 | 7.083    5.87 | 10.08    3.12
                1.167    2.38 | 4.167    4.95 | 7.167    5.87 | 10.17    3.12
                1.250    2.38 | 4.250    4.95 | 7.250    5.87 | 10.25    3.12
                1.333    2.38 | 4.333    4.95 | 7.333    5.87 | 10.33    3.12
                1.417    2.38 | 4.417    4.95 | 7.417    5.87 | 10.42    3.12
                1.500    2.38 | 4.500    4.95 | 7.500    5.87 | 10.50    3.12
                1.583    2.38 | 4.583    6.23 | 7.583    5.13 | 10.58    2.02
                1.667    2.38 | 4.667    6.23 | 7.667    5.13 | 10.67    2.02
                1.750    2.38 | 4.750    6.23 | 7.750    5.13 | 10.75    2.02
                1.833    2.38 | 4.833    6.23 | 7.833    5.13 | 10.83    2.02
                1.917    2.38 | 4.917    6.23 | 7.917    5.13 | 10.92    2.02
                2.000    2.38 | 5.000    6.23 | 8.000    5.13 | 11.00    2.02
                2.083    3.12 | 5.083    9.90 | 8.083    4.03 | 11.08    1.83
                2.167    3.12 | 5.167    9.90 | 8.167    4.03 | 11.17    1.83
                2.250    3.12 | 5.250    9.90 | 8.250    4.03 | 11.25    1.83
                2.333    3.12 | 5.333    9.90 | 8.333    4.03 | 11.33    1.83
                2.417    3.12 | 5.417    9.90 | 8.417    4.03 | 11.42    1.83
                2.500    3.12 | 5.500    9.90 | 8.500    4.03 | 11.50    1.83
                2.583    2.75 | 5.583   78.46 | 8.583    4.22 | 11.58    1.83
                2.667    2.75 | 5.667   78.46 | 8.667    4.22 | 11.67    1.83
                2.750    2.75 | 5.750   78.46 | 8.750    4.22 | 11.75    1.83
                2.833    2.75 | 5.833   78.46 | 8.833    4.22 | 11.83    1.83
                2.917    2.75 | 5.917   78.46 | 8.917    4.22 | 11.92    1.83
                3.000    2.75 | 6.000   78.46 | 9.000    4.22 | 12.00    1.83

     Max.Eff.Inten.(mm/hr)=      78.46        81.91
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       3.43 (ii)   11.07 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.26         0.09
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.30         0.21         0.515 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.08          6.00
     RUNOFF VOLUME    (mm)=      90.66        60.32         74.88
     TOTAL RAINFALL   (mm)=      91.66        91.66         91.66
     RUNOFF COEFFICIENT   =       0.99         0.66          0.82

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  83.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DUHYD    (  0210)|
| Inlet Cap.= 0.304|
| #of Inlets=     1|
| Total(cms)=   0.3|      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):   2.89      0.52      6.00   74.88
```

```
     =====================================================
     MAJOR SYS.(ID= 2):   0.30      0.21      6.00   74.88
     MINOR SYS.(ID= 3):   2.59      0.30      5.67   74.88

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  --------------------------
  | Junction Command(0032) |
  --------------------------

                        AREA     QPEAK   TPEAK     R.V.
                        (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0210)    2.59     0.30    5.67    74.88
  OUTFLOW: ID= 2(  0032)    2.59     0.30    5.67    74.88

  --------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0100)|   Area    (ha)=   4.94   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.42

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                                   ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    2.75 | 3.083    3.67 | 6.083   19.98 |   9.08    2.75
               0.167    2.75 | 3.167    3.67 | 6.167   19.98 |   9.17    2.75
               0.250    2.75 | 3.250    3.67 | 6.250   19.98 |   9.25    2.75
               0.333    2.75 | 3.333    3.67 | 6.333   19.98 |   9.33    2.75
               0.417    2.75 | 3.417    3.67 | 6.417   19.98 |   9.42    2.75
               0.500    2.75 | 3.500    3.67 | 6.500   19.98 |   9.50    2.75
               0.583    1.28 | 3.583    3.67 | 6.583    8.80 |   9.58    2.20
               0.667    1.28 | 3.667    3.67 | 6.667    8.80 |   9.67    2.20
               0.750    1.28 | 3.750    3.67 | 6.750    8.80 |   9.75    2.20
               0.833    1.28 | 3.833    3.67 | 6.833    8.80 |   9.83    2.20
               0.917    1.28 | 3.917    3.67 | 6.917    8.80 |   9.92    2.20
               1.000    1.28 | 4.000    3.67 | 7.000    8.80 |  10.00    2.20
               1.083    2.38 | 4.083    4.95 | 7.083    5.87 |  10.08    3.12
               1.167    2.38 | 4.167    4.95 | 7.167    5.87 |  10.17    3.12
               1.250    2.38 | 4.250    4.95 | 7.250    5.87 |  10.25    3.12
               1.333    2.38 | 4.333    4.95 | 7.333    5.87 |  10.33    3.12
               1.417    2.38 | 4.417    4.95 | 7.417    5.87 |  10.42    3.12
               1.500    2.38 | 4.500    4.95 | 7.500    5.87 |  10.50    3.12
               1.583    2.38 | 4.583    6.23 | 7.583    5.13 |  10.58    2.02
               1.667    2.38 | 4.667    6.23 | 7.667    5.13 |  10.67    2.02
               1.750    2.38 | 4.750    6.23 | 7.750    5.13 |  10.75    2.02
               1.833    2.38 | 4.833    6.23 | 7.833    5.13 |  10.83    2.02
               1.917    2.38 | 4.917    6.23 | 7.917    5.13 |  10.92    2.02
               2.000    2.38 | 5.000    6.23 | 8.000    5.13 |  11.00    2.02
               2.083    3.12 | 5.083    9.90 | 8.083    4.03 |  11.08    1.83
               2.167    3.12 | 5.167    9.90 | 8.167    4.03 |  11.17    1.83
               2.250    3.12 | 5.250    9.90 | 8.250    4.03 |  11.25    1.83
               2.333    3.12 | 5.333    9.90 | 8.333    4.03 |  11.33    1.83
               2.417    3.12 | 5.417    9.90 | 8.417    4.03 |  11.42    1.83
               2.500    3.12 | 5.500    9.90 | 8.500    4.03 |  11.50    1.83
               2.583    2.75 | 5.583   78.46 | 8.583    4.22 |  11.58    1.83
               2.667    2.75 | 5.667   78.46 | 8.667    4.22 |  11.67    1.83
               2.750    2.75 | 5.750   78.46 | 8.750    4.22 |  11.75    1.83
               2.833    2.75 | 5.833   78.46 | 8.833    4.22 |  11.83    1.83
               2.917    2.75 | 5.917   78.46 | 8.917    4.22 |  11.92    1.83
               3.000    2.75 | 6.000   78.46 | 9.000    4.22 |  12.00    1.83

     Unit Hyd Qpeak  (cms)=   0.449

     PEAK FLOW       (cms)=   0.389 (i)
     TIME TO PEAK    (hrs)=   6.250
     RUNOFF VOLUME    (mm)=  48.623
     TOTAL RAINFALL   (mm)=  91.660
     RUNOFF COEFFICIENT   =   0.530

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DUHYD    (  0110)|
| Inlet Cap.= 0.000|
| #of Inlets=     1|
| Total(cms)=   0.0|      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
```

```
     TOTAL HYD.(ID= 1):   4.94      0.39      6.25   48.62
     ==================================================
     MAJOR SYS.(ID= 2):   4.94      0.39      6.25   48.62
     MINOR SYS.(ID= 3):   0.00      0.00      0.00    0.00

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  | Junction Command(0043) |
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                        AREA     QPEAK   TPEAK     R.V.
                        (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0110)    4.94     0.39    6.25    48.62
  OUTFLOW: ID= 2(  0043)    4.94     0.39    6.25    48.62

  --------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0400)|   Area    (ha)=   0.96   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.17

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                                 ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.083    2.75 | 3.083    3.67 | 6.083   19.98 |  9.08    2.75
              0.167    2.75 | 3.167    3.67 | 6.167   19.98 |  9.17    2.75
              0.250    2.75 | 3.250    3.67 | 6.250   19.98 |  9.25    2.75
              0.333    2.75 | 3.333    3.67 | 6.333   19.98 |  9.33    2.75
              0.417    2.75 | 3.417    3.67 | 6.417   19.98 |  9.42    2.75
              0.500    2.75 | 3.500    3.67 | 6.500   19.98 |  9.50    2.75
              0.583    1.28 | 3.583    3.67 | 6.583    8.80 |  9.58    2.20
              0.667    1.28 | 3.667    3.67 | 6.667    8.80 |  9.67    2.20
              0.750    1.28 | 3.750    3.67 | 6.750    8.80 |  9.75    2.20
              0.833    1.28 | 3.833    3.67 | 6.833    8.80 |  9.83    2.20
              0.917    1.28 | 3.917    3.67 | 6.917    8.80 |  9.92    2.20
              1.000    1.28 | 4.000    3.67 | 7.000    8.80 | 10.00    2.20
              1.083    2.38 | 4.083    4.95 | 7.083    5.87 | 10.08    3.12
              1.167    2.38 | 4.167    4.95 | 7.167    5.87 | 10.17    3.12
              1.250    2.38 | 4.250    4.95 | 7.250    5.87 | 10.25    3.12
              1.333    2.38 | 4.333    4.95 | 7.333    5.87 | 10.33    3.12
              1.417    2.38 | 4.417    4.95 | 7.417    5.87 | 10.42    3.12
              1.500    2.38 | 4.500    4.95 | 7.500    5.87 | 10.50    3.12
              1.583    2.38 | 4.583    6.23 | 7.583    5.13 | 10.58    2.02
              1.667    2.38 | 4.667    6.23 | 7.667    5.13 | 10.67    2.02
              1.750    2.38 | 4.750    6.23 | 7.750    5.13 | 10.75    2.02
              1.833    2.38 | 4.833    6.23 | 7.833    5.13 | 10.83    2.02
              1.917    2.38 | 4.917    6.23 | 7.917    5.13 | 10.92    2.02
              2.000    2.38 | 5.000    6.23 | 8.000    5.13 | 11.00    2.02
              2.083    3.12 | 5.083    9.90 | 8.083    4.03 | 11.08    1.83
              2.167    3.12 | 5.167    9.90 | 8.167    4.03 | 11.17    1.83
              2.250    3.12 | 5.250    9.90 | 8.250    4.03 | 11.25    1.83
              2.333    3.12 | 5.333    9.90 | 8.333    4.03 | 11.33    1.83
              2.417    3.12 | 5.417    9.90 | 8.417    4.03 | 11.42    1.83
              2.500    3.12 | 5.500    9.90 | 8.500    4.03 | 11.50    1.83
              2.583    2.75 | 5.583   78.46 | 8.583    4.22 | 11.58    1.83
              2.667    2.75 | 5.667   78.46 | 8.667    4.22 | 11.67    1.83
              2.750    2.75 | 5.750   78.46 | 8.750    4.22 | 11.75    1.83
              2.833    2.75 | 5.833   78.46 | 8.833    4.22 | 11.83    1.83
              2.917    2.75 | 5.917   78.46 | 8.917    4.22 | 11.92    1.83
              3.000    2.75 | 6.000   78.46 | 9.000    4.22 | 12.00    1.83

     Unit Hyd Qpeak  (cms)=   0.216

     PEAK FLOW       (cms)=   0.120 (i)
     TIME TO PEAK    (hrs)=   6.000
     RUNOFF VOLUME    (mm)=  48.535
     TOTAL RAINFALL   (mm)=  91.660
     RUNOFF COEFFICIENT    =   0.530

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DUHYD    (  0410)|
| Inlet Cap.= 0.056|
| #of Inlets=     1|
| Total(cms)=   0.1|      AREA     QPEAK     TPEAK    R.V.
```

```
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):   0.96      0.12      6.00   48.53
     ==================================================
     MAJOR SYS.(ID= 2):   0.16      0.06      6.00   48.53
     MINOR SYS.(ID= 3):   0.80      0.06      5.75   48.53

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  | Junction Command(0041) |
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                         AREA     QPEAK   TPEAK     R.V.
                         (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0410)    0.16     0.06    6.00    48.53
  OUTFLOW: ID= 2(  0041)    0.16     0.06    6.00    48.53

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  --------------------------
  | Junction Command(0033) |
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                         AREA     QPEAK   TPEAK     R.V.
                         (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0210)    0.30     0.21    6.00    74.88
  OUTFLOW: ID= 2(  0033)    0.30     0.21    6.00    74.88

  -------------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD (  0300)|   Area    (ha)=   3.28
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  48.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.97         1.31
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     147.82        40.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                              ---- TRANSFORMED HYETOGRAPH ----
                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.083    2.75 | 3.083    3.67 | 6.083   19.98 |  9.08    2.75
                0.167    2.75 | 3.167    3.67 | 6.167   19.98 |  9.17    2.75
                0.250    2.75 | 3.250    3.67 | 6.250   19.98 |  9.25    2.75
                0.333    2.75 | 3.333    3.67 | 6.333   19.98 |  9.33    2.75
                0.417    2.75 | 3.417    3.67 | 6.417   19.98 |  9.42    2.75
                0.500    2.75 | 3.500    3.67 | 6.500   19.98 |  9.50    2.75
                0.583    1.28 | 3.583    3.67 | 6.583    8.80 |  9.58    2.20
                0.667    1.28 | 3.667    3.67 | 6.667    8.80 |  9.67    2.20
                0.750    1.28 | 3.750    3.67 | 6.750    8.80 |  9.75    2.20
                0.833    1.28 | 3.833    3.67 | 6.833    8.80 |  9.83    2.20
                0.917    1.28 | 3.917    3.67 | 6.917    8.80 |  9.92    2.20
                1.000    1.28 | 4.000    3.67 | 7.000    8.80 | 10.00    2.20
                1.083    2.38 | 4.083    4.95 | 7.083    5.87 | 10.08    3.12
                1.167    2.38 | 4.167    4.95 | 7.167    5.87 | 10.17    3.12
                1.250    2.38 | 4.250    4.95 | 7.250    5.87 | 10.25    3.12
                1.333    2.38 | 4.333    4.95 | 7.333    5.87 | 10.33    3.12
                1.417    2.38 | 4.417    4.95 | 7.417    5.87 | 10.42    3.12
                1.500    2.38 | 4.500    4.95 | 7.500    5.87 | 10.50    3.12
                1.583    2.38 | 4.583    6.23 | 7.583    5.13 | 10.58    2.02
                1.667    2.38 | 4.667    6.23 | 7.667    5.13 | 10.67    2.02
                1.750    2.38 | 4.750    6.23 | 7.750    5.13 | 10.75    2.02
                1.833    2.38 | 4.833    6.23 | 7.833    5.13 | 10.83    2.02
                1.917    2.38 | 4.917    6.23 | 7.917    5.13 | 10.92    2.02
                2.000    2.38 | 5.000    6.23 | 8.000    5.13 | 11.00    2.02
                2.083    3.12 | 5.083    9.90 | 8.083    4.03 | 11.08    1.83
                2.167    3.12 | 5.167    9.90 | 8.167    4.03 | 11.17    1.83
                2.250    3.12 | 5.250    9.90 | 8.250    4.03 | 11.25    1.83
                2.333    3.12 | 5.333    9.90 | 8.333    4.03 | 11.33    1.83
                2.417    3.12 | 5.417    9.90 | 8.417    4.03 | 11.42    1.83
                2.500    3.12 | 5.500    9.90 | 8.500    4.03 | 11.50    1.83
                2.583    2.75 | 5.583   78.46 | 8.583    4.22 | 11.58    1.83
                2.667    2.75 | 5.667   78.46 | 8.667    4.22 | 11.67    1.83
                2.750    2.75 | 5.750   78.46 | 8.750    4.22 | 11.75    1.83
                2.833    2.75 | 5.833   78.46 | 8.833    4.22 | 11.83    1.83
                2.917    2.75 | 5.917   78.46 | 8.917    4.22 | 11.92    1.83
```

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               3.000    2.75 | 6.000   78.46 | 9.000    4.22 | 12.00    1.83

     Max.Eff.Inten.(mm/hr)=      78.46        81.91
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       3.56 (ii)   11.20 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.26         0.09
                                                           *TOTALS*
     PEAK FLOW       (cms)=       0.34         0.24          0.584 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.08           6.00
     RUNOFF VOLUME    (mm)=      90.66        60.32          74.88
     TOTAL RAINFALL   (mm)=      91.66        91.66          91.66
     RUNOFF COEFFICIENT   =       0.99         0.66           0.82

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  83.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
--------------------
| DUHYD    (  0310)|
| Inlet Cap.= 0.345|
| #of Inlets=     1|
| Total(cms)=   0.3|      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):   3.28      0.58      6.00   74.88
     ==================================================
     MAJOR SYS.(ID= 2):   0.34      0.24      6.00   74.88
     MINOR SYS.(ID= 3):   2.94      0.34      5.67   74.88

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  | Junction Command(0037) |
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                           AREA     QPEAK   TPEAK     R.V.
                           (ha)     (cms)    (hrs)     (mm)
  INFLOW : ID= 1(  0310)    0.34     0.24    6.00    74.88
  OUTFLOW: ID= 2(  0037)    0.34     0.24    6.00    74.88

  ------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0500)|   Area    (ha)=   1.15
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  48.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.69         0.46
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      87.42        40.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                               ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    2.75 | 3.083    3.67 | 6.083   19.98 |   9.08    2.75
               0.167    2.75 | 3.167    3.67 | 6.167   19.98 |   9.17    2.75
               0.250    2.75 | 3.250    3.67 | 6.250   19.98 |   9.25    2.75
               0.333    2.75 | 3.333    3.67 | 6.333   19.98 |   9.33    2.75
               0.417    2.75 | 3.417    3.67 | 6.417   19.98 |   9.42    2.75
               0.500    2.75 | 3.500    3.67 | 6.500   19.98 |   9.50    2.75
               0.583    1.28 | 3.583    3.67 | 6.583    8.80 |   9.58    2.20
               0.667    1.28 | 3.667    3.67 | 6.667    8.80 |   9.67    2.20
               0.750    1.28 | 3.750    3.67 | 6.750    8.80 |   9.75    2.20
               0.833    1.28 | 3.833    3.67 | 6.833    8.80 |   9.83    2.20
               0.917    1.28 | 3.917    3.67 | 6.917    8.80 |   9.92    2.20
               1.000    1.28 | 4.000    3.67 | 7.000    8.80 |  10.00    2.20
               1.083    2.38 | 4.083    4.95 | 7.083    5.87 |  10.08    3.12
               1.167    2.38 | 4.167    4.95 | 7.167    5.87 |  10.17    3.12
               1.250    2.38 | 4.250    4.95 | 7.250    5.87 |  10.25    3.12
               1.333    2.38 | 4.333    4.95 | 7.333    5.87 |  10.33    3.12
               1.417    2.38 | 4.417    4.95 | 7.417    5.87 |  10.42    3.12
               1.500    2.38 | 4.500    4.95 | 7.500    5.87 |  10.50    3.12
```

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             1.583    2.38 | 4.583    6.23 | 7.583    5.13 | 10.58    2.02
             1.667    2.38 | 4.667    6.23 | 7.667    5.13 | 10.67    2.02
             1.750    2.38 | 4.750    6.23 | 7.750    5.13 | 10.75    2.02
             1.833    2.38 | 4.833    6.23 | 7.833    5.13 | 10.83    2.02
             1.917    2.38 | 4.917    6.23 | 7.917    5.13 | 10.92    2.02
             2.000    2.38 | 5.000    6.23 | 8.000    5.13 | 11.00    2.02
             2.083    3.12 | 5.083    9.90 | 8.083    4.03 | 11.08    1.83
             2.167    3.12 | 5.167    9.90 | 8.167    4.03 | 11.17    1.83
             2.250    3.12 | 5.250    9.90 | 8.250    4.03 | 11.25    1.83
             2.333    3.12 | 5.333    9.90 | 8.333    4.03 | 11.33    1.83
             2.417    3.12 | 5.417    9.90 | 8.417    4.03 | 11.42    1.83
             2.500    3.12 | 5.500    9.90 | 8.500    4.03 | 11.50    1.83
             2.583    2.75 | 5.583   78.46 | 8.583    4.22 | 11.58    1.83
             2.667    2.75 | 5.667   78.46 | 8.667    4.22 | 11.67    1.83
             2.750    2.75 | 5.750   78.46 | 8.750    4.22 | 11.75    1.83
             2.833    2.75 | 5.833   78.46 | 8.833    4.22 | 11.83    1.83
             2.917    2.75 | 5.917   78.46 | 8.917    4.22 | 11.92    1.83
             3.000    2.75 | 6.000   78.46 | 9.000    4.22 | 12.00    1.83

     Max.Eff.Inten.(mm/hr)=      78.46        81.91
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       2.60 (ii)   10.24 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.29         0.09
                                                           *TOTALS*
     PEAK FLOW       (cms)=       0.12         0.09          0.207 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.00           6.00
     RUNOFF VOLUME    (mm)=      90.66        60.32          74.88
     TOTAL RAINFALL   (mm)=      91.66        91.66          91.66
     RUNOFF COEFFICIENT   =       0.99         0.66           0.82

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  83.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DUHYD    (  0510)|
| Inlet Cap.= 0.122|
| #of Inlets=     1|
| Total(cms)=   0.1|      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):   1.15      0.21      6.00   74.88
     ==================================================
     MAJOR SYS.(ID= 2):   0.12      0.08      6.00   74.88
     MINOR SYS.(ID= 3):   1.03      0.12      5.67   74.88

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  | Junction Command(0039) |
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                           AREA     QPEAK   TPEAK     R.V.
                           (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0510)    0.12     0.08    6.00    74.88
  OUTFLOW: ID= 2(  0039)    0.12     0.08    6.00    74.88

  --------------------------------------------------------------------------------

--------------------
| ADD HYD  (  1000)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0033):     0.30   0.211     6.00    74.88
      + ID2= 2 (  0037):     0.34   0.239     6.00    74.88
        ==================================================
        ID = 3 (  1000):     0.64   0.450     6.00    74.88

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  1000)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  1000):     0.64   0.450     6.00    74.88
      + ID2= 2 (  0039):     0.12   0.085     6.00    74.88
```

```
        ====================================================
        ID = 1 (  1000):     0.76   0.535     6.00    74.88

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  1000)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  1000):     0.76   0.535     6.00    74.88
      + ID2= 2 (  0041):     0.16   0.064     6.00    48.53
        ====================================================
        ID = 3 (  1000):     0.92   0.598     6.00    70.30

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  1000)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  1000):     0.92   0.598     6.00    70.30
      + ID2= 2 (  0043):     4.94   0.389     6.25    48.62
        ====================================================
        ID = 1 (  1000):     5.86   0.889     6.00    52.04

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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  --------------------------
  | Junction Command(0036) |
  --------------------------

                           AREA     QPEAK   TPEAK     R.V.
                           (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0310)    2.94     0.35    5.67    74.88
  OUTFLOW: ID= 2(  0036)    2.94     0.35    5.67    74.88

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  --------------------------
  | Junction Command(0038) |
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                           AREA     QPEAK   TPEAK     R.V.
                           (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0510)    1.03     0.12    5.67    74.88
  OUTFLOW: ID= 2(  0038)    1.03     0.12    5.67    74.88

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  | Junction Command(0040) |
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                           AREA     QPEAK   TPEAK     R.V.
                           (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0410)    0.80     0.06    5.75    48.53
  OUTFLOW: ID= 2(  0040)    0.80     0.06    5.75    48.53

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  --------------------------
  | Junction Command(0042) |
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                           AREA     QPEAK   TPEAK     R.V.
                           (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0110)    0.00     0.00    0.00     0.00
  OUTFLOW: ID= 2(  0042)    0.00     0.00    0.00     0.00

  --------------------------------------------------------------------------------

 FINISH
===========================================================================================================

===========================================================================================================

       V    V   I    SSSSS  U   U    A    L              (v 6.1.2002)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL
```

```
         OOO    TTTTT  TTTTT  H    H  Y    Y  M    M   OOO     TM
        O   O     T      T    H    H   Y Y    MM MM  O   O
        O   O     T      T    H    H    Y     M    M  O   O
         OOO      T      T    H    H    Y     M    M   OOO
```



```
                   *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.1\VO2\voin.dat

  Output  filename:
C:\Users\shahrzad.samani\AppData\Local\Civica\VH5\5e38ad16-99a2-41a3-a6d1-fd92652c9e8f\4f3a29e6-d887-4fd1-a494-718
b4e955
  Summary filename:
C:\Users\shahrzad.samani\AppData\Local\Civica\VH5\5e38ad16-99a2-41a3-a6d1-fd92652c9e8f\4f3a29e6-d887-4fd1-a494-718
b4e955


DATE: 03/09/2021                          TIME: 04:15:01

USER:



COMMENTS: ____________________________________________________________


---------------------------------------------------------------------------------------------------------------
  ************************************************
  ** SIMULATION : 12SCS100                      **
  ************************************************


--------------------
|    READ STORM    |    Filename: C:\Users\shahrzad.samani\AppD
|                  |              ata\Local\Temp\
|                  |              4d6a0629-9c3f-4bb8-a55b-48312e7da1e6\1b175d27
| Ptotal=102.22 mm |    Comments: 12SCS100
--------------------
                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                 0.17    3.07 |  3.17    4.09 |  6.17   22.28 |  9.17    3.07
                 0.33    3.07 |  3.33    4.09 |  6.33   22.28 |  9.33    3.07
                 0.50    3.07 |  3.50    4.09 |  6.50   22.28 |  9.50    3.07
                 0.67    1.43 |  3.67    4.09 |  6.67    9.81 |  9.67    2.45
                 0.83    1.43 |  3.83    4.09 |  6.83    9.81 |  9.83    2.45
                 1.00    1.43 |  4.00    4.09 |  7.00    9.81 | 10.00    2.45
                 1.17    2.66 |  4.17    5.52 |  7.17    6.54 | 10.17    3.48
                 1.33    2.66 |  4.33    5.52 |  7.33    6.54 | 10.33    3.48
                 1.50    2.66 |  4.50    5.52 |  7.50    6.54 | 10.50    3.48
                 1.67    2.66 |  4.67    6.95 |  7.67    5.72 | 10.67    2.25
                 1.83    2.66 |  4.83    6.95 |  7.83    5.72 | 10.83    2.25
                 2.00    2.66 |  5.00    6.95 |  8.00    5.72 | 11.00    2.25
                 2.17    3.48 |  5.17   11.04 |  8.17    4.50 | 11.17    2.04
                 2.33    3.48 |  5.33   11.04 |  8.33    4.50 | 11.33    2.04
                 2.50    3.48 |  5.50   11.04 |  8.50    4.50 | 11.50    2.04
                 2.67    3.07 |  5.67   87.50 |  8.67    4.70 | 11.67    2.04
                 2.83    3.07 |  5.83   87.50 |  8.83    4.70 | 11.83    2.04
                 3.00    3.07 |  6.00   87.50 |  9.00    4.70 | 12.00    2.04

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--------------------
| CALIB            |
| STANDHYD (  0200)|   Area    (ha)=   2.89
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  48.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.73         1.16
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     138.81        40.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                                ---- TRANSFORMED HYETOGRAPH ----
                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
```

```
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    3.07 | 3.083    4.09 | 6.083   22.28 |  9.08    3.07
               0.167    3.07 | 3.167    4.09 | 6.167   22.28 |  9.17    3.07
               0.250    3.07 | 3.250    4.09 | 6.250   22.28 |  9.25    3.07
               0.333    3.07 | 3.333    4.09 | 6.333   22.28 |  9.33    3.07
               0.417    3.07 | 3.417    4.09 | 6.417   22.28 |  9.42    3.07
               0.500    3.07 | 3.500    4.09 | 6.500   22.28 |  9.50    3.07
               0.583    1.43 | 3.583    4.09 | 6.583    9.81 |  9.58    2.45
               0.667    1.43 | 3.667    4.09 | 6.667    9.81 |  9.67    2.45
               0.750    1.43 | 3.750    4.09 | 6.750    9.81 |  9.75    2.45
               0.833    1.43 | 3.833    4.09 | 6.833    9.81 |  9.83    2.45
               0.917    1.43 | 3.917    4.09 | 6.917    9.81 |  9.92    2.45
               1.000    1.43 | 4.000    4.09 | 7.000    9.81 | 10.00    2.45
               1.083    2.66 | 4.083    5.52 | 7.083    6.54 | 10.08    3.48
               1.167    2.66 | 4.167    5.52 | 7.167    6.54 | 10.17    3.48
               1.250    2.66 | 4.250    5.52 | 7.250    6.54 | 10.25    3.48
               1.333    2.66 | 4.333    5.52 | 7.333    6.54 | 10.33    3.48
               1.417    2.66 | 4.417    5.52 | 7.417    6.54 | 10.42    3.48
               1.500    2.66 | 4.500    5.52 | 7.500    6.54 | 10.50    3.48
               1.583    2.66 | 4.583    6.95 | 7.583    5.72 | 10.58    2.25
               1.667    2.66 | 4.667    6.95 | 7.667    5.72 | 10.67    2.25
               1.750    2.66 | 4.750    6.95 | 7.750    5.72 | 10.75    2.25
               1.833    2.66 | 4.833    6.95 | 7.833    5.72 | 10.83    2.25
               1.917    2.66 | 4.917    6.95 | 7.917    5.72 | 10.92    2.25
               2.000    2.66 | 5.000    6.95 | 8.000    5.72 | 11.00    2.25
               2.083    3.48 | 5.083   11.04 | 8.083    4.50 | 11.08    2.04
               2.167    3.48 | 5.167   11.04 | 8.167    4.50 | 11.17    2.04
               2.250    3.48 | 5.250   11.04 | 8.250    4.50 | 11.25    2.04
               2.333    3.48 | 5.333   11.04 | 8.333    4.50 | 11.33    2.04
               2.417    3.48 | 5.417   11.04 | 8.417    4.50 | 11.42    2.04
               2.500    3.48 | 5.500   11.04 | 8.500    4.50 | 11.50    2.04
               2.583    3.07 | 5.583   87.50 | 8.583    4.70 | 11.58    2.04
               2.667    3.07 | 5.667   87.50 | 8.667    4.70 | 11.67    2.04
               2.750    3.07 | 5.750   87.50 | 8.750    4.70 | 11.75    2.04
               2.833    3.07 | 5.833   87.50 | 8.833    4.70 | 11.83    2.04
               2.917    3.07 | 5.917   87.50 | 8.917    4.70 | 11.92    2.04
               3.000    3.07 | 6.000   87.50 | 9.000    4.70 | 12.00    2.04

     Max.Eff.Inten.(mm/hr)=      87.50        94.14
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       3.28 (ii)   10.51 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.27         0.09
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.34         0.25          0.588 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.00           6.00
     RUNOFF VOLUME    (mm)=     101.22        69.93          84.94
     TOTAL RAINFALL   (mm)=     102.22       102.22         102.22
     RUNOFF COEFFICIENT   =       0.99         0.68           0.83

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  83.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DUHYD    (  0210)|
| Inlet Cap.= 0.304|
| #of Inlets=     1|
| Total(cms)=   0.3|      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):   2.89      0.59      6.00   84.94
     ==================================================
     MAJOR SYS.(ID= 2):   0.40      0.28      6.00   84.94
     MINOR SYS.(ID= 3):   2.49      0.30      5.58   84.94

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  --------------------------
  | Junction Command(0032) |
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                           AREA     QPEAK   TPEAK     R.V.
                           (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0210)    2.49     0.30    5.58    84.94
  OUTFLOW: ID= 2(  0032)    2.49     0.30    5.58    84.94

  --------------------------------------------------------------------------------
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--------------------
| CALIB            |
| NASHYD   (  0100)|   Area    (ha)=   4.94   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.10   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.42

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                                    ---- TRANSFORMED HYETOGRAPH ----
                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.083    3.07 | 3.083    4.09 | 6.083   22.28 |  9.08    3.07
                0.167    3.07 | 3.167    4.09 | 6.167   22.28 |  9.17    3.07
                0.250    3.07 | 3.250    4.09 | 6.250   22.28 |  9.25    3.07
                0.333    3.07 | 3.333    4.09 | 6.333   22.28 |  9.33    3.07
                0.417    3.07 | 3.417    4.09 | 6.417   22.28 |  9.42    3.07
                0.500    3.07 | 3.500    4.09 | 6.500   22.28 |  9.50    3.07
                0.583    1.43 | 3.583    4.09 | 6.583    9.81 |  9.58    2.45
                0.667    1.43 | 3.667    4.09 | 6.667    9.81 |  9.67    2.45
                0.750    1.43 | 3.750    4.09 | 6.750    9.81 |  9.75    2.45
                0.833    1.43 | 3.833    4.09 | 6.833    9.81 |  9.83    2.45
                0.917    1.43 | 3.917    4.09 | 6.917    9.81 |  9.92    2.45
                1.000    1.43 | 4.000    4.09 | 7.000    9.81 | 10.00    2.45
                1.083    2.66 | 4.083    5.52 | 7.083    6.54 | 10.08    3.48
                1.167    2.66 | 4.167    5.52 | 7.167    6.54 | 10.17    3.48
                1.250    2.66 | 4.250    5.52 | 7.250    6.54 | 10.25    3.48
                1.333    2.66 | 4.333    5.52 | 7.333    6.54 | 10.33    3.48
                1.417    2.66 | 4.417    5.52 | 7.417    6.54 | 10.42    3.48
                1.500    2.66 | 4.500    5.52 | 7.500    6.54 | 10.50    3.48
                1.583    2.66 | 4.583    6.95 | 7.583    5.72 | 10.58    2.25
                1.667    2.66 | 4.667    6.95 | 7.667    5.72 | 10.67    2.25
                1.750    2.66 | 4.750    6.95 | 7.750    5.72 | 10.75    2.25
                1.833    2.66 | 4.833    6.95 | 7.833    5.72 | 10.83    2.25
                1.917    2.66 | 4.917    6.95 | 7.917    5.72 | 10.92    2.25
                2.000    2.66 | 5.000    6.95 | 8.000    5.72 | 11.00    2.25
                2.083    3.48 | 5.083   11.04 | 8.083    4.50 | 11.08    2.04
                2.167    3.48 | 5.167   11.04 | 8.167    4.50 | 11.17    2.04
                2.250    3.48 | 5.250   11.04 | 8.250    4.50 | 11.25    2.04
                2.333    3.48 | 5.333   11.04 | 8.333    4.50 | 11.33    2.04
                2.417    3.48 | 5.417   11.04 | 8.417    4.50 | 11.42    2.04
                2.500    3.48 | 5.500   11.04 | 8.500    4.50 | 11.50    2.04
                2.583    3.07 | 5.583   87.50 | 8.583    4.70 | 11.58    2.04
                2.667    3.07 | 5.667   87.50 | 8.667    4.70 | 11.67    2.04
                2.750    3.07 | 5.750   87.50 | 8.750    4.70 | 11.75    2.04
                2.833    3.07 | 5.833   87.50 | 8.833    4.70 | 11.83    2.04
                2.917    3.07 | 5.917   87.50 | 8.917    4.70 | 11.92    2.04
                3.000    3.07 | 6.000   87.50 | 9.000    4.70 | 12.00    2.04

     Unit Hyd Qpeak  (cms)=   0.449

     PEAK FLOW       (cms)=   0.461 (i)
     TIME TO PEAK    (hrs)=   6.250
     RUNOFF VOLUME    (mm)=  57.284
     TOTAL RAINFALL   (mm)= 102.219
     RUNOFF COEFFICIENT   =   0.560

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
--------------------
| DUHYD    (  0110)|
| Inlet Cap.= 0.000|
| #of Inlets=     1|
| Total(cms)=   0.0|      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):   4.94      0.46      6.25   57.28
     ==================================================
     MAJOR SYS.(ID= 2):   4.94      0.46      6.25   57.28
     MINOR SYS.(ID= 3):   0.00      0.00      0.00    0.00

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  --------------------------
  | Junction Command(0043) |
  --------------------------

                           AREA     QPEAK   TPEAK     R.V.
                           (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0110)    4.94     0.46    6.25    57.28
  OUTFLOW: ID= 2(  0043)    4.94     0.46    6.25    57.28
```

```
  ------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0400)|   Area    (ha)=   0.96   Curve Number   (CN)= 79.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.17

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                                 ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.083    3.07 | 3.083    4.09 | 6.083   22.28 |  9.08    3.07
              0.167    3.07 | 3.167    4.09 | 6.167   22.28 |  9.17    3.07
              0.250    3.07 | 3.250    4.09 | 6.250   22.28 |  9.25    3.07
              0.333    3.07 | 3.333    4.09 | 6.333   22.28 |  9.33    3.07
              0.417    3.07 | 3.417    4.09 | 6.417   22.28 |  9.42    3.07
              0.500    3.07 | 3.500    4.09 | 6.500   22.28 |  9.50    3.07
              0.583    1.43 | 3.583    4.09 | 6.583    9.81 |  9.58    2.45
              0.667    1.43 | 3.667    4.09 | 6.667    9.81 |  9.67    2.45
              0.750    1.43 | 3.750    4.09 | 6.750    9.81 |  9.75    2.45
              0.833    1.43 | 3.833    4.09 | 6.833    9.81 |  9.83    2.45
              0.917    1.43 | 3.917    4.09 | 6.917    9.81 |  9.92    2.45
              1.000    1.43 | 4.000    4.09 | 7.000    9.81 | 10.00    2.45
              1.083    2.66 | 4.083    5.52 | 7.083    6.54 | 10.08    3.48
              1.167    2.66 | 4.167    5.52 | 7.167    6.54 | 10.17    3.48
              1.250    2.66 | 4.250    5.52 | 7.250    6.54 | 10.25    3.48
              1.333    2.66 | 4.333    5.52 | 7.333    6.54 | 10.33    3.48
              1.417    2.66 | 4.417    5.52 | 7.417    6.54 | 10.42    3.48
              1.500    2.66 | 4.500    5.52 | 7.500    6.54 | 10.50    3.48
              1.583    2.66 | 4.583    6.95 | 7.583    5.72 | 10.58    2.25
              1.667    2.66 | 4.667    6.95 | 7.667    5.72 | 10.67    2.25
              1.750    2.66 | 4.750    6.95 | 7.750    5.72 | 10.75    2.25
              1.833    2.66 | 4.833    6.95 | 7.833    5.72 | 10.83    2.25
              1.917    2.66 | 4.917    6.95 | 7.917    5.72 | 10.92    2.25
              2.000    2.66 | 5.000    6.95 | 8.000    5.72 | 11.00    2.25
              2.083    3.48 | 5.083   11.04 | 8.083    4.50 | 11.08    2.04
              2.167    3.48 | 5.167   11.04 | 8.167    4.50 | 11.17    2.04
              2.250    3.48 | 5.250   11.04 | 8.250    4.50 | 11.25    2.04
              2.333    3.48 | 5.333   11.04 | 8.333    4.50 | 11.33    2.04
              2.417    3.48 | 5.417   11.04 | 8.417    4.50 | 11.42    2.04
              2.500    3.48 | 5.500   11.04 | 8.500    4.50 | 11.50    2.04
              2.583    3.07 | 5.583   87.50 | 8.583    4.70 | 11.58    2.04
              2.667    3.07 | 5.667   87.50 | 8.667    4.70 | 11.67    2.04
              2.750    3.07 | 5.750   87.50 | 8.750    4.70 | 11.75    2.04
              2.833    3.07 | 5.833   87.50 | 8.833    4.70 | 11.83    2.04
              2.917    3.07 | 5.917   87.50 | 8.917    4.70 | 11.92    2.04
              3.000    3.07 | 6.000   87.50 | 9.000    4.70 | 12.00    2.04

     Unit Hyd Qpeak  (cms)=   0.216

     PEAK FLOW       (cms)=   0.141 (i)
     TIME TO PEAK    (hrs)=   6.000
     RUNOFF VOLUME    (mm)=  57.168
     TOTAL RAINFALL   (mm)= 102.219
     RUNOFF COEFFICIENT   =   0.559

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DUHYD    (  0410)|
| Inlet Cap.= 0.056|
| #of Inlets=     1|
| Total(cms)=   0.1|      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):   0.96      0.14      6.00   57.17
     ==================================================
     MAJOR SYS.(ID= 2):   0.20      0.09      6.00   57.17
     MINOR SYS.(ID= 3):   0.76      0.06      5.75   57.17

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  --------------------------
  | Junction Command(0041) |
  --------------------------

                           AREA     QPEAK   TPEAK     R.V.
                           (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0410)    0.20     0.09    6.00    57.17
  OUTFLOW: ID= 2(  0041)    0.20     0.09    6.00    57.17
```

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 ----------------------------------------------------------------------------

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 | Junction Command(0033) |
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                         AREA     QPEAK   TPEAK     R.V.
                         (ha)     (cms)    (hrs)    (mm)
 INFLOW : ID= 1(  0210)    0.40     0.28    6.00    84.94
 OUTFLOW: ID= 2(  0033)    0.40     0.28    6.00    84.94

 ----------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD (  0300)|   Area    (ha)=   3.28
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  48.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       1.97         1.31
    Dep. Storage     (mm)=       1.00         5.00
    Average Slope     (%)=       1.00         2.00
    Length            (m)=     147.82        40.00
    Mannings n           =      0.013        0.250

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                              ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.083    3.07 | 3.083    4.09 | 6.083   22.28 |  9.08    3.07
              0.167    3.07 | 3.167    4.09 | 6.167   22.28 |  9.17    3.07
              0.250    3.07 | 3.250    4.09 | 6.250   22.28 |  9.25    3.07
              0.333    3.07 | 3.333    4.09 | 6.333   22.28 |  9.33    3.07
              0.417    3.07 | 3.417    4.09 | 6.417   22.28 |  9.42    3.07
              0.500    3.07 | 3.500    4.09 | 6.500   22.28 |  9.50    3.07
              0.583    1.43 | 3.583    4.09 | 6.583    9.81 |  9.58    2.45
              0.667    1.43 | 3.667    4.09 | 6.667    9.81 |  9.67    2.45
              0.750    1.43 | 3.750    4.09 | 6.750    9.81 |  9.75    2.45
              0.833    1.43 | 3.833    4.09 | 6.833    9.81 |  9.83    2.45
              0.917    1.43 | 3.917    4.09 | 6.917    9.81 |  9.92    2.45
              1.000    1.43 | 4.000    4.09 | 7.000    9.81 | 10.00    2.45
              1.083    2.66 | 4.083    5.52 | 7.083    6.54 | 10.08    3.48
              1.167    2.66 | 4.167    5.52 | 7.167    6.54 | 10.17    3.48
              1.250    2.66 | 4.250    5.52 | 7.250    6.54 | 10.25    3.48
              1.333    2.66 | 4.333    5.52 | 7.333    6.54 | 10.33    3.48
              1.417    2.66 | 4.417    5.52 | 7.417    6.54 | 10.42    3.48
              1.500    2.66 | 4.500    5.52 | 7.500    6.54 | 10.50    3.48
              1.583    2.66 | 4.583    6.95 | 7.583    5.72 | 10.58    2.25
              1.667    2.66 | 4.667    6.95 | 7.667    5.72 | 10.67    2.25
              1.750    2.66 | 4.750    6.95 | 7.750    5.72 | 10.75    2.25
              1.833    2.66 | 4.833    6.95 | 7.833    5.72 | 10.83    2.25
              1.917    2.66 | 4.917    6.95 | 7.917    5.72 | 10.92    2.25
              2.000    2.66 | 5.000    6.95 | 8.000    5.72 | 11.00    2.25
              2.083    3.48 | 5.083   11.04 | 8.083    4.50 | 11.08    2.04
              2.167    3.48 | 5.167   11.04 | 8.167    4.50 | 11.17    2.04
              2.250    3.48 | 5.250   11.04 | 8.250    4.50 | 11.25    2.04
              2.333    3.48 | 5.333   11.04 | 8.333    4.50 | 11.33    2.04
              2.417    3.48 | 5.417   11.04 | 8.417    4.50 | 11.42    2.04
              2.500    3.48 | 5.500   11.04 | 8.500    4.50 | 11.50    2.04
              2.583    3.07 | 5.583   87.50 | 8.583    4.70 | 11.58    2.04
              2.667    3.07 | 5.667   87.50 | 8.667    4.70 | 11.67    2.04
              2.750    3.07 | 5.750   87.50 | 8.750    4.70 | 11.75    2.04
              2.833    3.07 | 5.833   87.50 | 8.833    4.70 | 11.83    2.04
              2.917    3.07 | 5.917   87.50 | 8.917    4.70 | 11.92    2.04
              3.000    3.07 | 6.000   87.50 | 9.000    4.70 | 12.00    2.04

    Max.Eff.Inten.(mm/hr)=      87.50        94.14
               over (min)       5.00        15.00
    Storage Coeff.  (min)=       3.41 (ii)   10.64 (ii)
    Unit Hyd. Tpeak (min)=       5.00        15.00
    Unit Hyd. peak  (cms)=       0.26         0.09
                                                          *TOTALS*
    PEAK FLOW       (cms)=       0.38         0.28          0.666 (iii)
    TIME TO PEAK    (hrs)=       6.00         6.00           6.00
    RUNOFF VOLUME    (mm)=     101.22        69.93          84.94
    TOTAL RAINFALL   (mm)=     102.22       102.22         102.22
    RUNOFF COEFFICIENT   =       0.99         0.68           0.83

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  83.0    Ia = Dep. Storage  (Above)
```

```
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DUHYD    (  0310)|
| Inlet Cap.= 0.345|
| #of Inlets=     1|
| Total(cms)=   0.3|      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):   3.28      0.67      6.00   84.94
     ==================================================
     MAJOR SYS.(ID= 2):   0.46      0.32      6.00   84.94
     MINOR SYS.(ID= 3):   2.82      0.34      5.58   84.94

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

  --------------------------
  | Junction Command(0037) |
  --------------------------

                         AREA     QPEAK   TPEAK     R.V.
                         (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0310)    0.46     0.32    6.00    84.94
  OUTFLOW: ID= 2(  0037)    0.46     0.32    6.00    84.94

  --------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0500)|   Area    (ha)=   1.15
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  48.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.69         0.46
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      87.42        40.00
     Mannings n          =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                                        ---- TRANSFORMED HYETOGRAPH ----
                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.083    3.07 | 3.083    4.09 | 6.083   22.28 |   9.08    3.07
                0.167    3.07 | 3.167    4.09 | 6.167   22.28 |   9.17    3.07
                0.250    3.07 | 3.250    4.09 | 6.250   22.28 |   9.25    3.07
                0.333    3.07 | 3.333    4.09 | 6.333   22.28 |   9.33    3.07
                0.417    3.07 | 3.417    4.09 | 6.417   22.28 |   9.42    3.07
                0.500    3.07 | 3.500    4.09 | 6.500   22.28 |   9.50    3.07
                0.583    1.43 | 3.583    4.09 | 6.583    9.81 |   9.58    2.45
                0.667    1.43 | 3.667    4.09 | 6.667    9.81 |   9.67    2.45
                0.750    1.43 | 3.750    4.09 | 6.750    9.81 |   9.75    2.45
                0.833    1.43 | 3.833    4.09 | 6.833    9.81 |   9.83    2.45
                0.917    1.43 | 3.917    4.09 | 6.917    9.81 |   9.92    2.45
                1.000    1.43 | 4.000    4.09 | 7.000    9.81 |  10.00    2.45
                1.083    2.66 | 4.083    5.52 | 7.083    6.54 |  10.08    3.48
                1.167    2.66 | 4.167    5.52 | 7.167    6.54 |  10.17    3.48
                1.250    2.66 | 4.250    5.52 | 7.250    6.54 |  10.25    3.48
                1.333    2.66 | 4.333    5.52 | 7.333    6.54 |  10.33    3.48
                1.417    2.66 | 4.417    5.52 | 7.417    6.54 |  10.42    3.48
                1.500    2.66 | 4.500    5.52 | 7.500    6.54 |  10.50    3.48
                1.583    2.66 | 4.583    6.95 | 7.583    5.72 |  10.58    2.25
                1.667    2.66 | 4.667    6.95 | 7.667    5.72 |  10.67    2.25
                1.750    2.66 | 4.750    6.95 | 7.750    5.72 |  10.75    2.25
                1.833    2.66 | 4.833    6.95 | 7.833    5.72 |  10.83    2.25
                1.917    2.66 | 4.917    6.95 | 7.917    5.72 |  10.92    2.25
                2.000    2.66 | 5.000    6.95 | 8.000    5.72 |  11.00    2.25
                2.083    3.48 | 5.083   11.04 | 8.083    4.50 |  11.08    2.04
                2.167    3.48 | 5.167   11.04 | 8.167    4.50 |  11.17    2.04
                2.250    3.48 | 5.250   11.04 | 8.250    4.50 |  11.25    2.04
                2.333    3.48 | 5.333   11.04 | 8.333    4.50 |  11.33    2.04
                2.417    3.48 | 5.417   11.04 | 8.417    4.50 |  11.42    2.04
                2.500    3.48 | 5.500   11.04 | 8.500    4.50 |  11.50    2.04
                2.583    3.07 | 5.583   87.50 | 8.583    4.70 |  11.58    2.04
                2.667    3.07 | 5.667   87.50 | 8.667    4.70 |  11.67    2.04
                2.750    3.07 | 5.750   87.50 | 8.750    4.70 |  11.75    2.04
                2.833    3.07 | 5.833   87.50 | 8.833    4.70 |  11.83    2.04
                2.917    3.07 | 5.917   87.50 | 8.917    4.70 |  11.92    2.04
                3.000    3.07 | 6.000   87.50 | 9.000    4.70 |  12.00    2.04
```

```
     Max.Eff.Inten.(mm/hr)=      87.50        94.14
                over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.49 (ii)    9.72 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.29         0.11
                                                           *TOTALS*
     PEAK FLOW       (cms)=       0.13         0.11          0.241 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.00           6.00
     RUNOFF VOLUME    (mm)=     101.22        69.93          84.94
     TOTAL RAINFALL   (mm)=     102.22       102.22         102.22
     RUNOFF COEFFICIENT   =       0.99         0.68           0.83

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  83.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DUHYD    (  0510)|
| Inlet Cap.= 0.122|
| #of Inlets=     1|
| Total(cms)=   0.1|      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):   1.15      0.24      6.00   84.94
     ==================================================
     MAJOR SYS.(ID= 2):   0.18      0.12      6.00   84.94
     MINOR SYS.(ID= 3):   0.97      0.12      5.58   84.94

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  --------------------------
  | Junction Command(0039) |
  --------------------------

                           AREA     QPEAK   TPEAK     R.V.
                           (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0510)    0.18     0.12    6.00    84.94
  OUTFLOW: ID= 2(  0039)    0.18     0.12    6.00    84.94

  --------------------------------------------------------------------------------

--------------------
| ADD HYD  (  1000)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0033):     0.40   0.284     6.00    84.94
      + ID2= 2 (  0037):     0.46   0.321     6.00    84.94
        ===================================================
        ID = 3 (  1000):     0.86   0.605     6.00    84.94

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  1000)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  1000):     0.86   0.605     6.00    84.94
      + ID2= 2 (  0039):     0.18   0.119     6.00    84.94
        ===================================================
        ID = 1 (  1000):     1.04   0.724     6.00    84.94

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  1000)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  1000):     1.04   0.724     6.00    84.94
      + ID2= 2 (  0041):     0.20   0.085     6.00    57.17
        ===================================================
        ID = 3 (  1000):     1.25   0.809     6.00    80.41

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
```

```
--------------------
| ADD HYD  (  1000)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  1000):     1.25   0.809     6.00    80.41
      + ID2= 2 (  0043):     4.94   0.461     6.25    57.28
        ====================================================
        ID = 1 (  1000):     6.19   1.156     6.00    61.95

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

  --------------------------
  | Junction Command(0036) |
  --------------------------

                           AREA     QPEAK   TPEAK     R.V.
                           (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0310)    2.82     0.35    5.58    84.94
  OUTFLOW: ID= 2(  0036)    2.82     0.35    5.58    84.94

  --------------------------------------------------------------------------------

  --------------------------
  | Junction Command(0038) |
  --------------------------

                           AREA     QPEAK   TPEAK     R.V.
                           (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0510)    0.97     0.12    5.58    84.94
  OUTFLOW: ID= 2(  0038)    0.97     0.12    5.58    84.94

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  | Junction Command(0040) |
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                           AREA     QPEAK   TPEAK     R.V.
                           (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0410)    0.76     0.06    5.75    57.17
  OUTFLOW: ID= 2(  0040)    0.76     0.06    5.75    57.17

  --------------------------------------------------------------------------------

  --------------------------
  | Junction Command(0042) |
  --------------------------

                           AREA     QPEAK   TPEAK     R.V.
                           (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 1(  0110)    0.00     0.00    0.00     0.00
  OUTFLOW: ID= 2(  0042)    0.00     0.00    0.00     0.00

  --------------------------------------------------------------------------------
```

APPENDIX

B

HY-8 Hydraulic Output

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: User Defined

Table 1 - Summary of Culvert Flows at Crossing: Crossing 1

Headwater Elevation (m)	Discharge Names	Total Discharge (cms)	Culvert 1 Discharge (cms)	Roadway Discharge (cms)	Iterations
129.03	5yr	0.52	0.52	0.00	1
129.25	10yr	1.00	1.00	0.00	1
129.42	25yr	1.43	1.43	0.00	1
129.67	100yr	2.18	2.18	0.00	1
131.75	Overtopping	7.26	7.26	0.00	Overtopping

Rating Curve Plot for Crossing: Crossing 1

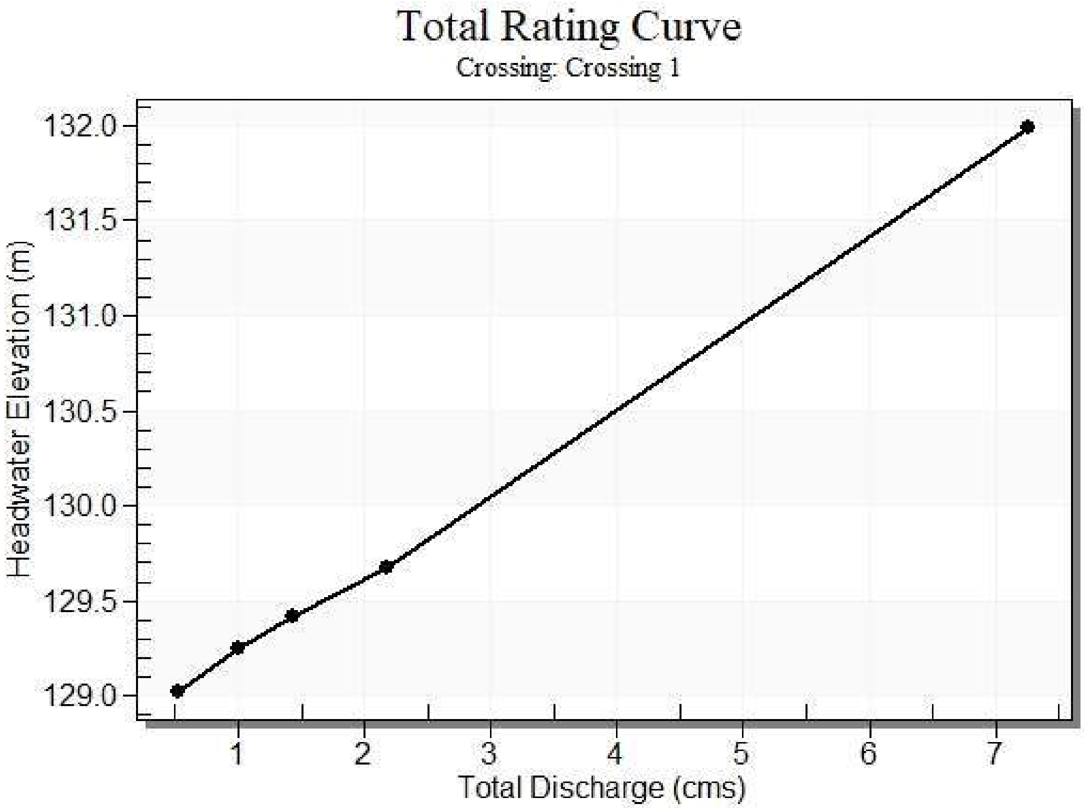


Table 2 - Culvert Summary Table: Culvert 1

Discharge Names	Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
5yr	0.52	0.52	129.03	0.504	0.554	2-M2c	0.437	0.344	0.344	0.201	1.544	0.725
10yr	1.00	1.00	129.25	0.706	0.776	2-M2c	0.609	0.478	0.478	0.301	1.839	0.919
25yr	1.43	1.43	129.42	0.856	0.944	2-M2c	0.741	0.577	0.577	0.380	2.032	1.047
100yr	2.18	2.18	129.67	1.083	1.197	2-M2c	0.947	0.718	0.718	0.499	2.303	1.213

****

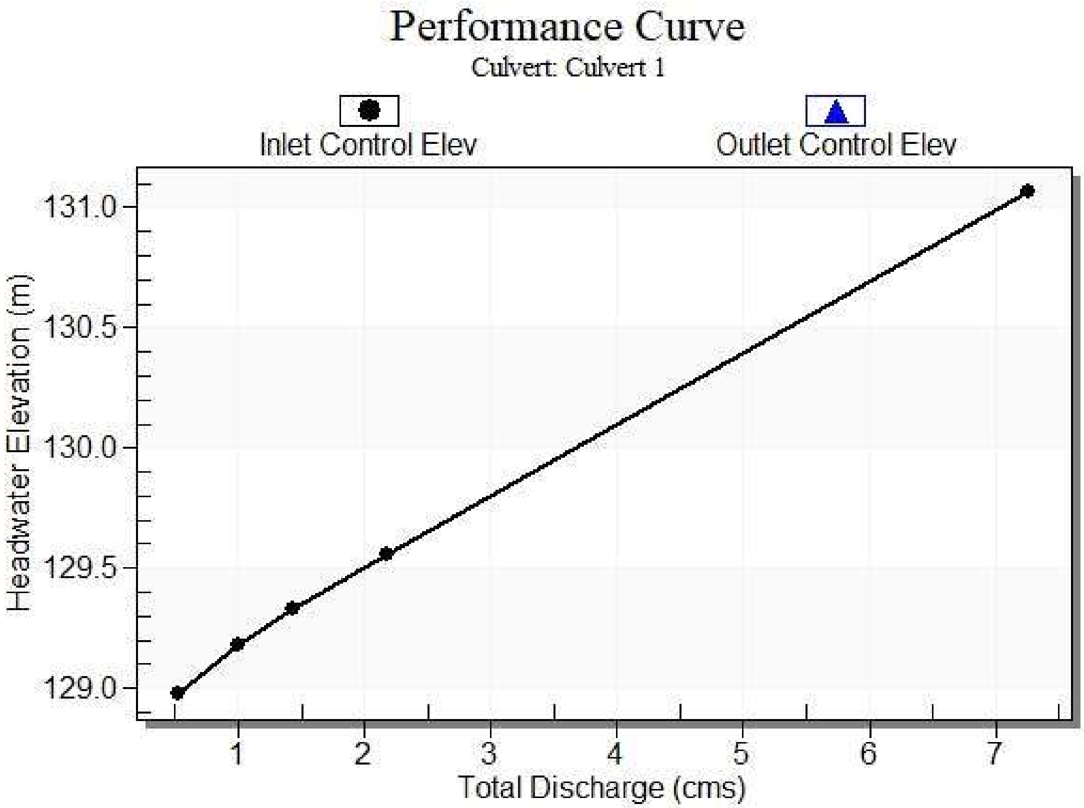
Straight Culvert

Inlet Elevation (invert): 128.47 m, Outlet Elevation (invert): 128.11 m

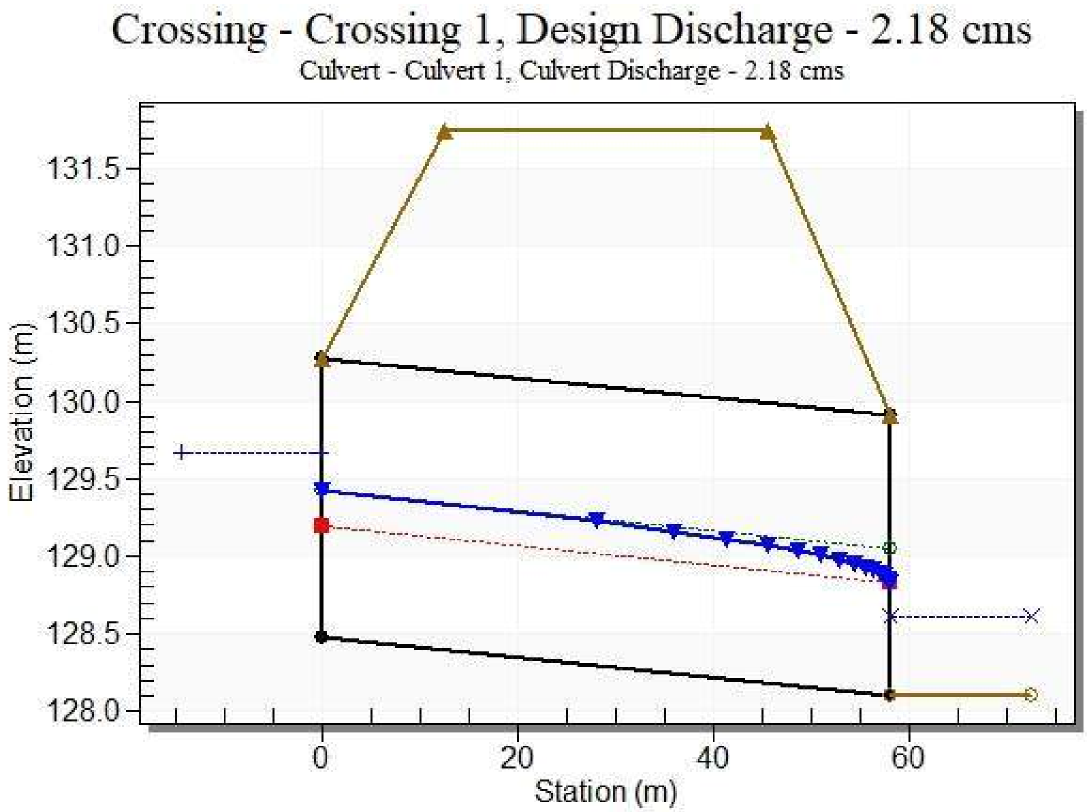
Culvert Length: 58.00 m, Culvert Slope: 0.0063

****

Culvert Performance Curve Plot: Culvert 1



Water Surface Profile Plot for Culvert: Culvert 1



Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 m

Inlet Elevation: 128.47 m

Outlet Station: 58.00 m

Outlet Elevation: 128.11 m

Number of Barrels: 1

Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 1800.00 mm

Barrel Material: Corrugated Aluminum

Embedment: 0.00 mm

Barrel Manning's n: 0.0310

Culvert Type: Straight

Inlet Configuration: Thin Edge Projecting

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Crossing 1)

Flow (cms)	Water Surface Elev (m)	Depth (m)	Velocity (m/s)	Shear (Pa)	Froude Number
0.52	128.31	0.20	0.72	12.40	0.52
1.00	128.41	0.30	0.92	18.59	0.53
1.43	128.49	0.38	1.05	23.44	0.54
2.18	128.61	0.50	1.21	30.84	0.55

Tailwater Channel Data - Crossing 1

Tailwater Channel Option: Rectangular Channel

Bottom Width: 3.60 m

Channel Slope: 0.0063

Channel Manning's n: 0.0350

Channel Invert Elevation: 128.11 m

Roadway Data for Crossing: Crossing 1

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 58.00 m

Crest Elevation: 131.75 m

Roadway Surface: Paved

Roadway Top Width: 33.00 m

APPENDIX

G STORM SEWER ASSESSMENT

Technical Memorandum

To: Rory O'Sullivan, P.Eng. **Date:** February 1, 2022

From: Don McLeod, C.E.T., PMP **Project No:** 19M-00836-03

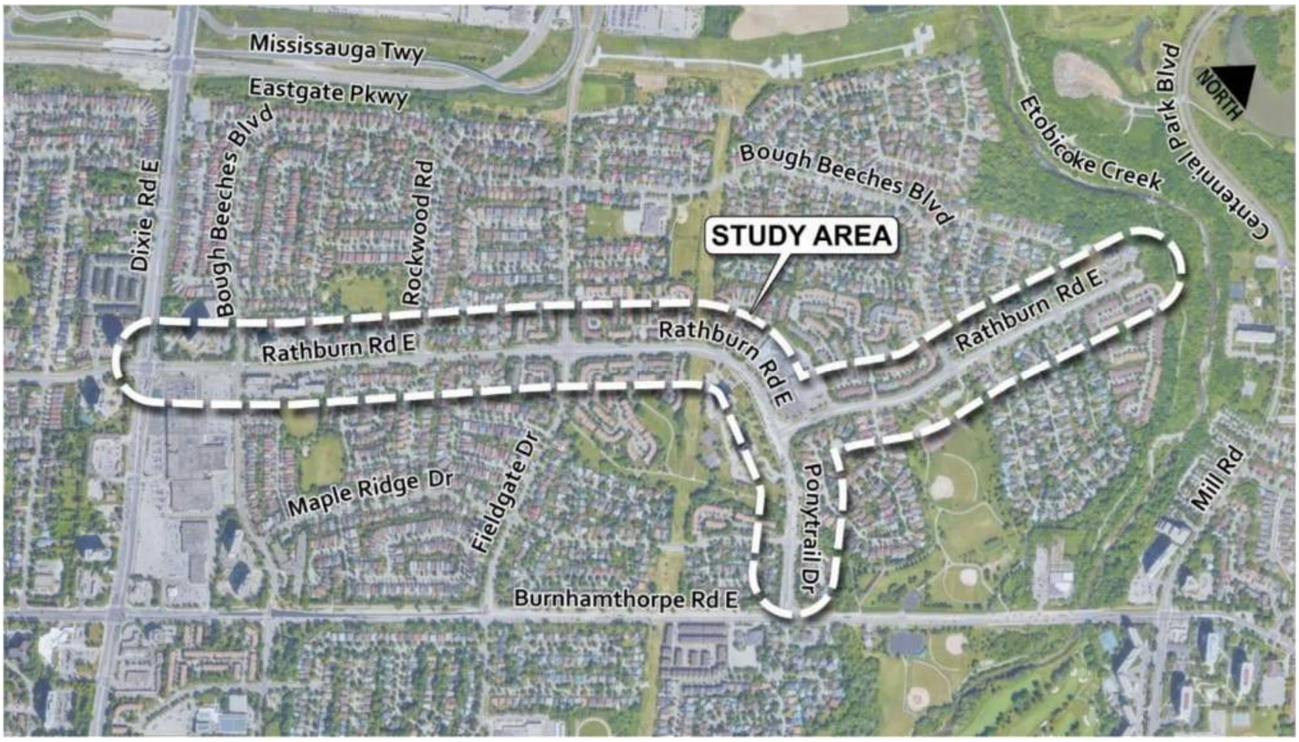
Subject: **Rathburn Road. & Ponytrail Drive Storm Sewer Assessment**

1 Introduction

The City of Mississauga is undertaking the Rathburn Road and Ponytrail Drive Integrated Road Project in accordance with the Schedule 'A+' Municipal Class Environmental Assessment (EA) process. The limits for the proposed road improvements are:

- Rathburn Road East from Dixie Road to Etobicoke Creek; and,
- Ponytrail Drive from Rathburn Road East to Burnhamthorpe Road East.

Figure 1.1 Study Area Map



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A Closed Circuit Television (CCTV) condition assessment was completed for storm sewers not previously assessed by the City. A map which identifies the sewers previously assessed and those completed as part of this project is located in **Appendix A**.

1.1 Inspections

The CCTV inspections were completed in two (2) separate occasions due to access limitations and sewer conditions. Storm sewer runs 2028949 and 9854 were removed from the inspection program as they were deemed to not be a priority.

The first inspections were completed on December 22, 2020 and included storm sewer segments 9979, 10038, 9870, and 9825. The CCTV Summary and Inspection Reports are included in **Appendix B** and CCTV media files have been delivered to the City for each section.

The second inspections were completed on January 20, 2022 and included storm sewer segments 9852, 9975, 31637, and 31639. The CCTV Summary and Inspection Reports are included in **Appendix C** and CCTV media files have been delivered to the City for each section.

2 CCTV Inspection Results

The CCTV program attempted to inspect eight (8) sewer runs as noted above with sewer sizes ranging from 375 to 2700mm in diameter for a total distance of 573.9m. All inspected sewers are made of concrete. Due to a significant obstruction, pipe run 31639 could not be inspected.

2.1 Structural Deficiencies

The structural condition of the pipes were assessed, and the following deficiencies were found:

- Longitudinal cracking
- Circumferential cracking
- Spiral cracking
- Fracture

2.2 Operation and Maintenance Deficiencies

The operational and maintenance of the pipes were assessed, and the following deficiencies were found:

- Obstructions including metal bars, MH lids, leaves, rocks and sediment
- Standing water
- infiltration

3 Recommendations and Comments

3.1 Structural Recommendations

The majority of the defects observed are minor in nature and will not affect the operation of the sewers. There was one pipe fracture observed in pipe segment 9870 located 1.0m in from STMH8 and a spot repair at this location is recommended.

3.2 Operation and Maintenance Recommendations

There were several obstructions observed within the surveyed sewers that are impacting the operation of the sewers. These obstructions range from minor obstructions (leaves / sediment) to more substantial obstructions (metal bars \ MH lids).

It is recommended that the sewers with significant obstructions be cleaned / flushed to remove the obstructions to allow the sewers to operate with maximum efficiency.

A spot repair is recommended to alleviate the infiltration runner observed within pipe segment 9975 located 41.3m from STMH3.

4 Summary

A summary of the Assessment including pipe identification, pipe size, shape, material, inspected length is located below.

Table 3.1 Assessment Summary

Rathburn Road / Ponytrail Drive Integrated Project									
CCTV Assessment Summary									
Assessment #1									
						Observed Defects		**Comments / Recommendations**	
Pipe ID #	**Street**	**From**	**To**	**Length (m)**	**Diametre (mm)**	**Structural**	**Operation / Maintenance**	**Structural**	**Operation / Maintenance**
9979	Rockwood	STMH1	STMH2	73.8	675	Circumferential cracking	None Observed	No Required Action	Regular City Maintenance
10038	Rathburn	STMH4	STMH5	20.8	450	circumferential and longnitutinal cracking	Standing water and deposits observed	No Required Action	Regular City Maintenance
9870	Rathburn	STMH9	STMH8	90.6	525	circumferential cracking and 1 documented fracture	Metal bar obstructions (multiple), standing gravel, rocks and sediment	Spot repair at fracture	Cleaning / Flushing to remove existing obstructions
9825	Rathburn	STMH7	STMH6	51.2	450	circumferential and longnitutinal cracking	metal bar	No Required Action	Cleaning / Flushing to remove existing obstructions
Assessment #1									
						Observed Defects		**Comments / Recommendations**	
Pipe ID #	**Street**	**From**	**To**	**Length (m)**	**Diametre (mm)**	**Structural**	**Operation / Maintenance**	**Structural**	**Operation / Maintenance**
9852	Ponytrail	STMH11A	STMH11	92.6	375	circumferential and longnitutinal cracking	deposits, water level above 50% at downstream end	No Required Action	Cleaning / Flushing to remove existing obstructions
9975	Rockwood	STMH3	STMH2	60.8	525	spirial and longnitutinal cracking	deposits / encrustation, 1 infiltration dripper, 1 infiltration runner	No Required Action	Spot repair at infiltration runner (41.3m)
31637	Ponytrail	STMH10	STMH10A	147.6	2100	None Observed	None Observed	No Required Action	No Required Action
31639	Ponytrail	CTMH10	Culvert	36.5	2700	None Observed	MH Lid	No Required Action	Remove obstruction and re survey

Appendix A

Key Map


HICKORY DRIVE
POLTAVA
BACCHUS CRES
HARTFIELD GROVE
LOVELADY WARREN
DRIVE
ROAD
CORKSTONE
GLADE
DRIVE
ROWNTREE CT.
CLAYPINE
RISE
BEECHES
SCADDEN
OWLSNEST LANE
BEECHKNOLL AVE.
GARNETWOOD
MARBLETHORNE COURT
CHASE
EAST
9870
CREEK
ANWORLD PLACE
ANWORLD COURT
GRAZIA CT.
BLVD.
FIELDGATE
CAPILANO COURT
9975
9979
10038
9825
RATHBURN
ROAD
EAST
RATHBURN
ROAD
OAK CT.
SHALE
ROCKWOOD
OTTEWELL
BRYCE
COLFAX CT.
BEECHES
BOOTH
SHALE OAK MEWS
UNICORN
TAPESTRY CT.
TAPESTRY TRAIL
GARNETWOOD
GARROWHILL TRAIL
CHASE
DRIVE
BRANCHWOOD PARK
RIDGE
PONYTRAIL
DRIVE
31637
31639
2028949
9854
9852
RIVER MILL WAY
MAPLE ROAD
CRES.
DEWBERRY CRES.
LANDING CT.
KINGS
LEWES WAY
FIELDGATE DRIVE
SALTDENE TERRACE
MAHOGANY
ROW
DR.
LOOKOUT COURT
DIXIE
DRIVE
ETOBICOKE
BURNHAMTHORPE ROAD EAST
RUTLEY CIRCLE
PICKMERE CT.
GULLEDEN DR.
GLEN
CHIPLOW RD.
DENBURN PLACE
CIRCLE
DR. PAGEHURST AVE.
PAGEHURST AVE.
PAGEHURST CT.
STONEPATH CRES.
ROAD
CITY OF TORONTO
SCALE 1:2500
LEGEND
STORM SEWER WITH NO INSPECTION RECORDS
STORM SEWER WITH INSPECTION RECORDS
STORM SEWER OUT OF STUDY AREA

	Segment ID	Size (mm)	Segment Length (m)	Material
Rockwood Road				
	9975	525	64	Concrete
	9979	675	75	Concrete
Rathburn Road E				
	10038	450	24	Concrete
	9825	450	52	Concrete
	9870	525	92	Concrete
Ponytrail Drive				
	31637	2100	152	Concrete
	31639	2700	161	Concrete
	2028949	1800	55	Corrugated Metal
	9852	375	95	Concrete
	9854	675	53	Concrete

`

Appendix B

CCTV Inspection Report #1

Badger Daylighting
6629 Orr Dr
London, ON N6L-1P1
Phone: 519-472-6181

Project Summary

Rathburn Rd E & Ponytail Dr

Main ID	Date	Address	Start MH	Finish MH	Pipe	Asset length	Surveyed Length
9979	12/22/2020	ROCKWOOD RD	STMH1	STMH2	RCP	73.8	73.8
10038	12/22/2020	RATHBURN RD E	STMH4	STMH5	RCP	20.8	20.8
9870	12/22/2020	RATHBURN RD E	STMH9	STMH8	RCP	90.6	90.6
9825	12/22/2020	RATHBURN RD E	STMH7	STMH6	RCP	51.2	51.2

Number of inspections: 4	**Subtotal**	**236.4 m**	**236.4 m**
	Total	**236.4 m**	**236.4 m**

Badger Daylighting
6629 Orr Dr
London, ON N6L-1P1
Phone: 519-472-6181

PACP Sewer Report

Surveyed by: BADGER-RC
Certificate No: U-0219-70303768
Owner:
Survey Customer: WSP
Drainage area:
Sheet number: 1

Work order:
Pipeline segment ref: 9979
Start date/time: 2020/12/22 08:29
Street: ROCKWOOD RD
City: MISSISSAUGA

Location details:
Upstream manhole No: STMH1
Rim to invert:
Grade to invert:
Rim to grade:

Downstream manhole No: STMH2
Rim to invert:
Grade to invert:
Rim to grade:
Sewer use: SW
Direction: D
Flow control:
Height: 675

Width:
Shape: C
Material: RCP
Ln. method:
Pipe joint length:
Total length: 73.8
Length surveyed: 73.8
Year laid:
Year renewed:
Media label: 9979

Purpose: A
Sewer category:
Pre-cleaning: N
Date cleaned:
Weather: 1
Location code: C
Additional info:

Starting access point:
Easting:
Northing:
Elevation:
Coordinate system:
GPS accuracy:

Distance (Feet) (Meters)	Video Ref.	Group/ Descriptor	Modifier/ Continuous Defect Severity	S/M/L	Value Inches (mm) 1st	Value Inches (mm) 2nd	%	Joint	Circumferential Location At/From	Circumferential Location to	Image Ref.	Remarks
0.0	0	AMH										STMH1
0.0	0	MWL					5					
1.0	47	MGO										CABLE CALIBRATION SET TO 1M
8.5	126	CL							12			
17.6	199	CL							12			
18.6	235	TB			200				2			SRV AROUND TB
33.3	356	CC							3	5		
43.7	477	TB			200				2			SRV AROUND TB
44.6	509	CC							7	8		

Badger Daylighting
6629 Orr Dr
London, ON N6L-1P1
Phone: 519-472-6181
Fax: 407-425-1569

Surveyed by:	Owner:	Start date/time:	Upstream manhole No:	Pipeline segment ref:	Sheet number:
BADGER-RC		2020/12/22	STMH1	9979	1

Distance (Feet) (Meters)	Video Ref.	Group/ Descriptor	Modifier/ Severity	Continuous Defect	S/M/L	Value Inches (mm) 1st	2nd	%	Joint	Circumferential Location At/From	to	Image Ref.	Remarks
50.7	592	TB				300				10			SRV AROUND TAP
57.7	705	TB				300				2			SRV AROUND TAP, CRACKS INSIDE TAP
71.8	828	TFA				675				6			@DROP STRUCTURE
73.8	875	AMH											STMH2

Badger Daylighting
6629 Orr Dr
London, ON N6L-1P1
Phone: 519-472-6181

PACP Sewer Report

Surveyed by:	Certificate No:	Owner:	Survey Customer:	Drainage area:	Sheet number:
BADGER-RC	U-0219-70303768		WSP		2

Work order:	Pipeline segment ref:	Start date/time:		Street:	City:
	10038	2020/12/22	09:50	RATHBURN RD E	MISSISSAUGA

Location details:	Upstream manhole No:	Rim to invert:	Grade to invert:	Rim to grade:
	STMH5			

Downstream manhole No:	Rim to invert:	Grade to invert:	Rim to grade:	Sewer use:	Direction:	Flow control:	Height:
STMH4				SW	U		450

Width:	Shape:	Material:	Ln. method:	Pipe joint length:	Total length:	Length surveyed:	Year laid:	Year renewed:	Media label:
	C	RCP			20.8	20.8			10038

Purpose:	Sewer category:	Pre-cleaning	Date cleaned:	Weather:	Location code:	Additional info:
A		N		1	C	

Starting access point:

Easting:	Northing:	Elevation:	Coordinate system:	GPS accuracy:

Distance (Feet) (Meters)	Video Ref.	Group/ Descriptor	Modifier/ Continuous Defect Severity	S/M/L	Value Inches (mm) 1st	Value Inches (mm) 2nd	%	Joint	Circumferential Location At/From	Circumferential Location to	Image Ref.	Remarks
0.0	0	AMH										STMH4
0.0	0	MWL					10					
0.0	15	MGO										UNABLE TO PAN DUE TO LIP IN MH
1.0	33	MGO										CABLE CALIIBRATION SET TO 1M
1.0	49	CC							7	5		
1.9	139	DSC					15		5	7		
2.1	163	CL	S01						12			
2.9	184	MWL					10					
4.3	210	DSC					15		5	7		

Badger Daylighting
6629 Orr Dr
London, ON N6L-1P1
Phone: 519-472-6181
Fax: 407-425-1569

Surveyed by:	Owner:	Start date/time:	Upstream manhole No:	Pipeline segment ref:	Sheet number:
BADGER-RC		2020/12/22	STMH5	10038	2

Distance (Feet) (Meters)	Video Ref.	Group/ Descriptor	Modifier/ Severity	Continuous Defect	S/M/L	Value Inches (mm) 1st	2nd	%	Joint	Circumferential Location At/From	to	Image Ref.	Remarks
6.1	245	DSC						15		5	7		
7.0	263	CL								8			
8.4	302	DSC		S02				10		6			
8.4	318	MWL						5					
20.8	426	CL		F01						12			
20.8	426	DSC		F02				10		6			
20.8	426	AMH											STMH5

Badger Daylighting
6629 Orr Dr
London, ON N6L-1P1
Phone: 519-472-6181

PACP Sewer Report

Surveyed by:	Certificate No:	Owner:	Survey Customer:	Drainage area:	Sheet number:
BADGER-RC	U-0219-70303768		WSP		3

Work order:	Pipeline segment ref:	Start date/time:		Street:	City:
	9870	2020/12/22	10:34	RATHBURN RD E	MISSISSAUGA

Location details:	Upstream manhole No:	Rim to invert:	Grade to invert:	Rim to grade:
	STMH9			

Downstream manhole No:	Rim to invert:	Grade to invert:	Rim to grade:	Sewer use:	Direction:	Flow control:	Height:
STMH8				SW	D		525

Width:	Shape:	Material:	Ln. method:	Pipe joint length:	Total length:	Length surveyed:	Year laid:	Year renewed:	Media label:
	C	RCP			90.6	90.6			9870

Purpose:	Sewer category:	Pre-cleaning	Date cleaned:	Weather:	Location code:	Additional info:
A		N		1	C	

Starting access point:	Easting:	Northing:	Elevation:	Coordinate system:	GPS accuracy:

Distance (Feet) (Meters)	Video Ref.	Group/ Descriptor	Modifier/ Continuous Defect Severity	S/M/L	Value Inches (mm) 1st	Value Inches (mm) 2nd	%	Joint	Circumferential Location At/From	Circumferential Location to	Image Ref.	Remarks
0.0	0	AMH										STMH9
0.0	0	MWL					5					
1.0	53	MGO										CABLE CALIBRATION SET TO 1M
1.7	80	TB			250				2			
4.5	132	OBZ					5		6			METAL BAR
5.7	184	OBZ					5		6			METAL BAR
13.3	294	OBZ					5		5	6		LEAVES
22.1	409	OBZ					5		6			METAL BAR
30.0	476	DSG V					10		6			

Badger Daylighting
6629 Orr Dr
London, ON N6L-1P1
Phone: 519-472-6181
Fax: 407-425-1569

Surveyed by:	Owner:	Start date/time:	Upstream manhole No:	Pipeline segment ref:	Sheet number:
BADGER-RC		2020/12/22	STMH9	9870	3

Distance (Feet) (Meters)	Video Ref.	Group/ Descriptor	Modifier/ Severity	Continuous Defect	S/M/L	Value Inches (mm) 1st	Value Inches (mm) 2nd	%	Joint	Circumferential Location At/From	Circumferential Location to	Image Ref.	Remarks
37.7	599	OBR						15		6			
61.4	809	DSGV		S01				5		6			
68.7	885	CC								11	12		
78.3	1012	DSGV		F01				5		6			
78.8	1031	DSC						10		7			
82.7	1093	DSC		S02				15		7			
86.3	1133	DSC		F02				15		7			
86.3	1148	DSC						10		5	6		
89.4	1185	DSC						10	J	8			
89.5	1233	FC								9	5		
90.6	1284	AMH											STMH8

Badger Daylighting
6629 Orr Dr
London, ON N6L-1P1
Phone: 519-472-6181

PACP Sewer Report

Surveyed by: BADGER-RC
Certificate No: U-0219-70303768
Owner:
Survey Customer: WSP
Drainage area:
Sheet number: 4

Work order:
Pipeline segment ref: 9825
Start date/time: 2020/12/22 11:38
Street: RATHBURN RD E
City: MISSISSAUGA

Location details:
Upstream manhole No: STMH7
Rim to invert:
Grade to invert:
Rim to grade:

Downstream manhole No: STMH6
Rim to invert:
Grade to invert:
Rim to grade:
Sewer use: SW
Direction: D
Flow control:
Height: 450

Width:
Shape: C
Material: RCP
Ln. method:
Pipe joint length:
Total length: 51.2
Length surveyed: 51.2
Year laid:
Year renewed:
Media label: 9825

Purpose: A
Sewer category:
Pre-cleaning: N
Date cleaned:
Weather: 1
Location code: C
Additional info:

Starting access point:
Easting:
Northing:
Elevation:
Coordinate system:
GPS accuracy:

Distance (Feet) (Meters)	Video Ref.	Group/ Descriptor	Modifier/ Continuous Defect Severity	S/M/L	Value Inches (mm) 1st	Value Inches (mm) 2nd	%	Joint	Circumferential Location At/From	Circumferential Location to	Image Ref.	Remarks
0.0	0	AMH										STMH7
0.0	0	MWL					5					
0.0	46	CL							12			
1.0	62	MGO										CABLE CALIBRATION SET TO 1M
2.5	95	CL							12			
2.8	117	CC							7	8		
3.7	147	CL	S01						12			
7.7	194	CC							12	1		
7.7	215	SSS							12	1		

Badger Daylighting
6629 Orr Dr
London, ON N6L-1P1
Phone: 519-472-6181
Fax: 407-425-1569

Surveyed by:	Owner:	Start date/time:	Upstream manhole No:	Pipeline segment ref:	Sheet number:
BADGER-RC		2020/12/22	STMH7	9825	4

Distance (Feet) (Meters)	Video Ref.	Group/ Descriptor	Modifier/ Severity	Continuous Defect	S/M/L	Value Inches (mm) 1st	2nd	%	Joint	Circumferential Location At/From	to	Image Ref.	Remarks
26.0	394	SSS								12			
26.0	433	CC								11	1		
27.4	498	CC								9	11		
28.1	548	SSS								9	12		
28.6	622	TBI				250	5			10			SRV AROUND TAP, CRACK IN TAP
28.7	663	CC								9	12		
29.0	704	SSS								9	12		
29.3	747	TB				250				2			SRV AROUND TAP
30.0	772	SSS								12			
41.0	887	CC								10	2		
41.1	917	SSS								12			
41.9	950	CC								3	5		
42.5	972	CC								3	5		
42.7	1002	CC								9	11		
43.3	1046	CC								8	10		
43.6	1073	CC								9	11		
46.2	1130	SSS								9	5		
46.2	1147	CL								10			

Badger Daylighting
6629 Orr Dr
London, ON N6L-1P1
Phone: 519-472-6181
Fax: 407-425-1569

Surveyed by:	Owner:	Start date/time:	Upstream manhole No:	Pipeline segment ref:	Sheet number:
BADGER-RC		2020/12/22	STMH7	9825	4

Distance (Feet) (Meters)	Video Ref.	Group/ Descriptor	Modifier/ Severity	Continuous Defect	S/M/L	Value Inches (mm) 1st	2nd	%	Joint	Circumferential Location At/From	to	Image Ref.	Remarks
46.9	1180	DAE						5		12	5		
47.4	1203	DAE						5		10	5		
49.4	1419	OBC						10		6	12		STEEL ROD STUCK IN MIDDLE OF PIPE
49.4	1478	TFA				450				6			DROP STRUCTURE STEEL ROD STUCK IN IT.
51.2	1504	CL		F01						12			
51.2	1504	AMH											STMH6

Appendix C

CCTV Inspection Report #2

PLANVIEW Utility Services Ltd.

Sewer CCTV Inspection Report

Prepared for:

CCTV Inspection

Ponytrail Drive and Rockwood Road

Mississauga, Ontario

PLANVIEW PROJECT# 21-3-0196

January 28, 2022

Contents

1 Project Details

1.1 Executive Summary

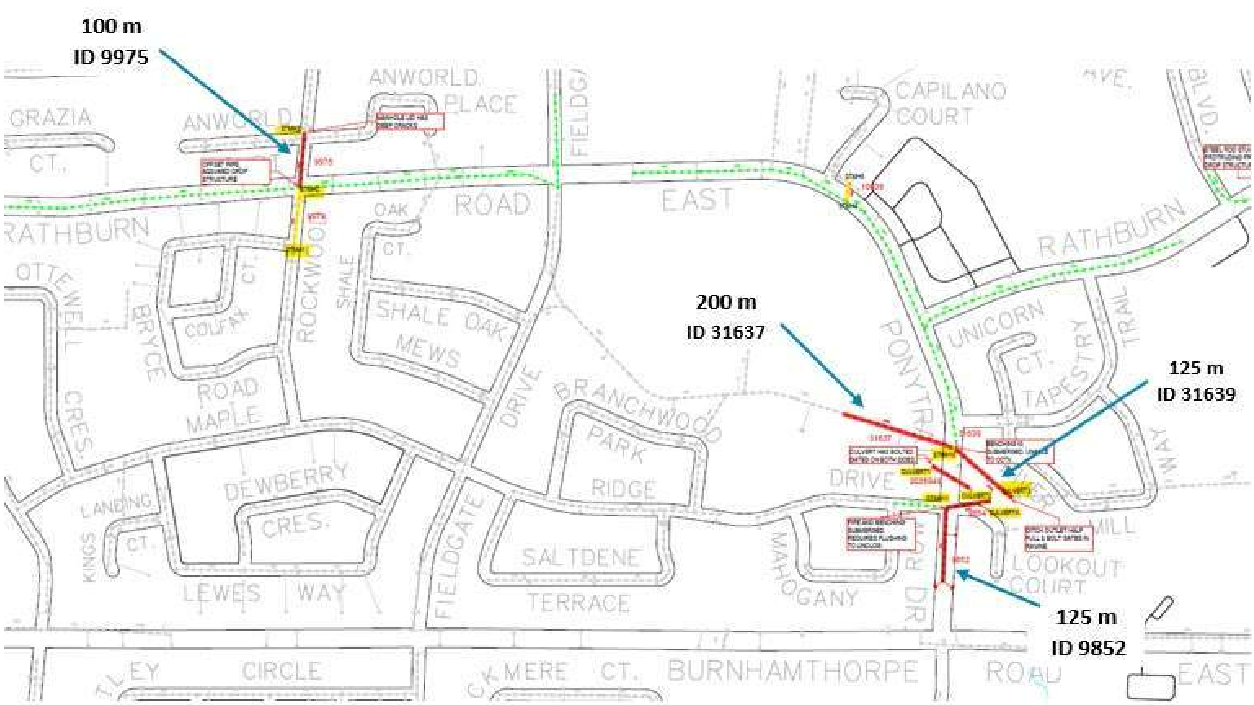
Planview Utility Services (Planview) was retained by WSP to provide a CCTV inspection in on Ponytrail Drive and Rockwood Road in the City of Mississauga.

The objective of the CCTV investigation was to determine horizontal alignments and conditions of identifiable storm sewer within the project scope area.

Planview retained **Pipetek Infrastructure Services** for the purpose of CCTV inspection. The investigation involved inspection of sewer pipes and evaluating their conditions.

1.2 Scope of Work

CCTV inspection was for the circular, 375mm, 525mm, 2100mm and 2700m concrete storm sewers on Ponytrail Drive and Rockwood Road illustrated below:



The CCTV inspection was completed on January 20th, 2022.

1.3 CCTV Methodology and Applied Technology

Closed Circuit Television (CCTV) is a technology used to investigate sewer mains and building service laterals. The CCTV unit has a transmitter that sends images and data back to a monitor so the inspector can identify the condition of the utility / drain lines. The camera transmitter head has a built-in locating sonde to enable above ground tracing for line and depth when required. The condition information is recorded and later used to generate a report based on the findings produced.

For lateral inspection, the focus is to check for blockages or cross boring. The inspection can be performed without intrusion via entering the sewer from the mainline, advancing up the mainline, and then launching the camera head up into the lateral. This process and the equipment used allows for superior efficiency and quality.
Since CCTV cameras are non-invasive, they are highly cost-effective. They can even be used for preventive maintenance so that minor issues can be identified before they turn into major problems.

Prior to CCTV inspection process, flushing of the pipes is accomplished. Flushing task includes pushing high pressure/volume water into the pipe's upstream end and then vacuuming debris from pipe's downstream end into a flusher unit and disposing the material at a MOE approved disposal facility.

The defects found in the pipe have a specific code used to identify them. Each defect is assigned a number score denoting the severity of the defect. Levels 1-5 with level 5 defects being the worst. As we inspect and code the defects, the inspection program creates a survey for each pipe segment. The program then compiles all the codes with scores and produces an overall Pipe Score for that segment of sewer. The program uses a simplified 4-digit Quick rating system to assign a Risk Score to the segment.

Common issues occurred during the CCTV inspection and Flushing are as following:

a) Excess levels of debris causing blockage of CCTV equipment. More cleaning may be required to clear the pipe to drive our camera tractor through. The presence of Hardened debris, roots or calcium deposits (calcite) may require mechanical sewer cleaning to remove.
b) High water level/surcharges may make it impossible for our camera equipment to identify defects in the pipe segment.

c) Dense steam or fog reduces visibility.
d) Construction Type/ Lay out of the Manholes and Sewer Pipe Segments may make it difficult or impossible to drive the wheeled camera tractor through the pipe or even position it in the MH Chambers.

Our CCTV inspection process is certified by NASSCO (National Association of Sewer Service Companies) and PACP (Pipeline Assessment Certification Program).

With the combination of experienced PACP-trained operators following PACP procedures and high-quality sewer inspection equipment used, precise CCTV inspection results are achieved.

1.4 Clarification Notes

- Following items were observed in certain pipes:
    - Obstruction rocks,
    - Obstruction Manhole lid,
    - Infiltration dripper,
    - Multiple cracks.

Consequently, full length inspection of some of the pipes was not feasible.

Please refer to relevant pages of multisection report in section 2.1 for the exact locations.

2 CCTV Inspection Results and findings

Detailed results of CCTV inspection are presented as following:

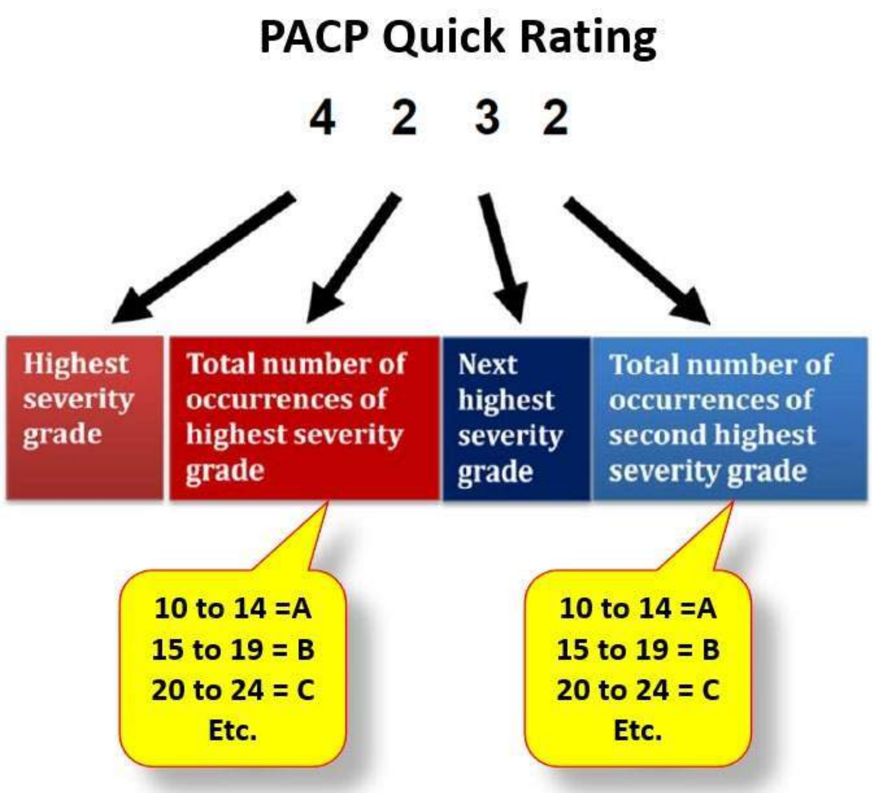
2.1 Inspection Summary and Multi-Section Report

This section includes generated reports from the CCTV investigation for the pipes shown in page 3 of multi-section report.

The directions mentioned in the pipe index table (3rd page), refer to direction of CCTV camera travel.

Following items are worth attention, prior to review of Mulit-section report:

1. PACP quick rating system of the pipe condition is shown below:



2. The pipe's likelihood of failure (LoF) shown in the pipe graphic report is calculated as following:

- No condition assessment data is available: Lof = 0*

  Condition assessment data is available and there are no defects: Lof = 1

- There are no more than 9 occurrences of the highest condition grade:
  Lof = The first two digits of quick rating /10, i.e., 42/10=4.2

- The second character is a letter (indicating more than 9 occurrences)
  Lof = (The first two digits of quick rating /10) + 1, i.e., (42/10)+1=5.2

*: A LoF of zero does not indicate that there is no likelihood of failure. Instead, any rating of zero is meant to be a flag indicating that data is missing or could not be collected.

A sample page showing the discussed ratings is as following:

Structural rating		O&M rating		Overall rating		Failure	
Peak:	0	Peak:	2	Peak:	2	Consequence:	
Quick rating:	0000	Quick rating:	2700	Quick rating:	2700	Likelihood:	2.7
Score:	0	Score:	14	Score:	14	Risk:	
Index:	0	Index:	2	Index:	2		

Index of pipes

5 items

Inspected length : 337.50
Total length : 301.00

Pipe	Start/End	Direction	Road	Date	Inspected	Total	Inspection Status	Page
9852	STMH11A --> STMH11	Direction of flow	PONYTRAIL DR	20/01/2022 8:39 AM	92.6	92.6	Complete Inspection	
9975	STMH3 --> STMH2	Direction of flow	ROCKWOOD RD	20/01/2022 7:28 AM	60.8	60.8	Complete Inspection	
31637	STMH10 --> STMH10A	Against flow	PONYTRAIL DR	20/01/2022 10:13 AM	147.6	147.6	Complete Inspection	
31639	STMH10 --> CULVERT3	Direction of flow	PONYTRAIL DR	20/01/2022 11:38 AM	36.5		Complete Inspection	
31639	CULVERT3 --> STMH10	Against flow	PONYTRAIL DR	20/01/2022 1:27 PM			No Access	

CCTV inspection report

TORONTO

PLANVIEW

9155-18-7147

PONYTRAIL DR, ROCKWOOD RD

20/01/2022

Table of contents

CT SPEC

1. Index of pipes, sorted by pipe

5 items

Pipe	Start/End	Inspection direction	Road	Inspection Status	Page
9852	STMH11A --> STMH11	Direction of flow	PONYTRAIL DR	Complete Inspection	11
9975	STMH3 --> STMH2	Direction of flow	ROCKWOOD RD	Complete Inspection	14
31637	STMH10 --> STMH10A	Against flow	PONYTRAIL DR	Complete Inspection	16
31639	STMH10 --> CULVERT3	Direction of flow	PONYTRAIL DR	Complete Inspection	18
31639	CULVERT3 --> STMH10	Against flow	PONYTRAIL DR	No Access	20

2. Index of pipes, sorted by manhole

5 items

Start/End	Inspection direction	Pipe	Road	Inspection Status	Page
CULVERT3 --> STMH10	Against flow	31639	PONYTRAIL DR	No Access	20
STMH3 --> STMH2	Direction of flow	9975	ROCKWOOD RD	Complete Inspection	14
STMH10 --> CULVERT3	Direction of flow	31639	PONYTRAIL DR	Complete Inspection	18
STMH10 --> STMH10A	Against flow	31637	PONYTRAIL DR	Complete Inspection	16
STMH11A --> STMH11	Direction of flow	9852	PONYTRAIL DR	Complete Inspection	11

3. Index of pipes, sorted by road

5 items

Road	Pipe	Start/End	Inspection direction	Inspection Status	Page
PONYTRAIL DR	9852	STMH11A --> STMH11	Direction of flow	Complete Inspection	11
PONYTRAIL DR	31637	STMH10 --> STMH10A	Against flow	Complete Inspection	16
PONYTRAIL DR	31639	STMH10 --> CULVERT3	Direction of flow	Complete Inspection	18
PONYTRAIL DR	31639	CULVERT3 --> STMH10	Against flow	No Access	20
ROCKWOOD RD	9975	STMH3 --> STMH2	Direction of flow	Complete Inspection	14

4. Structural rating

5 items

3 - Moderate defect grade (1 of 5 items)

Score	Quick	Index	Pipe	Start/End	Direction	Road	Page
75	312F	2	9852	STMH11A --> STMH11	Direction of flow	PONYTRAIL DR	11

2 - Minor to Moderate (1 of 5 items)

Score	Quick	Index	Pipe	Start/End	Direction	Road	Page
4	2200	2	9975	STMH3 --> STMH2	Direction of flow	ROCKWOOD RD	14

0 - No Defects (2 of 5 items)

Score	Quick	Index	Pipe	Start/End	Direction	Road	Page
0	0000	0	31637	STMH10 --> STMH10A	Against flow	PONYTRAIL DR	16
0	0000	0	31639	STMH10 --> CULVERT3	Direction of flow	PONYTRAIL DR	18

Incomplete Inspection (1 of 5 items)

Score	Quick	Index	Pipe	Start/End	Direction	Road	Page
			31639	CULVERT3 --> STMH10	Against flow	PONYTRAIL DR	20

5. O&M rating

5 items

4 - Significant (2 of 5 items)

Score	Quick	Index	Structural	Pipe	Start/End	Direction	Road	Page
10	4123	2.5	2	9975	STMH3 --> STMH2	Direction of flow	ROCKWOOD RD	14
5	4111	2.5	0	31637	STMH10 --> STMH10A	Against flow	PONYTRAIL DR	16

3 - Moderate defect grade (2 of 5 items)

Score	Quick	Index	Structural	Pipe	Start/End	Direction	Road	Page
13	3125	2.2	3	9852	STMH11A --> STMH11	Direction of flow	PONYTRAIL DR	11
6	3200	3	0	31639	STMH10 --> CULVERT3	Direction of flow	PONYTRAIL DR	18

Incomplete Inspection (1 of 5 items)

Score	Quick	Index	Structural	Pipe	Start/End	Direction	Road	Page
			Incomplete Inspection	31639	CULVERT3 --> STMH10	Against flow	PONYTRAIL DR	20

6. List of important structural observations

7. List of important observations of operation and maintenance

2 items

IRC - Infiltration Runner Connection (1 of 2 items)

Pipe	Start/End	Direction	Road	Distance	Cont.Def.	Page
9975	STMH3 --> STMH2	Direction of flow	ROCKWOOD RD	41.3		14

LL - Line Left (1 of 2 items)

Pipe	Start/End	Direction	Road	Distance	Cont.Def.	Page
31637	STMH10 --> STMH10A	Against flow	PONYTRAIL DR	18		16

8. Comments

1 item

Pipe	Start/End	Inspection direction	Comments	Page
31639	CULVERT3 --> STMH10	Against flow	NO ACCESS TO GATED CULVERT IN CREEK	20

9. Pipe summary and condition details

Pipe identification

Pipe:	9852	**Direction of inspection:**	STMH11A --> STMH11
Direction of flow:	STMH11A --> STMH11	**Direction:**	Direction of flow

Pipe location

Road:	PONYTRAIL DR	UPSTREAM	DOWNSTREAM
Crossroad:		**Easting (X):**	**Easting (X):**
Drainage Area:		**Northing (Y):**	**Northing (Y):**
City:	TORONTO	**Elevation (Z):**	**Elevation (Z):**
Location:	Secondary roads		
Location details:		**GPS Accuracy:**	
Owner:	CITY OF TORONTO	**Corrdinate System:**	
Road segment:		**Vertical Datum:**	

Pipe characteristics

Pipe Use:	Stormwater Pipe	**Surveyed Length:**	92.6
Height:	375	**Total length:**	92.6
Width:		**Joint length:**	
Shape:	Circular	**Rim/Inv.:**	1.7
Material:	Concrete Pipe (non-reinforced)	**Grade/Inv.:**	
Lining:		**Rim/Grade:**	
Coating Method:		**Rim/Inv.:**	0
Year Constructed:		**Grade/Inv.:**	
Year renewed:		**Rim/Grade:**	

Additional details

Inspection standard:	PACP 7.0	**Surveyed by:**	PT-AD
Inspection Status:	Complete Inspection	**Certificate Number:**	U-0321-704M0107
Date:	20/01/2022 8:39 AM	**Reviewed By:**	
Project:	9155-18-7147	**Reviewer Certificate:**	
Customer:	PLANVIEW	**Pre-Cleaning:**	No Pre-Cleaning
PO number:		**Date cleaned:**	
Work Order:		**Media Label:**	0
Purpose:		**Unit of measurement:**	Metric
Weather:	Dry	**Sheet Number:**	
Flow control:		**Additional information:**	
Used Technology:			

Structural rating		O&M rating		Overall rating		Failure	
Peak:	3	**Peak:**	3	**Peak:**	3	**Consequence:**	
Quick rating:	312F	**Quick rating:**	3125	**Quick rating:**	322G	**Likelihood:**	3.2
Score:	75	**Score:**	13	**Score:**	88	**Risk:**	
Index:	2	**Index:**	2.2	**Index:**	2		

Other information

CLEANING REQUIRED (NONE/FLUSH/REAM/CUT):	NONE	**CONTRACTOR:**	PIPETEK INFRASTRUCTURE SERVICES
(BLANK HEADER/DRIVE THROUGH):		**Information 7:**	
(COMPLETE/SA DEBRIS/SA OBSTRUCTION ETC):	COMPLETE	**Information 8:**	
COMPLETE MH TO MH(YES/NO):	YES	**Information 9:**	
UNCHARTED IN LINE[YES - IF APPLICABLE]:		**Information 10:**	

9. Pipe summary and condition details

#1 0.00 m AMH - Manhole, STMH11A	**#2 0.00 m** MWL - Miscellaneous Water Level, 5%
#3 1.20 m MGO - Miscellaneous General Observation, COUNTER SET TO 1.2M FOR SLACK	**#4 5.90 m** CM - Crack Multiple, from 12 o'clock to 1 o'clock
#5 6.30 m CL - Crack Longitudinal, at 1 o'clock	**#6 7.50 m** CL - Crack Longitudinal, at 11 o'clock
#7 11.70 m CL - Crack Longitudinal, at 11 o'clock	**#8 13.80 m** (S01) CL - Crack Longitudinal, at 12 o'clock
#9 15.10 m (F01) CL - Crack Longitudinal, at 12 o'clock	**#10 19.00 m** CL - Crack Longitudinal, at 12 o'clock
#11 23.00 m CL - Crack Longitudinal, at 1 o'clock	**#12 24.40 m** (S02) CL - Crack Longitudinal, at 1 o'clock
#13 26.20 m (S03) DSC - Deposits Settled Hard/Compacted, from 5 o'clock to 6 o'clock, 10%	**#14 27.30 m** (F02) CL - Crack Longitudinal, at 1 o'clock
#15 27.90 m (F03) DSC - Deposits Settled Hard/Compacted, from 5 o'clock to 6 o'clock, 10%	**#16 29.10 m** (S04) CL - Crack Longitudinal, at 12 o'clock
#17 31.00 m (F04) CL - Crack Longitudinal, at 12 o'clock	**#18 37.90 m** CL - Crack Longitudinal, at 1 o'clock
#19 39.60 m CL - Crack Longitudinal, at 1 o'clock	**#20 39.90 m** CS - Crack Spiral, from 10 o'clock to 11 o'clock
#21 41.70 m CL - Crack Longitudinal, at 7 o'clock	**#22 43.10 m** CL - Crack Longitudinal, at 4 o'clock
#23 43.10 m CL - Crack Longitudinal, at 11 o'clock	**#24 43.70 m** DSC - Deposits Settled Hard/Compacted, at 4 o'clock, 10%
#25 44.50 m DSC - Deposits Settled Hard/Compacted, at 5 o'clock, 5%	**#26 47.20 m** CL - Crack Longitudinal, at 1 o'clock
#27 47.70 m MWL - Miscellaneous Water Level, 10%	**#28 51.60 m** (S05) CL - Crack Longitudinal, at 12 o'clock
#29 52.50 m MWL - Miscellaneous Water Level, 15%	**#30 56.10 m** MWL - Miscellaneous Water Level, 25%
#31 58.50 m TF - Tap Factory, at 2 o'clock, Dim.1=250	**#32 61.70 m** MWL - Miscellaneous Water Level, 30%
#33 61.90 m CL - Crack Longitudinal, at 10 o'clock	**#34 62.90 m** (F05) CL - Crack Longitudinal, at 12 o'clock

9. Pipe summary and condition details

#35 64.80 m
(S06) CL - Crack Longitudinal, at 12 o'clock

#36 70.90 m
(F06) CL - Crack Longitudinal, at 12 o'clock

#37 73.00 m
MWL - Miscellaneous Water Level, 20%

#38 74.70 m
(S07) CL - Crack Longitudinal, at 12 o'clock

#39 76.20 m
DAE - Deposits Attached Encrustation, from 1 o'clock to 2 o'clock, 5%

#40 77.70 m
CL - Crack Longitudinal, at 10 o'clock

#41 79.10 m
MWL - Miscellaneous Water Level, 30%

#42 81.00 m
MWL - Miscellaneous Water Level, 40%

#43 83.60 m
(S08) DAE - Deposits Attached Encrustation,
from 11 o'clock to 12 o'clock, 10%

#44 83.60 m
(F07) CL - Crack Longitudinal, at 12 o'clock

#45 84.90 m
MWL - Miscellaneous Water Level, 50%

#46 85.20 m
ID - Infiltration Dripper, at 11 o'clock

#47 85.50 m
(F08) DAE - Deposits Attached Encrustation,
from 11 o'clock to 12 o'clock, 10%

#48 88.50 m
MWL - Miscellaneous Water Level, 60%

#49 92.00 m
MWL - Miscellaneous Water Level, 70%

#50 92.60 m
AMH - Manhole, STMH11

9. Pipe summary and condition details

Pipe identification

Pipe:	9975	**Direction of inspection:**	STMH3 --> STMH2
Direction of flow:	STMH3 --> STMH2	**Direction:**	Direction of flow

Pipe location

Road:	ROCKWOOD RD	UPSTREAM		DOWNSTREAM
Crossroad:		**Easting (X):**		**Easting (X):**
Drainage Area:		**Northing (Y):**		**Northing (Y):**
City:	TORONTO	**Elevation (Z):**		**Elevation (Z):**
Location:	Secondary roads			
Location details:		**GPS Accuracy:**		
Owner:	CITY OF TORONTO	**Corrdinate System:**		
Road segment:		**Vertical Datum:**		

Pipe characteristics

Pipe Use:	Stormwater Pipe	**Surveyed Length:**	60.8
Height:	525	**Total length:**	60.8
Width:		**Joint length:**	
Shape:	Circular	**Rim/Inv.:**	3.9
Material:	Concrete Pipe (non-reinforced)	**Grade/Inv.:**	
Lining:		**Rim/Grade:**	
Coating Method:		**Rim/Inv.:**	0
Year Constructed:		**Grade/Inv.:**	
Year renewed:		**Rim/Grade:**	

Additional details

Inspection standard:	PACP 7.0	**Surveyed by:**	PT-AD
Inspection Status:	Complete Inspection	**Certificate Number:**	U-0321-704M0107
Date:	20/01/2022 7:28 AM	**Reviewed By:**	
Project:	9155-18-7147	**Reviewer Certificate:**	
Customer:	PLANVIEW	**Pre-Cleaning:**	No Pre-Cleaning
PO number:		**Date cleaned:**	
Work Order:		**Media Label:**	0
Purpose:		**Unit of measurement:**	Metric
Weather:	Dry	**Sheet Number:**	
Flow control:		**Additional information:**	
Used Technology:	CCTV		

Structural rating		O&M rating		Overall rating		Failure	
Peak:	2	**Peak:**	4	**Peak:**	4	**Consequence:**	
Quick rating:	2200	**Quick rating:**	4123	**Quick rating:**	4125	**Likelihood:**	4.1
Score:	4	**Score:**	10	**Score:**	14	**Risk:**	
Index:	2	**Index:**	2.5	**Index:**	2.3		

Other information

CLEANING REQUIRED (NONE/FLUSH/REAM/CUT):	NONE	**CONTRACTOR:**	PIPETEK INFRASTRUCTURE SERVICES
(BLANK HEADER/DRIVE THROUGH):		**Information 7:**	
(COMPLETE/SA DEBRIS/SA OBSTRUCTION ETC):	COMPLETE	**Information 8:**	
COMPLETE MH TO MH(YES/NO):	YES	**Information 9:**	
UNCHARTED IN LINE[YES - IF APPLICABLE]:		**Information 10:**	

9. Pipe summary and condition details

#1 0.00 m
AMH - Manhole, STMH3

#2 0.00 m
MWL - Miscellaneous Water Level, 0%

#3 0.20 m
CS - Crack Spiral, from 2 o'clock to 3 o'clock

#4 1.40 m
MGO - Miscellaneous General Observation, COUNTER SET TO 1.4M FOR SLACK

#5 5.50 m
OBJ - Obstruction Wedged In The Joint, at joint, at 8 o'clock, 5%

#6 21.60 m
CL - Crack Longitudinal, at 11 o'clock

#7 38.90 m
DAE - Deposits Attached Encrustation, from 7 o'clock to 11 o'clock, 10%

#8 39.00 m
TFA - Tap Factory Activity, at 11 o'clock, Dim.1=250

#9 41.10 m
DSC - Deposits Settled Hard/Compacted, from 5 o'clock to 7 o'clock, 10%

#10 41.10 m
TFA - Tap Factory Activity, at 1 o'clock, Dim.1=250

#11 41.30 m
IRC - Infiltration Runner Connection, at 1 o'clock

#12 60.80 m
AMH - Manhole, STMH2

9. Pipe summary and condition details

Pipe identification

Pipe:	31637	**Direction of inspection:**	STMH10 --> STMH10A
Direction of flow:	STMH10A --> STMH10	**Direction:**	Against flow

Pipe location

Road:	PONYTRAIL DR		UPSTREAM	DOWNSTREAM
Crossroad:			**Easting (X):**	**Easting (X):**
Drainage Area:			**Northing (Y):**	**Northing (Y):**
City:	TORONTO		**Elevation (Z):**	**Elevation (Z):**
Location:	Secondary roads			
Location details:			**GPS Accuracy:**	
Owner:	CITY OF TORONTO		**Corrdinate System:**	
Road segment:			**Vertical Datum:**	

Pipe characteristics

Pipe Use:	Stormwater Pipe	**Surveyed Length:**	147.6
Height:	2100	**Total length:**	147.6
Width:		**Joint length:**	
Shape:	Circular	**Rim/Inv.:**	0
Material:	Concrete Pipe (non-reinforced)	**Grade/Inv.:**	
Lining:		**Rim/Grade:**	
Coating Method:		**Rim/Inv.:**	4.4
Year Constructed:		**Grade/Inv.:**	
Year renewed:		**Rim/Grade:**	

Additional details

Inspection standard:	PACP 7.0	**Surveyed by:**	PT-AD
Inspection Status:	Complete Inspection	**Certificate Number:**	U-0321-704M0107
Date:	20/01/2022 10:13 AM	**Reviewed By:**	
Project:	9155-18-7147	**Reviewer Certificate:**	
Customer:	PLANVIEW	**Pre-Cleaning:**	No Pre-Cleaning
PO number:		**Date cleaned:**	
Work Order:		**Media Label:**	0
Purpose:		**Unit of measurement:**	Metric
Weather:	Dry	**Sheet Number:**	
Flow control:		**Additional information:**	
Used Technology:	CCTV		

Structural rating		O&M rating		Overall rating		Failure	
Peak:	0	**Peak:**	4	**Peak:**	4	**Consequence:**	
Quick rating:	0000	**Quick rating:**	4111	**Quick rating:**	4111	**Likelihood:**	4.1
Score:	0	**Score:**	5	**Score:**	5	**Risk:**	
Index:	0	**Index:**	2.5	**Index:**	2.5		

Other information

CLEANING REQUIRED (NONE/FLUSH/REAM/CUT):	NONE	**CONTRACTOR:**	PIPETEK INFRASTRUCTURE SERVICES
(BLANK HEADER/DRIVE THROUGH):		**Information 7:**	
(COMPLETE/SA DEBRIS/SA OBSTRUCTION ETC):	COMPLETE	**Information 8:**	
COMPLETE MH TO MH(YES/NO):	YES	**Information 9:**	
UNCHARTED IN LINE[YES - IF APPLICABLE]:		**Information 10:**	

9. Pipe summary and condition details

#1 0.00 m
AMH - Manhole, STMH10

#2 0.00 m
MWL - Miscellaneous Water Level, 5%

#3 1.70 m
MGO - Miscellaneous General Observation, COUNTER SET TO 1.7M FOR SLACK

#4 18.00 m
LL - Line Left, 35%

#5 51.60 m
TF - Tap Factory, at 2 o'clock, Dim.1=525

#6 65.90 m
TF - Tap Factory, at 9 o'clock, Dim.1=450

#7 145.30 m
ISB - Infiltration Stain Barrel, at 10 o'clock

#8 147.60 m
AMH - Manhole, STMH10A

9. Pipe summary and condition details

Pipe identification

Pipe:	31639	**Direction of inspection:**	STMH10 --> CULVERT3
Direction of flow:	STMH10 --> CULVERT3	**Direction:**	Direction of flow

Pipe location

Road:	PONYTRAIL DR	UPSTREAM		DOWNSTREAM
Crossroad:		**Easting (X):**		**Easting (X):**
Drainage Area:		**Northing (Y):**		**Northing (Y):**
City:	TORONTO	**Elevation (Z):**		**Elevation (Z):**
Location:	Secondary roads			
Location details:		**GPS Accuracy:**		
Owner:	CITY OF TORONTO	**Corrdinate System:**		
Road segment:		**Vertical Datum:**		

Pipe characteristics

Pipe Use:	Stormwater Pipe	**Surveyed Length:**	36.5
Height:	2700	**Total length:**	
Width:		**Joint length:**	
Shape:	Circular	**Rim/Inv.:**	4.4
Material:	Concrete Pipe (non-reinforced)	**Grade/Inv.:**	
Lining:		**Rim/Grade:**	
Coating Method:		**Rim/Inv.:**	0
Year Constructed:		**Grade/Inv.:**	
Year renewed:		**Rim/Grade:**	

Additional details

Inspection standard:	PACP 7.0	**Surveyed by:**	PT-AD
Inspection Status:	Complete Inspection	**Certificate Number:**	U-0321-704M0107
Date:	20/01/2022 11:38 AM	**Reviewed By:**	
Project:	9155-18-7147	**Reviewer Certificate:**	
Customer:	PLANVIEW	**Pre-Cleaning:**	No Pre-Cleaning
PO number:		**Date cleaned:**	
Work Order:		**Media Label:**	0
Purpose:		**Unit of measurement:**	Metric
Weather:	Dry	**Sheet Number:**	
Flow control:		**Additional information:**	
Used Technology:	CCTV		

Structural rating / O&M rating / Overall rating / Failure

Structural rating		O&M rating		Overall rating		Failure	
Peak:	0	**Peak:**	3	**Peak:**	3	**Consequence:**	
Quick rating:	0000	**Quick rating:**	3200	**Quick rating:**	3200	**Likelihood:**	3.2
Score:	0	**Score:**	6	**Score:**	6	**Risk:**	
Index:	0	**Index:**	3	**Index:**	3		

Other information

CLEANING REQUIRED (NONE/FLUSH/REAM/CUT):	NONE	**CONTRACTOR:**	PIPETEK INFRASTRUCTURE SERVICES
(BLANK HEADER/DRIVE THROUGH):		**Information 7:**	
(COMPLETE/SA DEBRIS/SA OBSTRUCTION ETC):	COMPLETE	**Information 8:**	
COMPLETE MH TO MH(YES/NO):	YES	**Information 9:**	
UNCHARTED IN LINE[YES - IF APPLICABLE]:		**Information 10:**	

9. Pipe summary and condition details

#1 0.00 m
AMH - Manhole, STMH10

#2 0.00 m
MWL - Miscellaneous Water Level, 5%

#3 1.70 m
MGO - Miscellaneous General Observation, COUNTER SET TO 1.7M FOR SLACK

#4 9.60 m
TF - Tap Factory, at 1 o'clock, Dim.1=250

#5 18.60 m
MWL - Miscellaneous Water Level, 10%

#6 36.10 m
OBR - Obstruction Rocks, from 4 o'clock to 8 o'clock, 15%

#7 36.50 m
OBZ - Obstruction Other, from 5 o'clock to 7 o'clock, 15%, MANHOLE LID

#8 36.50 m
MSA - Miscellaneous Survey Abandoned, SA - OBZ

9. Pipe summary and condition details

Pipe identification

Pipe:	31639	**Direction of inspection:**	CULVERT3 --> STMH10
Direction of flow:	STMH10 --> CULVERT3	**Direction:**	Against flow

Pipe location

Road:	PONYTRAIL DR	UPSTREAM		DOWNSTREAM
Crossroad:		**Easting (X):**		**Easting (X):**
Drainage Area:		**Northing (Y):**		**Northing (Y):**
City:	TORONTO	**Elevation (Z):**		**Elevation (Z):**
Location:	Creek			
Location details:		**GPS Accuracy:**		
Owner:	CITY OF TORONTO	**Corrdinate System:**		
Road segment:		**Vertical Datum:**		

Pipe characteristics

Pipe Use:	Stormwater Pipe	**Surveyed Length:**	
Height:	2700	**Total length:**	
Width:		**Joint length:**	
Shape:	Circular	**Rim/Inv.:**	4.4
Material:	Concrete Pipe (non-reinforced)	**Grade/Inv.:**	
Lining:		**Rim/Grade:**	
Coating Method:		**Rim/Inv.:**	0
Year Constructed:		**Grade/Inv.:**	
Year renewed:		**Rim/Grade:**	

Additional details

Inspection standard:	PACP 7.0	**Surveyed by:**	PT-AD
Inspection Status:	No Access	**Certificate Number:**	U-0321-704M0107
Date:	20/01/2022 1:27 PM	**Reviewed By:**	
Project:	9155-18-7147	**Reviewer Certificate:**	
Customer:	PLANVIEW	**Pre-Cleaning:**	No Pre-Cleaning
PO number:		**Date cleaned:**	
Work Order:		**Media Label:**	0
Purpose:		**Unit of measurement:**	Metric
Weather:		**Sheet Number:**	
Flow control:		**Additional information:**	NO ACCESS TO GATED CULVERT IN CREEK
Used Technology:			

Structural rating		O&M rating		Overall rating		Failure
Peak:	Incomplete Inspection	**Peak:**	Incomplete Inspection	**Peak:**	Incomplete Inspection	**Consequence:**
Quick rating:		**Quick rating:**		**Quick rating:**		**Likelihood:**
Score:		**Score:**		**Score:**		**Risk:**
Index:		**Index:**		**Index:**		

Other information

CLEANING REQUIRED (NONE/FLUSH/REAM/CUT):		**CONTRACTOR:**	PIPETEK INFRASTRUCTURE SERVICES
(BLANK HEADER/DRIVE THROUGH):	BLANK HEADER	**Information 7:**	
(COMPLETE/SA DEBRIS/SA OBSTRUCTION ETC):		**Information 8:**	
COMPLETE MH TO MH(YES/NO):		**Information 9:**	
UNCHARTED IN LINE[YES - IF APPLICABLE]:		**Information 10:**	

9. Pipe summary and condition details

#1

3 Statement of Limitations

1. This Report contains Information, including but not limited to, drawings, field observations and data that represent professional judgement. The information may be based upon facts that have been provided to Planview by third party organizations. The Information has not been independently verified.

2. The report was prepared for specific purposes as outlined in the scope of work in section 1.2 and must be read as a whole.

3. Planview accepts no responsibility for any municipal infrastructure and utility activity that may have occurred since the date this report was issued.

4. This report is to be treated as confidential and should not be shared with any third party without the consent of Planview. Planview denies any liability whatsoever, for any damage(s) resulting from any third party using the Information in this report.

4 Conclusion

Findings of CCTV inspection for storm sewer lines on Ponytrail Drive and Rockwood Road has been summarized within this document. Summary of inspection results showing the conditions of sewer pipers are listed in the report.

Badger Daylighting
6629 Orr Dr
London, ON N6L-1P1
Phone: 519-472-6181

Project Summary

Rathburn Rd E & Ponytail Dr

Main ID	Date	Address	Start MH	Finish MH	Pipe	Asset length	Surveyed Length
9979	12/22/2020	ROCKWOOD RD	STMH1	STMH2	RCP	73.8	73.8
10038	12/22/2020	RATHBURN RD E	STMH4	STMH5	RCP	20.8	20.8
9870	12/22/2020	RATHBURN RD E	STMH9	STMH8	RCP	90.6	90.6
9825	12/22/2020	RATHBURN RD E	STMH7	STMH6	RCP	51.2	51.2

Number of inspections: 4

Subtotal	**236.4 m**	**236.4 m**
Total	**236.4 m**	**236.4 m**

Badger Daylighting
6629 Orr Dr
London, ON N6L-1P1
Phone: 519-472-6181

PACP Sewer Report

Surveyed by: BADGER-RC
Certificate No: U-0219-70303768
Owner:
Survey Customer: WSP
Drainage area:
Sheet number: 1

Work order:
Pipeline segment ref: 9979
Start date/time: 2020/12/22 08:29
Street: ROCKWOOD RD
City: MISSISSAUGA

Location details:
Upstream manhole No: STMH1
Rim to invert:
Grade to invert:
Rim to grade:

Downstream manhole No: STMH2
Rim to invert:
Grade to invert:
Rim to grade:
Sewer use: SW
Direction: D
Flow control:
Height: 675

Width:
Shape: C
Material: RCP
Ln. method:
Pipe joint length:
Total length: 73.8
Length surveyed: 73.8
Year laid:
Year renewed:
Media label: 9979

Purpose: A
Sewer category:
Pre-cleaning: N
Date cleaned:
Weather: 1
Location code: C
Additional info:

Starting access point:
Easting:
Northing:
Elevation:
Coordinate system:
GPS accuracy:

Distance (Feet) (Meters)	Video Ref.	Group/ Descriptor	Modifier/ Continuous Defect Severity	S/M/L	Value Inches (mm) 1st	Value Inches (mm) 2nd	%	Joint	Circumferential Location At/From	Circumferential Location to	Image Ref.	Remarks
0.0	0	AMH										STMH1
0.0	0	MWL					5					
1.0	47	MGO										CABLE CALIBRATION SET TO 1M
8.5	126	CL							12			
17.6	199	CL							12			
18.6	235	TB			200				2			SRV AROUND TB
33.3	356	CC							3	5		
43.7	477	TB			200				2			SRV AROUND TB
44.6	509	CC							7	8		

Badger Daylighting
6629 Orr Dr
London, ON N6L-1P1
Phone: 519-472-6181
Fax: 407-425-1569

Surveyed by:	Owner:	Start date/time:	Upstream manhole No:	Pipeline segment ref:	Sheet number:
BADGER-RC		2020/12/22	STMH1	9979	1

Distance (Feet) (Meters)	Video Ref.	Group/ Descriptor	Modifier/ Severity	Continuous Defect	S/M/L	Value Inches (mm) 1st	2nd	%	Joint	Circumferential Location At/From	to	Image Ref.	Remarks
50.7	592	TB				300				10			SRV AROUND TAP
57.7	705	TB				300				2			SRV AROUND TAP, CRACKS INSIDE TAP
71.8	828	TFA				675				6			@DROP STRUCTURE
73.8	875	AMH											STMH2

Badger Daylighting
6629 Orr Dr
London, ON N6L-1P1
Phone: 519-472-6181

PACP Sewer Report

Surveyed by:	Certificate No:	Owner:	Survey Customer:	Drainage area:	Sheet number:
BADGER-RC	U-0219-70303768		WSP		2

Work order:	Pipeline segment ref:	Start date/time:		Street:	City:
	10038	2020/12/22	09:50	RATHBURN RD E	MISSISSAUGA

Location details:	Upstream manhole No:	Rim to invert:	Grade to invert:	Rim to grade:
	STMH5			

Downstream manhole No:	Rim to invert:	Grade to invert:	Rim to grade:	Sewer use:	Direction:	Flow control:	Height:
STMH4				SW	U		450

Width:	Shape:	Material:	Ln. method:	Pipe joint length:	Total length:	Length surveyed:	Year laid:	Year renewed:	Media label:
	C	RCP			20.8	20.8			10038

Purpose:	Sewer category:	Pre-cleaning	Date cleaned:	Weather:	Location code:	Additional info:
A		N		1	C	

Starting access point:	Easting:	Northing:	Elevation:	Coordinate system:	GPS accuracy:

Distance (Feet) (Meters)	Video Ref.	Group/ Descriptor	Modifier/ Severity	Continuous Defect S/M/L	Value Inches (mm) 1st	Value Inches (mm) 2nd	%	Joint	Circumferential Location At/From	Circumferential Location to	Image Ref.	Remarks
0.0	0	AMH										STMH4
0.0	0	MWL					10					
0.0	15	MGO										UNABLE TO PAN DUE TO LIP IN MH
1.0	33	MGO										CABLE CALIIBRATION SET TO 1M
1.0	49	CC							7	5		
1.9	139	DSC					15		5	7		
2.1	163	CL	S01						12			
2.9	184	MWL					10					
4.3	210	DSC					15		5	7		

Badger Daylighting
6629 Orr Dr
London, ON N6L-1P1
Phone: 519-472-6181
Fax: 407-425-1569

Surveyed by:	Owner:	Start date/time:	Upstream manhole No:	Pipeline segment ref:	Sheet number:
BADGER-RC		2020/12/22	STMH5	10038	2

Distance (Feet) (Meters)	Video Ref.	Group/ Descriptor	Modifier/ Severity	Continuous Defect	S/M/L	Value Inches (mm) 1st	2nd	%	Joint	Circumferential Location At/From	to	Image Ref.	Remarks
6.1	245	DSC						15		5	7		
7.0	263	CL								8			
8.4	302	DSC		S02				10		6			
8.4	318	MWL						5					
20.8	426	CL		F01						12			
20.8	426	DSC		F02				10		6			
20.8	426	AMH											STMH5

Badger Daylighting
6629 Orr Dr
London, ON N6L-1P1
Phone: 519-472-6181

PACP Sewer Report

Surveyed by: BADGER-RC
Certificate No: U-0219-70303768
Owner:
Survey Customer: WSP
Drainage area:
Sheet number: 3

Work order:
Pipeline segment ref: 9870
Start date/time: 2020/12/22 10:34
Street: RATHBURN RD E
City: MISSISSAUGA

Location details:
Upstream manhole No: STMH9
Rim to invert:
Grade to invert:
Rim to grade:

Downstream manhole No: STMH8
Rim to invert:
Grade to invert:
Rim to grade:
Sewer use: SW
Direction: D
Flow control:
Height: 525

Width:
Shape: C
Material: RCP
Ln. method:
Pipe joint length:
Total length: 90.6
Length surveyed: 90.6
Year laid:
Year renewed:
Media label: 9870

Purpose: A
Sewer category:
Pre-cleaning: N
Date cleaned:
Weather: 1
Location code: C
Additional info:

Starting access point:
Easting:
Northing:
Elevation:
Coordinate system:
GPS accuracy:

Distance (Feet) (Meters)	Video Ref.	Group/ Descriptor	Modifier/ Continuous Defect Severity	S/M/L	Value Inches (mm) 1st	Value Inches (mm) 2nd	%	Joint	Circumferential Location At/From	Circumferential Location to	Image Ref.	Remarks
0.0	0	AMH										STMH9
0.0	0	MWL					5					
1.0	53	MGO										CABLE CALIBRATION SET TO 1M
1.7	80	TB			250				2			
4.5	132	OBZ					5		6			METAL BAR
5.7	184	OBZ					5		6			METAL BAR
13.3	294	OBZ					5		5	6		LEAVES
22.1	409	OBZ					5		6			METAL BAR
30.0	476	DSG V					10		6			

Badger Daylighting
6629 Orr Dr
London, ON N6L-1P1
Phone: 519-472-6181
Fax: 407-425-1569

Surveyed by:	Owner:	Start date/time:	Upstream manhole No:	Pipeline segment ref:	Sheet number:
BADGER-RC		2020/12/22	STMH9	9870	3

Distance (Feet) (Meters)	Video Ref.	Group/ Descriptor	Modifier/ Severity	Continuous Defect	S/M/L	Value Inches (mm) 1st	2nd	%	Joint	Circumferential Location At/From	to	Image Ref.	Remarks
37.7	599	OBR						15		6			
61.4	809	DSG V		S01				5		6			
68.7	885	CC								11	12		
78.3	1012	DSG V		F01				5		6			
78.8	1031	DSC						10		7			
82.7	1093	DSC		S02				15		7			
86.3	1133	DSC		F02				15		7			
86.3	1148	DSC						10		5	6		
89.4	1185	DSC						10	J	8			
89.5	1233	FC								9	5		
90.6	1284	AMH											STMH8

Badger Daylighting
6629 Orr Dr
London, ON N6L-1P1
Phone: 519-472-6181

PACP Sewer Report

Surveyed by:	Certificate No:	Owner:	Survey Customer:	Drainage area:	Sheet number:
BADGER-RC	U-0219-70303768		WSP		4

Work order:	Pipeline segment ref:	Start date/time:		Street:	City:
	9825	2020/12/22	11:38	RATHBURN RD E	MISSISSAUGA

Location details:	Upstream manhole No:	Rim to invert:	Grade to invert:	Rim to grade:
	STMH7			

Downstream manhole No:	Rim to invert:	Grade to invert:	Rim to grade:	Sewer use:	Direction:	Flow control:	Height:
STMH6				SW	D		450

Width:	Shape:	Material:	Ln. method:	Pipe joint length:	Total length:	Length surveyed:	Year laid:	Year renewed:	Media label:
	C	RCP			51.2	51.2			9825

Purpose:	Sewer category:	Pre-cleaning	Date cleaned:	Weather:	Location code:	Additional info:
A		N		1	C	

Starting access point:	Easting:	Northing:	Elevation:	Coordinate system:	GPS accuracy:

Distance (Feet) (Meters)	Video Ref.	Group/ Descriptor	Modifier/ Severity	Continuous Defect S/M/L	Value Inches (mm) 1st	2nd	%	Joint	Circumferential Location At/From	to	Image Ref.	Remarks
0.0	0	AMH										STMH7
0.0	0	MWL					5					
0.0	46	CL							12			
1.0	62	MGO										CABLE CALIBRATION SET TO 1M
2.5	95	CL							12			
2.8	117	CC							7	8		
3.7	147	CL	S01						12			
7.7	194	CC							12	1		
7.7	215	SSS							12	1		

Badger Daylighting
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London, ON N6L-1P1
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Fax: 407-425-1569

Surveyed by:	Owner:	Start date/time:	Upstream manhole No:	Pipeline segment ref:	Sheet number:
BADGER-RC		2020/12/22	STMH7	9825	4

Distance (Feet) (Meters)	Video Ref.	Group/ Descriptor	Modifier/ Severity	Continuous Defect	S/M/L	Value Inches (mm) 1st	2nd	%	Joint	Circumferential Location At/From	to	Image Ref.	Remarks
26.0	394	SSS								12			
26.0	433	CC								11	1		
27.4	498	CC								9	11		
28.1	548	SSS								9	12		
28.6	622	TBI				250	5			10			SRV AROUND TAP, CRACK IN TAP
28.7	663	CC								9	12		
29.0	704	SSS								9	12		
29.3	747	TB				250				2			SRV AROUND TAP
30.0	772	SSS								12			
41.0	887	CC								10	2		
41.1	917	SSS								12			
41.9	950	CC								3	5		
42.5	972	CC								3	5		
42.7	1002	CC								9	11		
43.3	1046	CC								8	10		
43.6	1073	CC								9	11		
46.2	1130	SSS								9	5		
46.2	1147	CL								10			

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Surveyed by:	Owner:	Start date/time:	Upstream manhole No:	Pipeline segment ref:	Sheet number:
BADGER-RC		2020/12/22	STMH7	9825	4

Distance (Feet) (Meters)	Video Ref.	Group/ Descriptor	Modifier/ Severity	Continuous Defect	S/M/L	Value Inches (mm) 1st	2nd	%	Joint	Circumferential Location At/From	to	Image Ref.	Remarks
46.9	1180	DAE						5		12	5		
47.4	1203	DAE						5		10	5		
49.4	1419	OBC						10		6	12		STEEL ROD STUCK IN MIDDLE OF PIPE
49.4	1478	TFA				450				6			DROP STRUCTURE STEEL ROD STUCK IN IT.
51.2	1504	CL		F01						12			
51.2	1504	AMH											STMH6


HICKORY
DRIVE
POLTAVA
BACCHUS CRES.
HARTFIELD GROVE
LOVELADY
WARREN
DRIVE
ROAD
CORKSTONE
GLADE
DRIVE
ROWNTREE
CT.
CLAYPINE
RISE
BEECHES
SCADDEN
OWLSNEST
LANE
BEECHNOLL
AVE.
GARNETWOOD
MARBLETHORNE
COURT
CHASE
EAST
9870
CREEK
GRAZIA
CT.
ANWORLD
PLACE
ANWORLD
COURT
9975
FIELDGATE
CAPILANO
COURT
BLVD.
ROAD
9825
RATHBURN
OAK
ROAD
EAST
10038
RATHBURN
9979
CT.
OTTEWELL
BRYCE
CT.
COLFAX
ROCKWOOD
SHALE
SHALE OAK
MEWS
BOOTH
BEECHES
CRES.
ROAD
MAPLE
DRIVE
BRANCHWOOD
PARK
RIDGE
PONYTRAIL
UNICORN
CT.
TAPESTRY
TRAIL
GARNETWOOD
TRAIL
GARROWHILL
WAY
31637
31639
2028949
DRIVE
RIVER
CHASE
DIXIE
LANDING
CT.
KINGS
DEWBERRY
CRES.
LEWES
WAY
FIELDGATE
SALTDENE
TERRACE
MAHOGANY
ROW
DR.
9854
9852
MILL
LOOKOUT
COURT
ETOBICOKE
RUTLEY
CIRCLE
PICKMERE CT.
BURNHAMTHORPE
ROAD
EAST
GULLEDEN
DR.
GLEN
CHIPLOW RD.
DENBURN
PLACE
CIRCLE
PAGEHURST AVE.
PAGEHURST
CT.
DR.
DR.
PAGEHURST
AVE.
STONE PATH
CRES.
ROAD
CITY OF TORONTO
SCALE 1:2500
LEGEND
STORM SEWER WITH NO INSPECTION RECORDS
STORM SEWER WITH INSPECTION RECORDS
STORM SEWER OUT OF STUDY AREA

	Segment ID	Size (mm)	Segment Length (m)	Material
Rockwood Road				
	9975	525	64	Concrete
	9979	675	75	Concrete
Rathburn Road E				
	10038	450	24	Concrete
	9825	450	52	Concrete
	9870	525	92	Concrete
Ponytrail Drive				
	31637	2100	152	Concrete
	31639	2700	161	Concrete
	2028949	1800	55	Corrugated Metal
	9852	375	95	Concrete
	9854	675	53	Concrete

`

PLANVIEW
Utility Services Ltd.

Sewer CCTV Inspection Report

Prepared for:

CCTV Inspection

Ponytrail Drive and Rockwood Road

Mississauga, Ontario

PLANVIEW PROJECT# 21-3-0196

February 2, 2022

Contents

1 Project Details

1.1 Executive Summary

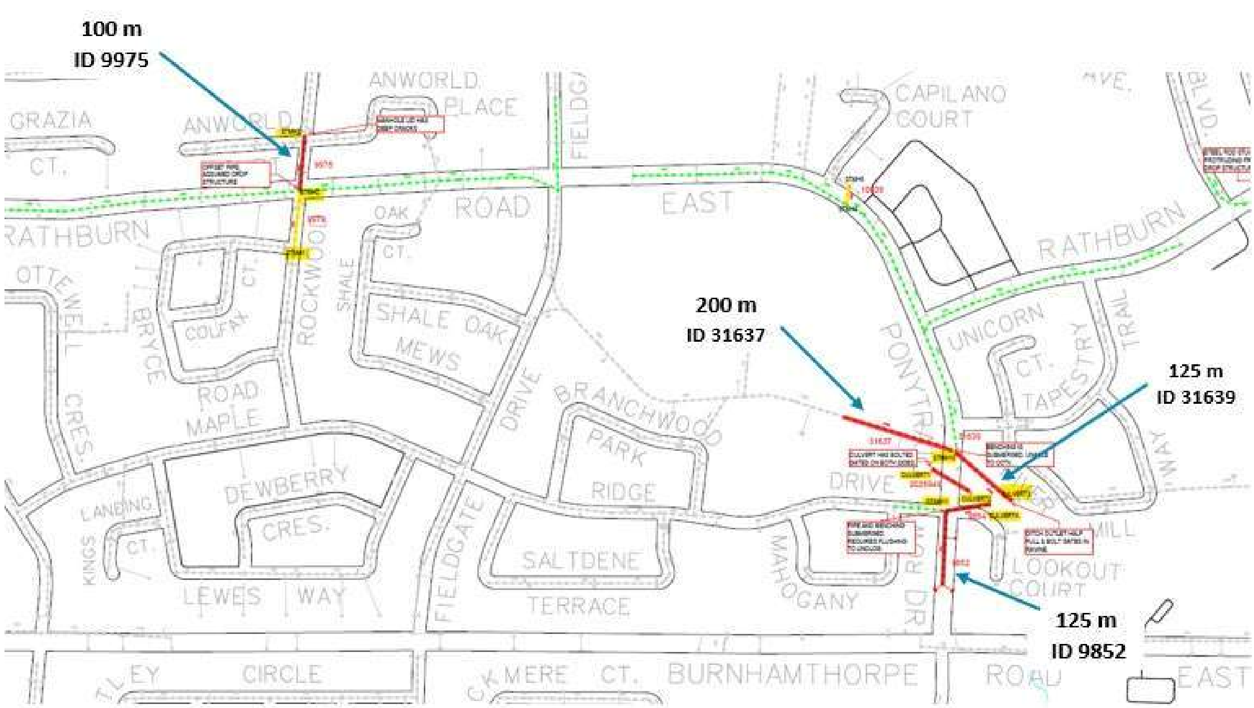
Planview Utility Services (Planview) was retained by WSP to provide a CCTV inspection in on Ponytrail Drive and Rockwood Road in the City of Mississauga.

The objective of the CCTV investigation was to determine horizontal alignments and conditions of identifiable storm sewer within the project scope area.

Planview retained **Pipetek Infrastructure Services** for the purpose of CCTV inspection. The investigation involved inspection of sewer pipes and evaluating their conditions.

1.2 Scope of Work

CCTV inspection was for the circular, 375mm, 525mm, 2100mm and 2700m concrete storm sewers on Ponytrail Drive and Rockwood Road illustrated below:



The CCTV inspection was completed on January 20th, 2022.

1.3 CCTV Methodology and Applied Technology

Closed Circuit Television (CCTV) is a technology used to investigate sewer mains and building service laterals. The CCTV unit has a transmitter that sends images and data back to a monitor so the inspector can identify the condition of the utility / drain lines. The camera transmitter head has a built-in locating sonde to enable above ground tracing for line and depth when required. The condition information is recorded and later used to generate a report based on the findings produced.

For lateral inspection, the focus is to check for blockages or cross boring. The inspection can be performed without intrusion via entering the sewer from the mainline, advancing up the mainline, and then launching the camera head up into the lateral. This process and the equipment used allows for superior efficiency and quality.
Since CCTV cameras are non-invasive, they are highly cost-effective. They can even be used for preventive maintenance so that minor issues can be identified before they turn into major problems.

Prior to CCTV inspection process, flushing of the pipes is accomplished. Flushing task includes pushing high pressure/volume water into the pipe's upstream end and then vacuuming debris from pipe's downstream end into a flusher unit and disposing the material at a MOE approved disposal facility.

The defects found in the pipe have a specific code used to identify them. Each defect is assigned a number score denoting the severity of the defect. Levels 1-5 with level 5 defects being the worst. As we inspect and code the defects, the inspection program creates a survey for each pipe segment. The program then compiles all the codes with scores and produces an overall Pipe Score for that segment of sewer. The program uses a simplified 4-digit Quick rating system to assign a Risk Score to the segment.

Common issues occurred during the CCTV inspection and Flushing are as following:

a) Excess levels of debris causing blockage of CCTV equipment. More cleaning may be required to clear the pipe to drive our camera tractor through. The presence of Hardened debris, roots or calcium deposits (calcite) may require mechanical sewer cleaning to remove.
b) High water level/surcharges may make it impossible for our camera equipment to identify defects in the pipe segment.

c) Dense steam or fog reduces visibility.
d) Construction Type/ Lay out of the Manholes and Sewer Pipe Segments may make it difficult or impossible to drive the wheeled camera tractor through the pipe or even position it in the MH Chambers.

Our CCTV inspection process is certified by NASSCO (National Association of Sewer Service Companies) and PACP (Pipeline Assessment Certification Program).

With the combination of experienced PACP-trained operators following PACP procedures and high-quality sewer inspection equipment used, precise CCTV inspection results are achieved.

1.4 Clarification Notes

- Following items were observed in certain pipes:
    - Obstruction rocks,
    - Obstruction Manhole lid,
    - Infiltration dripper,
    - Multiple cracks.

Consequently, full length inspection of some of the pipes was not feasible.

Please refer to relevant pages of multisection report in section 2.1 for the exact locations.

2 CCTV Inspection Results and findings

Detailed results of CCTV inspection are presented as following:

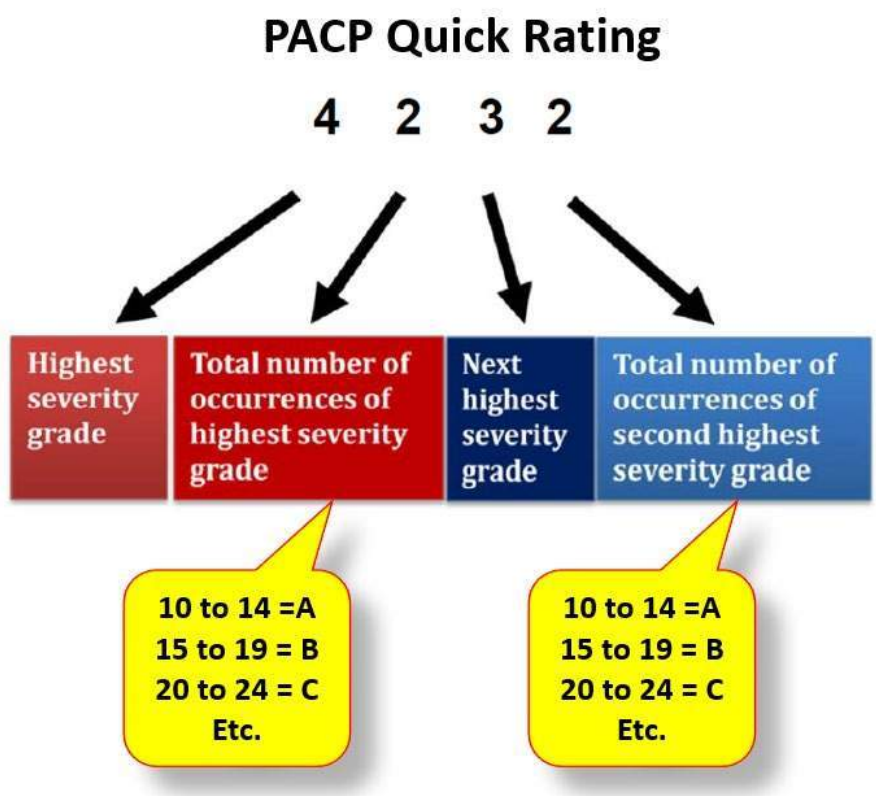
2.1 Inspection Summary and Multi-Section Report

This section includes generated reports from the CCTV investigation for the pipes shown in page 3 of multi-section report.

The directions mentioned in the pipe index table (3rd page), refer to direction of CCTV camera travel.

Following items are worth attention, prior to review of Mulit-section report:

1. PACP quick rating system of the pipe condition is shown below:



2. The pipe's likelihood of failure (LoF) shown in the pipe graphic report is calculated as following:

   - No condition assessment data is available: Lof = 0*

     Condition assessment data is available and there are no defects: Lof = 1

   - There are no more than 9 occurrences of the highest condition grade:
     Lof = The first two digits of quick rating /10, i.e., 42/10=4.2

   - The second character is a letter (indicating more than 9 occurrences)
     Lof = (The first two digits of quick rating /10) + 1, i.e., (42/10)+1=5.2

*: A LoF of zero does not indicate that there is no likelihood of failure. Instead, any rating of zero is meant to be a flag indicating that data is missing or could not be collected.

A sample page showing the discussed ratings is as following:

Structural rating		O&M rating		Overall rating		Failure	
Peak:	0	Peak:	2	Peak:	2	Consequence:	
Quick rating:	0000	Quick rating:	2700	Quick rating:	2700	Likelihood:	2.7
Score:	0	Score:	14	Score:	14	Risk:	
Index:	0	Index:	2	Index:	2		

CCTV inspection report

CITY OF MISSISSAUGA

PLANVIEW

9155-18-7147

PONYTRAIL DR, ROCKWOOD RD

20/01/2022

Table of contents

Page

1. Index of pipes, sorted by pipe

5 items

Pipe	Start/End	Inspection direction	Road	Inspection Status	Page
9852	STMH11A --> STMH11	Direction of flow	PONYTRAIL DR	Complete Inspection	11
9975	STMH3 --> STMH2	Direction of flow	ROCKWOOD RD	Complete Inspection	14
31637	STMH10 --> STMH10A	Against flow	PONYTRAIL DR	Complete Inspection	16
31639	STMH10 --> CULVERT3	Direction of flow	PONYTRAIL DR	Complete Inspection	18
31639	CULVERT3 --> STMH10	Against flow	PONYTRAIL DR	No Access	20

2. Index of pipes, sorted by manhole

5 items

Start/End	Inspection direction	Pipe	Road	Inspection Status	Page
CULVERT3 --> STMH10	Against flow	31639	PONYTRAIL DR	No Access	20
STMH3 --> STMH2	Direction of flow	9975	ROCKWOOD RD	Complete Inspection	14
STMH10 --> CULVERT3	Direction of flow	31639	PONYTRAIL DR	Complete Inspection	18
STMH10 --> STMH10A	Against flow	31637	PONYTRAIL DR	Complete Inspection	16
STMH11A --> STMH11	Direction of flow	9852	PONYTRAIL DR	Complete Inspection	11

3. Index of pipes, sorted by road

5 items

Road	Pipe	Start/End	Inspection direction	Inspection Status	Page
PONYTRAIL DR	9852	STMH11A --> STMH11	Direction of flow	Complete Inspection	11
PONYTRAIL DR	31637	STMH10 --> STMH10A	Against flow	Complete Inspection	16
PONYTRAIL DR	31639	STMH10 --> CULVERT3	Direction of flow	Complete Inspection	18
PONYTRAIL DR	31639	CULVERT3 --> STMH10	Against flow	No Access	20
ROCKWOOD RD	9975	STMH3 --> STMH2	Direction of flow	Complete Inspection	14

4. Structural rating

5 items

3 - Moderate defect grade (1 of 5 items)

Score	Quick	Index	Pipe	Start/End	Direction	Road	Page
75	312F	2	9852	STMH11A --> STMH11	Direction of flow	PONYTRAIL DR	11

2 - Minor to Moderate (1 of 5 items)

Score	Quick	Index	Pipe	Start/End	Direction	Road	Page
4	2200	2	9975	STMH3 --> STMH2	Direction of flow	ROCKWOOD RD	14

0 - No Defects (2 of 5 items)

Score	Quick	Index	Pipe	Start/End	Direction	Road	Page
0	0000	0	31637	STMH10 --> STMH10A	Against flow	PONYTRAIL DR	16
0	0000	0	31639	STMH10 --> CULVERT3	Direction of flow	PONYTRAIL DR	18

Incomplete Inspection (1 of 5 items)

Score	Quick	Index	Pipe	Start/End	Direction	Road	Page
			31639	CULVERT3 --> STMH10	Against flow	PONYTRAIL DR	20

5. O&M rating

5 items

4 - Significant (2 of 5 items)

Score	Quick	Index	Structural	Pipe	Start/End	Direction	Road	Page
10	4123	2.5	2	9975	STMH3 --> STMH2	Direction of flow	ROCKWOOD RD	14
5	4111	2.5	0	31637	STMH10 --> STMH10A	Against flow	PONYTRAIL DR	16

3 - Moderate defect grade (2 of 5 items)

Score	Quick	Index	Structural	Pipe	Start/End	Direction	Road	Page
13	3125	2.2	3	9852	STMH11A --> STMH11	Direction of flow	PONYTRAIL DR	11
6	3200	3	0	31639	STMH10 --> CULVERT3	Direction of flow	PONYTRAIL DR	18

Incomplete Inspection (1 of 5 items)

Score	Quick	Index	Structural	Pipe	Start/End	Direction	Road	Page
			Incomplete Inspection	31639	CULVERT3 --> STMH10	Against flow	PONYTRAIL DR	20

6. List of important structural observations

7. List of important observations of operation and maintenance

2 items

IRC - Infiltration Runner Connection (1 of 2 items)

Pipe	Start/End	Direction	Road	Distance	Cont.Def.	Page
9975	STMH3 --> STMH2	Direction of flow	ROCKWOOD RD	41.3		14

LL - Line Left (1 of 2 items)

Pipe	Start/End	Direction	Road	Distance	Cont.Def.	Page
31637	STMH10 --> STMH10A	Against flow	PONYTRAIL DR	18		16

8. Comments

1 item

Pipe	Start/End	Inspection direction	Comments	Page
31639	CULVERT3 --> STMH10	Against flow	NO ACCESS TO GATED CULVERT IN CREEK	20

9. Pipe summary and condition details

Pipe identification

Pipe:	9852	**Direction of inspection:**	STMH11A --> STMH11
Direction of flow:	STMH11A --> STMH11	**Direction:**	Direction of flow

Pipe location

Road:	PONYTRAIL DR	UPSTREAM	DOWNSTREAM
Crossroad:		**Easting (X):**	**Easting (X):**
Drainage Area:		**Northing (Y):**	**Northing (Y):**
City:	CITY OF MISSISSAUGA	**Elevation (Z):**	**Elevation (Z):**
Location:	Secondary roads		
Location details:		**GPS Accuracy:**	
Owner:	CITY OF MISSISSAUGA	**Corrdinate System:**	
Road segment:		**Vertical Datum:**	

Pipe characteristics

Pipe Use:	Stormwater Pipe	**Surveyed Length:**	92.6
Height:	375	**Total length:**	92.6
Width:		**Joint length:**	
Shape:	Circular	**Rim/Inv.:**	1.7
Material:	Concrete Pipe (non-reinforced)	**Grade/Inv.:**	
Lining:		**Rim/Grade:**	
Coating Method:		**Rim/Inv.:**	0
Year Constructed:		**Grade/Inv.:**	
Year renewed:		**Rim/Grade:**	

Additional details

Inspection standard:	PACP 7.0	**Surveyed by:**	PT-AD
Inspection Status:	Complete Inspection	**Certificate Number:**	U-0321-704M0107
Date:	20/01/2022 8:39 AM	**Reviewed By:**	
Project:	9155-18-7147	**Reviewer Certificate:**	
Customer:	PLANVIEW	**Pre-Cleaning:**	No Pre-Cleaning
PO number:		**Date cleaned:**	
Work Order:		**Media Label:**	0
Purpose:		**Unit of measurement:**	Metric
Weather:	Dry	**Sheet Number:**	
Flow control:		**Additional information:**	
Used Technology:			

Structural rating		O&M rating		Overall rating		Failure	
Peak:	3	**Peak:**	3	**Peak:**	3	**Consequence:**	
Quick rating:	312F	**Quick rating:**	3125	**Quick rating:**	322G	**Likelihood:**	3.2
Score:	75	**Score:**	13	**Score:**	88	**Risk:**	
Index:	2	**Index:**	2.2	**Index:**	2		

Other information

CLEANING REQUIRED (NONE/FLUSH/REAM/CUT):	NONE	**CONTRACTOR:**	PIPETEK INFRASTRUCTURE SERVICES
(BLANK HEADER/DRIVE THROUGH):		**Information 7:**	
(COMPLETE/SA DEBRIS/SA OBSTRUCTION ETC):	COMPLETE	**Information 8:**	
COMPLETE MH TO MH(YES/NO):	YES	**Information 9:**	
UNCHARTED IN LINE[YES - IF APPLICABLE]:		**Information 10:**	

9. Pipe summary and condition details

#1 0.00 m
AMH - Manhole, STMH11A

#2 0.00 m
MWL - Miscellaneous Water Level, 5%

#3 1.20 m
MGO - Miscellaneous General Observation, COUNTER SET TO 1.2M FOR SLACK

#4 5.90 m
CM - Crack Multiple, from 12 o'clock to 1 o'clock

#5 6.30 m
CL - Crack Longitudinal, at 1 o'clock

#6 7.50 m
CL - Crack Longitudinal, at 11 o'clock

#7 11.70 m
CL - Crack Longitudinal, at 11 o'clock

#8 13.80 m
(S01) CL - Crack Longitudinal, at 12 o'clock

#9 15.10 m
(F01) CL - Crack Longitudinal, at 12 o'clock

#10 19.00 m
CL - Crack Longitudinal, at 12 o'clock

#11 23.00 m
CL - Crack Longitudinal, at 1 o'clock

#12 24.40 m
(S02) CL - Crack Longitudinal, at 1 o'clock

#13 26.20 m
(S03) DSC - Deposits Settled Hard/Compacted, from 5 o'clock to 6 o'clock, 10%

#14 27.30 m
(F02) CL - Crack Longitudinal, at 1 o'clock

#15 27.90 m
(F03) DSC - Deposits Settled Hard/Compacted, from 5 o'clock to 6 o'clock, 10%

#16 29.10 m
(S04) CL - Crack Longitudinal, at 12 o'clock

#17 31.00 m
(F04) CL - Crack Longitudinal, at 12 o'clock

#18 37.90 m
CL - Crack Longitudinal, at 1 o'clock

#19 39.60 m
CL - Crack Longitudinal, at 1 o'clock

#20 39.90 m
CS - Crack Spiral, from 10 o'clock to 11 o'clock

#21 41.70 m
CL - Crack Longitudinal, at 7 o'clock

#22 43.10 m
CL - Crack Longitudinal, at 4 o'clock

#23 43.10 m
CL - Crack Longitudinal, at 11 o'clock

#24 43.70 m
DSC - Deposits Settled Hard/Compacted, at 4 o'clock, 10%

#25 44.50 m
DSC - Deposits Settled Hard/Compacted, at 5 o'clock, 5%

#26 47.20 m
CL - Crack Longitudinal, at 1 o'clock

#27 47.70 m
MWL - Miscellaneous Water Level, 10%

#28 51.60 m
(S05) CL - Crack Longitudinal, at 12 o'clock

#29 52.50 m
MWL - Miscellaneous Water Level, 15%

#30 56.10 m
MWL - Miscellaneous Water Level, 25%

#31 58.50 m
TF - Tap Factory, at 2 o'clock, Dim.1=250

#32 61.70 m
MWL - Miscellaneous Water Level, 30%

#33 61.90 m
CL - Crack Longitudinal, at 10 o'clock

#34 62.90 m
(F05) CL - Crack Longitudinal, at 12 o'clock

9. Pipe summary and condition details

#35 64.80 m
(S06) CL - Crack Longitudinal, at 12 o'clock

#36 70.90 m
(F06) CL - Crack Longitudinal, at 12 o'clock

#37 73.00 m
MWL - Miscellaneous Water Level, 20%

#38 74.70 m
(S07) CL - Crack Longitudinal, at 12 o'clock

#39 76.20 m
DAE - Deposits Attached Encrustation, from 1 o'clock to 2 o'clock, 5%

#40 77.70 m
CL - Crack Longitudinal, at 10 o'clock

#41 79.10 m
MWL - Miscellaneous Water Level, 30%

#42 81.00 m
MWL - Miscellaneous Water Level, 40%

#43 83.60 m
(S08) DAE - Deposits Attached Encrustation, from 11 o'clock to 12 o'clock, 10%

#44 83.60 m
(F07) CL - Crack Longitudinal, at 12 o'clock

#45 84.90 m
MWL - Miscellaneous Water Level, 50%

#46 85.20 m
ID - Infiltration Dripper, at 11 o'clock

#47 85.50 m
(F08) DAE - Deposits Attached Encrustation, from 11 o'clock to 12 o'clock, 10%

#48 88.50 m
MWL - Miscellaneous Water Level, 60%

#49 92.00 m
MWL - Miscellaneous Water Level, 70%

#50 92.60 m
AMH - Manhole, STMH11

9. Pipe summary and condition details

Pipe identification

Pipe:	9975	**Direction of inspection:**	STMH3 --> STMH2
Direction of flow:	STMH3 --> STMH2	**Direction:**	Direction of flow

Pipe location

Road:	ROCKWOOD RD	UPSTREAM	DOWNSTREAM
Crossroad:		**Easting (X):**	**Easting (X):**
Drainage Area:		**Northing (Y):**	**Northing (Y):**
City:	CITY OF MISSISSAUGA	**Elevation (Z):**	**Elevation (Z):**
Location:	Secondary roads		
Location details:		**GPS Accuracy:**	
Owner:	CITY OF MISSISSAUGA	**Corrdinate System:**	
Road segment:		**Vertical Datum:**	

Pipe characteristics

Pipe Use:	Stormwater Pipe	**Surveyed Length:**	60.8
Height:	525	**Total length:**	60.8
Width:		**Joint length:**	
Shape:	Circular	**Rim/Inv.:**	3.9
Material:	Concrete Pipe (non-reinforced)	**Grade/Inv.:**	
Lining:		**Rim/Grade:**	
Coating Method:		**Rim/Inv.:**	0
Year Constructed:		**Grade/Inv.:**	
Year renewed:		**Rim/Grade:**	

Additional details

Inspection standard:	PACP 7.0	**Surveyed by:**	PT-AD
Inspection Status:	Complete Inspection	**Certificate Number:**	U-0321-704M0107
Date:	20/01/2022 7:28 AM	**Reviewed By:**	
Project:	9155-18-7147	**Reviewer Certificate:**	
Customer:	PLANVIEW	**Pre-Cleaning:**	No Pre-Cleaning
PO number:		**Date cleaned:**	
Work Order:		**Media Label:**	0
Purpose:		**Unit of measurement:**	Metric
Weather:	Dry	**Sheet Number:**	
Flow control:		**Additional information:**	
Used Technology:	CCTV		

Structural rating		O&M rating		Overall rating		Failure	
Peak:	2	**Peak:**	4	**Peak:**	4	**Consequence:**	
Quick rating:	2200	**Quick rating:**	4123	**Quick rating:**	4125	**Likelihood:**	4.1
Score:	4	**Score:**	10	**Score:**	14	**Risk:**	
Index:	2	**Index:**	2.5	**Index:**	2.3		

Other information

CLEANING REQUIRED (NONE/FLUSH/REAM/CUT):	NONE	**CONTRACTOR:**	PIPETEK INFRASTRUCTURE SERVICES
(BLANK HEADER/DRIVE THROUGH):		**Information 7:**	
(COMPLETE/SA DEBRIS/SA OBSTRUCTION ETC):	COMPLETE	**Information 8:**	
COMPLETE MH TO MH(YES/NO):	YES	**Information 9:**	
UNCHARTED IN LINE[YES - IF APPLICABLE]:		**Information 10:**	

9. Pipe summary and condition details

#1 0.00 m
AMH - Manhole, STMH3

#2 0.00 m
MWL - Miscellaneous Water Level, 0%

#3 0.20 m
CS - Crack Spiral, from 2 o'clock to 3 o'clock

#4 1.40 m
MGO - Miscellaneous General Observation, COUNTER SET TO 1.4M FOR SLACK

#5 5.50 m
OBJ - Obstruction Wedged In The Joint, at joint, at 8 o'clock, 5%

#6 21.60 m
CL - Crack Longitudinal, at 11 o'clock

#7 38.90 m
DAE - Deposits Attached Encrustation, from 7 o'clock to 11 o'clock, 10%

#8 39.00 m
TFA - Tap Factory Activity, at 11 o'clock, Dim.1=250

#9 41.10 m
DSC - Deposits Settled Hard/Compacted, from 5 o'clock to 7 o'clock, 10%

#10 41.10 m
TFA - Tap Factory Activity, at 1 o'clock, Dim.1=250

#11 41.30 m
IRC - Infiltration Runner Connection, at 1 o'clock

#12 60.80 m
AMH - Manhole, STMH2

9. Pipe summary and condition details

Pipe identification

Pipe:	31637	**Direction of inspection:**	STMH10 --> STMH10A
Direction of flow:	STMH10A --> STMH10	**Direction:**	Against flow

Pipe location

Road:	PONYTRAIL DR		UPSTREAM	DOWNSTREAM
Crossroad:			**Easting (X):**	**Easting (X):**
Drainage Area:			**Northing (Y):**	**Northing (Y):**
City:	CITY OF MISSISSAUGA		**Elevation (Z):**	**Elevation (Z):**
Location:	Secondary roads			
Location details:			**GPS Accuracy:**	
Owner:	CITY OF MISSISSAUGA		**Corrdinate System:**	
Road segment:			**Vertical Datum:**	

Pipe characteristics

Pipe Use:	Stormwater Pipe	**Surveyed Length:**	147.6
Height:	2100	**Total length:**	147.6
Width:		**Joint length:**	
Shape:	Circular	**Rim/Inv.:**	0
Material:	Concrete Pipe (non-reinforced)	**Grade/Inv.:**	
Lining:		**Rim/Grade:**	
Coating Method:		**Rim/Inv.:**	4.4
Year Constructed:		**Grade/Inv.:**	
Year renewed:		**Rim/Grade:**	

Additional details

Inspection standard:	PACP 7.0	**Surveyed by:**	PT-AD
Inspection Status:	Complete Inspection	**Certificate Number:**	U-0321-704M0107
Date:	20/01/2022 10:13 AM	**Reviewed By:**	
Project:	9155-18-7147	**Reviewer Certificate:**	
Customer:	PLANVIEW	**Pre-Cleaning:**	No Pre-Cleaning
PO number:		**Date cleaned:**	
Work Order:		**Media Label:**	0
Purpose:		**Unit of measurement:**	Metric
Weather:	Dry	**Sheet Number:**	
Flow control:		**Additional information:**	
Used Technology:	CCTV		

Structural rating / O&M rating / Overall rating / Failure

Structural rating		O&M rating		Overall rating		Failure	
Peak:	0	**Peak:**	4	**Peak:**	4	**Consequence:**	
Quick rating:	0000	**Quick rating:**	4111	**Quick rating:**	4111	**Likelihood:**	4.1
Score:	0	**Score:**	5	**Score:**	5	**Risk:**	
Index:	0	**Index:**	2.5	**Index:**	2.5		

Other information

CLEANING REQUIRED (NONE/FLUSH/REAM/CUT):	NONE	**CONTRACTOR:**	PIPETEK INFRASTRUCTURE SERVICES
(BLANK HEADER/DRIVE THROUGH):		**Information 7:**	
(COMPLETE/SA DEBRIS/SA OBSTRUCTION ETC):	COMPLETE	**Information 8:**	
COMPLETE MH TO MH(YES/NO):	YES	**Information 9:**	
UNCHARTED IN LINE[YES - IF APPLICABLE]:		**Information 10:**	

9. Pipe summary and condition details

#1 0.00 m AMH - Manhole, STMH10	**#2 0.00 m** MWL - Miscellaneous Water Level, 5%
#3 1.70 m MGO - Miscellaneous General Observation, COUNTER SET TO 1.7M FOR SLACK	**#4 18.00 m** LL - Line Left, 35%
#5 51.60 m TF - Tap Factory, at 2 o'clock, Dim.1=525	**#6 65.90 m** TF - Tap Factory, at 9 o'clock, Dim.1=450
#7 145.30 m ISB - Infiltration Stain Barrel, at 10 o'clock	**#8 147.60 m** AMH - Manhole, STMH10A

9. Pipe summary and condition details

Pipe identification

Pipe:	31639	**Direction of inspection:**	STMH10 --> CULVERT3
Direction of flow:	STMH10 --> CULVERT3	**Direction:**	Direction of flow

Pipe location

Road:	PONYTRAIL DR		UPSTREAM	DOWNSTREAM
Crossroad:		**Easting (X):**		**Easting (X):**
Drainage Area:		**Northing (Y):**		**Northing (Y):**
City:	CITY OF MISSISSAUGA	**Elevation (Z):**		**Elevation (Z):**
Location:	Secondary roads			
Location details:		**GPS Accuracy:**		
Owner:	CITY OF MISSISSAUGA	**Corrdinate System:**		
Road segment:		**Vertical Datum:**		

Pipe characteristics

Pipe Use:	Stormwater Pipe	**Surveyed Length:**	36.5
Height:	2700	**Total length:**	
Width:		**Joint length:**	
Shape:	Circular	**Rim/Inv.:**	4.4
Material:	Concrete Pipe (non-reinforced)	**Grade/Inv.:**	
Lining:		**Rim/Grade:**	
Coating Method:		**Rim/Inv.:**	0
Year Constructed:		**Grade/Inv.:**	
Year renewed:		**Rim/Grade:**	

Additional details

Inspection standard:	PACP 7.0	**Surveyed by:**	PT-AD
Inspection Status:	Complete Inspection	**Certificate Number:**	U-0321-704M0107
Date:	20/01/2022 11:38 AM	**Reviewed By:**	
Project:	9155-18-7147	**Reviewer Certificate:**	
Customer:	PLANVIEW	**Pre-Cleaning:**	No Pre-Cleaning
PO number:		**Date cleaned:**	
Work Order:		**Media Label:**	0
Purpose:		**Unit of measurement:**	Metric
Weather:	Dry	**Sheet Number:**	
Flow control:		**Additional information:**	
Used Technology:	CCTV		

Structural rating		O&M rating		Overall rating		Failure	
Peak:	0	**Peak:**	3	**Peak:**	3	**Consequence:**	
Quick rating:	0000	**Quick rating:**	3200	**Quick rating:**	3200	**Likelihood:**	3.2
Score:	0	**Score:**	6	**Score:**	6	**Risk:**	
Index:	0	**Index:**	3	**Index:**	3		

Other information

CLEANING REQUIRED (NONE/FLUSH/REAM/CUT):	NONE	**CONTRACTOR:**	PIPETEK INFRASTRUCTURE SERVICES
(BLANK HEADER/DRIVE THROUGH):		**Information 7:**	
(COMPLETE/SA DEBRIS/SA OBSTRUCTION ETC):	COMPLETE	**Information 8:**	
COMPLETE MH TO MH(YES/NO):	YES	**Information 9:**	
UNCHARTED IN LINE[YES - IF APPLICABLE]:		**Information 10:**	

9. Pipe summary and condition details

#1 0.00 m
AMH - Manhole, STMH10

#2 0.00 m
MWL - Miscellaneous Water Level, 5%

#3 1.70 m
MGO - Miscellaneous General Observation, COUNTER SET TO 1.7M FOR SLACK

#4 9.60 m
TF - Tap Factory, at 1 o'clock, Dim.1=250

#5 18.60 m
MWL - Miscellaneous Water Level, 10%

#6 36.10 m
OBR - Obstruction Rocks, from 4 o'clock to 8 o'clock, 15%

#7 36.50 m
OBZ - Obstruction Other, from 5 o'clock to 7 o'clock, 15%, MANHOLE LID

#8 36.50 m
MSA - Miscellaneous Survey Abandoned, SA - OBZ

9. Pipe summary and condition details

Pipe identification

Pipe:	31639	**Direction of inspection:**	CULVERT3 --> STMH10
Direction of flow:	STMH10 --> CULVERT3	**Direction:**	Against flow

Pipe location

Road:	PONYTRAIL DR	UPSTREAM	DOWNSTREAM
Crossroad:		**Easting (X):**	**Easting (X):**
Drainage Area:		**Northing (Y):**	**Northing (Y):**
City:	CITY OF MISSISSAUGA	**Elevation (Z):**	**Elevation (Z):**
Location:	Creek		
Location details:		**GPS Accuracy:**	
Owner:	CITY OF MISSISSAUGA	**Corrdinate System:**	
Road segment:		**Vertical Datum:**	

Pipe characteristics

Pipe Use:	Stormwater Pipe	**Surveyed Length:**	
Height:	2700	**Total length:**	
Width:		**Joint length:**	
Shape:	Circular	**Rim/Inv.:**	4.4
Material:	Concrete Pipe (non-reinforced)	**Grade/Inv.:**	
Lining:		**Rim/Grade:**	
Coating Method:		**Rim/Inv.:**	0
Year Constructed:		**Grade/Inv.:**	
Year renewed:		**Rim/Grade:**	

Additional details

Inspection standard:	PACP 7.0	**Surveyed by:**	PT-AD
Inspection Status:	No Access	**Certificate Number:**	U-0321-704M0107
Date:	20/01/2022 1:27 PM	**Reviewed By:**	
Project:	9155-18-7147	**Reviewer Certificate:**	
Customer:	PLANVIEW	**Pre-Cleaning:**	No Pre-Cleaning
PO number:		**Date cleaned:**	
Work Order:		**Media Label:**	0
Purpose:		**Unit of measurement:**	Metric
Weather:		**Sheet Number:**	
Flow control:		**Additional information:**	NO ACCESS TO GATED CULVERT IN CREEK
Used Technology:			

Structural rating		O&M rating		Overall rating		Failure
Peak:	Incomplete Inspection	**Peak:**	Incomplete Inspection	**Peak:**	Incomplete Inspection	**Consequence:**
Quick rating:		**Quick rating:**		**Quick rating:**		**Likelihood:**
Score:		**Score:**		**Score:**		**Risk:**
Index:		**Index:**		**Index:**		

Other information

CLEANING REQUIRED (NONE/FLUSH/REAM/CUT):		**CONTRACTOR:**	PIPETEK INFRASTRUCTURE SERVICES
(BLANK HEADER/DRIVE THROUGH):	BLANK HEADER	**Information 7:**	
(COMPLETE/SA DEBRIS/SA OBSTRUCTION ETC):		**Information 8:**	
COMPLETE MH TO MH(YES/NO):		**Information 9:**	
UNCHARTED IN LINE[YES - IF APPLICABLE]:		**Information 10:**	

9. Pipe summary and condition details

#1

3 Statement of Limitations

1. This Report contains Information, including but not limited to, drawings, field observations and data that represent professional judgement. The information may be based upon facts that have been provided to Planview by third party organizations. The Information has not been independently verified.

2. The report was prepared for specific purposes as outlined in the scope of work in section 1.2 and must be read as a whole.

3. Planview accepts no responsibility for any municipal infrastructure and utility activity that may have occurred since the date this report was issued.

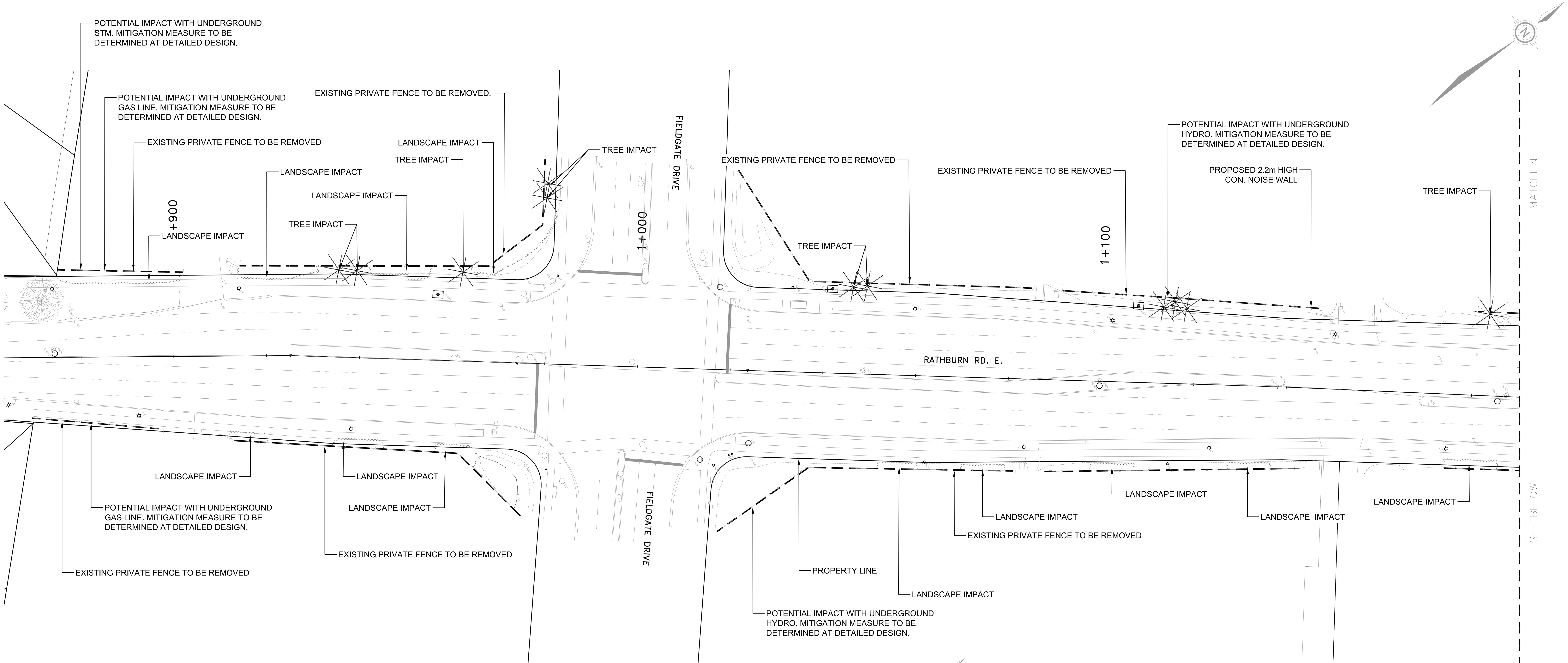
4. This report is to be treated as confidential and should not be shared with any third party without the consent of Planview. Planview denies any liability whatsoever, for any damage(s) resulting from any third party using the Information in this report.

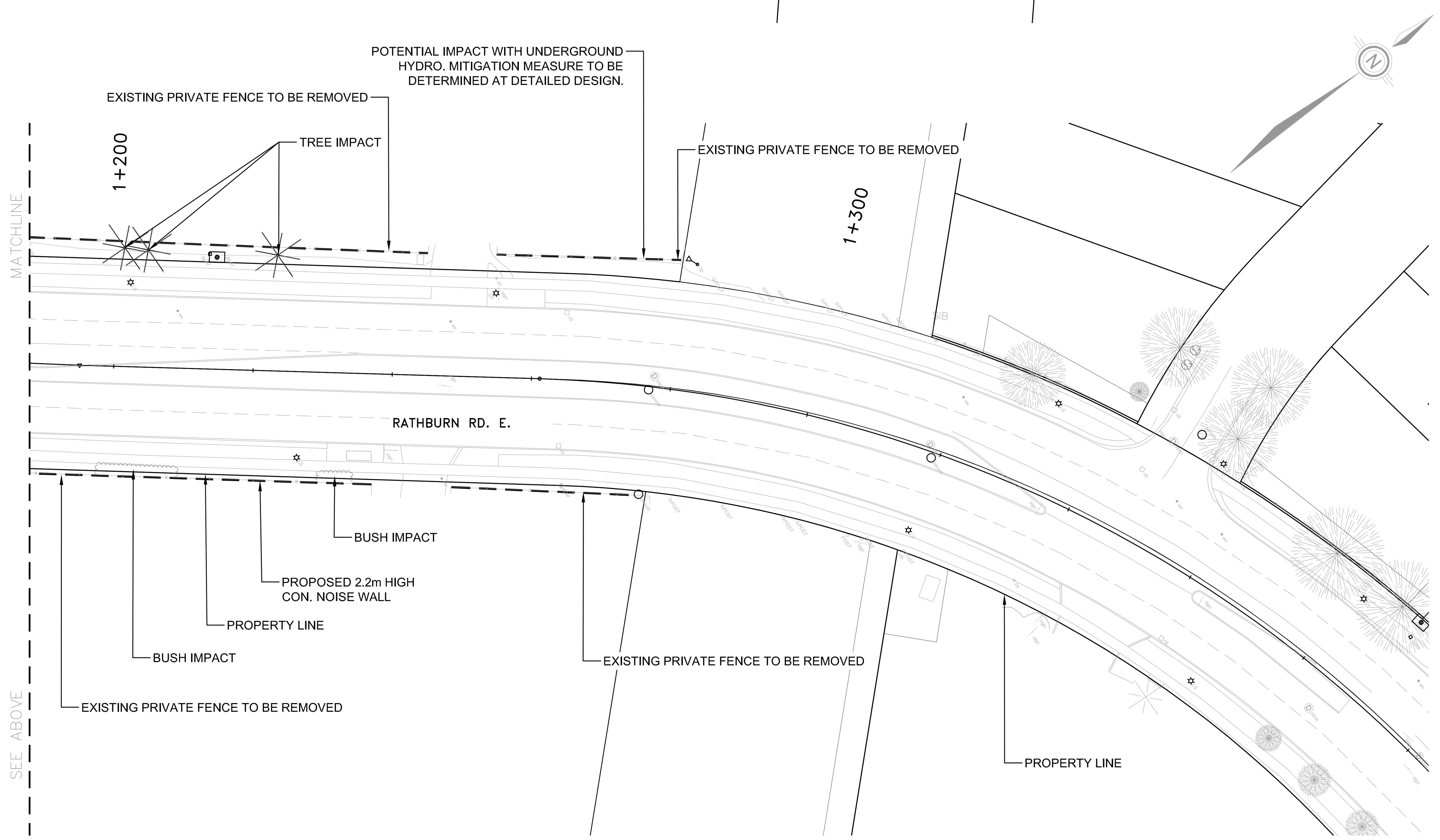
4 Conclusion

Findings of CCTV inspection for storm sewer lines on Ponytrail Drive and Rockwood Road has been summarized within this document. Summary of inspection results showing the conditions of sewer pipers are listed in the report.

APPENDIX

H PRELIMINARY NOISEWALL DRAWINGS





EXISTING NOISE WALL APPROXIMATELY
50m WEST OF RATHBURN RD. E. AT
ROCKWOOD RD. FACING SOUTH

SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN. SEWERS			GAS MAINS		
STM. SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
M.O.E.			ROGERS U/G CABLE		

REVISIONS

DATE	DETAILS	INIT.

LEGEND

- PROPOSED 2.2m HIGH CONCRETE NOISE WALL
- PROPERTY LINE
- TREE REMOVAL

DESIGN BY ______ C.E.T.

APPROVED BY

DEPARTMENTAL APPROVAL

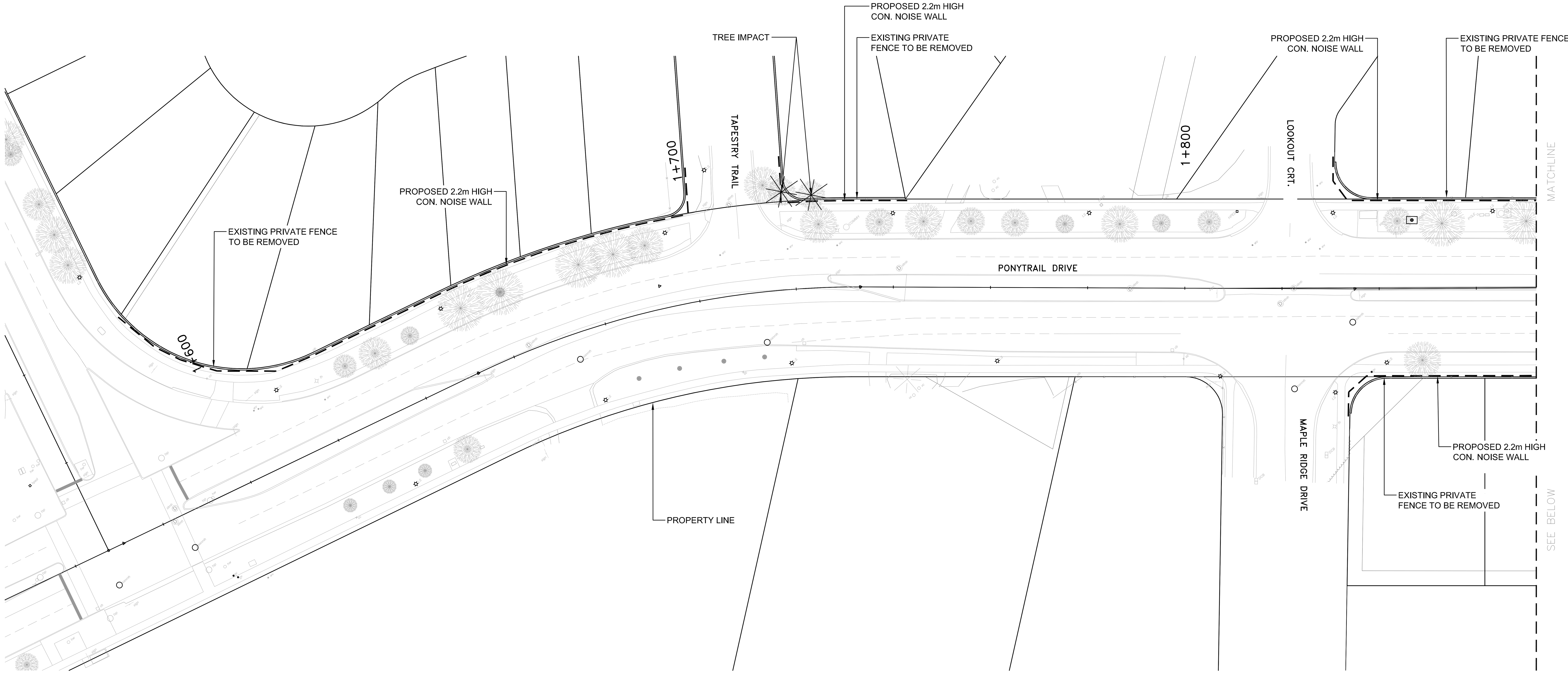
SILVIO CESARIO P.ENG.

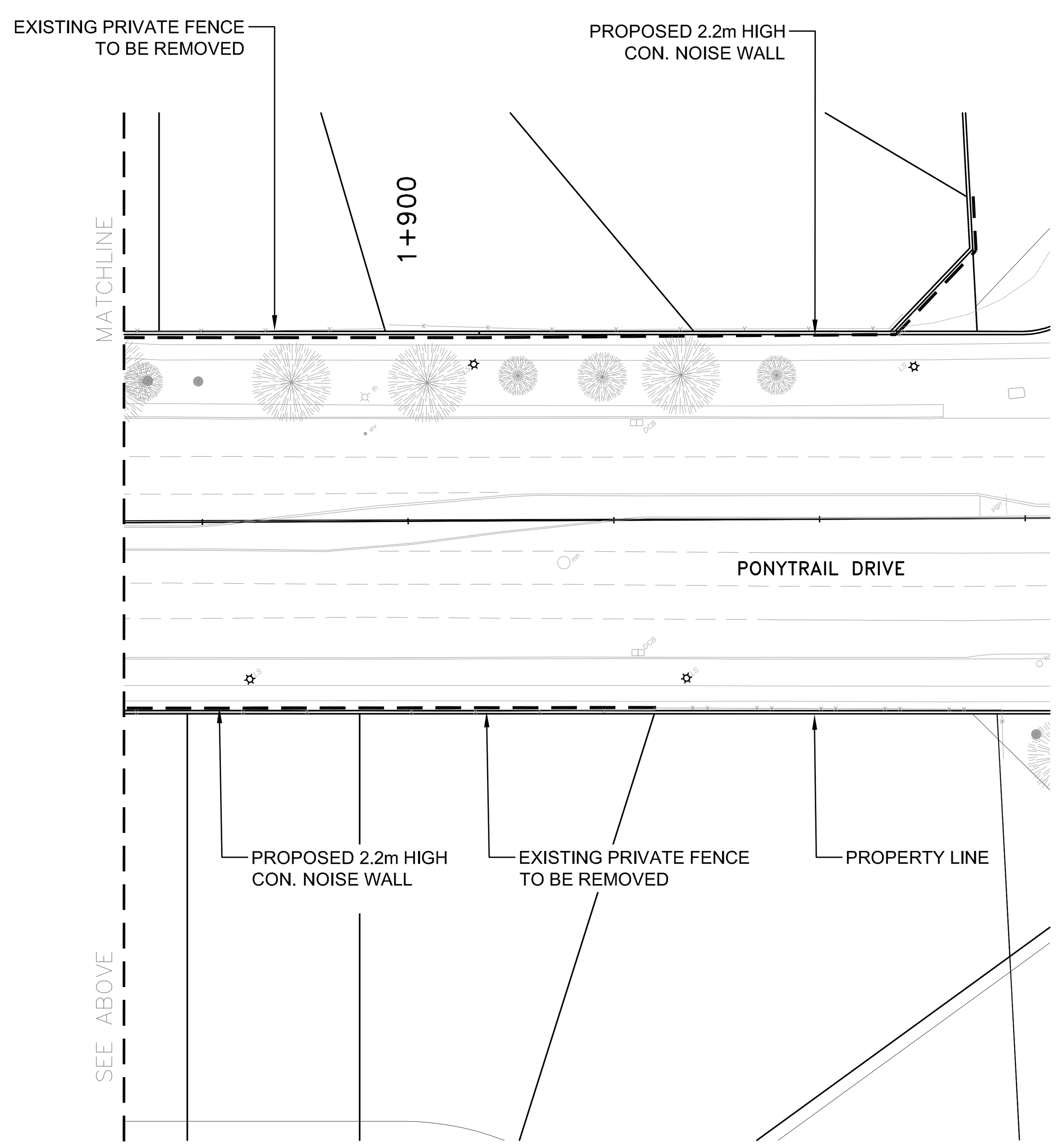
MISSISSAUGA

PRODUCED FOR - T&W, ENGINEERING AND WORKS

RATHBURN RD & PONYTRAILDR
NOISE WALL LOCATION PLAN

SCALE 1:500	AREA	PROJECT No.
C.A.D.D. BY S.L./ M.N.	CHECKED BY S.L./ D.M.	PLAN No.
DATE 2022-01-14	SHEET 1 OF 3	





EXISTING NOISE WALL AT NORTH WEST
CORNER OF RATHBURN RD. E. AT
ROCKWOOD RD.

SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN. SEWERS	________	______	GAS MAINS	________	______
STM. SEWERS	________	______	BELL U/G CABLE	________	______
WATERMAINS	________	______	HYDRO U/G CABLE	________	______
M.O.E.	________	______	ROGERS U/G CABLE	________	______

REVISIONS

DATE	DETAILS	INIT.

LEGEND

PROPOSED 2.2m HIGH CONCRETE NOISE WALL

PROPERTY LINE

TREE REMOVAL

DESIGN BY	APPROVED BY
_______________ C.E.T.	
DEPARTMENTAL APPROVAL	
SILVIO CESARIO P.ENG.	

MISSISSAUGA

PRODUCED FOR - T&W, ENGINEERING AND WORKS

RATHBURN RD & PONYTRAILDR
NOISE WALL LOCATION PLAN

SCALE 1:500	AREA ______________	PROJECT No.________
C.A.D.D. BY S.L./ M.N.	CHECKED BY S.L./ D.M.	PLAN No.
DATE 2022-01-14	SHEET 2 OF 3	_ _ _ _ _ _ _

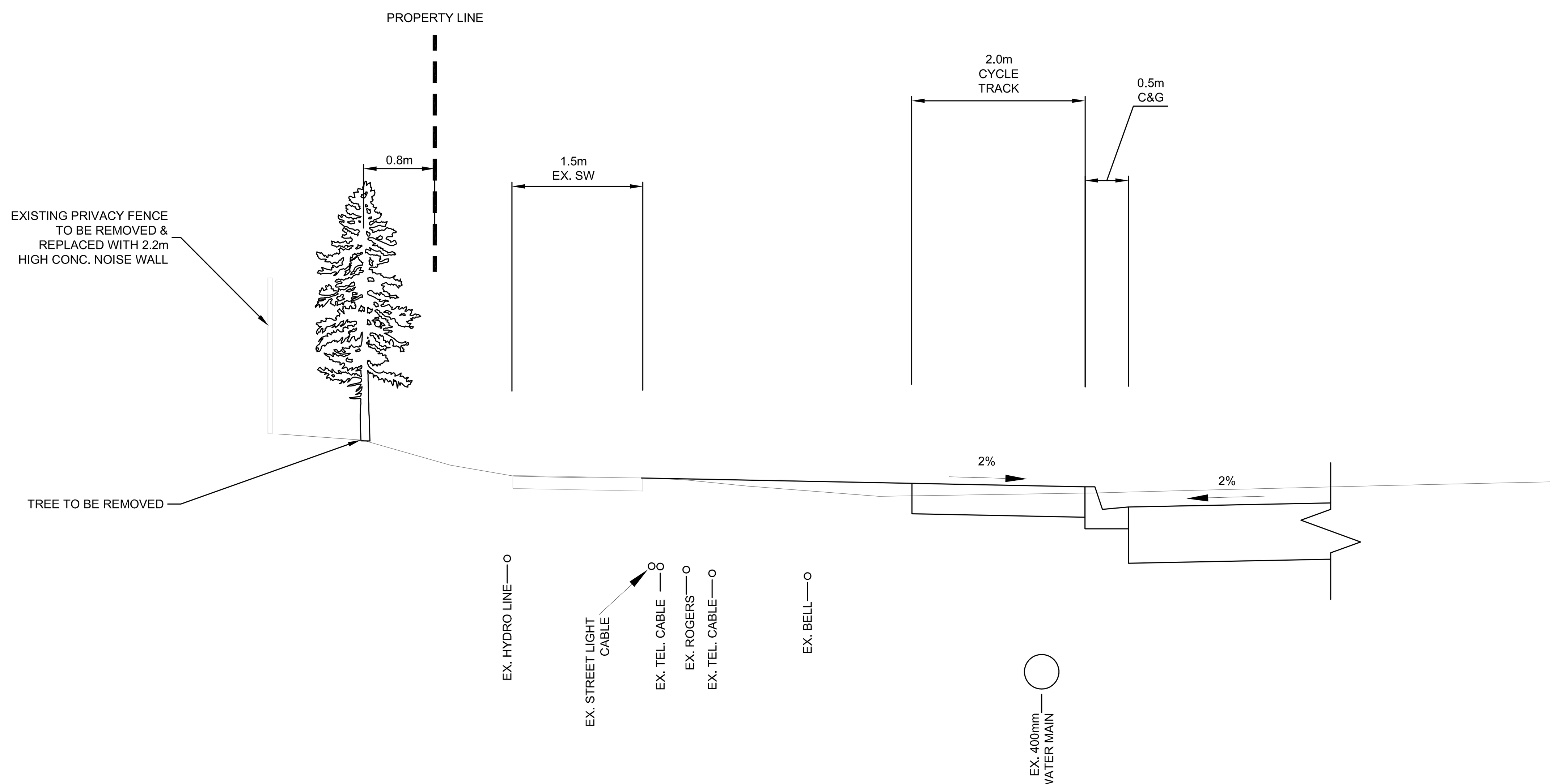
K:\DRAWINGS\2020\19M-00836-03-MISSISSAUGA_RATHBURN RD E AND PONYTRAIL DR\1_CONTRACT DRAWINGS\19M-00836-03_NOISEWALL REVISED 2021-01-14.DWG

SERVICE DATA

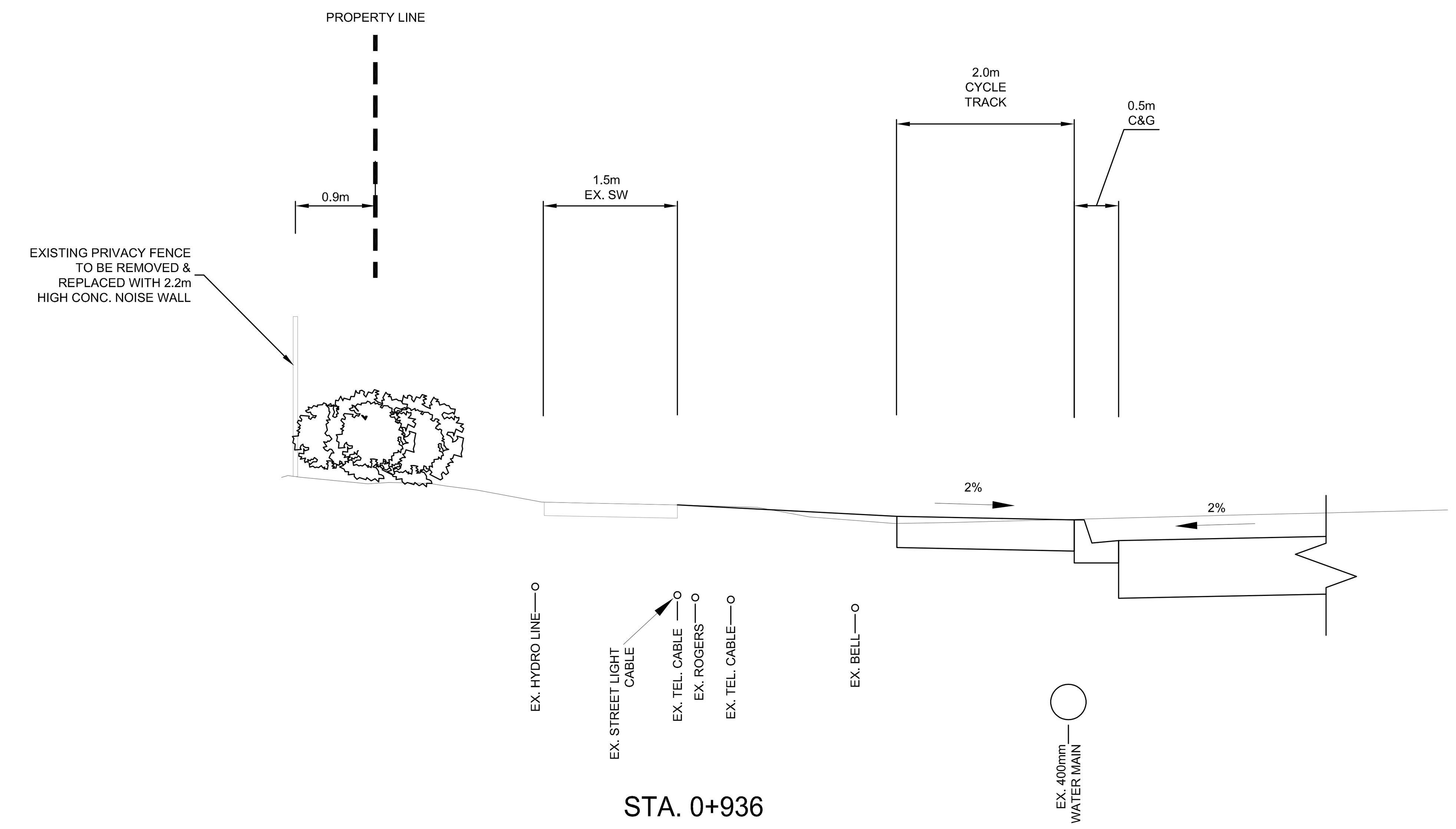
SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN. SEWERS	________	______	GAS MAINS	________	______
STM. SEWERS	________	______	BELL U/G CABLE	________	______
WATERMAINS	________	______	HYDRO U/G CABLE	________	______
M.O.E.	________	______	ROGERS U/G CABLE	________	______

REVISIONS

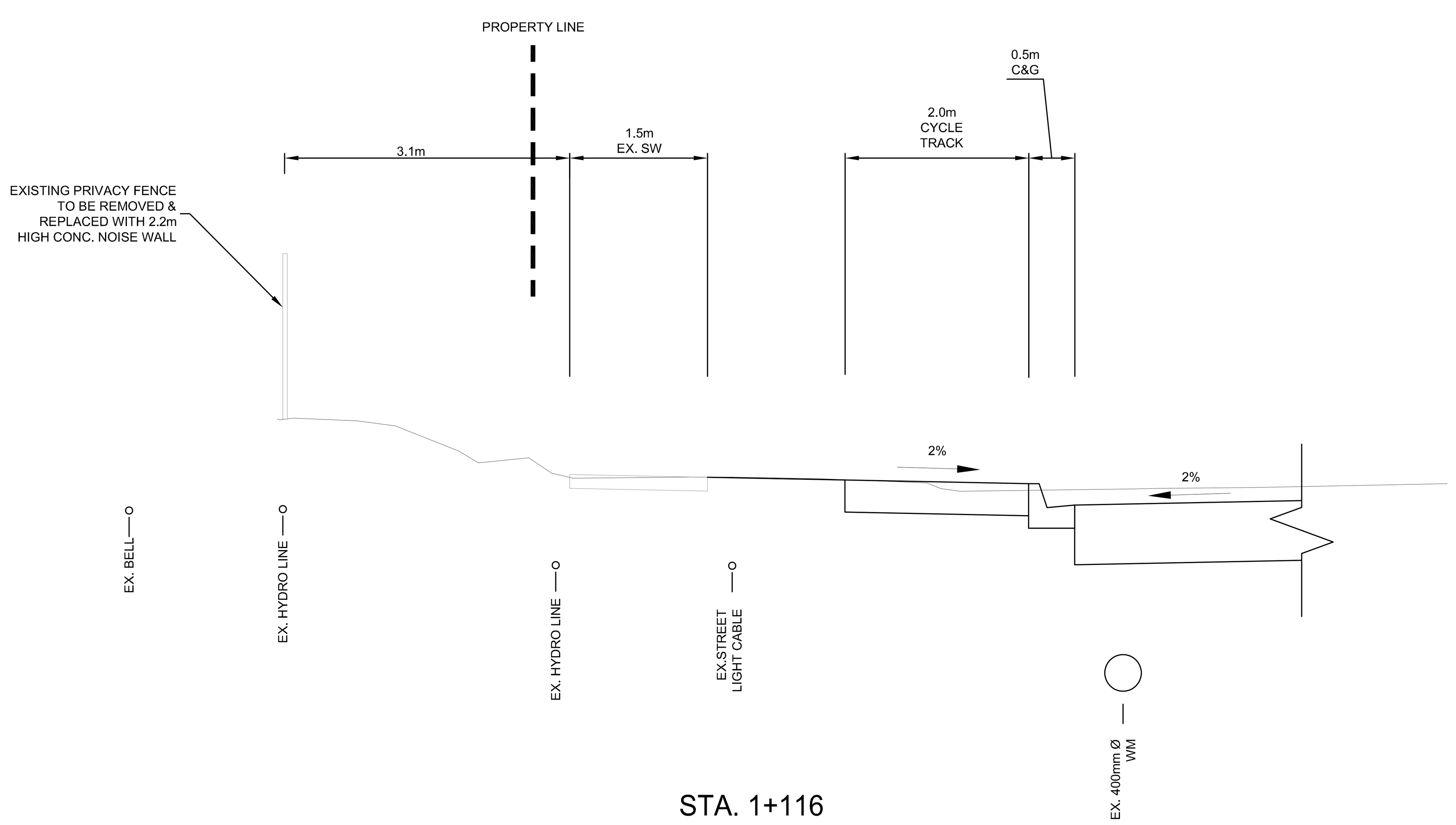
DATE	DETAILS	INIT.



STA. 0+939



STA. 0+936



STA. 1+116

DESIGN BY	APPROVED BY
______________ C.E.T.	
DEPARTMENTAL APPROVAL	
SILVIO CESARIO P.ENG.	

MISSISSAUGA

PRODUCED FOR - T&W, ENGINEERING AND WORKS

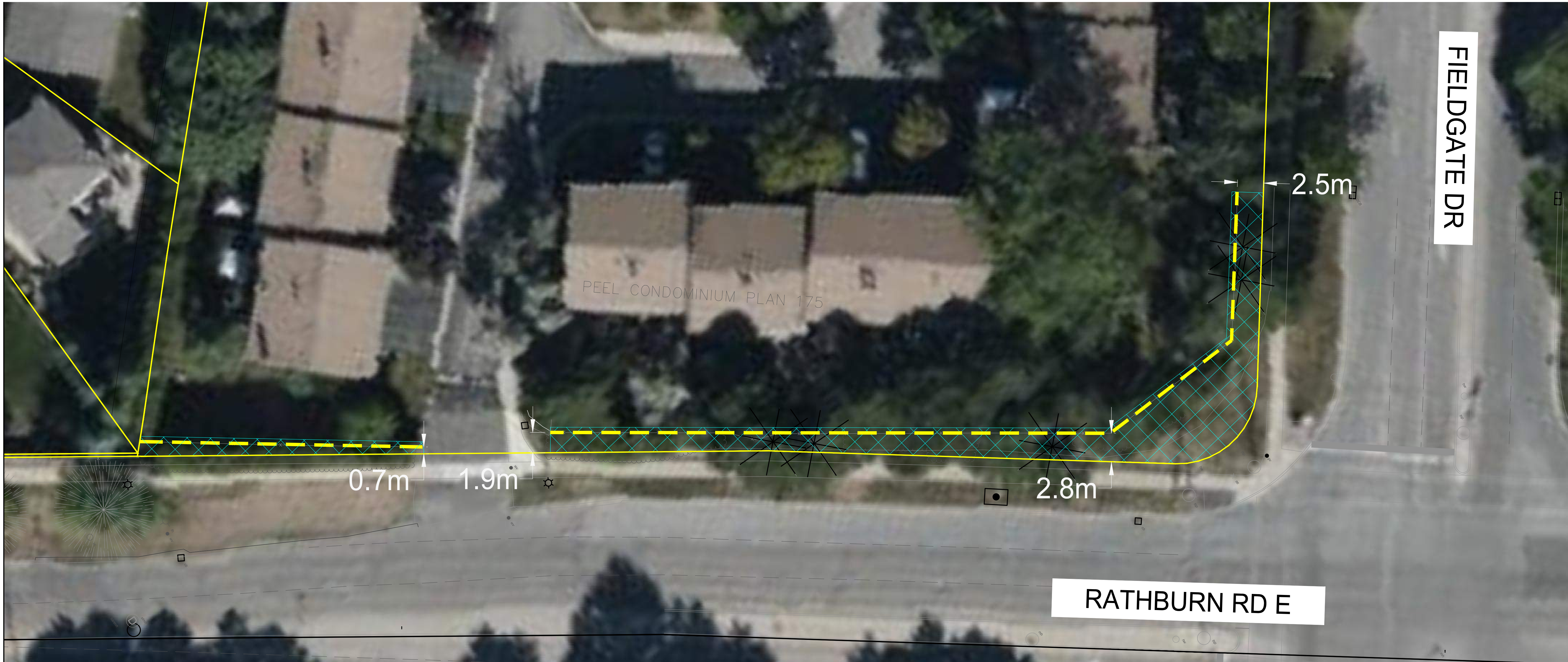
RATHBURN RD & PONYTRAILDR

NOISE WALL LOCATION PLAN

SCALE 1:50	AREA ____________	PROJECT No.________
C.A.D.D. BY S.L./ M.N.	CHECKED BY S.L./ D.M.	PLAN No.
DATE 2022-01-14	SHEET 3 OF 3	_ _ _ _ _ _ _

I

PROPERTY IMPACT PLANS



LEGEND:

EXISTING PROPERTY LINE

PROPOSED PROPERTY LINE

PROPERTY AREA REQUIRED

APPROXIMATE PROPERTY REQUIREMENT

332.5 sq.m.

FOR DISCUSSION ONLY
SCALE: N.T.S

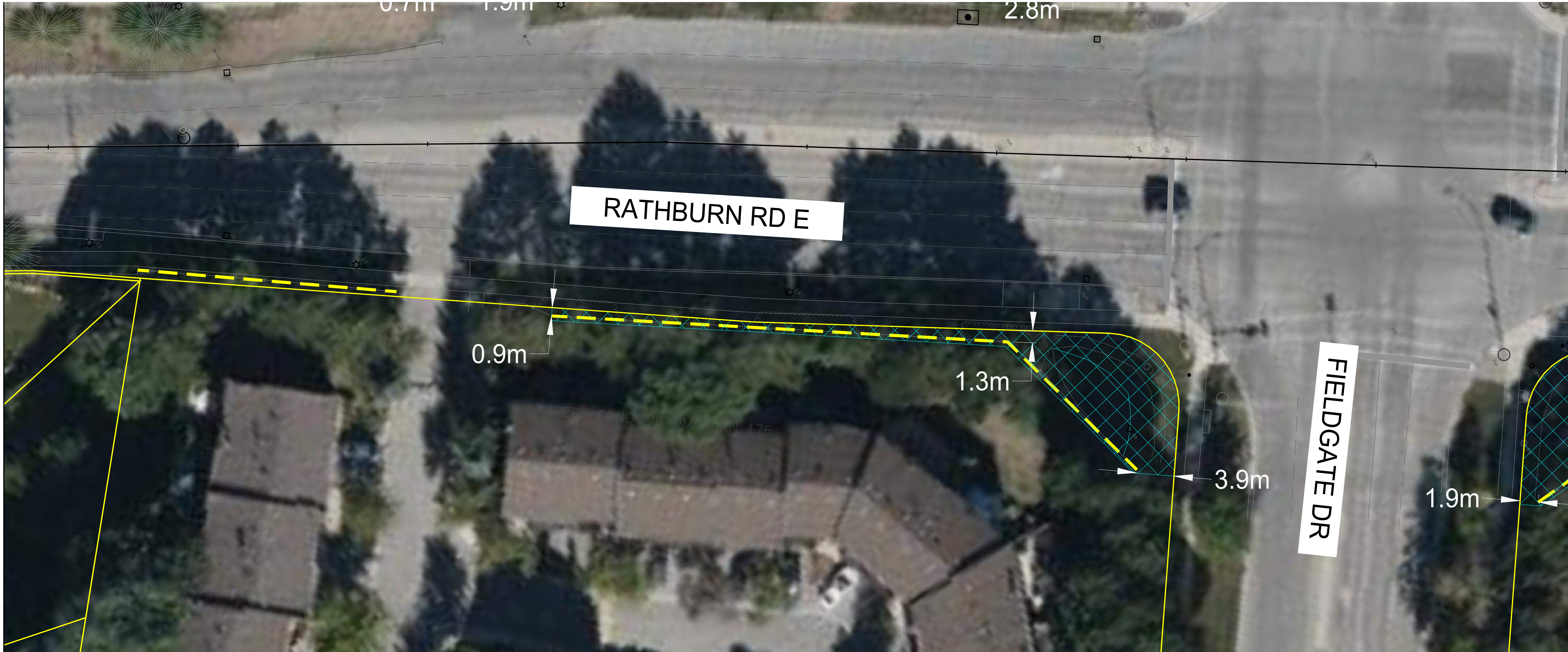
MISSISSAUGA

ENGINEERING COMPANY NAME:

WSP

582 Lancaster Street West
Kitchener, Ontario N2K 1M3

RATHBURN RD PROPERTY ACQUISITION
PROPERTY PLAN PIN: 191750000
4230 FIELDGATE DRIVE



LEGEND:

(solid yellow line)	EXISTING PROPERTY LINE
(dashed yellow line)	PROPOSED PROPERTY LINE
(cyan hatch)	PROPERTY AREA REQUIRED

APPROXIMATE PROPERTY REQUIREMENT

230.5 sq.m.

FOR DISCUSSION ONLY
SCALE: N.T.S

MISSISSAUGA

ENGINEERING COMPANY NAME:

wsp

582 Lancaster Street West
Kitchener, Ontario N2K 1M3

RATHBURN RD PROPERTY ACQUISITION
PROPERTY PLAN PIN: 191760000
4156 FIELDGATE DRIVE

LEGEND:

EXISTING PROPERTY LINE	
PROPOSED PROPERTY LINE	
PROPERTY AREA REQUIRED	

APPROXIMATE PROPERTY REQUIREMENT

845.3 sq.m.

FOR DISCUSSION ONLY
SCALE: N.T.S

MISSISSAUGA

ENGINEERING COMPANY NAME:

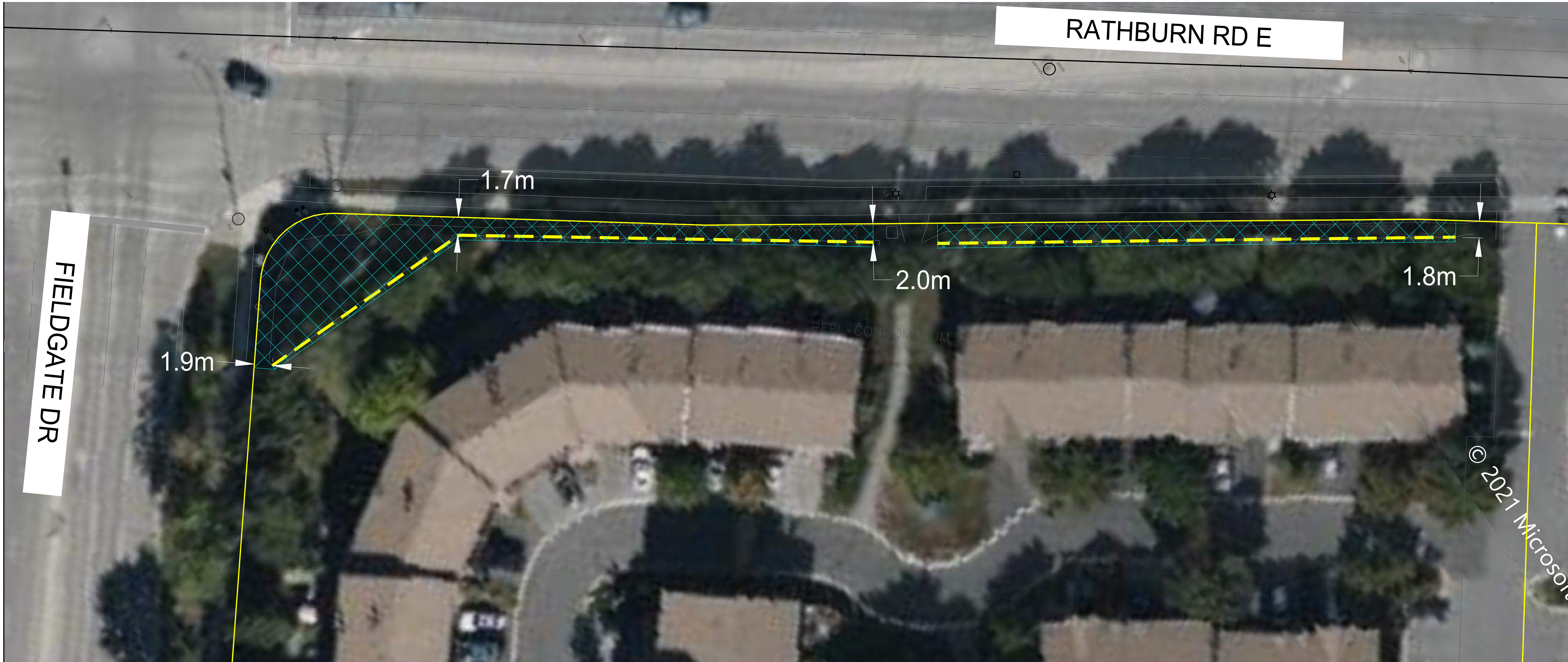
wsp

582 Lancaster Street West
Kitchener, Ontario N2K 1M3

RATHBURN RD PROPERTY ACQUISITION

PROPERTY PLAN PIN: 92130000

1755 RATHBURN ROAD EAST



LEGEND:

Solid yellow line	EXISTING PROPERTY LINE
Dashed yellow line	PROPOSED PROPERTY LINE
Cyan crosshatch	PROPERTY AREA REQUIRED

APPROXIMATE PROPERTY REQUIREMENT

440.3 sq.m.

FOR DISCUSSION ONLY
SCALE: N.T.S

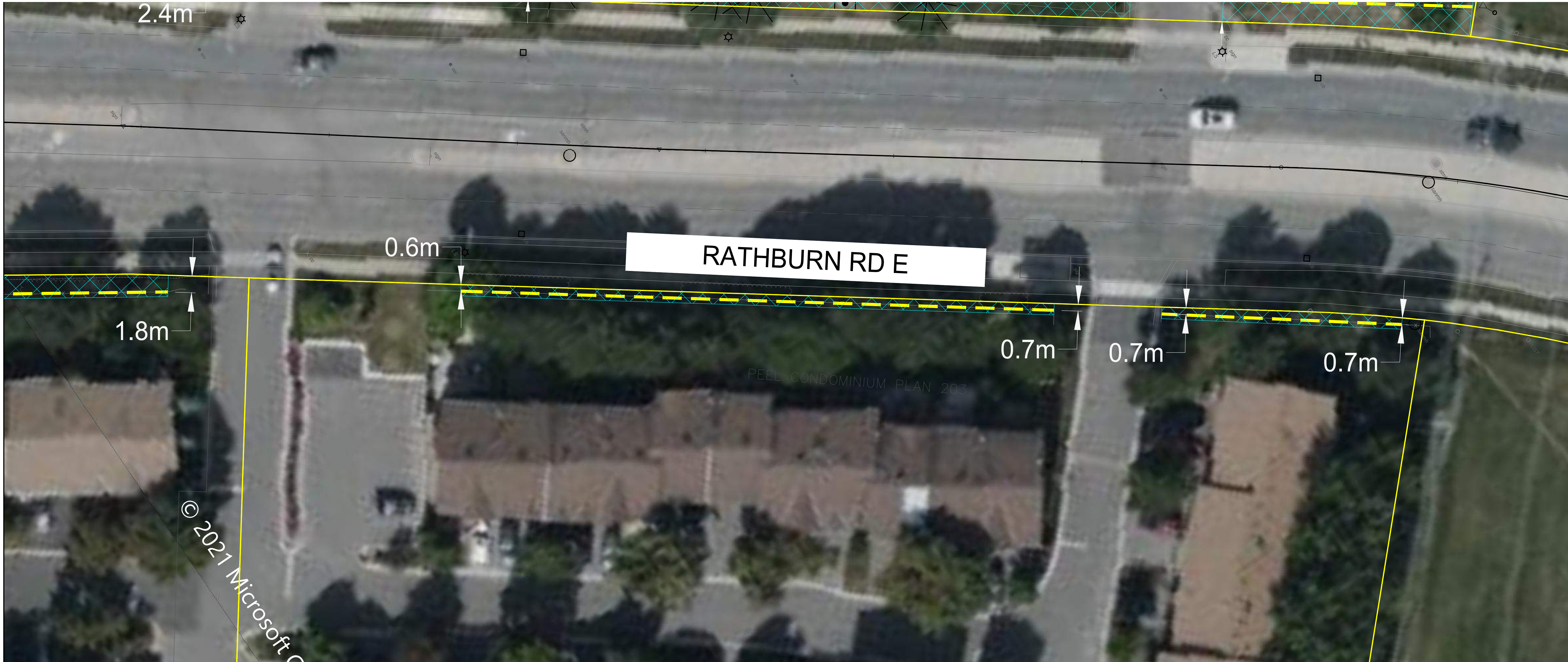
MISSISSAUGA

ENGINEERING COMPANY NAME:

WSP

582 Lancaster Street West
Kitchener, Ontario N2K 1M3

RATHBURN RD PROPERTY ACQUISITION
PROPERTY PLAN PIN: 191800000
4165 FIELDGATE DRIVE



LEGEND:

EXISTING PROPERTY LINE

PROPOSED PROPERTY LINE

PROPERTY AREA REQUIRED

APPROXIMATE PROPERTY REQUIREMENT

109.7 sq.m.

FOR DISCUSSION ONLY
SCALE: N.T.S

MISSISSAUGA

ENGINEERING COMPANY NAME:

wsp

582 Lancaster Street West
Kitchener, Ontario N2K 1M3

RATHBURN RD PROPERTY ACQUISITION
PROPERTY PLAN PIN: 192030000
1764 RATHBURN ROAD EAST

LEGEND:

Solid yellow line	EXISTING PROPERTY LINE
Dashed yellow line	PROPOSED PROPERTY LINE
Cyan cross-hatch	PROPERTY AREA REQUIRED

APPROXIMATE PROPERTY REQUIREMENT

32.6 sq.m.

FOR DISCUSSION ONLY
SCALE: N.T.S

MISSISSAUGA

ENGINEERING COMPANY NAME:

WSP

582 Lancaster Street West
Kitchener, Ontario N2K 1M3

RATHBURN RD PROPERTY ACQUISITION
PROPERTY PLAN PIN: 133030034
1315 BOUGH BEECHES BLVD

APPENDIX

J ARBORIST REPORT

CITY OF MISSISSAUGA

RATHBURN ROAD AND PONYTRAIL DRIVE

ARBORIST REPORT

SEPTEMBER 30, 2021

RATHBURN ROAD AND PONYTRAIL DRIVE

ARBORIST REPORT

CITY OF MISSISSAUGA

PROJECT NO.: 19M-00836-03
DATE: SEPTEMBER 30, 2021

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FIRST ISSUE				
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REVISION 1				
September 30, 2021	Preliminary Design Report – Final			
Prepared by	Reviewed by	Approved By		
Peter McNamara	Peter McNamara	Junfeng (Max) Li		
REVISION 2				
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September 30, 2021

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Date

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1 INTRODUCTION

WSP Canada Inc. has been retained by the City of Mississauga to complete an arborist report as part of the Rathburn Road East and Ponytrail Drive Preliminary Design. This report and associated Tree Preservation Plans will be submitted as part of the Preliminary Design Report (PDR)/ 30% Design. This project is a component of an Integrated Road Program to identify opportunities for a complete streets approach to complex road improvement projects on the City of Mississauga's arterial and major collector road network. The objective of the Integrated Road Program is to improve coordination of City road projects, reduce construction costs, and construction nuisance/fatigue for residents through the bundling of road improvement projects. As part of the preliminary design WSP Landscape Architecture has completed a vegetation inventory within the limits of the proposed works. Tree Preservation Plans have been prepared in association with this report.

1.1 STUDY LIMITS

The study area is within the City of Mississauga, near the intersection of Dixie Road and Burnhamthorpe Road East.

The following road corridors have been included in the Rathburn Road and Ponytrail Drive study area:

- Rathburn Road East from Dixie Road to Etobicoke Creek (approx. 2.5km), and
- Ponytrail Drive from Rathburn Road East to Burnhamthorpe Road East (approx.0.5km).

A map illustrating the approximate limits of the study area is shown in **Figure 1**.

Figure 1: Study Area

Source: City of Mississauga Proposal Document – Study Area

1.2 REPORT FRAMEWORK

This report details the results of the tree inventory; provides an overview of the relevant policy and legislation in relation to the proposed works; and makes recommends for tree protection, tree injury, mitigative measures and removals based on the proposed works. Tree assessments have been conducted per the following criteria:

- Individual trees > 10 cm DBH (diameter at breast height) within the right-of-way (ROW) limits of work.
- Individual trees <10cm DBH were noted on plans, however not assessed in Table;
- Trees generally over 10cm DBH on private property with a dripline that overhangs the ROW;

This report is to be read in conjunction with:

- Appendix A: Tree Inventory and Preservation Tables;
- Appendix B: Site Photos; and
- Tree Preservation Plans (TP-1 & TP-9).

2 EXISTING CONDITIONS

2.1 OVERVIEW

- 238 trees greater than 10 cm DBH ere recorded and assessed within the study area;
- The following 21 species were recorded in the study area: Manitoba Maple (*Acer negundo*), Norway Maple (*Acer platanoides*), Linden species (*Tilia* sp.), White Mulberry (*Morus alba*), White Oak (*Quercus alba*), Silver Maple (*Acer saccharinum*), Freeman's Maple (*Acer x freemanii*), Green Ash (*Fraxinus pennsylvanica*), European Ash (*Fraxinus excelsior*), Honey Locust (*Gleditsia triacanthos*), Black Locust (*Robinia pseudoacacia*), English Hawthorn (*Crataegus monogyna*), Serviceberry (*Amelanchier* sp.), Ivory Silk Lilac (*Syringa reticulata*), Trembling Aspen (*Populus tremuloides*), American Basswood (*Tilia americana*), Apple (*Malus* sp.), Maple sp. (*Acer sp.*), Austrian Pine *(Pinus nigra)* and an unknown species.
- Almost all trees recorded within the study area are planted and are of species commonly found in an urban environment.
- The tree species are represented by both native species and non-native species.
- Inventoried trees range in size from 10 to 58 cm effective DBH. Additional streets trees less than 10 cm DBH are present.

2.2 TREE HEALTH

Tree health ranged between good and poor. Most trees were observed to be in good condition. Signs of decline and defects observed included:

- Lean;
- Trunk wounds;
- Exposed and girdling roots;
- Fungus growth;
- Twisted trunk;
- Topped/poor pruning;
- Seam/frost crack;
- Missing or peeling bark;
- Suckering;
- Dead stem/branch;
- Woodpecker/insect holes;
- Included bark;
- Uneven crown;
- Exposed root collar; and
- Broken branches.

3 POLICY CONTEXT

This section summarizes the various municipal, regional, provincial and federal planning policies and regulations that provide the policy context for this Arborist Report.

3.1 City of Mississauga Private Tree Protection By-law

The Private Tree Protection By-law (0254-2012) applies to all private property within the City of Mississauga. The By-law aims to protect and enhance the City's existing tree cover while considering landowner requests to make changes to the landscape of their property.

- A permit is required from the City's Parks & Forestry division if the applicant proposes to remove 3 or more trees that are 15cm (6 inches) or greater in diameter, including dead and/or dying trees, per calendar year.

Applicability to project

  - **Applicable**. Trees inventoried on private property will be impacted (injure or remove). A permit for removal will be required at the detailed design stage.

3.2 City of Mississauga Woodland Management

The Region of Peel By-law # 106-2005 delegates all power respecting the destruction or injuring of trees in woodlands, within the jurisdictional boundaries of the City of Mississauga, to the City of Mississauga, passed: December 15, 2005.

- This By-law states that:
  - 'Whereas the Regional Municipality of Peel has the authority pursuant to section 135(8) of the Municipal Act, 2001, as amended (hereinafter referred to as the "Act"), to delegate all or part of its power to pass a by-law respecting the destruction or injuring of trees in woodlands to one or more of its lower-tier municipalities with the agreement of the lower-tier municipality or municipalities, as the case may be;'
  - 'and whereas "woodlands" means woodlands as defined in the Forestry Act that are one hectare or more in area;'
  - 'and whereas the City of Mississauga requests the Regional Municipality of Peel to delegate its power to pass a by-law respecting the destruction or injuring of trees in woodlands to the City of Mississauga;'
- NOW THEREFORE the Council of the Regional Municipality of Peel enacts as follows:

  1. That all power to pass a by-law respecting the destruction or injuring of trees in woodlands, within the jurisdictional boundaries of the City of Mississauga, is hereby delegated to the City of Mississauga.

Applicability to Project

- **Not applicable** as there are no woodlands within or adjacent to the study area.

3.3 City of Mississauga Parks By-law

The City of Mississauga Parks By-law (By-law 0197-2020) regulates activities within parkland that is owned or made available to the City of Mississauga by lease, agreement, or otherwise, and that is established, dedicated, set apart or made available for use as public open space (excluding marinas, golf courses, and cemeteries) It prohibits the planting, pruning, removal, or damage of trees and shrubs of any size unless authorized by the Commissioner of

Community Services or their designate. The by-law does not apply to the City, its vehicles, and its employees or agents acting within the scope of their duties as employees or agents of the City.

Applicability to Project

- **Not Applicable.** The study area does not include parkland.
- Parkland is present just outside the study area and includes the following: Garnetwood Park, Wood Creek Park, and an Unnamed Park along Armour Creek,
- At detailed design, if any Parkland trees may be impacted, an authorization may be required.

3.4 Toronto and Region Conservation Authority O. Reg. 166/06

The Toronto and Region Conservation Authority (TRCA), as mandated under O. Reg. 166/06 TRCA Regulation of Development, Interference with Wetlands and Alteration to Shorelines and Watercourses, regulates and may prohibit work that may take place within a regulated area ("an area that represents the greatest physical extent of the combined hazards, plus a prescribed allowance, as set out in the Conservation Authorities Act"). This includes valley and stream corridors, wetlands and associated areas of interference and the Lake Ontario waterfront.

Applicability to Project

- **Applicable**. A small portion of the study area is within the regulated area of the TRCA; therefore O. Reg. 166/06 does apply.
  - The regulated area is along Armour Creek, which crosses under Ponytrail Drive, between Maple Ridge Road and Tapestry Trail. The regulated area includes street trees on both sides of Ponytrail Drive.
- In addition, a regulated area is present along Etobicoke Creek, just outside of the study area at the east end of Rathburn Road East.
- Please refer to **Figure 2** for TRCA regulation limits in relation to the study area.

Figure 2: TRCA Regulated Area

Source: TRCA.ca Regulation Mapping

3.5 ENDANGERED SPECIES ACT, 2007

Species designated as Threatened or Endangered by the Committee on the Status of Species at Risk in Ontario (COSSARO), otherwise known as Species at Risk in Ontario (SARO), and their habitats (i.e., areas essential for breeding, rearing, feeding, hibernation and migration) are automatically afforded legal protection under the Endangered Species Act, 2007 (ESA) (Government of Ontario 2007). The ESA (Subsection 9 (1)) states that:

- "No person shall,
  - a) kill, harm, harass, capture or take a living member of a species that is listed on the SARO List as an extirpated, endangered or threatened species;
  - b) possess, transport, collect, buy, sell, lease, trade or offer to buy, sell, lease or trade;
    - (i) a living or dead member of a species that is listed on the Species at Risk in Ontario List as an extirpated, endangered or threatened species;
    - (ii) any part of a living or dead member of a species referred to in subclause (i);

(iii) anything derived from a living or dead member of a species referred to in subclause (i); or

c) sell, lease, trade or offer to sell, lease or trade anything that the person represents to be a thing described in subclause (b) (i), (ii) or (iii)".

- Clause 10(1) (a) of the ESA states that:
- "No person shall damage or destroy the habitat of a species that is listed on the SARO list as an endangered or threatened species".

Applicability to Project

- **Applicable*.** One provincial Species at Risk was observed within the Focus Area: Kentucky Coffee Tree (*Gymnocladus dioicus*). It is provincially 'Threatened.' Only native stock is protected, whereas non-native stock is not subject to regulation under the ESA.
- *The Kentucky Coffee Tree's present are planted trees and thus do not meet the definition of native stock. Therefore, the planted Kentucky Coffee Trees are not subject to the regulation under the ESA.
- Planted Kentucky Coffee Trees less than 10 cm DBH were noted along Rathburn Road East. Due to their small size they did not meet criteria to be included in this inventory.

3.6 MIGRATORY BIRDS CONVENTION ACT, 1994

The Migratory Birds Convention Act, MBCA (1994) and Migratory Birds Regulations, MBR (2014) protect most species of migratory birds anywhere they are found in Canada, including surrounding ocean waters, regardless of ownership. General prohibitions under the MBCA and MBR protect migratory birds, their nests and eggs and prohibit the deposit of harmful substances in waters / areas frequented by them.

- The MBR includes an additional prohibition against incidental take, defined by Environmental Canada as:

  "*The inadvertent harming, killing, disturbance or destruction of migratory birds, nests and eggs*."

- Environment Canada implements policies and guidelines to protect migratory birds, their eggs and their nests. There is guidance on the Environment Canada website to minimize the risk of incidental take effects on migratory birds, achieve compliance with the law and maintain sustainable populations of migratory birds.
- Compliance with the MBCA and MBR is best achieved through a due diligence approach, which identifies potential risk, based on a site-specific analysis in consideration of the Avoidance Guidelines and Best Management Practices information on the Environment Canada website.

Applicability to Project

- **Applicable**. Migratory bird species subject to the MBCA may be present within the study area and may use various habitats within the study area (e.g. trees, grass and other herbaceous material, buildings). Recommended measures to reduce the possibility of contravention to the MBCA and its regulations are provided in **Section 7.6**.
- Tree removals are recommended to be coordinated outside of the Migratory Bird Nesting Season (**April 1 to August 31**) in order to reduce the potential of contravention to the MBCA and its Regulations. In addition, tree removals are recommended to be conducted outside of the active period for bats (e.g. up to the end of September) to reduce the potential to contravene Species at Risk bats protected under the ESA. Overall clearing of trees is recommended to occur between **October 1 to March 31**.

3.7 CANADA FOOD AND INSPECTION AGENCY

Canada Food and Inspection Agency (CFIA) Directive D-03-08: Phytosanitary Requirements to Prevent the Introduction into and Spread within Canada of the Emerald Ash Borer, *Agrilus planipennis (Fairmaire*) applies to Ash (*Fraxinus spp*.) species observed on properties that are located within the Emerald Ash Borer (EAB) Regulated Areas of Canada, prepared by the Canada Food and Inspection Agency (CFIA) and dated: June 2019. This area covers all south and central Ontario and western Quebec. Ash trees that require removal are subject to this directive.

The CFIA restricts the movement of all Ash material including wood, bark, chips or bark chips from being transported outside of a Regulated Area. A Movement Certificate is required by the CFIA for any Ash material leaving the Regulated Area. Refer to the CFIA website for a current map of the 'Emerald Ash Borer Regulated Areas of Canada.'

Ash are permitted to be chipped on site and/or removed or cut down and removed from site. Chipped Ash material that is to remain on site must be ground or chipped to a size of less than 2.5 cm in any two dimensions. All Ash material chipped or whole that is to be removed from site must be disposed of within the Regulated Areas of Canada.

<u>Applicability to Project</u>

- **Applicable.** The study area is within an Emerald Ash Borer regulated area and ash trees are present.
- Three Green Ash trees and one European Ash tree were observed.

4 DEFINITIONS

The following are the definitions of the assessment categories utilized in our tree assessment:

Table 4.1 – Definitions

ACRONYM / DEFINITION	DESCRIPTION
Tree Number	This number refers to the number on the on the tree tag or alpha-numeric, alphabetical or tree grouping label listed in Table 1: Tree Inventory and Preservation Charts and labelled on the Tree Preservation Plans (e.g. P29, 1216, A or TG-1).
Tree Grouping	A tree grouping is more than one (1) tree located within proximity of other trees sometimes with no separation between the canopies.
DBH	This refers to diameter (in centimetres) at breast height and is measured at 1.4 m above the ground for each tree.
Tree Protection Zone	This to the area around a tree that is to be protected through tree protection measures e.g. hoarding. No construction activities are to be undertaken within this zone.
Suppressed	Refers to trees that have their crowns completely overtopped by adjacent trees and received limited to very limited sunlight.
Co-dominant Stem	Stems equal in size and relative importance that make up the overall crown of the tree.
Union	Junction point where two or more stems meet. A ‘U’ shaped junction indicates a well-formed union. A ‘V’ shaped junction indicates a weakly formed union, whereas stems grow and increase in girth, weak bark called ‘included bark’ forms within the junction and stems start to push apart causing vertical cracks and loss of structure.
Compartmentalization	This is a naturally occurring process by which chemical and physical barriers are synthesized to prevent the spread of decay and disease in trees.
Irregular Tree Form	Refers to branches and stems that have formed irregularly often resulting in contorted growth, weak attachments, weakly formed unions and codominant stems. The irregular growth of scaffold (lateral) branches typically leads to damage to other scaffold branches.
Imminently Hazardous Tree	Refers to a destabilized or structurally compromised tree that is in imminent danger of causing damage or injury to life or property.
Injure and Injury	Described as any act that will harm a tree's health, including failure to protect in accordance with standards set by the Cities tree protection / preservation policy.
Root Zone	Refers to the subterranean area around the tree measured from the trunk to up to 2-3m beyond the dripline.
Critical Root Zone	The minimum area of the root system necessary to maintain vitality or stability of the tree. Typically, this area extends to the drip line of the tree. The severing of one root can cause approximately 5-20% loss of the root system. A reduction of this area by greater than 30% can pose stability concerns for the tree.

Table 4.2 – Tree Assessment Criteria

DEFINITION	DESCRIPTION
Trunk Integrity (T.I.)	This is an assessment of the trunk for any defects or weaknesses. It is measured on a scale of poor, fair, good.
Canopy Structure (C.S.)	This is an assessment of the scaffold branches, unions and the canopy of the tree. This is measured on a scale of poor, fair, good.
Canopy Vigour (C.V.)	This is an assessment of the health of the tree and assesses the amount of deadwood and live growth in the crown as compared to a 100% healthy tree. The size, colour and amount of foliage are also considered in this category. This is measured on a scale of poor, fair, good.
Good	Tree displays less than 15% deficiency/defect within the given tree assessment criteria (TI, CS, CV).
Fair	Tree displays 15%-40% deficiency/defect within the given tree assessment criteria (TI, CS, CV).
Poor	Tree displays greater than 40% deficiency/defect within the given tree assessment criteria (TI, CS, CV).

5 FIELD SURVEYS

5.1 TREE INVENTORY METHODOLOGY

The field observations were conducted by certified arborists on December 9, 2020 within the study limits.

Tree were inventoried as follows:

- Trees were assessed for species, quantity, DBH, dripline radius and general health condition;
- Tree location identified using a topographic survey and aerial photography;
- Representative photographs were taken, which are on file at WSP
- Trees were assessed in accordance with City of Mississauga By-laws;
- Within the ROW, individual trees > 10cm DBH were labelled numerically but were not tagged.

5.2 TREE INVENTORY RESULTS

Please refer to the following table for a breakdown of trees within the study area. Refer to Appendix A for details on the inventory of each tree / tree grouping.

Table 5.1 – Tree Location

LOCATION	TREE ID'S	TOTAL
City of Mississauga ROW	L7 to L11, L13 to L56, L60 to L66, L68 to L112, L114 to L123, C1 to C20, C27, C29, C33, C36 to C81, C83 to C102, C105	201
Private property	L1 to L6, L12, L57, L58, L59, L67, L113, C21 to C26, C28, C30, C31, C32, C34, C35, C82, C103, C104, P1 to P14	41
Total		**242**

Table 5.2 – Tree Composition

228 trees comprised of 19 species. See below for species, size and quantities.

COMMON NAME	*SCIENTIFIC NAME*	DBH	QUANTITY
Manitoba Maple	*Acer negnundo*	28 & 42	2
Norway Maple	*Acer platanoides*	10 to 58	88
Maple sp.	*Acer sp.*	20	1
Linden	*Tilia sp.*	30 to 35	3
White Mulberry	*Morus alba*	12 & 15	2
White Oak	*Quercus alba*	21 to 40	20
Silver Maple	*Acer saccharinum*	24 to 40	17
Freeman's Maple	*Acer x freemanii*	20 to 33	6
Green Ash	*Fraxinus pennsylvanica*	26 to 36	3
European Ash	*Fraxinus excelsior*	37	1
Honey Locust	*Gleditsia triacanthos*	14 to 34	24
Cherry sp.	*Prunus sp.*	25 to 40	1
Elm sp.	*Ulmus sp.*	10 to 11	3
Black Locust	*Robinia pseudoacacia*	11 to 38	11
English Hawthorn	*Crataegus monogyna*	11	1
Serviceberry	*Amelanchier sp.*	11	1
Ivory Silk Tree	*Syringa reticulata*	16	2
Trembling Aspen	*Populus tremuloides*	10	1
Basswood	*Tilia americana*	10	1
Apple	*Malus sp.*	12 to 39	40
Austrian Pine	*Pinus nigra*	25 to 35	14
Total			**242**

6 DISCUSSION

This section is a discussion of the retention potential, preservation and / or impacts to trees within the limits of the study area. Vegetation recommendations, impacts and preservation are detailed in the following sections.

6.1 PROPOSED WORKS

The City of Mississauga is planning various roadway improvements for both Rathburn Road East and Ponytrail Drive that include pavement rehabilitation, construction of new cycling facilities, pedestrian crossings, drainage infrastructure, noise walls, transit infrastructure, and intersection improvements. Detailed design will occur at a future date.

6.2 TREE RECOMMENDATIONS / ASSUMPTIONS

Tree recommendations will be identified / refined at detailed design. The extent of tree impact, if any, is not currently known, however we offer the following general recommendations and comments for trees that are to be removed, injured, preserved, retained and or transplanted.

6.2.1 TREE REMOVAL

- Tree removal is based on the degree of excavation / disturbance within the TPZ, considering tree species, size, condition and the amount of critical roots that would be impacted that are vital to sustaining the trees overall health and stability. This amount of impact and above is likely to cause a significant and irreversible decline in health of the tree.
- Where an encroachment into the root zone is equal to or greater than 3x the DBH, trees will be removed (e.g. 30cm DBH tree x 3 = 90cm. Any encroachment into this limit will result in the removal of the tree, as the impact within the root zone will be too severe).
- This designation also may be applied to trees that are dead, in poor condition or trees that could pose future safety concerns and trees dying because of a disease or insect infestation.

6.2.2 TREE INJURY

- Tree injury is based on encroachments into the Tree Protection Zone (TPZ).
- Tree injury will occur where a TPZ will be reduced and construction activity will impact roots and/or branches.
- Mitigative measures may be recommended to minimize the damage to existing roots.

6.2.3 TREE PRESERVATION

- Preservation of trees is considered where an encroachment, excavation or disturbance into the TPZ is expected to be minor or nil and that tree health and stability will not be adversely impacted.
- The implementation of mitigation measures will reduce potential impacts to the tree therefore allowing for the tree to be preserved e.g. air spade excavation and / or horizontal root protection.

6.2.4 TREE RETENTION

- Proposed works will occur beyond the TPZ and the dripline with no impacts to the tree. Trees can be retained and do not require tree protection hoarding.

6.2.5 TREE TRANSPLANTING

- Deemed to be within the limit of work, in good condition and typically under 30cm DBH. Transplanting of trees is dependent on available space on site.

6.2.6 CITY OF MISSISSAUGA BY-LAWS

- Existing trees may be protected or subject to removal requirements under the By-laws of the City of Mississauga. Trees per By-law are listed below in the following table.

Table 6.1 – Tree By-Law Table

LOCATION	APPLICABLE BY-LAW	TREE ID'S	TOTAL
Surveyed trees beyond the study area on private property are protected by the Private Tree By-law or Parks By-law City tree Impacts will require approval from Urban Forestry.	City of Mississauga ROW	L7 to L11, L13 to L56, L60 to L66, L68 to L112, L114 to L123, C1 to C20, C27, C29, C33, C36 to C81, C83 to C102, C105	201
	Private Properties	L1 to L6, L12, L57 to L59, L67, L113, C21 to C26, C28, C30 to C32, C34, C35, C82, C103, C104, P1 to P14	41
Total			**242**

6.3 TREE REMOVALS

In general, tree removals are required where the proposed works will either completely impact the tree or significantly affect the critical root zone and encroach into 3x the trunk diameter.

Refer to Tables 6.2 and 6.3 which detail removals, tree number, encroachment / reason for removal, quantity, and applicable By-law.

Table 6.2 – Tree Removal Table – Construction Activities

Tree #	Impact / Reason for removal	Total
L20, L21, L26 to L28, L54, L68, L69, L78, L80 to L87, L96, L97, L101, L102, L106 to L112, C36, C37, C43, C63, C69, C70, C71, C72, C73, C74, C79, C81, C82, C91, C92, C93, C105, C106, P1 to P14	encroachment exceeds 3x diameter	59
Total		**59**

Table 6.3 – Tree Removal Table – Summary per By-law

By-Law	Tree #	Subtotal	Exemption from Private Property Tree Removal Permit Application (trees <15cm DBH)	Trees subject to By-laws	Total (Included in tree removal permits)
City of Mississauga ROW	L20, L21, L26 to L28, L54, L68, L69, L78, L80 to L87, L96, L97, L101, L102, L106 to L112, C36, C37, C43, C63, C69, C70 to C74, C79, C81, C91, C92, C93, C105	44		L20, L21, L26 to L28, L54, L68, L69, L78, L80 to L87, L96, L97, L101, L102, L106 to L112, C36, C37, C43, C63, C69, C70 to C74, C79, C81, C91, C92, C93, C105	44
Private Property	C82, P1 to P14	15	0	C82, P1 to P14	15
Total					59

- Approval is required from Urban Forestry for the removal of City trees;
- An '*Application to Injure or Remove Trees'* will be required to be submitted for the removal of private trees. This application is to be submitted should the project proceed to detailed design;
- Refer to **Section 8** for removal compensation requirements.

6.4 TREE INJURY

- The location of the limit of excavation, in particular work to access the install cycle facilities has the potential to encroach into and require a reduction of the Tree Protection Zone's (TPZ) of trees;
- Specific mitigation measures e.g. Air Spade / Hydro-vacuum excavation or horizontal root protection may be recommended to be applied as detailed in Sections 7.2 and 7.3 to reduce the potential for root damage and excavation, compaction and construction;

- Any roots and branches encountered are to be pruned in accordance with the recommendations in Sections 7.4 and 7.5. Refer to the following tree injury details.
- Refer to the Tables below that detail the severity of injuries, likelihood of survival and mitigation measures, quantities and tree ID numbers.

Table 6.4 – Tree Injury Location Table

LOCATION	BY-LAW	TREE #	TOTAL
City of Mississauga ROW		L14, L19, L29 to L33, L51, L52, L53, L70, L74 to L77, L79, L98, L103, L104, L105, L117, L119 to L123, C18, C27, C29, C42, C77, C83, C90	34

Table 6.5 – Tree Injury and Mitigation Table

TREE #	SPECIES	DBH (cm) (DBH)	INJURY	MITIGATION & SURVIVAL
L14	White Oak	37	Tree protection zone reduction from 2.4m to 1.9	**Root prune**. During excavation any roots exposed are to be pruned at the limit of disturbance using accepted pruning techniques (see Section 7.4 and 7.5. This measure will enable pruned root ends to sprout new roots, once construction has been completed and site has been restored and ensure that structural stability and health will remain unchanged. Refer to Section 7.
L19	Green Ash	26	Tree protection zone reduction from 1.8m to 1.75	Same as tree # L14
L29	Silver Maple	38	Tree protection zone reduction from 2.4m to 1.96	Same as tree # L14
L30	Silver Maple	34	Tree protection zone reduction from 2.4m to 2.08	Same as tree # L14
L31	Silver Maple	35	Tree protection zone reduction from 2.4m to 2.32	Same as tree # L14
L32	Silver Maple	35	Tree protection zone reduction from 2.4m to 2.29	Same as tree # L14
L33	Silver Maple	38	Tree protection zone reduction 2.4m to 2.34	Same as tree # L14

L51	Norway Maple	20	Tree protection zone reduction from 1.5m to 1.2	Same as tree # L14
L74	Norway Maple	24	Tree protection zone reduction from 1.8m to 1.65	Same as tree # L14
L75	Norway Maple	28	Tree protection zone reduction from 1.8m to 1.2	Same as tree # L14
L76	Norway Maple	22	Tree protection zone reduction from 1.8m to 1.1	Same as tree # L14
L77	Honey-locust	22	Tree protection zone reduction from 1.8m to 0.93	Same as tree # L14
L79	Honey-locust	20	Tree protection zone reduction from 1.5m to 0.91	Same as tree # L14
L98	Norway Maple	28	Tree protection zone reduction from 1.8m to 1.7	Same as tree # L14
L103	Elm sp.	11	Tree protection zone reduction from 1.5m to 0.67	Same as tree # L14
L104	Elm sp.	12	Tree protection zone reduction from 1.5m to 0.66	Same as tree # L14
L105	Elm sp.	12	Tree protection zone reduction from 1.5m to 0.39	Same as tree # L14
L117	Honey-locust	25	Tree protection zone reduction from 1.8m to 0.86	Same as tree # L14
L119	Honey-locust	23	Tree protection zone reduction from 1.8m to 1.3	Same as tree # L14
L120	Honey-locust	18	Tree protection zone reduction from 1.5m to 0.77	Same as tree # L14
L121	Honey-locust	18	Tree protection zone reduction from 1.5m to 0.78	Same as tree # L14
L122	Norway Maple	22	Tree protection zone reduction from 1.8m to 1.02	Same as tree # L14
L123	Norway Maple	24	Tree protection zone reduction from 1.8m to 0.77	Same as tree # L14
C18	White Oak	38	Tree protection zone reduction from 2.4m to 2.3	Same as tree # L14
C27	Black Locust	12	Tree protection zone reduction from 1.5m to 0.62m	Same as tree #L14
C29	Black Locust	13	Tree protection zone reduction from 1.5m to 0.91m	Same as tree #L14

C42	White Oak	39	Tree protection zone reduction from 2.4m to 1.96	Same as tree # L14
C77	Freeman's Maple	33	Tree protection zone reduction from 2.4m to 2.3m	Same as tree # L14
C78	Freeman's Maple	32	Tree protection zone reduction from 2.4m to 2.2m	Same as tree # L14
C83	Norway Maple	24	Tree protection zone reduction from 1.8m to 1.7	Same as tree # L14
C90	Norway Maple	15	Tree protection zone reduction from 1.8m to 1.7	Same as tree # L14

6.5 TREE PROTECTION ZONE ENCROACHMENT (NO INJURY)

- There will be no injury where the proposed limit of disturbance will occur within the paved portion of the road only and will not occur within the boulevard;
- There will be no injury where reductions of the tree protection hoarding will be required at the limits of existing paved surfaces, to not impede vehicular or pedestrian access / flow. These reductions are not construction related;
- This applies to **6** trees. Refer to the table below.

Table 6.6 – Tree Protection Zone Encroachment Table

Tree #	Species (Common Name)	Size (DBH)	Dripline (m)	Minimum TPZ (m)	Comments
L24	Manitoba Maple	28cm	10	1.8	Reduction to existing board fence. No disturbance within softscape boulevard. TPZ within boulevard will be fully protected
L25	Norway Maple	24	4	1.8	Reduction to existing board fence. No disturbance within softscape boulevard. TPZ within boulevard will be fully protected
L118	Honey-locust	21	4	1.8	Reduction to existing sidewalk. No disturbance within softscape boulevard. TPZ within boulevard will be fully protected
C1	Norway Maple	20	3	1.8	Reduction to existing board fence. No disturbance within softscape boulevard. TPZ within boulevard will be fully protected
C2	Norway Maple	24	3	1.8	Reduction to existing sidewalk. No disturbance within softscape boulevard. TPZ within boulevard will be fully protected
C10	Apple species	22	4	1.8	Reduction to existing sidewalk. No disturbance within softscape boulevard. TPZ within boulevard will be fully protected

6.6 TREE PRESERVATION

Trees that are well beyond construction limits with no encroachment into the tree protection zone can be retained. These trees will not require tree protection hoarding. Trees where construction limits will either encroach into the tree protection zone or will be within proximity of the TPZ and / or dripline, will require tree protection hoarding. Table 6.7 details the minimum required TPZ's. Table 6.8 details trees by category (retain or preserve), location and tree ID. Refer to Appendix A for minimum TPZ distances for trees.

Table 6.7 – Minimum Tree Protection Zone (TPZ) Determination

TRUNK DIAMETER	MINIMUM PROTECTION ZONE (TPZ) DISTANCE FROM TRUNK (M)	MINIMUM TREE PROTECTION ZONE (TPZ) DISTANCE FROM TRUNK (M) FOR TREES IN OPEN SPACES AND WOODLANDS
<10cm	1.2	2.4
10 to 20cm	1.5	2.4
21 to 30cm	1.8	3.6
31 to 40	2.4	4.8
41 to 50	3.0	6.0
51 to 60	3.6	7.2
61 to 70	4.2	8.4
71 to 80	4.8	9.6
81 to 90	5.4	10.8
91 to 100	6.0	12.0
>100cm	6 cm per 1cm DBH	12cm per 1cm DBH

*City of Mississauga (May 15, 2017). *Tree Preservation and Protection Standards.* The Urban Tree Management Group.

Table 6.8 – Tree Preservation Table

CATEGORY	BY-LAW	TREE ID'S	MIN. TPZ	QUANTITY
Retain	City of Mississauga ROW	L9 to L11, L22, L56, L60 to L66, C19, C20, C38, C39, C44 to C47, C60, C61, C62	N/A	**23**
	Private Properties	L12, L58, L59, L113, C21 to C26, C28, C30, C31, C32, C34, C35	N/A	**16**
Preserve	City of Mississauga ROW	L7, L8, L13, L15 to L19, L23, L24, L25, L29 to L53, L55, L70 to L77, L79, L88 to L95, L98, L99 to L100, L103 to L105, L114 to L123, C1 to C18, C27, C29, C33, C40, C41, C42, C48 to C59, C64 to C68, C75 to C78, C80, C83 to C90, C94 to C102	1.5 to 2.4m	**134**
	Private Properties	L1 to L6, L57, L67, C103, C104	1.5	**10**
Total				**183**

7 MITIGATION MEASURES

The survival rates for trees, which are in proximity to construction, are dependent on the resultant changes to a variety of environmental and anthropogenic factors. These construction activities bring about changes to a variety of environmental features such as the existing microclimate that includes winds, air temperature, soil moisture, amount of available sunlight, soil quality, and the level of the water table. Increased human activities may also damage the structure and/or physiological activities of the trees. The full effects of any damage that occurs may not appear until several years after its occurrence. Thus, it is essential that both vegetative clearing and preservation methods follow the guidelines below and those generally accepted as keeping with good horticultural and construction practices. The guidelines are subject to adjustments deemed reasonable and appropriate considering the proximity and number of trees involved and the site-specific servicing requirements.

7.1 GENERAL MITIGATION MEASURES

- To minimize damage to roots it is recommended that excavators scrape soil within the same direction of the roots and not across. Any roots exposed are too be pruned neatly and cleanly; and
- Areas where excavation, grading and construction have compacted soil within a reduced TPZ, at the completion of construction, scarify soil to a depth of 100mm. Restore disturbed areas and apply the following methods below:
  - Water trees periodically during construction; and
  - After construction apply a 75mm deep layer of mulch in a 2m radius around the tree trunks.
- The tree protection fencing will be maintained until all construction is completed, soils are stabilized, and all the equipment has been removed from the site.
- Prior to the commencement of tree removals, all limits of the locations of the tree preservation fencing must be clearly staked in the field, installed per approved plans, and approved by the contract administrator. All trees within the tree preservation zone must be left standing.
- All removals must be felled into the work area to ensure that damage does not occur to the trees within the tree preservation zone.
- Upon completion of the tree removals, all felled trees are to be removed from the site, and all should be brush chipped. All brush, roots and wood debris must be shredded into pieces that are smaller than 25 mm in size to ensure that any insect pests that could be present within the wood are destroyed.
- The Canadian Food and Inspection Agency (CFIA) has issued a prohibition of movement where the Emerald Ash Borer (EAB) has been confirmed. EAB has been found within the City of Mississauga and it is within the EAB Regulated Area. This directive pertains to the movement of regulated materials (including but not limited to ash wood or bark and ash wood chips or bark chips) from a regulated area. EAB regulated articles moving out of a regulated area must be accompanied by a Movement Certificate issued by the CFIA. Refer to the EAB Regulated Areas of Canada found on the CFIA website.
- Ash materials, if present, may be removed from the site and disposed of within the 'Regulated Area' (see CFIA website for the 'Regulated Area' limits). Should it be necessary to dispose of Ash products outside of the 'Regulated Area' a 'Movement Certificate' will be required from the CFIA prior to transport.
- Tree protection fencing must be constructed and installed as per the details on the approved Tree Preservation Plan. Upon installation of the fencing, the contractor will contact the contract administrator to review and approve the fencing and its location prior to commencement of any grading work.
- Areas within the tree preservation zone (TPZ) are not to be used for any type of storage (e.g. storage of debris, construction material, surplus soils, and construction equipment). No trenching or tunneling for underground

services shall be located within the tree protection zone or dripline of trees designated for preservation within or adjacent to the construction zone.

- No grade changes shall occur within tree preservation zone unless approved as part of this report. If any grade changes may occur, either as a cut or fill situation, the consulting arborist must be notified prior to such work occurring to ensure that all precautions to preserve the tree are made.
- Trees shall not have any rigging cables or hardware of any sort attached or wrapped around them, nor shall any contaminants be dumped within the protective areas. Further, no contaminants shall be dumped or flushed where they may come into contact with the feeder roots of the trees.
- If it is necessary to remove additional limbs or portions of trees after construction has commenced, to accommodate the construction, the consulting arborist is to be informed and under their direction the removal is to be executed carefully and in full accordance with arboricultural techniques, by a certified arborist.

7.2 AIR SPADE / HYDRO VACUUM EXCAVATION

Air spade / hydro vacuum excavation may be recommended as a preventative measure to reduce the potential damage to roots from construction and to provide an opportunity for pruned root ends to grow after pruning.

The extent of trees requiring air spade / hydro vacuum excavation, if any, is not yet known and will be determined at detailed design.

Excavation and grading required to install the cycle facilities will encroach into the minimum tree protection zones of **34 trees** identified in Section 6.4

Table 7.1 – Hydro-Vacuum Excavation Table

BY-LAW	TREE #	SIZE	CONDITION	QUANTITY
City ROW	L14, L19, L29 to L33, L51, L52, L53, L70, L74 to L77, L79, L98, L103, L104, L105, L117, L119 to L123, C18, C27, C29, C42, C77, C78, C83, C90	11 to 38	Good	34

Air-spade / hydro-vacuum excavation is recommended to minimize the damage to roots from construction activities. The following methods may be applied:

- Install tree protection hoarding as shown on plans TP-1 to TP-8;
- At the limit of the excavation where the tree protection hoarding has been placed, air-spade / hydro-vacuum excavate to a depth of 300mm and at a width of 0.5m to expose roots;
- Air spade excavation on the outside of the TPZ;
- Ensure that the pressure used from the air spade / hydro-vacuum is such that it will not damage roots during excavation;
- Prune any roots in this area using good arboricultural practices per the guidelines in this report or under the supervision of a Certified Arborist;
- Backfill with excavated material or better, immediately after completion of air spade excavation to prevent roots from drying out;
- Upon completion reinstate tree protection fencing to original location;

- Water trees periodically during construction;
- Apply a layer of 50mm depth mulch in a 2m radius around the trees.

7.3 HORIZONTAL ROOT PROTECTION

Horizontal root protection may be recommended as a preventative measure where limits of work will encroach into the TPZ of existing trees and will require a reduction.

The extent of trees requiring horizontal root protection, if any, is not yet known and will be determined at detailed design.

7.4 ROOT PRUNING PRACTICES

- All approved root pruning is to take place by or under the supervision of an arborist and in accordance with the Toronto Tree Protection Specifications.
- Pruned root ends shall be neatly and squarely trimmed and the area shall be backfilled with clean native fill as soon as possible to prevent desiccation and promote root growth.
- The exposed roots shall not be allowed to dry out and an appropriate watering schedule shall be undertaken (e.g. water bi-weekly to field capacity between June 1st and September 15th) so that the roots maintain optimum soil moisture during construction and backfilling operations.
- Backfilling shall occur immediately and shall be with clean uncontaminated topsoil from an approved source. It is recommended that texture of backfill be coarser than existing soils, and that backfill comes into clean contact with existing soils (remove air pockets, sod, etc.).

7.5 BRANCH PRUNING PRACTICES

- All limbs damaged or broken during the course of construction should be pruned cleanly, utilizing by-pass secateurs in accordance with approved horticultural practices. Should there be a potential risk of transfer of disease from infected to non-infected trees, tools must be disinfected after pruning each tree by dipping in methyl hydrate. This practice is particularly important during periods of tree stress and when pruning many members of the same genera, within which a disease could be spread quickly (i.e., Verticillium Wilt on Maples or Fireblight on genera of the Rosaceae family).
- All pruning cuts should be made to a growing point such as a bud, twig or branch, cut just outside the branch collar (the swollen area at the base of the branch that sometimes has a bark ridge), and perpendicular to the branch being pruned rather than as close to the trunk as possible. This minimizes the site of the wound. No stubs should be left. Poor cut location, poor cut angle and torn cuts are not acceptable.
- Extensive pruning is best completed before plants break dormancy. Pruning should be limited to the removal of no more than 25% of the total bud and leaf bearing branches. Pruning should include the careful removal of:
  - Deadwood;
  - branches that are weak, damaged, diseased and those which will interfere with construction activity,
  - secondary leaders of conifers,
  - trunk and root suckers,
  - trunk waterspouts, and
  - tight V-shaped or weak crotches (included unions).

- Any branches that overhang the work area and require pruning are to be pruned using good arboricultural practices utilizing by-pass secateurs in accordance with approved horticultural practices and/or American National Standard (ANSI) A300 (Part 1) – 2008 Pruning.

The Contractor must report immediately any damage to trees such as broken limbs, damage to roots, or wounds to the main trunk or stem systems so that the damage can be assessed immediately.

7.6 MIGRATORY BIRD PROTECTION

- To reduce the possibility of contravention of the MBCA, vegetation removal should be scheduled to occur outside of the overall bird nesting season of **April 1 to August 31**. Some birds may nest before and after this peak bird nesting season due to annual seasonal fluctuations. If a nest of a migratory bird is found within the construction area outside of this nesting period it still receives protection.
- In addition to the bird nesting season, tree removals should also occur outside of the active period for bats (e.g. up to the end of September), therefore considering the bird nesting and bat active seasons, clearing of trees is permitted between **October 1 to March 31.**
- If vegetation must be removed during the overall bird nesting season:
  - Nest and nesting activity searches will be conducted in areas of simple habitat by a qualified avian Biologist no more than 24 hours prior to vegetation removal. For examples of simple and complex habitat please refer to the Environment and Climate Change Canada's Guidelines to Reduce Risk to Migratory Birds (ECCC 2019). Nesting activity will be documented when it consists of confirmed breeding evidence, as defined by OBBA criteria (Cadman 2009).
  - If an active nest or confirmed nesting activity of a migratory bird is observed in simple habitat, regardless of the timing window recommended, a species-specific buffer area following ECCC guidelines will be applied to the nest or confirmed nesting activity wherein no vegetation removal will be permitted until the young have fledged from the nest. The radius of the buffer will depend on species, level of disturbance and landscape context (ECCC 2019), which will be confirmed by a qualified avian Biologist, but will protect a minimum of 10 m around the nest or nesting activity.
  - The results of all nest searches will be documented at the end of each survey day in a Technical Memorandum, including information on the searcher, date, time conducted, weather conditions, habitat type, vegetation community type, observations of breeding activity, observations of confirmed nests including co-ordinates, and, if required, the buffer applied to identified breeding/nesting sites.
- If vegetation removal must occur in complex habitats within the above-listed timing windows and absolutely cannot be avoided, the same Best Management Practices (BMPs) such as nest and nesting activity searches described above will be undertaken.

7.7 CONSTRUCTION IMPLEMENTATION

- Prior to construction, a site meeting shall be held with the Contractor and Contract Administrator to review the clearing limits and confirm the installation location for the temporary tree protection fence.
- Tree protection barriers shall be clearly staked in the field and approved by Urban Forestry prior to construction to ensure correct positioning of fencing and avoid unnecessary disturbance.
- To avoid root zone impacts on trees to be retained, excavated material shall not be stored against the tree protection barrier.
- Inspection of the tree protection fencing, including photographic records and deficiency notes, shall be undertaken by the site supervisor and submitted to Urban Forestry prior to the commencement of construction, during construction and after construction is completed.

- All removals should be felled into the work area to ensure that damage does not occur to the trees within the tree preservation zone. Upon completion of the tree removals, all felled trees are to be removed from the site, and all brush chipped. All brush, roots and wood debris should be shredded into pieces that are smaller than 25 mm in size to ensure that any insect pests that could be present within the wood are destroyed.

8 TREE REMOVALS / INJURY / COMPENSATION

To facilitate the proposed works tree removals may be required. Refer to the charts below that detail removals, injuries, and compensation.

Table 8.1 – Removal and Compensation Table

BY-LAW	TREES TO BE REMOVED	TREES SUBJECT TO BY-LAW	COMPENSATION DUE TO POOR CONDITION (ASH)	TREES SUBJECT TO COMPENSATION	REPLACEMENT RATIO	REPLACEMENT TREES REQUIRED
City	41	N/A	N/A	41	See Table 8.4	141
Private	14	14		14	See Table 8.2	28
Total						**169**

8.1 CITY OF MISSISSAUGA COMPENSATION NOTES

The City of Mississauga has compensation requirements for tree removals on private and public property.

8.1.1 PRIVATE PROPERTY

The City of Mississauga website details compensation requirements for tree removals on private property[2]. Replacement trees are required when three or more healthy trees > 15 cm DBH are removed from private property. If there is no space for replacement trees on the private property, 'cash-in-lieu' can be submitted to the City of Mississauga to plant replacement trees on City property.

The requirements for replacement tree planting for tree removals on private property:

- The replacement tree must be at least 1.8 m tall (if coniferous/evergreen) or at least 6 cm DBH if it's a deciduous tree;
- The replacement tree(s) must remain healthy for at least one year after being planted.

Table 8.2 – Compensation Criteria Table

CRITERIA	REPLACEMENT TREES REQUIRED
For each healthy tree removed that is 49cm DBH or less	1
For each health tree removed that is 50cm DBH or more	2

[2] https://www.mississauga.ca/services-and-programs/forestry-and-environment/trees/removing-trees-on-private-property/

8.1.2 PUBLIC PROPERTY

The City of Mississauga's "Tree Preservation & Protection Standards" details compensation requirements for tree removals on public property[3]. Replacement trees are required when trees 6 cm or more are removed.

The requirements for replacement tree planting for tree removals on public property:

- The replacement tree must be at least 1.8 m tall (if coniferous/evergreen) or at least 6 cm DBH if it's a deciduous tree;

Table 8.3 – Compensation Criteria Table

CRITERIA	REPLACEMENT TREES REQUIRED
For each tree removed that is 6 to 15cm DBH	1
For each tree removed that is 16 to 30cm DBH	2
For each tree removed that is 31 to 45cm DBH	3
For each tree removed that is 46 to 60cm DBH	4
For each tree removed that is 61 to 75cm DBH	5
For each tree removed that is 76 to 90cm DBH	6
For each tree removed that is 91 to 105cm DBH	7
For each tree removed that is 106 to 120cm DBH	8
For each tree removed that is >120cm DBH	9

Table 8.4 – Removal and Compensation Table

COMPENSATION CATEGORY	TREE ID'S	QUANTITY	REPLACEMENT TREES REQUIRED	TOTAL REPLACEMENT TREES REQUIRED
Trees 6 to 15cm DBH	L68, L69, C63	3	1	3
Trees 16 to 30cm DBH	L21, L54, L78, L80, L96, L97, L101, L112, C37, C69 C70 to C74, C79, C81, C91, C92, C93, C105, P1 to P8, P13, P14	30	2	60
Trees 31 to 45cm DBH	L20, L26, L27, L28, L81 to L87, L102, L106 to L111, C43, P9 to P12	26	3	78
Total				**141**

[3] https://www.mississauga.ca/wp-content/uploads/2020/07/16113507/Mississauga-Tree-Preservation-Protection-Standards.pdf

8.2 CITY OF MISSISSAUGA COMPENSATION EXEMPTIONS

The following trees have been excluded from the removal and compensation table as:

- The removal of trees under 15 cm DBH on private property are exempt from the Private Tree By-law
- The removal of less than 3 trees > 15 cm DBH on private property are exempt from the Private Tree By-law
- The removal of unhealthy trees (i.e. dead, dying, or hazardous trees) on private property are exempt from compensation
- The removal of shrubs is not regulated by the Private Tree By-law, or subject to the Tree Preservation & Protection Standards

Table 8.5 – Exemptions Table

By-law	Tree ID	Reason	Quantity
Private	None		None
Total			

9 CONCLUSION

Certified arborists conducted a tree assessment of 228 trees within the City ROW as part of the Rathburn Road East and Ponytrail Drive Environmental Assessment (EA). The EA is a component of an Integrated Road Program to identify opportunities for a complete streets approach to complex road improvement projects on the City of Mississauga's arterial and major collector road network. The City of Mississauga is planning various roadway improvements for both Rathburn Road East and Ponytrail Drive that include pavement rehabilitation, construction of new cycling facilities, pedestrian crossings, drainage infrastructure, noise walls, transit infrastructure, and intersection improvements. Detailed design will occur at a future date.

The 228 trees are comprised of 19 species. Trees ranged in age from young to mature, with a DBH range of 10 to 58 cm. Most trees are in good condition. Additional trees under 10 cm DBH are present and were not inventoried.

Street trees are not protected under a by-law; however, the Tree Preservation and Protection Standards apply. The City of Mississauga's Private Tree By-law applies to trees on private property. If any parkland trees are identified during detailed design as being impacted by the proposed works, the Parks By-law will apply. TRCA regulations apply to trees within its regulation area along Armour Creek (within the study area), and along Etobicoke Creek (just outside of the study area).

Ash (*Fraxinus ssp.*) trees are present within the study area. CFIA restrictions on the movement of ash wood apply due to possible infestation by the invasive Emerald Ash Borer beetle. One tree species is a Species at Risk: Kentucky Coffee Tree, however these represent planted trees and therefore they are not regulated under the Endangered Species Act. Suitable migratory bird habitat is present within the study area; therefore, the Migratory Birds Convention Act and its Regulations apply.

Infractions to the Migratory Birds Convention Act and its Regulations has the potential to occur during the construction phase, potentially impacting migratory birds, nests and eggs. Migratory bird habitat on the subject property may be found in trees, shrubs, ground vegetation (i.e. grass and forbs) and built structures. To minimize the possibility of contravention to the Act and its Regulations, vegetation removals and work within vegetated areas (e.g. moving of heavy equipment), or work on buildings where birds may nest, should occur outside of the "regional bird nesting period" (approximately April 1 to August 31). If work must occur during this period, please refer to the mitigation measures in **Section 7.6**.

10 LITERATURE CITED

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11 LIMITATIONS OF ASSESSMENT

- It is our policy to attach the following clause regarding limitations. We do this to ensure that the client is aware of what is technically and professionally realistic in retaining trees.
- The assessment of the trees presented in this report has been made using accepted arboricultural techniques. These include a visual examination of all the above ground parts of the tree for structural defects, scars, external indications of decay such as fungal fruiting bodies, evidence of attack by insects, discoloured foliage, the condition of any visible root structures, the degree and direction of lean (if any), the general condition of the trees and the surrounding site, and the proximity of property and people. Except where specifically noted, the trees were not cored, probed or climbed and there was no detailed inspection of the root crowns involving excavations.
- Notwithstanding the recommendations and conclusions made in this report, it must be recognized that trees are living organisms, and their health and vigour constantly change over time. They are not immune to changes in site conditions or seasonal variations in the weather conditions.
- While reasonable efforts have been made to ensure that the subject trees are healthy, no guarantees are offered, or implied, that these trees or any of their parts will remain standing. It is both professionally and practically impossible to predict with absolute certainty the behaviour of any single tree or its component parts under all circumstances. Inevitably, a standing tree will always pose some level of risk. Most trees have the potential for failure under adverse weather conditions, and the risk can only be eliminated if the tree is removed.

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APPENDIX

A

TREE PRESERVATION TABLES

Appendix A: Tree Preservation Tables

Project: City of Missisauga, Rathburn - Ponytrail EA | Field Work Completed By: L. Wallis (ISA#ON-2484A), C. Van Daele (ISA#ON-2346A), S. Gibbs, T. Waters (ISA#ON-2590A)

Date of Field Work: 9-Dec-20 | Weather: overcast, some light rain, 1 degree

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Tree Condition:
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Legend:
Trees to be Retained
Trees to be Preserved
Trees to be Removed
Tree location / grouping
Minimum TPZ reduction / Injury
Minimum TPZ reduction / No Injury

Tree #	Code	Botanical Name	Common Name	Qty.	DBH (cm)	Effective DBH	TI	CS	CV	Dripline Radius (m)	Height (m)	Tree Location / Applicable By-law	Tree Protection Zone (m)	Recommendation	Comments - Health	Comments - Removal/Preservation
L1 to L123																
L1	ACERPLA	*Acer platanoides*	Norway Maple	1	27	27	G	G	G	3	11	Private	1.8	Preserve		Fully protected
L2	ACERPLA	*Acer platanoides*	Norway Maple	1	22	22	G	G	G	3	9	Private	1.8	Preserve		Fully protected
L3	ACERPLA	*Acer platanoides*	Norway Maple	1	18	18	m	G	G	3	9	Private	1.5	Preserve		Fully protected
L4	ACERPLA	*Acer platanoides*	Norway Maple	1	18	18	P	P	P	2	6	Private	1.5	Preserve	Topped, severe trunk wounds	Fully protected
L5	ACERPLA	*Acer platanoides*	Norway Maple	1	18	18	G	G	G	3	9	Private	1.5	Preserve		Fully protected
L6	ACERPLA	*Acer platanoides*	Norway Maple	1	18	18	G	G	G	3	9	Private	1.5	Preserve	Poor pruning of branches	Fully protected
L7	ACERPLA	*Acer platanoides*	Norway Maple	1	30	30	G	G	G	5	14	ROW	1.8	Preserve	Poor pruning of branches overhanging yard	Fully protected
L8	ACERPLA	*Acer platanoides*	Norway Maple	1	30	30	G	G	G	5	18	ROW	1.8	Preserve	Poor pruning of branches overhanging yard	Fully protected
L9	TILIAME	*Tilia sp.*	Linden sp.	1	30	30	G	G	G	5	18	ROW	1.8	Retain		Beyond limits of construction
L10	TILIAME	*Tilia sp.*	Linden sp.	1	35	35	G	G	G	5	18	ROW	2.4	Retain	Photo:100-0165	Beyond limits of construction
L11	TILIAME	*Tilia sp.*	Linden sp.	1	35	35	G	G	G	5	16	ROW	2.4	Retain		Beyond limits of construction
L12	MORUALB	*Morus alba*	White Mulberry	1	12	12	G	G	G	1	5	Private	1.5	Retain	Weeping ornamental	Beyond limits of construction
L13	ACERPLA	*Acer platanoides*	Norway Maple	1	22	22	G	G	G	6	14	ROW	1.8	Preserve		Fully protected
L14	QUERALB	*Quercus alba*	White Oak	1	37	37	G	G	G	6	14	ROW	2.4	Preserve / TPZ reduction		Tree protection reduction. Mitigate via root pruning
L15	QUERALB	*Quercus alba*	White Oak	1	30	30	F	G	G	5	14	ROW	1.8	Preserve	Uneven crown, branch wound, severe trunk wound	Fully protected
L16	ACERSAC	*Acer saccharinum*	Silver Maple	1	32	32	G	G	G	8	16	ROW	2.4	Preserve		Fully protected
L17	ACERSAC	*Acer saccharinum*	Silver Maple	1	24	24	G	G	G	4	12	ROW	1.8	Preserve		Fully protected
L18	ACERSAC	*Acer saccharinum*	Silver Maple	1	26	26	G	G	G	8	16	ROW	1.8	Preserve		Fully protected
L19	FRAXPEN	*Fraxinus pennsylvanica*	Green Ash	1	26	26	G	G	G	6	14	ROW	1.8	Preserve / TPZ reduction	Winter conditions - difficult to assess % of dead branches . Due to Emerald Ash Borer the actual condition may be worse than recorded.	Tree protection reduction. Mitigate via root pruning
L20	ACERSAC	*Acer saccharinum*	Silver Maple	1	40	40	G	G	G	8	18	ROW	2.4	Remove		encroachment exceeds 3x diameter
L21	ACERSAC	*Acer saccharinum*	Silver Maple	1	24	24	G	G	G	5	14	ROW	1.8	Remove	Photo:100-0198	encroachment exceeds 3x diameter
L22	GLEDTRI	*Gleditsia triacanthos*	Honey-locust	1	16	16	G	G	G	4	12	ROW	1.5	Retain		Beyond limits of construction
L23	ACERPLA	*Acer platanoides*	Norway Maple	1	16	16	G	G	G	4	12	ROW	1.5	Preserve		Fully protected
L24	ACERNEG	*Acer negundo*	Manitoba Maple	1	28	28	F	G	G	10	12	ROW	1.8	Preserve / TPZ reduction	Lean	Tree protection reduction to exisitng fence
L25	CRAT_SP	*Crataegus monogyna*	English Hawthorn	1	8, 8	11	G	G	G	2	7	ROW	1.2	Preserve / TPZ reduction	two stems	Fully protected

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Tree location / grouping
Minimum TPZ reduction / Injury
Minimum TPZ reduction / No Injury

Tree #	Code	Botanical Name	Common Name	Qty.	DBH (cm)	Effective DBH	TI	CS	CV	Dripline Radius (m)	Height (m)	Tree Location / Applicable By-law	Tree Protection Zone (m)	Recommendation	Comments - Health	Comments - Removal/Preservation
L26	ACERSAC	*Acer saccharinum*	Silver Maple	1	40	40	G	G	G	7	18	ROW	2.4	Remove		encroachment exceeds 3x diameter
L27	ACERSAC	*Acer saccharinum*	Silver Maple	1	37	37	G	G	G	7	18	ROW	2.4	Remove		encroachment exceeds 3x diameter
L28	ACERSAC	*Acer saccharinum*	Silver Maple	1	35	35	G	G	G	7	18	ROW	2.4	Remove		encroachment exceeds 3x diameter
L29	ACERSAC	*Acer saccharinum*	Silver Maple	1	38	38	G	G	G	7	18	ROW	2.4	Preserve / TPZ reduction		Tree protection reduction. Mitigate via root pruning
L30	ACERSAC	*Acer saccharinum*	Silver Maple	1	34	34	G	G	G	6	16	ROW	2.4	Preserve / TPZ reduction	Photo:100-0227	Tree protection reduction. Mitigate via root pruning
L31	ACERSAC	*Acer saccharinum*	Silver Maple	1	35	35	G	G	G	8	20	ROW	2.4	Preserve / TPZ reduction		Tree protection reduction. Mitigate via root pruning
L32	ACERSAC	*Acer saccharinum*	Silver Maple	1	35	35	G	G	G	8	18	ROW	2.4	Preserve / TPZ reduction		Tree protection reduction. Mitigate via root pruning
L33	ACERSAC	*Acer saccharinum*	Silver Maple	1	38	38	G	G	G	8	20	ROW	2.4	Preserve / TPZ reduction		Tree protection reduction. Mitigate via root pruning
L34	FRAXPEN	*Fraxinus pennsylvanica*	Green Ash	1	36	36	G	G	G	6	16	ROW	2.4	Preserve	Winter conditions - difficult to assess % of dead branches . Due to Emerald Ash Borer the actual condition may be worse than recorded.	Fully protected
L35	FRAXPEN	*Fraxinus pennsylvanica*	Green Ash	1	34	34	G	G	G	6	16	ROW	2.4	Preserve	Winter conditions - difficult to assess % of dead branches . Due to Emerald Ash Borer the actual condition may be worse than recorded.	Fully protected
L36	ACERPLA	*Acer platanoides*	Norway Maple	1	24	24	G	G	G	6	16	ROW	1.8	Preserve		Fully protected
L37	ACERPLA	*Acer platanoides*	Norway Maple	1	24	24	G	G	G	6	14	ROW	1.8	Preserve		Fully protected
L38	ACERPLA	*Acer platanoides*	Norway Maple	1	23	23	F	G	G	5	12	ROW	1.8	Preserve	Unhealed frost crack	Fully protected
L39	ACERPLA	*Acer platanoides*	Norway Maple	1	22	22	P	F	F	2	12	ROW	1.8	Preserve	Severe trunk wound, unbalanced crown	Fully protected
L40	ACERPLA	*Acer platanoides*	Norway Maple	1	24	24	G	G	G	4	14	ROW	1.8	Preserve	Photo:100-0261, unbalanced crown	Fully protected
L41	ACERPLA	*Acer platanoides*	Norway Maple	1	25	25	G	G	G	4	14	ROW	1.8	Preserve	Girdling roots	Fully protected
L42	ACERPLA	*Acer platanoides*	Norway Maple	1	20	20	G	G	G	4	15	ROW	1.5	Preserve		Fully protected
L43	ACERPLA	*Acer platanoides*	Norway Maple	1	20	20	G	G	G	4	15	ROW	1.5	Preserve		Fully protected
L44	ACERPLA	*Acer platanoides*	Norway Maple	1	20	20	F	G	G	4	15	ROW	1.5	Preserve	Trunk crack	Fully protected
L45	ACERPLA	*Acer platanoides*	Norway Maple	1	20	20	P	G	F	4	15	ROW	1.5	Preserve	Wound with rot at trunk base, wounds all up stem, dead branches	Fully protected
L46	ACERPLA	*Acer platanoides*	Norway Maple	1	20	20	G	G	G	4	15	ROW	1.5	Preserve		Fully protected
L47	ACERPLA	*Acer platanoides*	Norway Maple	1	20	20	F	G	G	4	15	ROW	1.5	Preserve	Trunk crack	Fully protected
L48	ACERPLA	*Acer platanoides*	Norway Maple	1	20	20	F	G	G	4	15	ROW	1.5	Preserve	Trunk crack	Fully protected
L49		*Unknown sp.*	Unknown sp.	1	20	20	P	G	G	4	8	ROW	1.5	Preserve	Debarked portions of trunk and trunk crack	Fully protected

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Tree #	Code	Botanical Name	Common Name	Qty.	DBH (cm)	Effective DBH	TI	CS	CV	Dripline Radius (m)	Height (m)	Tree Location / Applicable By-law	Tree Protection Zone (m)	Recommendation	Comments - Health	Comments - Removal/Preservation
L50	ACERPLA	*Acer platanoides*	Norway Maple	1	20	20	F	G	G	4	15	ROW	1.5	Preserve	Trunk crack, Photo:100-0292	Fully protected
L51	ACERPLA	*Acer platanoides*	Norway Maple	1	20	20	G	G	G	4	15	ROW	1.5	Preserve / TPZ reduction		Tree protection reduction. Mitigate via root pruning
L52	ACERPLA	*Acer platanoides*	Norway Maple	1	20	20	F	G	G	4	15	ROW	1.5	Preserve / TPZ reduction	Trunk wound at base	Tree protection reduction. Mitigate via root pruning
L53	ACERPLA	*Acer platanoides*	Norway Maple	1	20	20	F	G	G	4	15	ROW	1.5	Preserve / TPZ reduction	Trunk wound at base - mostly sealed	Tree protection reduction. Mitigate via root pruning
L54	ACERPLA	*Acer platanoides*	Norway Maple	1	20	20	P	F	G	4	8	ROW	1.5	Remove	Trunk wound at base	encroachment exceeds 3x diameter
L55	ACERPLA	*Acer platanoides*	Norway Maple	1	35	35	G	G	G	6	15	ROW	2.4	Preserve		Fully protected
L56	GLEDTRI	*Gleditsia triacanthos*	Honey-locust	1	16	16	G	G	G	3	12	ROW	1.5	Retain		Beyond limits of construction
L57	ACERCAM	*Unknown sp.*	Unknown sp.	1	30, 40, 25	56	G	G	G	6	14	Private	2.4	Preserve	Existing tree tag 7131	Fully protected
L58	ACERPLA	*Acer platanoides*	Norway Maple	1	36	36	G	G	G	5	16	Private	2.4	Retain		Beyond limits of construction
L59	ACERNEG	*Acer negundo*	Manitoba Maple	1	42	42	F	F	F	8	16	Private	3	Retain	Dryads saddle fungus at base of trunk, branch scar rot, pruned for hydro, poor form	Beyond limits of construction
L60	ACER__SP	*Acer sp.*	Maple sp.	1	20	20	G	G	G	3	8	ROW	1.5	Retain	Under hydro, Photo:100-0322	Beyond limits of construction
L61	GLEDTRI	*Gleditsia triacanthos*	Honey-locust	1	26	26	G	G	G	6	13	ROW	1.8	Retain		Beyond limits of construction
L62	GLEDTRI	*Gleditsia triacanthos*	Honey-locust	1	26	26	G	G	G	6	13	ROW	1.8	Retain		Beyond limits of construction
L63	GLEDTRI	*Gleditsia triacanthos*	Honey-locust	1	24	24	G	G	G	6	13	ROW	1.8	Retain	Uneven crown	Beyond limits of construction
L64	GLEDTRI	*Gleditsia triacanthos*	Honey-locust	1	22	22	G	G	G	4	10	ROW	1.5	Retain		Beyond limits of construction
L65	ACERPLA	*Acer platanoides*	Norway Maple	1	24	24	G	G	G	4	12	ROW	1.8	Retain		Beyond limits of construction
L66	ACERPLA	*Acer platanoides*	Norway Maple	1	22	22	G	G	G	4	12	ROW	1.8	Retain		Beyond limits of construction
L67	GLEDTRI	*Gleditsia triacanthos*	Honey-locust	1	34	34	G	G	G	6	14	Private	2.4	Preserve		Fully protected
L68	GLEDTRI	*Gleditsia triacanthos*	Honey-locust	1	14	14	F	P	F	2	3	ROW	1.5	Remove	Trunk crack, topped	encroachment exceeds 3x diameter
L69	GLEDTRI	*Gleditsia triacanthos*	Honey-locust	1	14	14	G	G	G	3	5	ROW	1.5	Remove		encroachment exceeds 3x diameter
L70	GLEDTRI	*Gleditsia triacanthos*	Honey-locust	1	14	14	G	G	G	3	6	ROW	1.5	Preserve / TPZ reduction		Tree protection reduction. Mitigate via root pruning
L71	GLEDTRI	*Gleditsia triacanthos*	Honey-locust	1	14	14	G	G	G	3	6	ROW	1.5	Preserve		Fully protected
L72	GLEDTRI	*Gleditsia triacanthos*	Honey-locust	1	14	14	F	G	G	3	6	ROW	1.5	Preserve	Tunk wound at base	Fully protected
L73	GLEDTRI	*Gleditsia triacanthos*	Honey-locust	1	14	14	F	F	G	3	6	ROW	1.5	Preserve	Topped, trunk wounds at base	Fully protected
L74	ACERPLA	*Acer platanoides*	Norway Maple	1	24	24	G	G	G	3	12	ROW	1.8	Preserve / TPZ reduction		Tree protection reduction. Mitigate via root pruning
L75	ACERPLA	*Acer platanoides*	Norway Maple	1	28	28	P	G	G	4	12	ROW	1.8	Preserve / TPZ reduction	Trunk crack, trunk wound	Tree protection reduction. Mitigate via root pruning
L76	ACERPLA	*Acer platanoides*	Norway Maple	1	22	22	G	G	G	3	12	ROW	1.8	Preserve / TPZ reduction		Tree protection reduction. Mitigate via root pruning

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Tree #	Code	Botanical Name	Common Name	Qty.	DBH (cm)	Effective DBH	TI	CS	CV	Dripline Radius (m)	Height (m)	Tree Location / Applicable By-law	Tree Protection Zone (m)	Recommendation	Comments - Health	Comments - Removal/Preservation
L77	GLEDTRI	*Gleditsia triacanthos*	Honey-locust	1	22	22	G	G	G	8	12	ROW	1.8	Preserve / TPZ reduction		Tree protection reduction. Mitigate via root pruning
L78	GLEDTRI	*Gleditsia triacanthos*	Honey-locust	1	22	22	G	G	G	3	12	ROW	1.8	Remove		encroachment exceeds 3x diameter
L79	GLEDTRI	*Gleditsia triacanthos*	Honey-locust	1	20	20	G	G	G	3	12	ROW	1.5	Preserve / TPZ reduction		Tree protection reduction. Mitigate via root pruning
L80	GLEDTRI	*Gleditsia triacanthos*	Honey-locust	1	18	18	G	G	G	3	12	ROW	1.5	Remove	Trunk wound at base	encroachment exceeds 3x diameter
L81	QUERALB	*Quercus alba*	White Oak	1	40	40	G	G	G	6	22	ROW	2.4	Remove	Exposed roots	encroachment exceeds 3x diameter
L82	QUERALB	*Quercus alba*	White Oak	1	40	40	G	G	G	6	20	ROW	2.4	Remove	Root damage from mower	encroachment exceeds 3x diameter
L83	ACERSAC	*Acer saccharinum*	Silver Maple	1	35	35	G	G	G	6	18	ROW	2.4	Remove		encroachment exceeds 3x diameter
L84	ACERSAC	*Acer saccharinum*	Silver Maple	1	38	38	G	G	G	6	16	ROW	2.4	Remove	Root damage from mower	encroachment exceeds 3x diameter
L85	ACERSAC	*Acer saccharinum*	Silver Maple	1	36	36	G	G	G	6	14	ROW	2.4	Remove	Girdling roots, suckers	encroachment exceeds 3x diameter
L86	QUERALB	*Quercus alba*	White Oak	1	32	32	G	G	G	6	14	ROW	2.4	Remove		encroachment exceeds 3x diameter
L87	ACERSAC	*Acer saccharinum*	Silver Maple	1	32	32	G	G	G	5	16	ROW	2.4	Remove		encroachment exceeds 3x diameter
L88	MALU_SP	*Malus sp.*	Apple sp.	1	24	24	G	P	P	1	3	ROW	1.8	Preserve	Broken top,suckers on stem	Fully protected
L89	MALU_SP	*Malus sp.*	Apple sp.	1	22	22	F	F	G	3	7	ROW	1.8	Preserve	Trunk wounds at base, poor form	Fully protected
L90	MALU_SP	*Malus sp.*	Apple sp.	1	20	20	G	G	G	3	7	ROW	1.5	Preserve		Fully protected
L91	ACERPLA	*Acer platanoides*	Norway Maple	1	24	24	F	G	G	4	12	ROW	1.8	Preserve	Trunk wound/crack, girdling roots	Fully protected
L92	GLEDTRI	*Gleditsia triacanthos*	Honey-locust	1	25	25	G	G	G	6	14	ROW	1.8	Preserve		Fully protected
L93	MALU_SP	*Malus sp.*	Apple sp.	1	22	22	F	G	G	3	8	ROW	1.8	Preserve	Trunk wound at base	Fully protected
L94	MALU_SP	*Malus sp.*	Apple sp.	1	24	24	G	G	G	4	10	ROW	1.8	Preserve		Fully protected
L95	MALU_SP	*Malus sp.*	Apple sp.	1	25	25	G	G	G	6	10	ROW	1.8	Preserve		Fully protected
L96	ACERPLA	*Acer platanoides*	Norway Maple	1	30	30	G	G	G	8	16	ROW	1.8	Remove	Girdling roots	encroachment exceeds 3x diameter
L97	ACERPLA	*Acer platanoides*	Norway Maple	1	30	30	F	G	G	6	14	ROW	1.8	Remove	Girdling roots, severe trunk wound	encroachment exceeds 3x diameter
L98	ACERPLA	*Acer platanoides*	Norway Maple	1	28	28	G	G	G	8	16	ROW	1.8	Preserve / TPZ reduction	Girdling roots, trunk wound at base	Tree protection reduction. Mitigate via root pruning
L99	ACERPLA	*Acer platanoides*	Norway Maple	1	30	30	G	G	G	8	16	ROW	1.5	Preserve	Girdling roots	Fully protected
L100	ACERPLA	*Acer platanoides*	Norway Maple	1	28	28	G	G	G	8	16	ROW	1.8	Preserve	Girdling roots	Fully protected
L101	ACERPLA	*Acer platanoides*	Norway Maple	1	22	22	G	F	G	4	14	ROW	1.8	Remove	Trunk wound at base, poor form	encroachment exceeds 3x diameter
L102	QUERALB	*Quercus alba*	White Oak	1	40	40	G	G	G	10	20	ROW	2.4	Remove		encroachment exceeds 3x diameter
L103	MALU_SP	*Unknown sp.*	Unknown sp.	1	11	11	P	G	G	2	5	ROW	1.5	Preserve / TPZ reduction	Trunk wound	Tree protection reduction. Mitigate via root pruning

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L104	MALU_SP	*Unknown sp.*	Unknown sp.	1	12	12	G	G	G	3	7	ROW	1.5	Preserve / TPZ reduction	Downy twigs	Tree protection reduction. Mitigate via root pruning
L105	MALU_SP	*Unknown sp.*	Unknown sp.	1	12	12	G	G	G	3	7	ROW	1.5	Preserve / TPZ reduction	Downy twigs	Tree protection reduction. Mitigate via root pruning
L106	ACERPLA	*Acer platanoides*	Norway Maple	1	35	35	G	G	G	5	16	ROW	2.4	Remove	Girdling roots, trunk crack	encroachment exceeds 3x diameter
L107	QUERALB	*Quercus alba*	White Oak	1	38	38	G	G	G	8	20	ROW	2.4	Remove	Trunk cracks	encroachment exceeds 3x diameter
L108	QUERALB	*Quercus alba*	White Oak	1	40	40	G	G	G	8	20	ROW	2.4	Remove	Mower damage to exposed roots, crack	encroachment exceeds 3x diameter
L109	QUERALB	*Quercus alba*	White Oak	1	32	32	G	G	G	6	20	ROW	2.4	Remove		encroachment exceeds 3x diameter
L110	ACERPLA	*Acer platanoides*	Norway Maple	1	32	32	G	G	G	6	12	ROW	2.4	Remove		encroachment exceeds 3x diameter
L111	ACERPLA	*Acer platanoides*	Norway Maple	1	35	35	G	G	G	12	18	ROW	2.4	Remove	Girdling roots	encroachment exceeds 3x diameter
L112	ACERPLA	*Acer platanoides*	Norway Maple	1	25	25	G	G	G	6	15	ROW	1.8	Remove	Mower damage to exposed roots, trunk crack, girdling roots	encroachment exceeds 3x diameter
L113	ACERPLA	*Acer platanoides*	Norway Maple	1	32	32	G	G	G	6	15	Private	2.4	Retain	Mower damage to exposed roots, trunk crack, girdling roots	Beyond limits of construction
L114	MALU_SP	*Malus sp.*	Apple sp.	1	20	20	G	G	G	2	11	ROW	1.5	Preserve		Fully protected
L115	MALU_SP	*Malus sp.*	Apple sp.	1	12	12	G	G	G	1	8	ROW	1.5	Preserve		Fully protected
L116	MALU_SP	*Malus sp.*	Apple sp.	1	15	15	G	G	G	2	11	ROW	1.5	Preserve		Fully protected
L117	GLEDTRI	*Gleditsia triacanthos*	Honey-locust	1	25	25	G	G	G	6	12	ROW	1.8	Preserve / TPZ reduction		Tree protection reduction. Mitigate via root pruning
L118	GLEDTRI	*Gleditsia triacanthos*	Honey-locust	1	21	21	G	G	G	4	10	ROW	1.8	Preserve / TPZ reduction	Minor frost crack	Tree protection reduction. Mitigate via root pruning
L119	GLEDTRI	*Gleditsia triacanthos*	Honey-locust	1	23	23	G	G	G	6	12	ROW	1.8	Preserve / TPZ reduction	Minor frost crack	Tree protection reduction. Mitigate via root pruning
L120	GLEDTRI	*Gleditsia triacanthos*	Honey-locust	1	18	18	G	G	G	3	6	ROW	1.5	Preserve / TPZ reduction		Tree protection reduction. Mitigate via root pruning
L121	GLEDTRI	*Gleditsia triacanthos*	Honey-locust	1	18	18	G	G	G	3	6	ROW	1.5	Preserve / TPZ reduction		Tree protection reduction. Mitigate via root pruning
L122	ACERPLA	*Acer platanoides*	Norway Maple	1	22	22	G	G	G	2	12	ROW	1.8	Preserve / TPZ reduction	Loose bark	Tree protection reduction. Mitigate via root pruning
L123	ACERPLA	*Acer platanoides*	Norway Maple	1	24	24	G	G	G	3	10	ROW	1.8	Preserve / TPZ reduction	Dead branch	Tree protection reduction. Mitigate via root pruning
C1 to C105																
C1	ACERPLA	*Acer platanoides*	Norway Maple	1	20	20	G	G	G	3	10	ROW	1.5	Preserve	Root collar exposed	Tree protection reduction. Mitigate via root pruning
C2	ACERPLA	*Acer platanoides*	Norway Maple	1	24	24	G	G	G	3	10	ROW	1.8	Preserve	Gypsy moth nest	Tree protection reduction. Mitigate via root pruning
C3		*Malus* sp.	Apple species	1	22,19	29	F	F	G	4	12	ROW	1.8	Preserve	Pruned	Fully protected
C4		*Malus* sp.	Apple species	1	26,18	32	F	F	G	4	12	ROW	2.4	Preserve	Pruned	Fully protected
C5		*Malus* sp.	Apple species	1	17,17	24	F	F	G	4	12	ROW	1.5	Preserve	Bark missing at base, pruned	Fully protected
C6	ACERPLA	*Acer platanoides*	Norway Maple	1	11	11	G	G	G	2	8	ROW	1.5	Preserve	Wasp nest, pruned	Fully protected

Appendix A: Tree Preservation Tables

Project: City of Missisauga, Rathburn - Ponytrail EA **Field Work Completed By:** L. Wallis (ISA#ON-2484A), C. Van Daele (ISA#ON-2346A), S. Gibbs, T. Waters (ISA#ON-2590A)

Date of Field Work: 9-Dec-20 **Weather:** overcast, some light rain, 1 degree

Tree Condition Assessment Criteria:
TI - Trunk Integrity: assessment of the trunk for any defects or weaknesses.
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CV - Canopy vigour: assessment of the health of the tree, based on the % of deadwood, disease, pests & live crown

Tree Condition:
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Legend:
Trees to be Retained
Trees to be Preserved
Trees to be Removed
Tree location / grouping
Minimum TPZ reduction / Injury
Minimum TPZ reduction / No Injury

Tree #	Code	Botanical Name	Common Name	Qty.	DBH (cm)	Effective DBH	TI	CS	CV	Dripline Radius (m)	Height (m)	Tree Location / Applicable By-law	Tree Protection Zone (m)	Recommendation	Comments - Health	Comments - Removal/Preservation
C7		*Malus* sp.	Apple species	1	18	18	F	F	G	3	9	ROW	1.5	Preserve	Codominant stem, second stem pruned	Fully protected
C8		*Malus* sp.	Apple species	1	19,17	25	G	F	G	4	10	ROW	1.5	Preserve	Missing bark at base	Fully protected
C9		*Malus* sp.	Apple species	1	18	18	F	F	G	3	9	ROW	1.5	Preserve	Codominant stem, second stem pruned	Fully protected
C10		*Malus* sp.	Apple species	1	22	22	G	F	G	4	10	ROW	1.8	Preserve / TPZ reduction	Pruned	Tree protection reduction. Mitigate via root pruning
C11	QUERALB	*Quercus alba*	White Oak	1	26	26	G	G	G	5	12	ROW	1.8	Preserve	Pruned, knot holes	Fully protected
C12	QUERALB	*Quercus alba*	White Oak	1	21	21	G	G	G	3	10	ROW	1.8	Preserve	Knot holes	Fully protected
C13	QUERALB	*Quercus alba*	White Oak	1	26	26	G	G	G	4	10	ROW	1.8	Preserve	Sprouting	Fully protected
C14	QUERALB	*Quercus alba*	White Oak	1	27	27	G	G	G	3	12	ROW	1.8	Preserve		Fully protected
C15	ACERPLA	*Acer platanoides*	Norway Maple	1	26	26	P	F	F	3	8	ROW	1.8	Preserve	Missing bark, dead branches	Fully protected
C16	QUERALB	*Quercus alba*	White Oak	1	23	23	F	G	G	4	12	ROW	1.8	Preserve	Missing bark, suckering, pruned	Fully protected
C17	QUERALB	*Quercus alba*	White Oak	1	23	23	F	G	G	3	10	ROW	1.8	Preserve	Pruned, sprouting	Fully protected
C18	QUERALB	*Quercus alba*	White Oak	1	38	38	G	G	G	6	15	ROW	2.4	Preserve / TPZ reduction	Pruned, squirrels nest	Tree protection reduction. Mitigate via root pruning
C19	Tiliame	*Tilia americana*	American Basswood	1	10	10	P	F	F	2	5	ROW	1.5	Retain	Major lean	Beyond limits of construction
C20	POPUTRE	*Populus tremuloides*	Trembling Aspen	1	10	10	G	G	G	1	8	ROW	1.5	Retain		Beyond limits of construction
C21	ACERPLA	*Acer platanoides*	Norway Maple	1	58	58	G	G	G	6	15	Private	3.6	Retain		Beyond limits of construction
C22	ACERPLA	*Acer platanoides*	Norway Maple	1	40	40	G	G	G	5	14	Private	2.4	Retain	Exposed and girdling roots	Beyond limits of construction
C23	ACERPLA	*Acer platanoides*	Norway Maple	1	38	38	F	G	G	6	12	Private	2.4	Retain	Seam, exposed roots	Beyond limits of construction
C24	ACERPLA	*Acer platanoides*	Norway Maple	1	33	33	F	G	G	5	10	Private	2.4	Retain	Exposed roots, knot holes, seam	Beyond limits of construction
C25	ACERPLA	*Acer platanoides*	Norway Maple	1	37	37	G	G	G	5	12	Private	2.4	Retain	Pruned	Beyond limits of construction
C26	ACERPLA	*Acer platanoides*	Norway Maple	1	34	34	F	G	G	5	12	Private	2.4	Retain	Seams, pruned	Beyond limits of construction
C27	ROBIPSE	*Robinia pseudoacacia*	Black Locust	1	12	12	F	G	G	2	8	ROW	1.5	Preserve / TPZ reduction	Seams, pruned	Tree protection reduction. Mitigate via root pruning
C28	ACERPLA	*Acer platanoides*	Norway Maple	1	34	34	F	G	G	5	12	Private	2.4	Retain	Seam, exposed roots	Beyond limits of construction
C29	ROBIPSE	*Robinia pseudoacacia*	Black Locust	1	13	13	G	G	G	3	8	ROW	1.5	Preserve / TPZ reduction		Tree protection reduction. Mitigate via root pruning
C30	ACERPLA	*Acer platanoides*	Norway Maple	1	37	37	G	G	G	6	12	Private	2.4	Retain	Exposed roots	Beyond limits of construction
C31	ACERPLA	*Acer platanoides*	Norway Maple	1	27	27	F	G	G	4	8	Private	1.8	Retain	Missing bark at base	Beyond limits of construction
C32	ACERPLA	*Acer platanoides*	Norway Maple	1	38	38	F	G	G	6	12	Private	2.4	Retain	Exposed roots, included bark	Beyond limits of construction
C33		*Malus* sp.	Apple species	1	20,17	26	P	F	F	3	8	ROW	1.5	Preserve	Broken branch, trunk rot	Fully protected

Appendix A: Tree Preservation Tables

Project: City of Missisauga, Rathburn - Ponytrail EA | Field Work Completed By: L. Wallis (ISA#ON-2484A), C. Van Daele (ISA#ON-2346A), S. Gibbs, T. Waters (ISA#ON-2590A)

Date of Field Work: 9-Dec-20 | Weather: overcast, some light rain, 1 degree

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Legend:
Trees to be Retained
Trees to be Preserved
Trees to be Removed
Tree location / grouping
Minimum TPZ reduction / Injury
Minimum TPZ reduction / No Injury

Tree #	Code	Botanical Name	Common Name	Qty.	DBH (cm)	Effective DBH	TI	CS	CV	Dripline Radius (m)	Height (m)	Tree Location / Applicable By-law	Tree Protection Zone (m)	Recommendation	Comments - Health	Comments - Removal/Preservation
C34	ACERPLA	*Acer platanoides*	Norway Maple	1	39	39	F	F	G	5	12	Private	2.4	Retain	New shoots at pruning	Beyond limits of construction
C35	ACERPLA	*Acer platanoides*	Norway Maple	1	42	42	G	G	G	5	12	Private	3	Retain	Seam	Beyond limits of construction
C36	ROBIPSE	*Robinia pseudoacacia*	Black Locust	1	31	31	G	G	G	6	10	ROW	2.4	Remove		encroachment exceeds 3x diameter
C37	ROBIPSE	*Robinia pseudoacacia*	Black Locust	1	19	19	G	G	G	4	10	ROW	1.5	Remove		encroachment exceeds 3x diameter
C38	ROBIPSE	*Robinia pseudoacacia*	Black Locust	1	37	37	G	G	G	7	12	ROW	2.4	Retain		Beyond limits of construction
C39	ROBIPSE	*Robinia pseudoacacia*	Black Locust	1	38	38	G	G	G	6	12	ROW	2.4	Retain		Beyond limits of construction
C40	ACERPLA	*Acer platanoides*	Norway Maple	1	12	12	F	G	G	2	6	ROW	1.5	Preserve	Missing bark, pruned	Fully protected
C41	ACERPLA	*Acer platanoides*	Norway Maple	1	10	10	F	G	G	2	5	ROW	1.5	Preserve	Missing bark	Fully protected
C42	QUERALB	*Quercus alba*	White Oak	1	39	39	F	G	G	5	12	ROW	2.4	Preserve / TPZ reduction	Seams, pruning wounds	Tree protection reduction. Mitigate via root pruning
C43	QUERALB	*Quercus alba*	White Oak	1	38	38	F	G	G	5	8	ROW	2.4	Remove	Sprouting	encroachment exceeds 3x diameter
C44		*Malus* sp.	Apple species	1	14,10	17	F	F	G	1	4	ROW	1.5	Retain		Beyond limits of construction
C45		*Malus* sp.	Apple species	1	14	14	F	F	G	1	4	ROW	1.5	Retain		Beyond limits of construction
C46		*Malus* sp.	Apple species	1	14,12	18	F	F	G	1	4	ROW	1.5	Retain		Beyond limits of construction
C47	FRAXEXC	*Fraxinus excelsior*	European ash	1	37	37	P	F	F	4	12	ROW	2.4	Retain	Sprouting, seams, missing bark	Beyond limits of construction
C48		*Malus* sp.	Apple species	1	24	24	G	F	G	3	5	ROW	1.8	Preserve		Fully protected
C49		*Malus* sp.	Apple species	1	25	25	F	F	G	3	5	ROW	1.8	Preserve	Missing bark, sapsucker holes	Fully protected
C50		*Malus* sp.	Apple species	1	20	20	G	F	G	2	5	ROW	1.5	Preserve		Fully protected
C51		*Amelanchier* sp.	Serviceberry species	1	11	11	G	G	G	2	5	ROW	1.5	Preserve		Fully protected
C52		*Malus* sp.	Apple species	1	24	24	F	F	G	4	6	ROW	1.8	Preserve	Exposed roots	Fully protected
C53		*Malus* sp.	Apple species	1	22	22	G	F	G	3	6	ROW	1.8	Preserve		Fully protected
C54		*Malus* sp.	Apple species	1	14	14	F	F	G	2	5	ROW	1.5	Preserve	Trunk wound	Fully protected
C55		*Malus* sp.	Apple species	1	16	16	F	F	G	2	5	ROW	1.5	Preserve		Fully protected
C56		*Malus* sp.	Apple species	1	16	16	P	F	F	2	5	ROW	1.5	Preserve	Major lean and trunk wound	Fully protected
C57		*Malus* sp.	Apple species	1	20	20	F	F	G	3	6	ROW	1.5	Preserve	Exposed root collar, sapsucker holes	Fully protected
C58		*Malus* sp.	Apple species	1	18	18	F	F	G	2	6	ROW	1.5	Preserve	Branch with missing bark, sapsucker holes	Fully protected
C59		*Malus* sp.	Apple species	1	18	18	F	F	G	2	5	ROW	1.5	Preserve	Sapsucker holes	Fully protected
C60	ACERFRE	*Acer x freemanii*	Freeman's Maple	1	32	32	F	G	G	6	12	ROW	2.4	Retain	Sprouting	Beyond limits of construction

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Legend:
Trees to be Retained
Trees to be Preserved
Trees to be Removed
Tree location / grouping
Minimum TPZ reduction / Injury
Minimum TPZ reduction / No Injury

Tree #	Code	Botanical Name	Common Name	Qty.	DBH (cm)	Effective DBH	TI	CS	CV	Dripline Radius (m)	Height (m)	Tree Location / Applicable By-law	Tree Protection Zone (m)	Recommendation	Comments - Health	Comments - Removal/Preservation
C61		*Syringa reticulata*	Ivory Silk Lilac	1	16	16	F	G	G	1	6	ROW	1.5	Retain	Girdling roots	Beyond limits of construction
C62		*Syringa reticulata*	Ivory Silk Lilac	1	16	16	F	G	G	1	6	ROW	1.5	Retain	Trunk wound, bulge at root collar	Beyond limits of construction
C63	ACERPLA	*Acer platanoides*	Norway Maple	1	12	12	F	G	G	2	6	ROW	1.5	Remove	Trunk wound	encroachment exceeds 3x diameter
C64		*Malus* sp.	Apple species	1	14	14	F	F	G	1	6	ROW	1.5	Preserve	Dead stem	Fully protected
C65		*Malus* sp.	Apple species	1	15	15	G	F	G	2	10	ROW	1.5	Preserve		Fully protected
C66		*Malus* sp.	Apple species	1	15,12,16,16	39	F	F	G	2	8	ROW	1.5	Preserve	Sprouting	Fully protected
C67		*Malus* sp.	Apple species	1	26	26	F	F	G	3	10	ROW	1.8	Preserve		Fully protected
C68		*Malus* sp.	Apple species	1	26	26	F	F	G	2	10	ROW	1.8	Preserve	Suckering	Fully protected
C69		*Malus* sp.	Apple species	1	18,16,16	29	F	F	G	2	8	ROW	1.5	Remove		encroachment exceeds 3x diameter
C70		*Malus* sp.	Apple species	1	18,21	28	F	F	G	3	8	ROW	1.8	Remove	Trunk wound	encroachment exceeds 3x diameter
C71	QUERALB	*Quercus alba*	White Oak	1	25	25	G	G	G	4	10	ROW	1.8	Remove		encroachment exceeds 3x diameter
C72	QUERALB	*Quercus alba*	White Oak	1	24	24	G	G	G	4	10	ROW	1.8	Remove	Closed trunk wounds	encroachment exceeds 3x diameter
C73	ROBIPSE	*Robinia pseudoacacia*	Black Locust	1	18	18	G	G	G	4	8	ROW	1.5	Remove	Sprouting	encroachment exceeds 3x diameter
C74	ROBIPSE	*Robinia pseudoacacia*	Black Locust	1	22	22	F	G	G	4	8	ROW	1.8	Remove	Sprouting, main stem topped	encroachment exceeds 3x diameter
C75	ACERFRE	*Acer x freemanii*	Freeman's Maple	1	25	25	G	G	G	4	14	ROW	1.8	Preserve	Codominant stem	Fully protected
C76	ROBIPSE	*Robinia pseudoacacia*	Black Locust	1	29	29	G	G	G	6	14	ROW	1.8	Preserve	Exposed roots	Fully protected
C77	ACERFRE	*Acer x freemanii*	Freeman's Maple	1	33	33	F	G	G	5	14	ROW	2.4	Preserve / TPZ reduction	Exposed roots, pruned	Tree protection reduction. Mitigate via root pruning
C78	ACERFRE	*Acer x freemanii*	Freeman's Maple	1	32	32	F	G	G	5	14	ROW	2.4	Preserve / TPZ reduction	Exposed roots	Tree protection reduction. Mitigate via root pruning
C79	ACERFRE	*Acer x freemanii*	Freeman's Maple	1	30	30	F	G	G	4	12	ROW	2.4	Remove	Exposed roots	encroachment exceeds 3x diameter
C80	ACERFRE	*Acer x freemanii*	Freeman's Maple	1	20	20	F	G	G	4	10	ROW	1.5	Preserve	Sprouting	Fully protected
C81		*Malus* sp.	Apple species	1	21	21	F	F	G	1	8	ROW	1.8	Remove		encroachment exceeds 3x diameter
C82		*Malus* sp.	Apple species	1	20	20	F	F	G	2	8	Private	1.5	Remove		encroachment exceeds 3x diameter
C83	ACERPLA	*Acer platanoides*	Norway Maple	1	24	24	G	G	G	4	12	ROW	1.8	Preserve / TPZ reduction		Tree protection reduction. Mitigate via root pruning
C84	ACERPLA	*Acer platanoides*	Norway Maple	1	18	18	G	G	G	3	10	ROW	1.5	Preserve		Fully protected
C85	ACERPLA	*Acer platanoides*	Norway Maple	1	23	23	F	G	G	4	9	ROW	1.8	Preserve	Peeling bark, bark missing at base	Fully protected
C86	ACERPLA	*Acer platanoides*	Norway Maple	1	18	18	F	G	G	3	7	ROW	1.5	Preserve	Seam, moth eggs	Fully protected
C87	ACERPLA	*Acer platanoides*	Norway Maple	1	15	15	F	G	G	2	6	ROW	1.5	Preserve		Fully protected

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Trees to be Retained
Trees to be Preserved
Trees to be Removed
Tree location / grouping
Minimum TPZ reduction / Injury
Minimum TPZ reduction / No Injury

Tree #	Code	Botanical Name	Common Name	Qty.	DBH (cm)	Effective DBH	TI	CS	CV	Dripline Radius (m)	Height (m)	Tree Location / Applicable By-law	Tree Protection Zone (m)	Recommendation	Comments - Health	Comments - Removal/Preservation
C88	ACERPLA	*Acer platanoides*	Norway Maple	1	22	22	G	G	G	4	9	ROW	1.8	Preserve	Exposed roots	Fully protected
C89	ACERPLA	*Acer platanoides*	Norway Maple	1	14	14	G	G	G	2	7	ROW	1.5	Preserve		Fully protected
C90	ACERPLA	*Acer platanoides*	Norway Maple	1	15	15	G	G	G	2	7	ROW	1.5	Preserve / TPZ reduction		Tree protection reduction. Mitigate via root pruning
C91	ACERPLA	*Acer platanoides*	Norway Maple	1	17	17	F	G	G	4	8	ROW	1.5	Remove	Peeling bark on trunk	encroachment exceeds 3x diameter
C92	ACERPLA	*Acer platanoides*	Norway Maple	1	18	18	G	G	G	4	9	ROW	1.5	Remove		encroachment exceeds 3x diameter
C93	ACERPLA	*Acer platanoides*	Norway Maple	1	29	29	G	G	G	4	8	ROW	1.8	Remove		encroachment exceeds 3x diameter
C94	ACERPLA	*Acer platanoides*	Norway Maple	1	13	13	G	G	G	2	9	ROW	1.5	Preserve		Fully protected
C95		*Morus alba*	White Mulberry	1	15	15	P	P	F	3	6	ROW	1.5	Preserve	Twisted trunk, topped main branch	Fully protected
C96	ACERPLA	*Acer platanoides*	Norway Maple	1	24	24	G	G	G	5	10	ROW	1.8	Preserve	Exposed roots	Fully protected
C97	ACERPLA	*Acer platanoides*	Norway Maple	1	20	20	F	G	G	3	10	ROW	1.5	Preserve	Slight lean and exposed roots	Fully protected
C98	ACERPLA	*Acer platanoides*	Norway Maple	1	22	22	G	G	G	3	10	ROW	1.8	Preserve	Loose bark	Fully protected
C99	ACERPLA	*Acer platanoides*	Norway Maple	1	14	14	F	G	G	2	8	ROW	1.5	Preserve	Main stem pruned off	Fully protected
C100	ACERPLA	*Acer platanoides*	Norway Maple	1	17	17	G	G	G	3	7	ROW	1.5	Preserve		Fully protected
C101	ACERPLA	*Acer platanoides*	Norway Maple	1	18	18	G	G	G	5	8	ROW	1.5	Preserve	Exposed roots	Fully protected
C102	ROBIPSE	*Robinia pseudoacacia*	Black Locust	1	11	11	G	G	G	3	7	ROW	1.5	Preserve		Fully protected
C103	ACERPLA	*Acer platanoides*	Norway Maple	1	25	25	F	G	G	5	9	Private	1.8	Preserve	Lean, fungus growth	Fully protected
C104	ACERPLA	*Acer platanoides*	Norway Maple	1	15	15	F	G	G	2	8	Private	1.5	Preserve	Lean	Fully protected
C105	ROBIPSE	*Robinia pseudoacacia*	Black Locust	1	18	18	F	G	G	3	8	ROW	1.5	Remove	Growing on pavement	encroachment exceeds 3x diameter
P1 to P14																
P1		*Pinus nigra*	Austrian Pine	1	±30	±30	G	G	G	3		Private	2.4	Remove		encroachment exceeds 3x diameter
P2		*Pinus nigra*	Austrian Pine	1	±30	±30	G	G	G	3		Private	2.4	Remove		encroachment exceeds 3x diameter
P3		*Pinus nigra*	Austrian Pine	1	±30	±25-30	G	G	G	3		Private	2.4	Remove		encroachment exceeds 3x diameter
P4		*Pinus nigra*	Austrian Pine	1	±25-30	±25-30	G	G	G	3		Private	2.4	Remove		encroachment exceeds 3x diameter
P5		*Pinus nigra*	Austrian Pine	1	±25-30	±30	G	G	G	3		Private	2.4	Remove		encroachment exceeds 3x diameter
P6		*Pinus nigra*	Austrian Pine	1	±30	±30	G	G	G	3		Private	2.4	Remove		encroachment exceeds 3x diameter
P7		*Pinus nigra*	Austrian Pine	1	±30	±30	G	G	G	3		Private	2.4	Remove		encroachment exceeds 3x diameter
P8		*Pinus nigra*	Austrian Pine	1	±30	±40	G	G	G	3		Private	2.4	Remove		encroachment exceeds 3x diameter

Appendix A: Tree Preservation Tables

Project: City of Missisauga, Rathburn - Ponytrail EA **Field Work Completed By:** L. Wallis (ISA#ON-2484A), C. Van Daele (ISA#ON-2346A), S. Gibbs, T. Waters (ISA#ON-2590A)

Date of Field Work: 9-Dec-20 **Weather:** overcast, some light rain, 1 degree

Tree Condition Assessment Criteria:
TI - Trunk Integrity: assessment of the trunk for any defects or weaknesses.
CS - Canopy Structure: assessment of scaffold branches, unions and canopy
CV - Canopy vigour: assessment of the health of the tree, based on the % of deadwood, disease, pests & live crown

Tree Condition:
Good (G): tree displays less than 15% deficiency/defect within the given tree assessment criteria (TI,CS,CV)
Fair (F): tree displays 15-40% deficiency/defect within the given tree assessment criteria (TI,CS,CV)
Poor (P): tree displays greater than 40% deficiency/defect within the given tree assessment criteria (TI,CS,CV)

Legend:
Trees to be Retained
Trees to be Preserved
Trees to be Removed
Tree location / grouping
Minimum TPZ reduction / Injury
Minimum TPZ reduction / No Injury

Tree #	Code	Botanical Name	Common Name	Qty.	DBH (cm)	Effective DBH	TI	CS	CV	Dripline Radius (m)	Height (m)	Tree Location / Applicable By-law	Tree Protection Zone (m)	Recommendation	Comments - Health	Comments - Removal/Preservation
P9		*Pinus nigra*	Austrian Pine	1	±40	±35	G	G	G	3		Private	2.4	Remove		encroachment exceeds 3x diameter
P10		*Pinus nigra*	Austrian Pine	1	±35	±35	G	G	F	3		Private	2.4	Remove		encroachment exceeds 3x diameter
P11		*Pinus nigra*	Austrian Pine	1	±35	±35	G	G	F	3		Private	2.4	Remove		encroachment exceeds 3x diameter
P12		*Pinus nigra*	Austrian Pine	1	±35	±35	G	G	G	3		Private	2.4	Remove		encroachment exceeds 3x diameter
P13		*Pinus nigra*	Austrian Pine	1	±30	±30	G	G	G	3		Private	2.4	Remove		encroachment exceeds 3x diameter
P14		*Pinus nigra*	Austrian Pine	1	±30	±30	G	G	G	3		Private	2.4	Remove		encroachment exceeds 3x diameter

APPENDIX

B

SITE PHOTOS

Rathburn Road East, looking west towards Fieldgate Drive. December 9, 2020.

Rathburn Road East, looking west towards Rockwood Road. December 9, 2020.

Rathburn Road East, looking west towards Bough Beeches Boulevard. December 9, 2020.

Rathburn Road East, looking west towards Dixie Rd. December 9, 2020.

Rathburn Road East, looking west from intersection with Ponytrail Drive. (Tree L71 in foreground). December 9, 2020.

Rathburn Road East, looking west from hydro corridor towards Rockwood Road. (Tree L83 in foreground).)May 4, 2020

Rathburn Road East, looking west from intersection with Rockwood Road. December 9, 2020.

West side of Ponytrail Drive, south of Rathburn Road East (Tree L121 in foreground). December 9, 2020.

RATHBURN ROAD EAST AND PONYTRAIL DRIVE EA
TREE INVENTORY PHOTOGRAPHS

Date: January 2020

Project No: 19M-00836-03

Appendix B

Rathburn Road East, looking east from intersection with Ponytrail Drive. (Tree C3 in foreground). December 9, 2020.

Rathburn Road East, looking west from intersection with Garnetwood Chase. (Tree C13 in foreground). December 9, 2020.

Rathburn Road East, looking west from terminus at Etobicoke Creek. (Tree C23 in foreground). December 9, 2020.

Rathburn Road East, near intersection with Garnetwood Chase. (Tree C43 in foreground). December 9, 2020.

Rathburn Road East, looking east from towards Tapestry Trail. (Tree C53 in foreground). December 9, 2020.

Rathburn Road East, at intersection of Bough Beaches Boulevard. (Tree C70 in foreground). December 9, 2020.

Ponytrail Drive, looking south towards Burnhamthorpe Road East. (Tree C83 in foreground). December 9, 2020.

Ponytrail Drive, looking south towards Burnhamthorpe Road East. (Tree C97 in foreground). December 9, 2020.

wsp

RATHBURN ROAD EAST AND PONYTRAIL DRIVE EA
TREE INVENTORY PHOTOGRAPHS

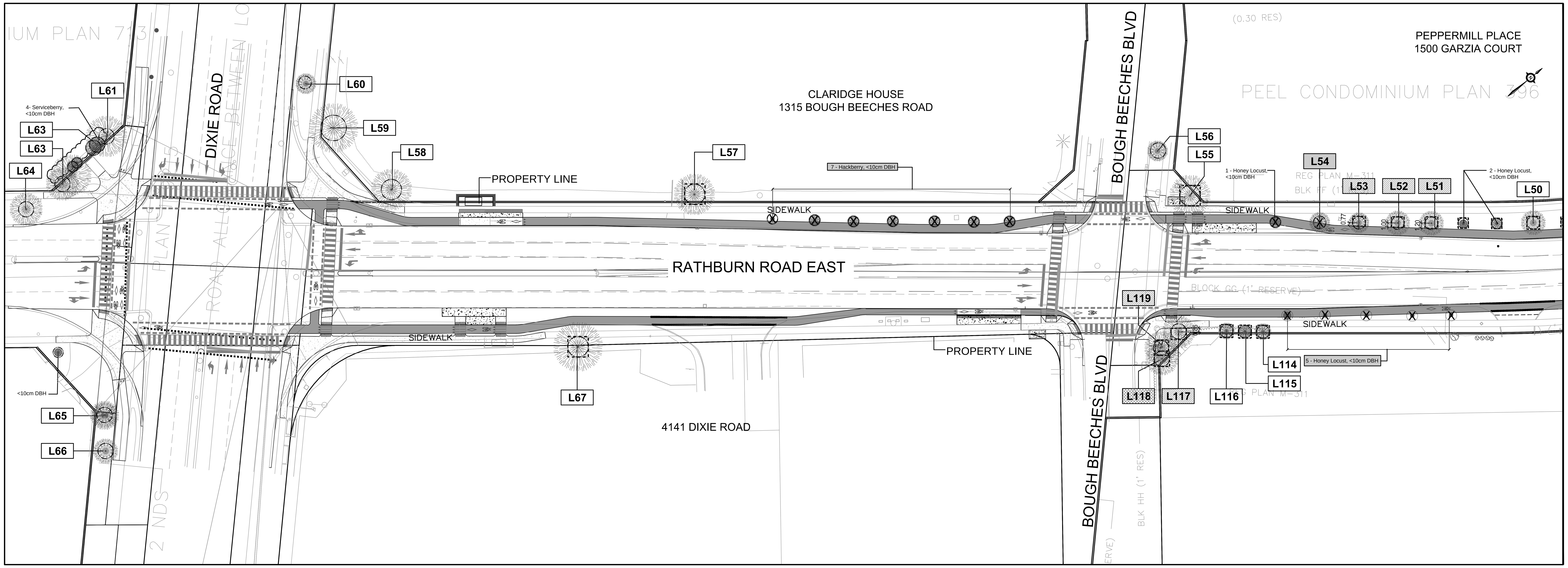
Date: January 2020

Project No: 19M-00836-03

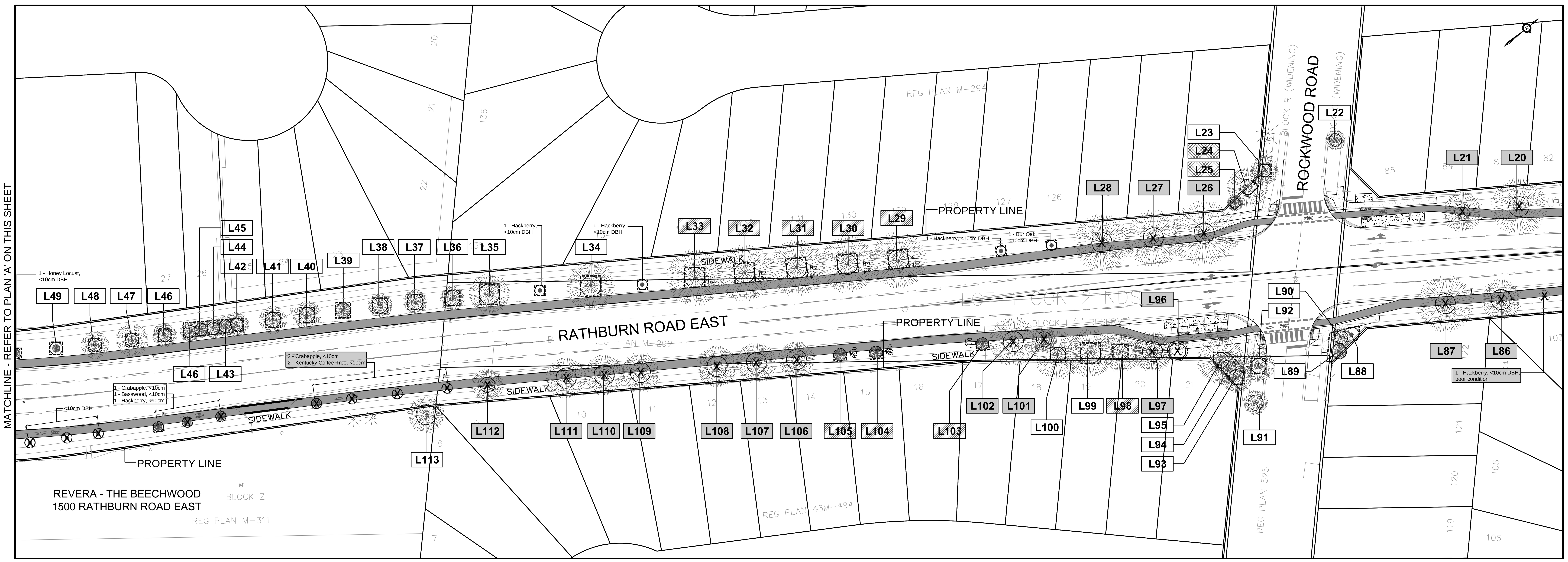
Appendix B

APPENDIX

K TREE PROTECTION PLANS



PLAN 'A'



PLAN 'B'

KEY MAP

LEGEND:

- PROPERTY LINE
- EXISTING INDIVIDUAL TREE (SURVEYED)
- EXISTING INDIVIDUAL TREE (NOT SURVEYED) LOCATIONS ARE APPROXIMATE.
- EXISTING TREE GROUPING
- EXISTING TREE GROUPING TO BE REMOVED
- T-? IDENTIFICATION NUMBER FOR EXISTING TREE TO BE PRESERVED
- T-? IDENTIFICATION NUMBER FOR TPZ REDUCTION / TREE INJURY. REFER TO NOTES ON TP-6
- T-? IDENTIFICATION NUMBER FOR TPZ REDUCTION / NO TREE INJURY. REFER TO NOTES ON TP-6
- T-? IDENTIFICATION NUMBER FOR EXISTING TREE TO BE REMOVED
- EXISTING INDIVIDUAL TREE TO BE REMOVED
- TREES ON PRIVATE PROPERTY: SOLID BOARD TREE PROTECTION HOARDING (TPZ). REFER TO CITY OF MISSISSAUGA DETAIL ON SHEET TP-9
- TREES ON CITY PROPERTY: FRAMED, ORANGE PLASTIC WEB TREE HOARDING (TPZ). REFER TO CITY OF MISSISSAUGA DETAIL ON SHEET TP-9
- MINIMUM TREE PROTECTION ZONE DISTANCE
- ASPAHLT CYCLE FACILITY
- PROPOSED PAVEMENT MARKING / CURB / CYCLE TRACK
- PROPOSED NOISE WALL

No.	REVISIONS	BY	DATE	APPR.
3	PRELIMINARY DESIGN REPORT	PM	2021.09.30	–
2	30% DESIGN PDR	PM	2021.06.18	–
1	PRELIMINARY DESIGN	PM	2021.02.19	–

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PETER McNAMARA, BA
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DESIGNED	DRAWN	CHECKED
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SCALE	DATE
1 : 500	JANUARY 2021

DRAWING NUMBER	SHEET NUMBER
19M-00836-03	TP-1

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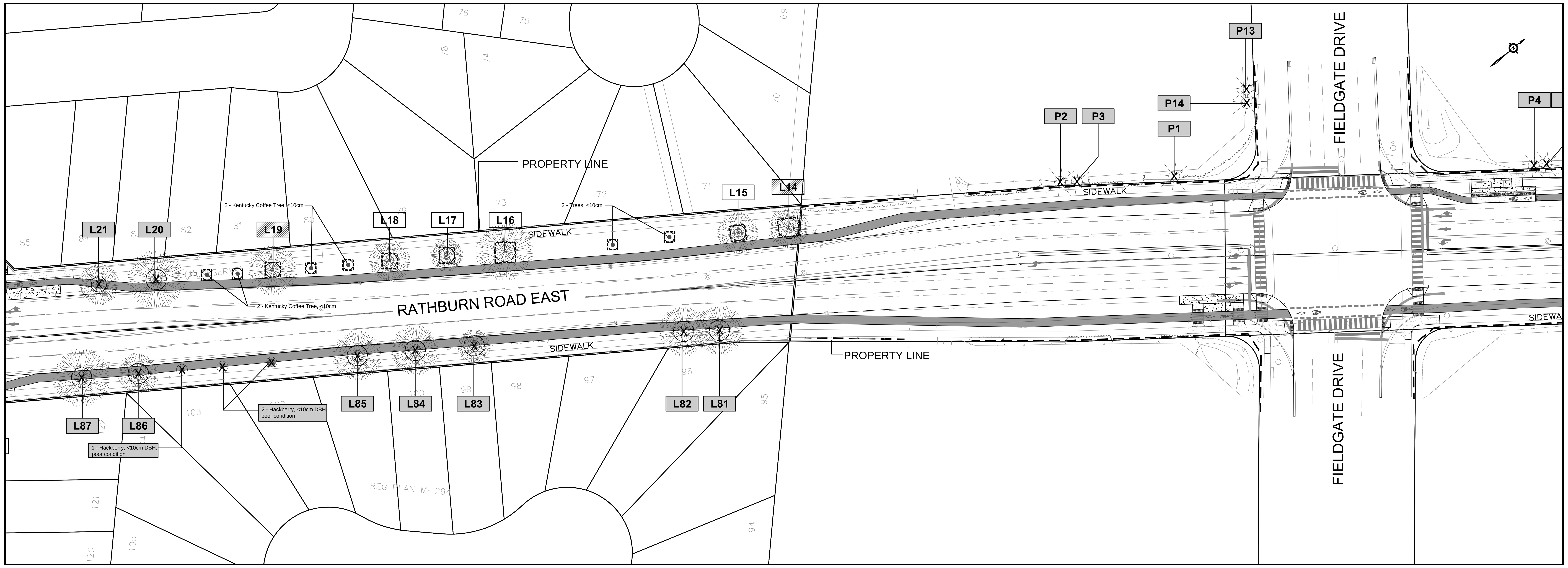

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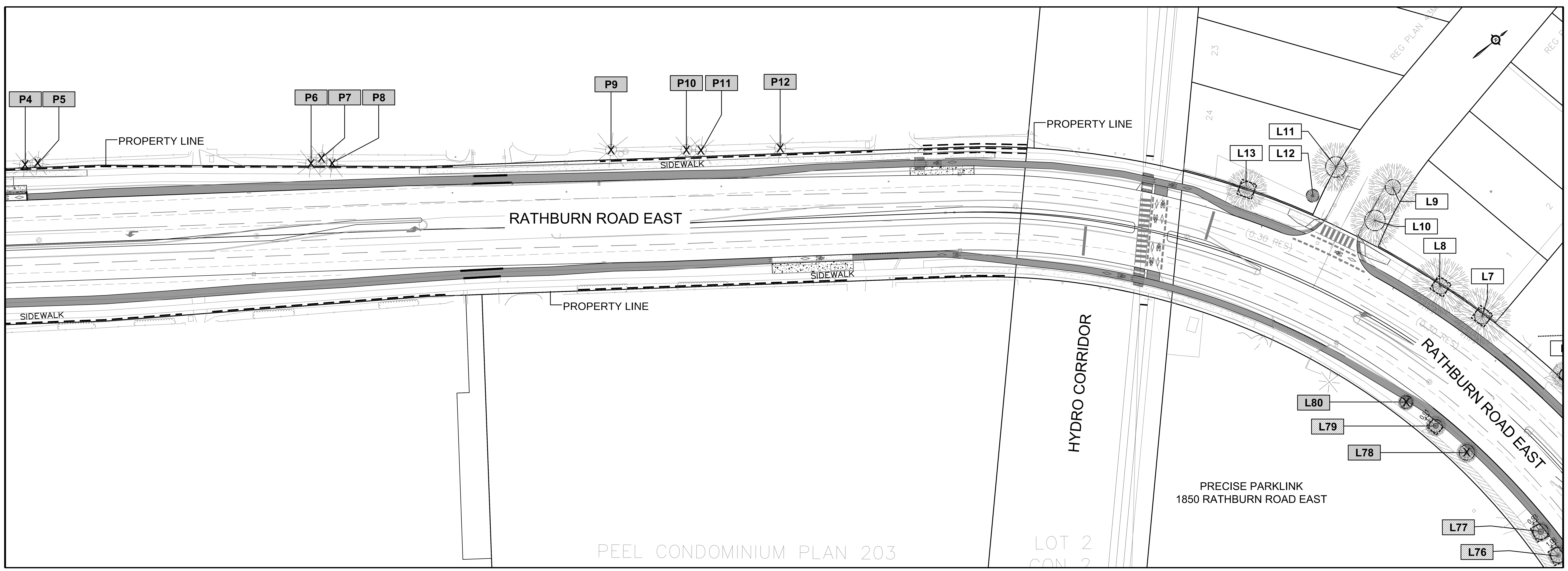

PLAN 'D'

KEY MAP

LEGEND:

- PROPERTY LINE
- EXISTING INDIVIDUAL TREE (SURVEYED)
- EXISTING INDIVIDUAL TREE (NOT SURVEYED) LOCATIONS ARE APPROXIMATE.
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- T-? IDENTIFICATION NUMBER FOR TPZ REDUCTION / NO TREE INJURY. REFER TO NOTES ON TP-6
- T-? IDENTIFICATION NUMBER FOR EXISTING TREE TO BE REMOVED
- EXISTING INDIVIDUAL TREE TO BE REMOVED
- TREES ON PRIVATE PROPERTY: SOLID BOARD TREE PROTECTION HOARDING (TPZ). REFER TO CITY OF MISSISSAUGA DETAIL ON SHEET TP-9
- TREES ON CITY PROPERTY: FRAMED, ORANGE PLASTIC WEB TREE HOARDING (TPZ). REFER TO CITY OF MISSISSAUGA DETAIL ON SHEET TP-9
- MINIMUM TREE PROTECTION ZONE DISTANCE
- ASPAHLT CYCLE FACILITY
- PROPOSED PAVEMENT MARKING / CURB / CYCLE TRACK
- PROPOSED NOISE WALL

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3	PRELIMINARY DESIGN REPORT	PM	2021.09.30	—
2	30% DESIGN PDR	PM	2021.06.18	—
1	PRELIMINARY DESIGN	PM	2021.02.19	—

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SCALE	DATE
1 : 500	JANUARY 2021

DRAWING NUMBER	SHEET NUMBER
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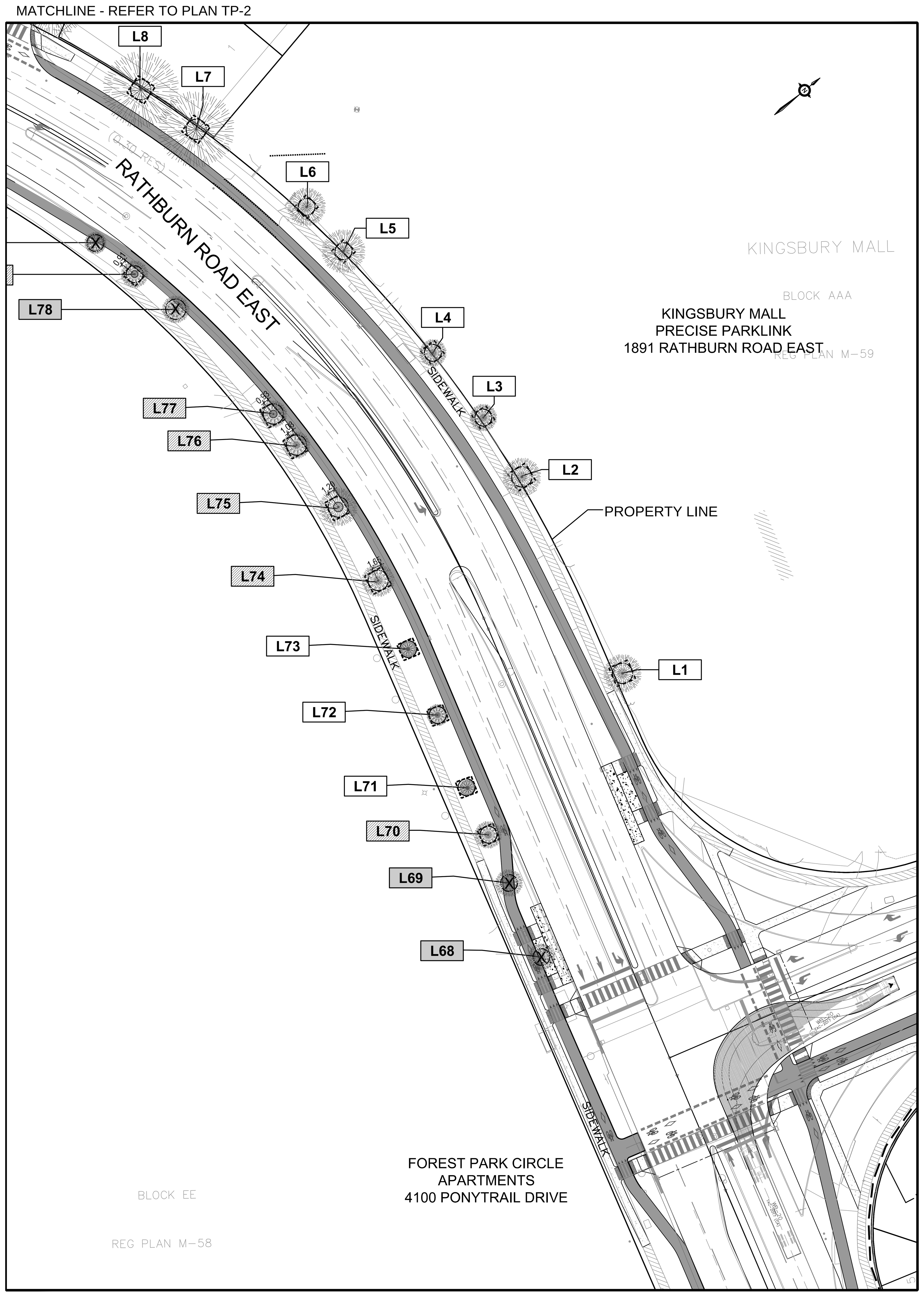

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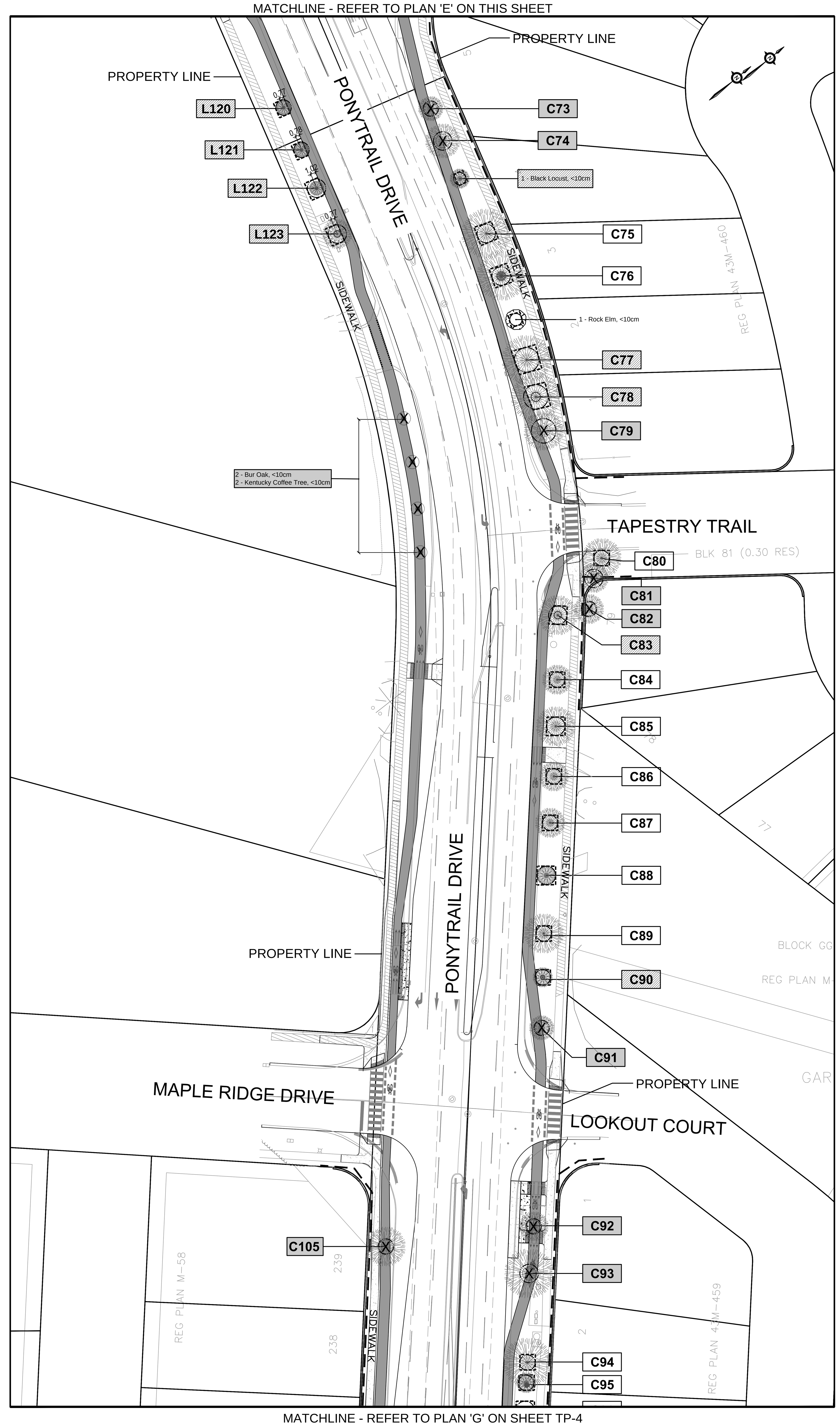

PLAN 'F'

KEY MAP

LEGEND:

- PROPERTY LINE
- EXISTING INDIVIDUAL TREE (SURVEYED)
- EXISTING INDIVIDUAL TREE (NOT SURVEYED) LOCATIONS ARE APPROXIMATE.
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- T-? IDENTIFICATION NUMBER FOR TPZ REDUCTION / NO TREE INJURY. REFER TO NOTES ON TP-6
- T-? IDENTIFICATION NUMBER FOR EXISTING TREE TO BE REMOVED
- EXISTING INDIVIDUAL TREE TO BE REMOVED
- TREES ON PRIVATE PROPERTY: SOLID BOARD TREE PROTECTION HOARDING (TPZ). REFER TO CITY OF MISSISSAUGA DETAIL ON SHEET TP-9
- TREES ON CITY PROPERTY: FRAMED, ORANGE PLASTIC WEB TREE HOARDING (TPZ). REFER TO CITY OF MISSISSAUGA DETAIL ON SHEET TP-9
- MINIMUM TREE PROTECTION ZONE DISTANCE
- ASPAHLT CYCLE FACILITY
- PROPOSED PAVEMENT MARKING / CURB / CYCLE TRACK
- PROPOSED NOISE WALL

No.	REVISIONS	BY	DATE	APPR.
3	PRELIMINARY DESIGN REPORT	PM	2021.09.30	--
2	30% DESIGN PDR	PM	2021.06.18	--
1	PRELIMINARY DESIGN	PM	2021.02.19	--

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PM	PM	CB

SCALE	DATE
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DRAWING NUMBER	SHEET NUMBER
19M-00836-03	TP-3

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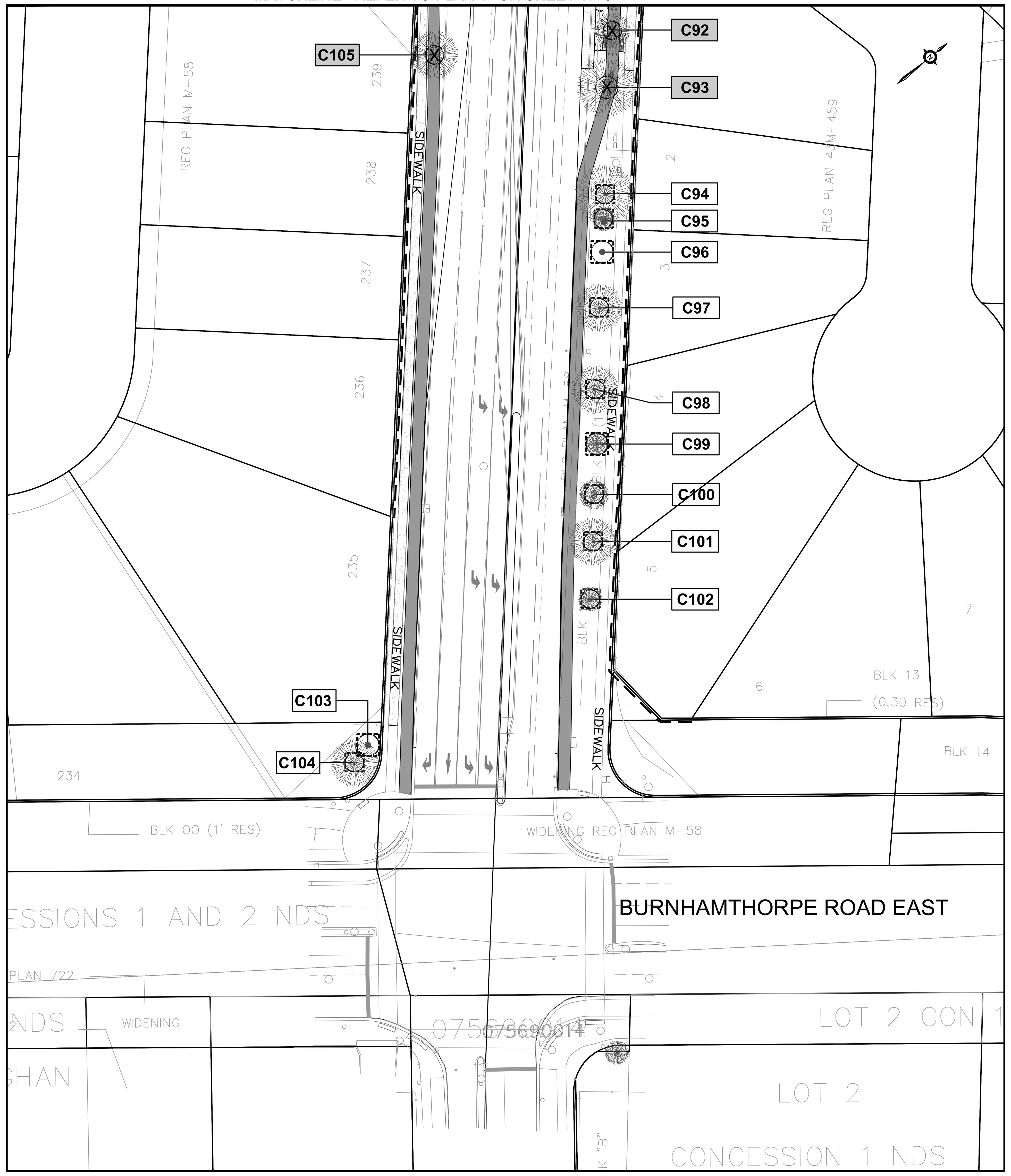

PLAN 'G'

KEY MAP

LEGEND:

- PROPERTY LINE
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- X EXISTING INDIVIDUAL TREE TO BE REMOVED
- TREES ON PRIVATE PROPERTY: SOLID BOARD TREE PROTECTION HOARDING (TPZ). REFER TO CITY OF MISSISSAUGA DETAIL ON SHEET TP-9
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3	PRELIMINARY DESIGN REPORT	PM	2021.09.30	–
2	30% DESIGN PDR	PM	2021.06.18	
1	PRELIMINARY DESIGN	PM	2021X02.19	–

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SCALE	DATE
1 : 500	JANUARY 2021

DRAWING NUMBER	SHEET NUMBER
19M-00836-03	TP-4

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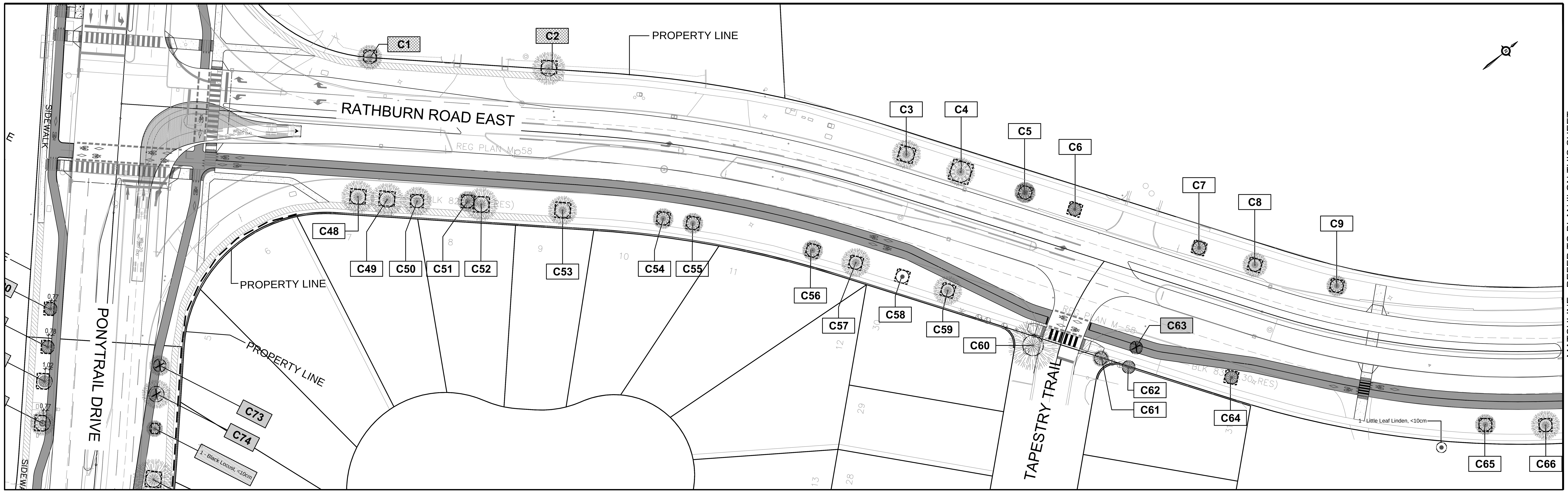

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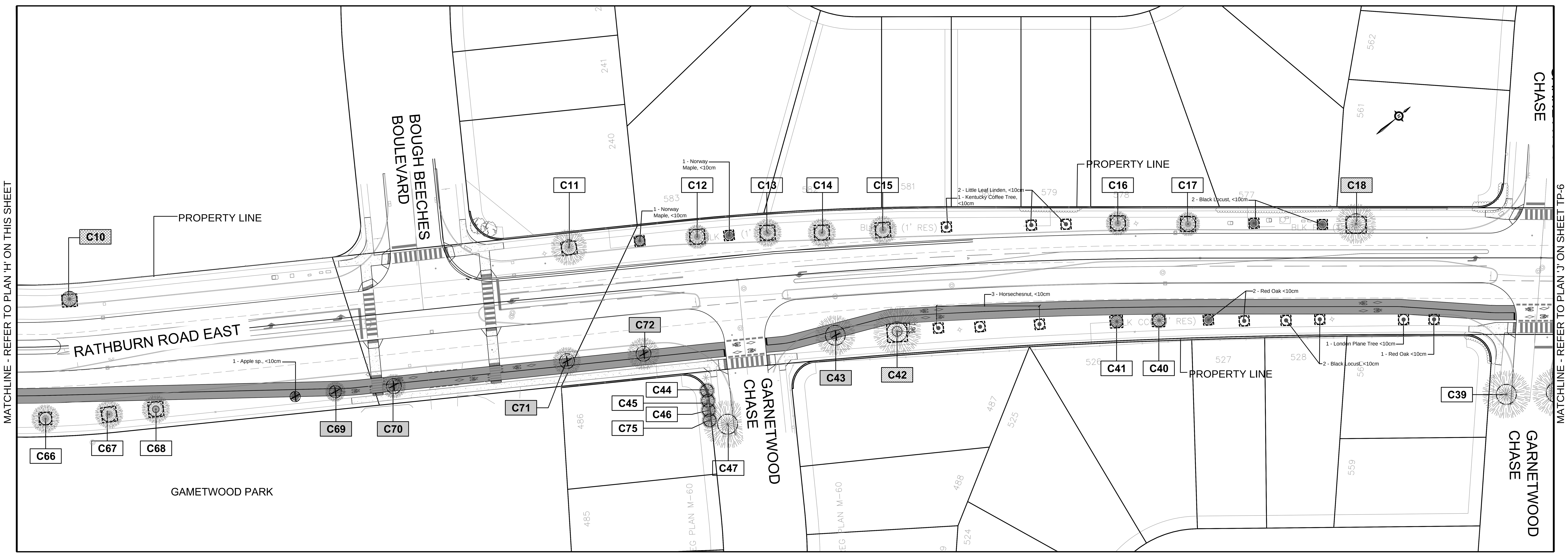

PLAN 'I'

KEY MAP

LEGEND:

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- TREES ON CITY PROPERTY: FRAMED, ORANGE PLASTIC WEB TREE HOARDING (TPZ). REFER TO CITY OF MISSISSAUGA DETAIL ON SHEET TP-9
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2	30% DESIGN PDR	PM	2021.06.18	–
1	PRELIMINARY DESIGN	PM	2021.02.19	–

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DESIGNED	DRAWN	CHECKED
PM	PM	CB

SCALE 1 : 500
DATE JANUARY 2021
DRAWING NUMBER 19M-00836-03
SHEET NUMBER TP-5

FILENAME: C:\Users\mcnamarap\OneDrive - WSP O365\Documents\Mississauga - Rathburn & Ponytrail EA\Drawings\TP-1 to TP-9_Tree Preservation-1PKJS73.dwg
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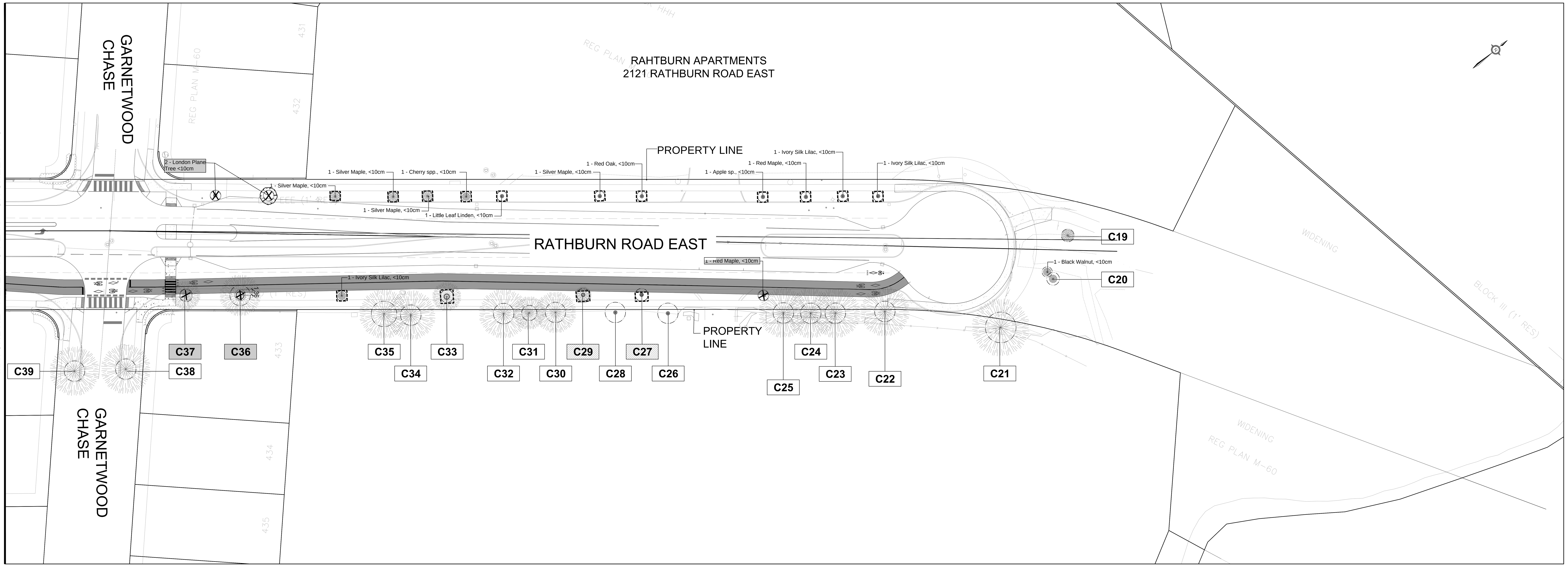

PLAN 'J'

TREE PRESERVATION NOTES AND GUIDELINES

TREE PROTECTION FENCING

THE APPLICANT IS RESPONSIBLE FOR ENSURING THAT TREE PROTECTION HOARDING IS MAINTAINED THROUGHOUT ALL PHASES OF DEMOLITION AND CONSTRUCTION IN THE LOCATION AND CONDITION AS APPROVED BY THE PLANNING AND BUILDING DEPARTMENT. NO MATERIALS (BUILDING MATERIALS, SOIL, ETC.) MAY BE STOCKPILED WITHIN THE AREA OF HOARDING. FAILURE TO MAINTAIN THE HOARDING AS ORIGINALLY APPROVED OR THE STORAGE OF MATERIALS WITHIN THE HOARDING WILL BE CAUSE FOR THE LETTER OF CREDIT TO BE HELD FOR TWO (2) YEARS FOLLOWING COMPLETION OF ALL SITE WORKS.

TPZ REDUCTION - TREE INJURY

- WHERE TREE PROTECTION ZONES WILL REQUIRE A REDUCTION DUE TO PROPOSED WORKS E.G. CYCLE TRACK, IT IS EXPECTED THAT SOME 'INJURY' MAY OCCUR DUE TO POTENTIAL DAMAGE TO ROOTS AND BRANCHES FROM EXCAVATION, COMPACTION ETC .
- AIR-SPADE / HYDRO-VACUUM EXCAVATION IS RECOMMENDED AS A MEASURE TO REDUCE 'INJURY'.
- REFER TO NOTES ON THIS SHEET AS WELL AS SHEETS TP-1 TO TP-8 FOR TREES WHERE THIS MEASURE IS RECOMMENDED.

TPZ REDUCTIONS (NO INJURY)

WHERE TREE PROTECTION ZONES WILL REQUIRE A REDUCTION DUE TO PROXIMITY TO AN EXISTING HARD SURFACE SUCH AS DRIVEWAYS, EDGE OF PAVEMENT AND SIDEWALKS, THERE WILL BE NO 'INJURY' AS IT IS ASSUMED THAT NO TREE ROOTS HAVE ESTABLISHED UNDER CURBS, ROADS, DRIVEWAYS AND SIDEWALKS AND THAT NO CONSTRUCTION WILL OCCUR IN THESE AREAS. THIS APPLIES TO THE FOLLOWING TREES:

- REFER TO NOTES ON THIS SHEET AS WELL AS SHEETS TP-1 TO TP-8 FOR TREES WHERE THIS MEASURE IS RECOMMENDED.
- THIS MEASURE APPLIES TO TREE NUMBERS: L24 & L25

TREE REMOVAL

- WHERE AN ENCROACHMENT EXCEEDS 3x THE TRUNK DIAMETER, TREES HAVE BEEN RECOMMENDED TO BE REMOVED.
- E.G. 30cm DBH x 3 = 90cm. ANY PROPOSED WORKS WITHIN 90cm OF THE TRUNK WILL BE DEEMED TOO SIGNIFICANT AN INJURY WITHIN THE CRITICAL ROOT ZONE, FOR THE TREE TO OVERCOME, LEADING TO A SPIRAL OF DECLINE AND THEREFORE REMOVAL IS RECOMMENDED.

ROOT AND BRANCH PRUNING

- IT IS LIKELY THAT SOME BRANCH PRUNING WILL BE NECESSARY WHERE EXISTING PRESERVED TREES ARE CLOSE TO SERVICE CONNECTION INSTALLATIONS. BRANCH PRUNING LOCATIONS ARE TO BE REVIEWED IN THE FIELD BY THE CONTRACT ADMINISTRATOR. THIS WORK IS TO BE CONDUCTED BY AN ISA CERTIFIED ARBORIST OR UNDER THE SUPERVISION OF ONE AND IN ACCORDANCE WITH THE GUIDELINES ON SHEET TP-14.
- TREE ROOTS ARE LIKELY TO BE IMPACTED WHERE THERE WILL BE ENCROACHMENT INTO THE MINIMUM TREE PROTECTION ZONE. ROOTS ARE TO BE PRUNED BY A CERTIFIED ARBORIST OR UNDER THE SUPERVISION OF ONE AND IN ACCORDANCE WITH THE 'ROOT PRUNING' GUIDELINES ON SHEET TP-14.

TREE PRESERVATION SPECIFIC NOTES

- HOARDING MUST BE INSPECTED BY THE CITY OF MISSISSAUGA PRIOR TO REMOVAL OF ANY TREE PROTECTION HOARDING FROM THE SITE. THE CONTRACTOR IS RESPONSIBLE FOR ARRANGING THIS INSPECTION WITH THE CITY OF MISSISSAUGA.
- CONTRACTOR TO IDENTITY THE LOCATION OF ALL EXISTING AND PROPOSED UNDERGROUND AND ABOVE GROUND UTILITIES PRIOR TO REMOVAL OF TREES AND COMMENCEMENT OF CONSTRUCTION.

TREE INVENTORY CRITERIA

- IN ACCORDANCE WITH THE CRITERIA SET OUT IN THE RFP, TREES >10cm DBH WITHIN THE ROAD ALLOWANCE WERE REQUIRED TO BE INVENTORIED.
- TREES >10cm DBH WERE INVENTORIED FOR SPECIES, SIZE, CONDITION, DRIPLINE RADIUS AND ASSIGNED AN ALPHA-NUMERIC IDENTIFIER;
- TREES <10cm DBH WERE INVENTORIED FOR SPECIES AND SIZE ONLY AND NOT ASSIGNED AN ALPHA-NUMBERIC IDENTIFIER.

ARBORIST REPORT NOTES

- FOR A DETAILED DESCRIPTION OF TREE SPECIES, SIZE, CONDITION AND RECOMMENDATIONS REFER TO THE TREE PRESERVATION CHARTS ON SHEETS TP-7 AND TP-8 AND APPENDIX A: TREE PRESERVATION CHARTS IN THE ARBORIST REPORT PREPARED BY WSP CANADA INC., DATED: 23, 09, 2021.
- REFER TO THE ARBORIST REPORT FOR SPECIFIC RECOMMENDATIONS, PROTECTIVE AND MITIGATION MEASURES.

HORIZONTAL ROOT PROTECTION

TO BE UTILIZED WHERE INDICATED ON PLANS, IN AREAS WHERE ENCROACHMENTS AND OR REDUCTIONS WILL OCCUR WITHIN A TREE PROTECTION ZONE (TPZ). CURRENTLY THIS MEASURE IS NOT RECOMMENDED AT ANY TREE LOCATIONS, HOWEVER SHOULD IT BE NECESSARY THE FOLLOWING STEPS ARE RECOMMENDED TO BE FOLLOWED:

- THE TREE AND TPZ ARE LOCATED WITHIN THE PROPOSED STAGING AREA;
- PLACE LAYER OF NON-WOVEN GEO-TEXTILE MATERIAL ON TOP OF SOD;
- PLACE 30CM DEPTH WOOD CHIP MULCH ON TOP OF GEO-TEXTILE. WHERE REQUIRED PLACE 4X4 TIMBERS TO HOLD MULCH IN PLACE;
- FIELD FIT IF NECESSARY. BOARD WIDTH AND LENGTH MAY VARY DEPENDING ON AVAILABLE SPACE;
- INSTALL TREE PROTECTION HOARDING AROUND ROOT PROTECTION AREA;
- UPON COMPLETION, REMOVE EXCESS MULCH AND SPREAD MULCH IN A 1M DIAMETER AROUND THE TRUNK TO A DEPTH OF 5CM AND REINSTATE TREE PROTECTION FENCING TO ORIGINAL LOCATION;
- APPLICATION TO BE REVIEWED AND APPROVED BY THE CONTRACT ADMINISTRATOR PRIOR TO INSTALLATION;
- RESTORE DISTURBED AREAS.

AIR-SPADE / HYDRO-VACUUMM EXCAVATION

WHERE EXCAVATION OR CONSTRUCTION ACTIVITIES WILL ENCROACH INTO TREE PROTECTION ZONES, AIR-SPADE EXCAVATION / HYDRO-VACUUM EXCAVATION IS RECOMMENCED.

PRIOR TO EXCAVATION AND CONSTRUCTION THIS MEASURE IS RECOMMENDED TO BE APPLIED TO TREE NUMBERS:

- L14, L19, L29 to L33, L51 to L53, L74 to L77, L79, L98, L103 to L105, L117, L119 to L123, C18, C36, C42, C83

- INSTALL TREE PROTECTION FENCING AS SHOWN ON PLAN;
- APPLY THIS MEASURE TO EXPOSE ROOTS SO THAT THEY CAN BE PRUNED. THE PRUNING OF ROOTS PRIOR TO CONSTRUCTION WILL ALLOW ROOTS TO SPROUT NEW ROOTS FROM CUT ROOT ENDS ONCE SOIL HAS BEEN BACKFILLED;
- AIR-SPADE / HYDRO-VACUUM EXCAVATE ON THE OUTSIDE OF THE TPZ AND ALONG THE LIMIT OF EXCAVATION OR CONSTRUCTION (AS SHOWN ON PLAN). APPLY AT A WIDTH OF 0.5m AND EXCAVATE TO A DEPTH OF 0.3m ALONG THE LENGTH OF THE TREE PROTECTION ZONE;
- ENSURE THAT THE PRESSURE USED FROM THE AIR-SPADE / HYDRO-VACUUM IS SUCH THAT IT WILL NOT DAMAGE ROOTS DURING EXCAVATION;
- PRUNE ROOTS IN ACCORDANCE WITH NOTES ON SHEET TP-9 OR UNDER THE SUPERVISION OF A CERTIFIED ARBORIST.
- BACKFILL WITH EXCAVATED MATERIAL OR BETTER, IMMEDIATELY AFTER COMPLETION OF EXCAVATION AND ROOT PRUNING, TO PROTECT ROOTS FROM DRYING OUT;
- WATER TREES PERIODICALLY DURING CONSTRUCTION;
- AT THE COMPLETION OF CONSTRUCTION, RESTORE DISTURBED AREAS WITH A LAYER OF 5cm SHREDDED BARK MULCH IN A 2m RADIUS AROUND THE AFFECTED TREES (MAY VARY DEPENDING ON TREE LOCATION).

WORK WITHIN A TREE PROTECTION ZONE

IF WORK MUST BE CONDUCTED WITHIN A TREE PROTECTION ZONE AND AIR-SPADE / HYDRO-VACUUM EXCAVATION CANNOT BE COMPLETED, THE CONTRACTOR SHALL MINIMIZE SOIL COMPACTION AND MECHANICAL ROOT DAMAGE BY UTILIZING ONE OF THE FOLLOWING METHODS:

1. APPLYING 150-300mm OF MULCH TO AREA. UPON COMPLETION REMOVE EXCESS MULCH LEAVING A 100mm DEPTH LAYER OF MULCH.
2. LAYING 20mm THICK PLYWOOD OR 100X100mm WOOD BEAMS OVER A 100+MM THICK LAYER OF WOOD CHIP MULCH. UPON COMPLETION REMOVE PLYWOOD AND LEAVE MULCH LAYER IN PLACE.

KEY MAP

LEGEND:

- PROPERTY LINE
- EXISTING INDIVIDUAL TREE (SURVEYED)
- EXISTING INDIVIDUAL TREE (NOT SURVEYED) LOCATIONS ARE APPROXIMATE.
- EXISTING TREE GROUPING
- EXISTING TREE GROUPING TO BE REMOVED
- T-? IDENTIFICATION NUMBER FOR EXISTING TREE TO BE PRESERVED
- T-? IDENTIFICATION NUMBER FOR TPZ REDUCTION / TREE INJURY. REFER TO NOTES ON TP-6
- T-? IDENTIFICATION NUMBER FOR TPZ REDUCTION / NO TREE INJURY. REFER TO NOTES ON TP-6
- T-? IDENTIFICATION NUMBER FOR EXISTING TREE TO BE REMOVED
- X EXISTING INDIVIDUAL TREE TO BE REMOVED
- TREES ON PRIVATE PROPERTY: SOLID BOARD TREE PROTECTION HOARDING (TPZ). REFER TO CITY OF MISSISSAUGA DETAIL ON SHEET TP-9
- TREES ON CITY PROPERTY: FRAMED, ORANGE PLASTIC WEB TREE HOARDING (TPZ). REFER TO CITY OF MISSISSAUGA DETAIL ON SHEET TP-9
- MINIMUM TREE PROTECTION ZONE DISTANCE
- ASPAHLT CYCLE FACILITY
- PROPOSED PAVEMENT MARKING / CURB / CYCLE TRACK
- PROPOSED NOISE WALL

No.	REVISIONS	BY	DATE	APPR.
3	PRELIMINARY DESIGN REPORT	PM	2021.09.30	--
2	30% DESIGN PDR	PM	2021.06.18	
1	PRELIMINARY DESIGN	PM	2021.02.19	--

ALL PREVIOUS ISSUES OF THIS DRAWING ARE SUPERSEDED

CLIENT
CITY OF MISSISSAUGA

MUNICIPALITY
MISSISSAUGA

PROJECT TITLE
RATHBURN ROAD & PONYTRAIL DRIVE FROM DIXIE ROAD TO BURNHAMTHORPE ROAD EAST ENVIRONMENTAL ASSESSMENT

SHEET TITLE
TREE PRESERVATION PLAN

wsp
100 Commerce Valley Dr. West
Thornhill, Ont. L3T 0A1
Tel (905) 882-1100
Fax (905) 882-0055
www.mmm.ca

PETER McNAMARA, BA
ISA Certified Arborist ON-1140A

DESIGNED	DRAWN	CHECKED
PM	PM	CB

SCALE	DATE
1 : 500	JANUARY 2021

DRAWING NUMBER	SHEET NUMBER
19M-00836-03	TP-6

FILENAME: C:\Users\mcnamarap\OneDrive - WSP O365\Documents\Mississauga - Rathburn & Ponytrail EA\Drawings\TP-1 to TP-9_Tree Preservation-IPKJS73.dwg

Appendix A: Tree Preservation Charts

Project: City of Missisauga, Rathburn - Ponytrail EA | Field Work Completed By: L. Wallis (ISA#ON-2484A), C. Van Daele (ISA#ON-2346A), S. Gibbs, T. Waters (ISA#ON-2590A)

Date of Field Work: 9-Dec-20 | Weather: overcast, some light rain, 1 degree

Tree Condition Assessment Criteria:
TI - Trunk Integrity: assessment of the trunk for any defects or weaknesses.
CS - Canopy Structure: assessment of scaffold branches, unions and canopy
CV - Canopy vigour: assessment of the health of the tree, based on the % of deadwood, disease, pests & live crown

Tree Condition:
Good (G): tree displays less than 15% deficiency/defect within the given tree assessment criteria (TI,CS,CV)
Fair (F): tree displays 15-40% deficiency/defect within the given tree assessment criteria (TI,CS,CV)
Poor (P): tree displays greater than 40% deficiency/defect within the given tree assessment criteria (TI,CS,CV)

Legend:
Trees to be Retained | Trees to be Removed | Minimum TPZ reduction / Injury
Trees to be Preserved | Tree location / grouping | Minimum TPZ reduction / No Injury

Tree #	Code	Botanical Name	Common Name	Qty.	DBH (cm)	Effective DBH	TI	CS	CV	Dripline Radius (m)	Height (m)	Tree Location / Applicable By-law	Tree Protection Zone (m)	Recommendation	Comments - Health	Comments - Removal/Preservation
L1 to L123																
L1	ACERPLA	Acer platanoides	Norway Maple	1	27	27	G	G	G	3	11	Private	1.8	Preserve		Fully protected
L2	ACERPLA	Acer platanoides	Norway Maple	1	22	22	G	G	G	3	9	Private	1.8	Preserve		Fully protected
L3	ACERPLA	Acer platanoides	Norway Maple	m	18	18	m	G	G	3	9	Private	1.5	Preserve		Fully protected
L4	ACERPLA	Acer platanoides	Norway Maple	1	18	18	P	P	P	2	6	Private	1.5	Preserve	Topped, severe trunk wounds	Fully protected
L5	ACERPLA	Acer platanoides	Norway Maple	1	18	18	G	G	G	3	9	Private	1.5	Preserve		Fully protected
L6	ACERPLA	Acer platanoides	Norway Maple	1	18	18	G	G	G	3	9	Private	1.5	Preserve	Poor pruning of branches	Fully protected
L7	ACERPLA	Acer platanoides	Norway Maple	1	30	30	G	G	G	5	14	ROW	1.8	Preserve	Poor pruning of branches overhanging yard	Fully protected
L8	ACERPLA	Acer platanoides	Norway Maple	1	30	30	G	G	G	5	18	ROW	1.8	Preserve	Poor pruning of branches overhanging yard	Fully protected
L9	TILIAME	Tilia sp.	Linden sp.	1	30	30	G	G	G	5	18	ROW	1.8	Retain		Beyond limits of construction
L10	TILIAME	Tilia sp.	Linden sp.	1	35	35	G	G	G	5	18	ROW	2.4	Retain	Photo:100-0165	Beyond limits of construction
L11	TILIAME	Tilia sp.	Linden sp.	1	35	35	G	G	G	5	16	ROW	2.4	Retain		Beyond limits of construction
L12	MORUALB	Morus alba	White Mulberry	1	12	12	G	G	G	1	5	Private	1.5	Retain	Weeping ornamental	Beyond limits of construction
L13	ACERPLA	Acer platanoides	Norway Maple	1	22	22	G	G	G	6	14	ROW	1.8	Preserve		Fully protected
L14	QUERALB	Quercus alba	White Oak	1	37	37	G	G	G	6	14	ROW	2.4	Preserve / TPZ reduction		Tree protection reduction. Mitigate via root pruning
L15	QUERALB	Quercus alba	White Oak	1	30	30	F	G	G	5	14	ROW	1.8	Preserve	Uneven crown, branch wound, severe trunk wound	Fully protected
L16	ACERSAC	Acer saccharinum	Silver Maple	1	32	32	G	G	G	8	16	ROW	2.4	Preserve		Fully protected
L17	ACERSAC	Acer saccharinum	Silver Maple	1	24	24	G	G	G	4	12	ROW	1.8	Preserve		Fully protected
L18	ACERSAC	Acer saccharinum	Silver Maple	1	26	26	G	G	G	8	16	ROW	1.8	Preserve		Fully protected
L19	FRAXPEN	Fraxinus pennsylvanica	Green Ash	1	26	26	G	G	G	6	14	ROW	1.8	Preserve / TPZ reduction	Winter conditions - difficult to assess % of dead branches . Due to Emerald Ash Borer the actual condition may be worse than recorded.	Tree protection reduction. Mitigate via root pruning
L20	ACERSAC	Acer saccharinum	Silver Maple	1	40	40	G	G	G	8	18	ROW	2.4	Remove		encroachment exceeds 3x diameter
L21	ACERSAC	Acer saccharinum	Silver Maple	1	24	24	G	G	G	5	14	ROW	1.8	Remove	Photo:100-0198	encroachment exceeds 3x diameter
L22	GLEDTRI	Gleditsia triacanthos	Honey-locust	1	16	16	G	G	G	4	12	ROW	1.5	Retain		Beyond limits of construction
L23	ACERPLA	Acer platanoides	Norway Maple	1	16	16	G	G	G	4	12	ROW	1.5	Preserve		Fully protected
L24	ACERNEG	Acer negundo	Manitoba Maple	1	28	28	F	G	G	10	12	ROW	1.8	Preserve / TPZ reduction	Lean	Tree protection reduction to exisitng fence
L25	CRAT_SP	Crataegus monogyna	English Hawthorn	1	8, 8	11	G	G	G	2	7	ROW	1.2	Preserve / TPZ reduction	two stems	Fully protected
L26	ACERSAC	Acer saccharinum	Silver Maple	1	40	40	G	G	G	7	18	ROW	2.4	Remove		encroachment exceeds 3x diameter
L27	ACERSAC	Acer saccharinum	Silver Maple	1	37	37	G	G	G	7	18	ROW	2.4	Remove		encroachment exceeds 3x diameter
L28	ACERSAC	Acer saccharinum	Silver Maple	1	35	35	G	G	G	7	18	ROW	2.4	Remove		encroachment exceeds 3x diameter
L29	ACERSAC	Acer saccharinum	Silver Maple	1	38	38	G	G	G	7	18	ROW	2.4	Preserve / TPZ reduction		Tree protection reduction. Mitigate via root pruning
L30	ACERSAC	Acer saccharinum	Silver Maple	1	34	34	G	G	G	6	16	ROW	2.4	Preserve / TPZ reduction	Photo:100-0227	Tree protection reduction. Mitigate via root pruning
L31	ACERSAC	Acer saccharinum	Silver Maple	1	35	35	G	G	G	8	20	ROW	2.4	Preserve / TPZ reduction		Tree protection reduction. Mitigate via root pruning
L32	ACERSAC	Acer saccharinum	Silver Maple	1	35	35	G	G	G	8	18	ROW	2.4	Preserve / TPZ reduction		Tree protection reduction. Mitigate via root pruning
L33	ACERSAC	Acer saccharinum	Silver Maple	1	38	38	G	G	G	8	20	ROW	2.4	Preserve / TPZ reduction		Tree protection reduction. Mitigate via root pruning
L34	FRAXPEN	Fraxinus pennsylvanica	Green Ash	1	36	36	G	G	G	6	16	ROW	2.4	Preserve	Winter conditions - difficult to assess % of dead branches . Due to Emerald Ash Borer the actual condition may be worse than recorded.	Fully protected

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Date of Field Work: 9-Dec-20 | Weather: overcast, some light rain, 1 degree

Tree #	Code	Botanical Name	Common Name	Qty.	DBH (cm)	Effective DBH	TI	CS	CV	Dripline Radius (m)	Height (m)	Tree Location / Applicable By-law	Tree Protection Zone (m)	Recommendation	Comments - Health	Comments - Removal/Preservation
L35	FRAXPEN	Fraxinus pennsylvanica	Green Ash	1	34	34	G	G	G	6	16	ROW	2.4	Preserve	Winter conditions - difficult to assess % of dead branches . Due to Emerald Ash Borer the actual condition may be worse than recorded.	Fully protected
L36	ACERPLA	Acer platanoides	Norway Maple	1	24	24	G	G	G	6	16	ROW	1.8	Preserve		Fully protected
L37	ACERPLA	Acer platanoides	Norway Maple	1	24	24	G	G	G	6	14	ROW	1.8	Preserve		Fully protected
L38	ACERPLA	Acer platanoides	Norway Maple	1	23	23	F	G	G	5	12	ROW	1.8	Preserve	Unhealed frost crack	Fully protected
L39	ACERPLA	Acer platanoides	Norway Maple	1	22	22	P	F	F	2	12	ROW	1.8	Preserve	Severe trunk wound, unbalanced crown	Fully protected
L40	ACERPLA	Acer platanoides	Norway Maple	1	24	24	G	G	G	4	14	ROW	1.8	Preserve	Photo:100-0261, unbalanced crown	Fully protected
L41	ACERPLA	Acer platanoides	Norway Maple	1	25	25	G	G	G	4	14	ROW	1.8	Preserve	Girdling roots	Fully protected
L42	ACERPLA	Acer platanoides	Norway Maple	1	20	20	G	G	G	4	15	ROW	1.5	Preserve		Fully protected
L43	ACERPLA	Acer platanoides	Norway Maple	1	20	20	G	G	G	4	15	ROW	1.5	Preserve		Fully protected
L44	ACERPLA	Acer platanoides	Norway Maple	1	20	20	F	G	G	4	15	ROW	1.5	Preserve	Trunk crack	Fully protected
L45	ACERPLA	Acer platanoides	Norway Maple	1	20	20	P	G	F	4	15	ROW	1.5	Preserve	Wound with rot at trunk base, wounds all up stem, dead	Fully protected
L46	ACERPLA	Acer platanoides	Norway Maple	1	20	20	G	G	G	4	15	ROW	1.5	Preserve		Fully protected
L47	ACERPLA	Acer platanoides	Norway Maple	1	20	20	F	G	G	4	15	ROW	1.5	Preserve	Trunk crack	Fully protected
L48	ACERPLA	Acer platanoides	Norway Maple	1	20	20	F	G	G	4	15	ROW	1.5	Preserve	Trunk crack	Fully protected
L49		Unknown sp.	Unknown sp.	1	20	20	P	G	G	4	8	ROW	1.5	Preserve	Debarked portions of trunk and trunk crack	Fully protected
L50	ACERPLA	Acer platanoides	Norway Maple	1	20	20	F	G	G	4	15	ROW	1.5	Preserve	Trunk crack, Photo:100-0292	Fully protected
L51	ACERPLA	Acer platanoides	Norway Maple	1	20	20	G	G	G	4	15	ROW	1.5	Preserve / TPZ reduction		Tree protection reduction. Mitigate via root pruning
L52	ACERPLA	Acer platanoides	Norway Maple	1	20	20	F	G	G	4	15	ROW	1.5	Preserve / TPZ reduction	Trunk wound at base	Tree protection reduction. Mitigate via root pruning
L53	ACERPLA	Acer platanoides	Norway Maple	1	20	20	F	G	G	4	15	ROW	1.5	Preserve / TPZ reduction	Trunk wound at base - mostly sealed	Tree protection reduction. Mitigate via root pruning
L54	ACERPLA	Acer platanoides	Norway Maple	1	20	20	P	F	G	4	8	ROW	1.5	Remove	Trunk wound at base	encroachment exceeds 3x diameter
L55	ACERPLA	Acer platanoides	Norway Maple	1	35	35	G	G	G	6	15	ROW	2.4	Preserve		Fully protected
L56	GLEDTRI	Gleditsia triacanthos	Honey-locust	1	16	16	G	G	G	3	12	ROW	1.5	Retain		Beyond limits of construction
L57	ACERCAM	Unknown sp.	Unknown sp.	1	30, 40, 25	56	G	G	G	6	14	Private	2.4	Preserve	Existing tree tag 7131	Fully protected
L58	ACERPLA	Acer platanoides	Norway Maple	1	36	36	G	G	G	5	16	Private	2.4	Retain		Beyond limits of construction
L59	ACERNEG	Acer negundo	Manitoba Maple	1	42	42	F	F	F	8	16	Private	3	Retain	Dryads saddle fungus at base of trunk, branch scar rot, pruned for hydro, poor form	Beyond limits of construction
L60	ACER__SP	Acer sp.	Maple sp.	1	20	20	G	G	G	3	8	ROW	1.5	Retain	Under hydro, Photo:100-0322	Beyond limits of construction
L61	GLEDTRI	Gleditsia triacanthos	Honey-locust	1	26	26	G	G	G	6	13	ROW	1.8	Retain		Beyond limits of construction
L62	GLEDTRI	Gleditsia triacanthos	Honey-locust	1	26	26	G	G	G	6	13	ROW	1.8	Retain		Beyond limits of construction
L63	GLEDTRI	Gleditsia triacanthos	Honey-locust	1	24	24	G	G	G	6	13	ROW	1.8	Retain	Uneven crown	Beyond limits of construction
L64	GLEDTRI	Gleditsia triacanthos	Honey-locust	1	22	22	G	G	G	4	10	ROW	1.5	Retain		Beyond limits of construction
L65	ACERPLA	Acer platanoides	Norway Maple	1	24	24	G	G	G	4	12	ROW	1.8	Retain		Beyond limits of construction
L66	ACERPLA	Acer platanoides	Norway Maple	1	22	22	G	G	G	4	12	ROW	1.8	Retain		Beyond limits of construction
L67	GLEDTRI	Gleditsia triacanthos	Honey-locust	1	34	34	G	G	G	6	14	Private	2.4	Preserve		Fully protected
L68	GLEDTRI	Gleditsia triacanthos	Honey-locust	1	14	14	F	P	F	2	3	ROW	1.5	Remove	Trunk crack, topped	encroachment exceeds 3x diameter
L69	GLEDTRI	Gleditsia triacanthos	Honey-locust	1	14	14	G	G	G	3	5	ROW	1.5	Remove		encroachment exceeds 3x diameter

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Tree #	Code	Botanical Name	Common Name	Qty.	DBH (cm)	Effective DBH	TI	CS	CV	Dripline Radius (m)	Height (m)	Tree Location / Applicable By-law	Tree Protection Zone (m)	Recommendation	Comments - Health	Comments - Removal/Preservation
L70	GLEDTRI	Gleditsia triacanthos	Honey-locust	1	14	14	G	G	G	3	6	ROW	1.5	Preserve / TPZ reduction		Tree protection reduction. Mitigate via root pruning
L71	GLEDTRI	Gleditsia triacanthos	Honey-locust	1	14	14	G	G	G	3	6	ROW	1.5	Preserve		Fully protected
L72	GLEDTRI	Gleditsia triacanthos	Honey-locust	1	14	14	F	G	G	3	6	ROW	1.5	Preserve	Trunk wound at base	Fully protected
L73	GLEDTRI	Gleditsia triacanthos	Honey-locust	1	14	14	F	F	G	3	6	ROW	1.5	Preserve	Topped, trunk wounds at base	Fully protected
L74	ACERPLA	Acer platanoides	Norway Maple	1	24	24	G	G	G	3	12	ROW	1.8	Preserve / TPZ reduction		Tree protection reduction. Mitigate via root pruning
L75	ACERPLA	Acer platanoides	Norway Maple	1	28	28	P	G	G	4	12	ROW	1.8	Preserve / TPZ reduction	Trunk crack, trunk wound	Tree protection reduction. Mitigate via root pruning
L76	ACERPLA	Acer platanoides	Norway Maple	1	22	22	G	G	G	3	12	ROW	1.8	Preserve / TPZ reduction		Tree protection reduction. Mitigate via root pruning
L77	GLEDTRI	Gleditsia triacanthos	Honey-locust	1	22	22	G	G	G	8	12	ROW	1.8	Preserve / TPZ reduction		Tree protection reduction. Mitigate via root pruning
L78	GLEDTRI	Gleditsia triacanthos	Honey-locust	1	22	22	G	G	G	3	12	ROW	1.8	Remove		encroachment exceeds 3x diameter
L79	GLEDTRI	Gleditsia triacanthos	Honey-locust	1	20	20	G	G	G	3	12	ROW	1.5	Preserve / TPZ reduction		Tree protection reduction. Mitigate via root pruning
L80	GLEDTRI	Gleditsia triacanthos	Honey-locust	1	18	18	G	G	G	3	12	ROW	1.5	Remove	Trunk wound at base	encroachment exceeds 3x diameter
L81	QUERALB	Quercus alba	White Oak	1	40	40	G	G	G	6	22	ROW	2.4	Remove	Exposed roots	encroachment exceeds 3x diameter
L82	QUERALB	Quercus alba	White Oak	1	40	40	G	G	G	6	20	ROW	2.4	Remove	Root damage from mower	encroachment exceeds 3x diameter
L83	ACERSAC	Acer saccharinum	Silver Maple	1	35	35	G	G	G	6	18	ROW	2.4	Remove		encroachment exceeds 3x diameter
L84	ACERSAC	Acer saccharinum	Silver Maple	1	38	38	G	G	G	6	16	ROW	2.4	Remove	Root damage from mower	encroachment exceeds 3x diameter
L85	ACERSAC	Acer saccharinum	Silver Maple	1	36	36	G	G	G	6	14	ROW	2.4	Remove	Girdling roots, suckers	encroachment exceeds 3x diameter
L86	QUERALB	Quercus alba	White Oak	1	32	32	G	G	G	6	14	ROW	2.4	Remove		encroachment exceeds 3x diameter
L87	ACERSAC	Acer saccharinum	Silver Maple	1	32	32	G	G	G	5	16	ROW	2.4	Remove		encroachment exceeds 3x diameter
L88	MALU_SP	Malus sp.	Apple sp.	1	24	24	G	P	P	1	3	ROW	1.8	Preserve	Broken top,suckers on stem	Fully protected
L89	MALU_SP	Malus sp.	Apple sp.	1	22	22	F	F	G	3	7	ROW	1.8	Preserve	Trunk wounds at base, poor form	Fully protected
L90	MALU_SP	Malus sp.	Apple sp.	1	20	20	G	G	G	3	7	ROW	1.5	Preserve		Fully protected
L91	ACERPLA	Acer platanoides	Norway Maple	1	24	24	F	G	G	4	12	ROW	1.8	Preserve	Trunk wound/crack, girdling roots	Fully protected
L92	GLEDTRI	Gleditsia triacanthos	Honey-locust	1	25	25	G	G	G	6	14	ROW	1.8	Preserve		Fully protected
L93	MALU_SP	Malus sp.	Apple sp.	1	22	22	F	G	G	3	8	ROW	1.8	Preserve	Trunk wound at base	Fully protected
L94	MALU_SP	Malus sp.	Apple sp.	1	24	24	G	G	G	4	10	ROW	1.8	Preserve		Fully protected
L95	MALU_SP	Malus sp.	Apple sp.	1	25	25	G	G	G	6	10	ROW	1.8	Preserve		Fully protected
L96	ACERPLA	Acer platanoides	Norway Maple	1	30	30	G	G	G	8	16	ROW	1.8	Remove	Girdling roots	encroachment exceeds 3x diameter
L97	ACERPLA	Acer platanoides	Norway Maple	1	30	30	F	G	G	6	14	ROW	1.8	Remove	Girdling roots, severe trunk wound	encroachment exceeds 3x diameter
L98	ACERPLA	Acer platanoides	Norway Maple	1	28	28	G	G	G	8	16	ROW	1.8	Preserve / TPZ reduction	Girdling roots, trunk wound at base	Tree protection reduction. Mitigate via root pruning
L99	ACERPLA	Acer platanoides	Norway Maple	1	30	30	G	G	G	8	16	ROW	1.5	Preserve	Girdling roots	Fully protected
L100	ACERPLA	Acer platanoides	Norway Maple	1	28	28	G	G	G	8	16	ROW	1.8	Preserve	Girdling roots	Fully protected
L101	ACERPLA	Acer platanoides	Norway Maple	1	22	22	G	F	G	4	14	ROW	1.8	Remove	Trunk wound at base, poor form	encroachment exceeds 3x diameter
L102	QUERALB	Quercus alba	White Oak	1	40	40	G	G	G	10	20	ROW	2.4	Remove		encroachment exceeds 3x diameter
L103	MALU_SP	Unknown sp.	Unknown sp.	1	11	11	P	G	G	2	5	ROW	1.5	Preserve / TPZ reduction	Trunk wound	Tree protection reduction. Mitigate via root pruning
L104	MALU_SP	Unknown sp.	Unknown sp.	1	12	12	G	G	G	3	7	ROW	1.5	Preserve / TPZ reduction	Downy twigs	Tree protection reduction. Mitigate via root pruning
L105	MALU_SP	Unknown sp.	Unknown sp.	1	12	12	G	G	G	3	7	ROW	1.5	Preserve / TPZ reduction	Downy twigs	Tree protection reduction. Mitigate via root pruning
L106	ACERPLA	Acer platanoides	Norway Maple	1	35	35	G	G	G	5	16	ROW	2.4	Remove	Girdling roots, trunk crack	encroachment exceeds 3x diameter

Appendix A: Tree Preservation Charts
Project: City of Missisauga, Rathburn - Ponytrail EA | Field Work Completed By: L. Wallis (ISA#ON-2484A), C. Van Daele (ISA#ON-2346A), S. Gibbs, T. Waters (ISA#ON-2590A)
Date of Field Work: 9-Dec-20 | Weather: overcast, some light rain, 1 degree

Tree #	Code	Botanical Name	Common Name	Qty.	DBH (cm)	Effective DBH	TI	CS	CV	Dripline Radius (m)	Height (m)	Tree Location / Applicable By-law	Tree Protection Zone (m)	Recommendation	Comments - Health	Comments - Removal/Preservation
L107	QUERALB	Quercus alba	White Oak	1	38	38	G	G	G	8	20	ROW	2.4	Remove	Trunk cracks	encroachment exceeds 3x diameter
L108	QUERALB	Quercus alba	White Oak	1	40	40	G	G	G	8	20	ROW	2.4	Remove	Mower damage to exposed roots, crack	encroachment exceeds 3x diameter
L109	QUERALB	Quercus alba	White Oak	1	32	32	G	G	G	6	20	ROW	2.4	Remove		encroachment exceeds 3x diameter
L110	ACERPLA	Acer platanoides	Norway Maple	1	32	32	G	G	G	6	12	ROW	2.4	Remove		encroachment exceeds 3x diameter
L111	ACERPLA	Acer platanoides	Norway Maple	1	35	35	G	G	G	12	18	ROW	2.4	Remove	Girdling roots	encroachment exceeds 3x diameter
L112	ACERPLA	Acer platanoides	Norway Maple	1	25	25	G	G	G	6	15	ROW	1.8	Remove	Mower damage to exposed roots, trunk crack, girdling roots	encroachment exceeds 3x diameter
L113	ACERPLA	Acer platanoides	Norway Maple	1	32	32	G	G	G	6	15	Private	2.4	Retain	Mower damage to exposed roots, trunk crack, girdling roots	Beyond limits of construction
L114	MALU_SP	Malus sp.	Apple sp.	1	20	20	G	G	G	2	11	ROW	1.5	Preserve		Fully protected
L115	MALU_SP	Malus sp.	Apple sp.	1	12	12	G	G	G	1	8	ROW	1.5	Preserve		Fully protected
L116	MALU_SP	Malus sp.	Apple sp.	1	15	15	G	G	G	2	11	ROW	1.5	Preserve		Fully protected
L117	GLEDTRI	Gleditsia triacanthos	Honey-locust	1	25	25	G	G	G	6	12	ROW	1.8	Preserve / TPZ reduction		Tree protection reduction. Mitigate via root pruning
L118	GLEDTRI	Gleditsia triacanthos	Honey-locust	1	21	21	G	G	G	4	10	ROW	1.8	Preserve / TPZ reduction	Minor frost crack	Tree protection reduction. Mitigate via root pruning
L119	GLEDTRI	Gleditsia triacanthos	Honey-locust	1	23	23	G	G	G	6	12	ROW	1.8	Preserve / TPZ reduction	Minor frost crack	Tree protection reduction. Mitigate via root pruning
L120	GLEDTRI	Gleditsia triacanthos	Honey-locust	1	18	18	G	G	G	3	6	ROW	1.5	Preserve / TPZ reduction		Tree protection reduction. Mitigate via root pruning
L121	GLEDTRI	Gleditsia triacanthos	Honey-locust	1	18	18	G	G	G	3	6	ROW	1.5	Preserve / TPZ reduction		Tree protection reduction. Mitigate via root pruning
L122	ACERPLA	Acer platanoides	Norway Maple	1	22	22	G	G	G	2	12	ROW	1.8	Preserve / TPZ reduction	Loose bark	Tree protection reduction. Mitigate via root pruning
L123	ACERPLA	Acer platanoides	Norway Maple	1	24	24	G	G	G	3	10	ROW	1.8	Preserve / TPZ reduction	Dead branch	Tree protection reduction. Mitigate via root pruning
C1 to C105																
C1	ACERPLA	Acer platanoides	Norway Maple	1	20	20	G	G	G	3	10	ROW	1.5	Preserve	Root collar exposed	Tree protection reduction. Mitigate via root pruning
C2	ACERPLA	Acer platanoides	Norway Maple	1	24	24	G	G	G	3	10	ROW	1.8	Preserve	Gypsy moth nest	Tree protection reduction. Mitigate via root pruning
C3		Malus sp.	Apple species	1	22,19	29	F	F	G	4	12	ROW	1.8	Preserve	Pruned	Fully protected
C4		Malus sp.	Apple species	1	26,18	32	F	F	G	4	12	ROW	2.4	Preserve	Pruned	Fully protected
C5		Malus sp.	Apple species	1	17,17	24	F	F	G	4	12	ROW	1.5	Preserve	Bark missing at base, pruned	Fully protected
C6	ACERPLA	Acer platanoides	Norway Maple	1	11	11	G	G	G	2	8	ROW	1.5	Preserve	Wasp nest, pruned	Fully protected
C7		Malus sp.	Apple species	1	18	18	F	F	G	3	9	ROW	1.5	Preserve	Codominant stem, second stem pruned	Fully protected
C8		Malus sp.	Apple species	1	19,17	25	G	F	G	4	10	ROW	1.5	Preserve	Missing bark at base	Fully protected
C9		Malus sp.	Apple species	1	18	18	F	F	G	3	9	ROW	1.5	Preserve	Codominant stem, second stem pruned	Fully protected
C10		Malus sp.	Apple species	1	22	22	G	F	G	4	10	ROW	1.8	Preserve / TPZ reduction	Pruned	Tree protection reduction. Mitigate via root pruning
C11	QUERALB	Quercus alba	White Oak	1	26	26	G	G	G	5	12	ROW	1.8	Preserve	Pruned, knot holes	Fully protected
C12	QUERALB	Quercus alba	White Oak	1	21	21	G	G	G	3	10	ROW	1.8	Preserve	Knot holes	Fully protected
C13	QUERALB	Quercus alba	White Oak	1	26	26	G	G	G	4	10	ROW	1.8	Preserve	Sprouting	Fully protected
C14	QUERALB	Quercus alba	White Oak	1	27	27	G	G	G	3	12	ROW	1.8	Preserve		Fully protected
C15	ACERPLA	Acer platanoides	Norway Maple	1	26	26	P	F	F	3	8	ROW	1.8	Preserve	Missing bark, dead branches	Fully protected
C16	QUERALB	Quercus alba	White Oak	1	23	23	F	G	G	4	12	ROW	1.8	Preserve	Missing bark, suckering, pruned	Fully protected
C17	QUERALB	Quercus alba	White Oak	1	23	23	F	G	G	3	10	ROW	1.8	Preserve	Pruned, sprouting	Fully protected
C18	QUERALB	Quercus alba	White Oak	1	38	38	G	G	G	6	15	ROW	2.4	Preserve / TPZ reduction	Pruned, squirrels nest	Tree protection reduction. Mitigate via root pruning
C19	Tiliame	Tilia americana	American Basswood	1	10	10	P	F	F	2	5	ROW	1.5	Retain	Major lean	Beyond limits of construction

KEY MAP

PRELIMINARY DESIGN REPORT | PM | 2021.09.30 | –
30% DESIGN PDR | PM | 2021.06.18 | –
PRELIMINARY DESIGN | PM | 2021.02.19 | –
REVISIONS | BY | DATE | APPR.

ALL PREVIOUS ISSUES OF THIS DRAWING ARE SUPERSEDED

CLIENT
CITY OF MISSISSAUGA

MUNICIPALITY
MISSISSAUGA

PROJECT TITLE
RATHBURN ROAD & PONYTRAIL DRIVE FROM DIXIE ROAD TO BURNHAMTHORPE ROAD EAST ENVIRONMENTAL ASSESSMENT

SHEET TITLE
TREE PRESERVATION CHARTS

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DESIGNED PM | DRAWN PM | CHECKED CB
SCALE 1 : 500 | DATE JANUARY 2021
DRAWING NUMBER 19M-00836-03 | SHEET NUMBER TP-7

KEY MAP

Appendix A: Tree Preservation Tables

Project: City of Mississauga, Rathburn - Ponytrail EA — Field Work Completed By: L. Wallis (ISA#ON-2484A), C. Van Daele (ISA#ON-2346A), S. Gibbs, T. Waters (ISA#ON-2590A)
Date of Field Work: 9-Dec-20 — Weather: overcast, some light rain, 1 degree

Tree Condition Assessment Criteria:
TI - Trunk Integrity: assessment of the trunk for any defects or weaknesses.
CS - Canopy Structure: assessment of scaffold branches, unions and canopy
CV - Canopy vigour: assessment of the health of the tree, based on the % of deadwood, disease, pests & live crown

Tree Condition:
Good (G): tree displays less than 15% deficiency/defect within the given tree assessment criteria (TI,CS,CV)
Fair (F): tree displays 15-40% deficiency/defect within the given tree assessment criteria (TI,CS,CV)
Poor (P): tree displays greater than 40% deficiency/defect within the given tree assessment criteria (TI,CS,CV)

Legend: Trees to be Retained; Trees to be Preserved; Trees to be Removed; Tree location / grouping; Minimum TPZ reduction / Injury; Minimum TPZ reduction / No Injury

Tree #	Code	Botanical Name	Common Name	Qty.	DBH (cm)	Effective DBH	TI	CS	CV	Dripline Radius (m)	Height (m)	Tree Location / Applicable By-law	Tree Protection Zone (m)	Recommendation	Comments - Health	Comments - Removal/Preservation
C20	POPUTRE	*Populus tremuloides*	Trembling Aspen	1	10	10	G	G	G	1	8	ROW	1.5	Retain		Beyond limits of construction
C21	ACERPLA	*Acer platanoides*	Norway Maple	1	58	58	G	G	G	6	15	Private	3.6	Retain		Beyond limits of construction
C22	ACERPLA	*Acer platanoides*	Norway Maple	1	40	40	G	G	G	5	14	Private	2.4	Retain	Exposed and girdling roots	Beyond limits of construction
C23	ACERPLA	*Acer platanoides*	Norway Maple	1	38	38	F	G	G	6	12	Private	2.4	Retain	Seam, exposed roots	Beyond limits of construction
C24	ACERPLA	*Acer platanoides*	Norway Maple	1	33	33	F	G	G	5	10	Private	2.4	Retain	Exposed roots, knot holes, seam	Beyond limits of construction
C25	ACERPLA	*Acer platanoides*	Norway Maple	1	37	37	G	G	G	5	12	Private	2.4	Retain	Pruned	Beyond limits of construction
C26	ACERPLA	*Acer platanoides*	Norway Maple	1	34	34	F	G	G	5	12	Private	2.4	Retain	Seams, pruned	Beyond limits of construction
C27	ROBIPSE	*Robinia pseudoacacia*	Black Locust	1	12	12	F	G	G	2	8	ROW	1.5	Preserve / TPZ reduction	Seams, pruned	Tree protection reduction. Mitigate via root pruning
C28	ACERPLA	*Acer platanoides*	Norway Maple	1	34	34	F	G	G	5	12	Private	2.4	Retain	Seam, exposed roots	Beyond limits of construction
C29	ROBIPSE	*Robinia pseudoacacia*	Black Locust	1	13	13	G	G	G	3	8	ROW	1.5	Preserve / TPZ reduction		Tree protection reduction. Mitigate via root pruning
C30	ACERPLA	*Acer platanoides*	Norway Maple	1	37	37	G	G	G	6	12	Private	2.4	Retain	Exposed roots	Beyond limits of construction
C31	ACERPLA	*Acer platanoides*	Norway Maple	1	27	27	F	G	G	4	8	Private	1.8	Retain	Missing bark at base	Beyond limits of construction
C32	ACERPLA	*Acer platanoides*	Norway Maple	1	38	38	F	G	G	6	12	Private	2.4	Retain	Exposed roots, included bark	Beyond limits of construction
C33		*Malus* sp.	Apple species	1	20,17	26	P	F	F	3	8	ROW	1.5	Preserve	Broken branch, trunk rot	Fully protected
C34	ACERPLA	*Acer platanoides*	Norway Maple	1	39	39	F	F	G	5	12	Private	2.4	Retain	New shoots at pruning	Beyond limits of construction
C35	ACERPLA	*Acer platanoides*	Norway Maple	1	42	42	G	G	G	5	12	Private	3	Retain	Seam	Beyond limits of construction
C36	ROBIPSE	*Robinia pseudoacacia*	Black Locust	1	31	31	G	G	G	6	10	ROW	2.4	Remove		encroachment exceeds 3x diameter
C37	ROBIPSE	*Robinia pseudoacacia*	Black Locust	1	19	19	G	G	G	4	10	ROW	1.5	Remove		encroachment exceeds 3x diameter
C38	ROBIPSE	*Robinia pseudoacacia*	Black Locust	1	37	37	G	G	G	7	12	ROW	2.4	Retain		Beyond limits of construction
C39	ROBIPSE	*Robinia pseudoacacia*	Black Locust	1	38	38	G	G	G	6	12	ROW	2.4	Retain		Beyond limits of construction
C40	ACERPLA	*Acer platanoides*	Norway Maple	1	12	12	F	G	G	2	6	ROW	1.5	Preserve	Missing bark, pruned	Fully protected
C41	ACERPLA	*Acer platanoides*	Norway Maple	1	10	10	F	G	G	2	5	ROW	1.5	Preserve	Missing bark	Fully protected
C42	QUERALB	*Quercus alba*	White Oak	1	39	39	F	G	G	5	12	ROW	2.4	Preserve / TPZ reduction	Seams, pruning wounds	Tree protection reduction. Mitigate via root pruning
C43	QUERALB	*Quercus alba*	White Oak	1	38	38	F	G	G	5	8	ROW	2.4	Remove	Sprouting	encroachment exceeds 3x diameter
C44		*Malus* sp.	Apple species	1	14,10	17	F	F	G	1	4	ROW	1.5	Retain		Beyond limits of construction
C45		*Malus* sp.	Apple species	1	14	14	F	F	G	1	4	ROW	1.5	Retain		Beyond limits of construction
C46		*Malus* sp.	Apple species	1	14,12	18	F	F	G	1	4	ROW	1.5	Retain		Beyond limits of construction
C47	FRAXEXC	*Fraxinus excelsior*	European ash	1	37	37	P	F	F	4	12	ROW	2.4	Retain	Sprouting, seams, missing bark	Beyond limits of construction
C48		*Malus* sp.	Apple species	1	24	24	G	F	G	3	5	ROW	1.8	Preserve		Fully protected
C49		*Malus* sp.	Apple species	1	25	25	F	F	G	3	5	ROW	1.8	Preserve	Missing bark, sapsucker holes	Fully protected
C50		*Malus* sp.	Apple species	1	20	20	G	F	G	2	5	ROW	1.5	Preserve		Fully protected
C51		*Amelanchier* sp.	Serviceberry species	1	11	11	G	G	G	2	5	ROW	1.5	Preserve		Fully protected
C52		*Malus* sp.	Apple species	1	24	24	F	F	G	4	6	ROW	1.8	Preserve	Exposed roots	Fully protected
C53		*Malus* sp.	Apple species	1	22	22	G	F	G	3	6	ROW	1.8	Preserve		Fully protected
C54		*Malus* sp.	Apple species	1	14	14	F	F	G	2	5	ROW	1.5	Preserve	Trunk wound	Fully protected
C55		*Malus* sp.	Apple species	1	16	16	F	F	G	2	5	ROW	1.5	Preserve		Fully protected
C56		*Malus* sp.	Apple species	1	16	16	P	F	F	2	5	ROW	1.5	Preserve	Major lean and trunk wound	Fully protected
C57		*Malus* sp.	Apple species	1	20	20	F	F	G	3	6	ROW	1.5	Preserve	Exposed root collar, sapsucker holes	Fully protected
C58		*Malus* sp.	Apple species	1	18	18	F	F	G	2	6	ROW	1.5	Preserve	Branch with missing bark, sapsucker holes	Fully protected
C59		*Malus* sp.	Apple species	1	18	18	F	F	G	2	5	ROW	1.5	Preserve	Sapsucker holes	Fully protected
C60	ACERFRE	*Acer x freemanii*	Freeman's Maple	1	32	32	F	G	G	6	12	ROW	2.4	Retain	Sprouting	Beyond limits of construction
C61		*Syringa reticulata*	Ivory Silk Lilac	1	16	16	F	G	G	1	6	ROW	1.5	Retain	Girdling roots	Beyond limits of construction
C62		*Syringa reticulata*	Ivory Silk Lilac	1	16	16	F	G	G	1	6	ROW	1.5	Retain	Trunk wound, bulge at root collar	Beyond limits of construction
C63	ACERPLA	*Acer platanoides*	Norway Maple	1	12	12	F	G	G	2	6	ROW	1.5	Remove	Trunk wound	encroachment exceeds 3x diameter
C64		*Malus* sp.	Apple species	1	14	14	F	F	G	1	6	ROW	1.5	Preserve	Dead stem	Fully protected
C65		*Malus* sp.	Apple species	1	15	15	G	F	G	2	10	ROW	1.5	Preserve		Fully protected
C66		*Malus* sp.	Apple species	1	15,12,16,16	39	F	F	G	2	8	ROW	1.5	Preserve	Sprouting	Fully protected
C67		*Malus* sp.	Apple species	1	26	26	F	F	G	3	10	ROW	1.8	Preserve		Fully protected
C68		*Malus* sp.	Apple species	1	26	26	F	F	G	2	10	ROW	1.8	Preserve	Suckering	Fully protected
C69		*Malus* sp.	Apple species	1	18,16,16	29	F	F	G	2	8	ROW	1.5	Remove		encroachment exceeds 3x diameter
C70		*Malus* sp.	Apple species	1	18,21	28	F	F	G	3	8	ROW	1.8	Remove	Trunk wound	encroachment exceeds 3x diameter
C71	QUERALB	*Quercus alba*	White Oak	1	25	25	G	G	G	4	10	ROW	1.8	Remove		encroachment exceeds 3x diameter
C72	QUERALB	*Quercus alba*	White Oak	1	24	24	G	G	G	4	10	ROW	1.8	Remove	Closed trunk wounds	encroachment exceeds 3x diameter
C73	ROBIPSE	*Robinia pseudoacacia*	Black Locust	1	18	18	G	G	G	4	8	ROW	1.5	Remove	Sprouting	encroachment exceeds 3x diameter
C74	ROBIPSE	*Robinia pseudoacacia*	Black Locust	1	22	22	F	G	G	4	8	ROW	1.8	Remove	Sprouting, main stem topped	encroachment exceeds 3x diameter
C75	ACERFRE	*Acer x freemanii*	Freeman's Maple	1	25	25	G	G	G	4	14	ROW	1.8	Preserve	Codominant stem	Fully protected
C76	ROBIPSE	*Robinia pseudoacacia*	Black Locust	1	29	29	G	G	G	6	14	ROW	1.8	Preserve	Exposed roots	Fully protected
C77	ACERFRE	*Acer x freemanii*	Freeman's Maple	1	33	33	F	G	G	5	14	ROW	2.4	Preserve / TPZ reduction	Exposed roots, pruned	Tree protection reduction. Mitigate via root pruning
C78	ACERFRE	*Acer x freemanii*	Freeman's Maple	1	32	32	F	G	G	5	14	ROW	2.4	Preserve / TPZ reduction	Exposed roots	Tree protection reduction. Mitigate via root pruning
C79	ACERFRE	*Acer x freemanii*	Freeman's Maple	1	30	30	F	G	G	4	12	ROW	2.4	Remove	Exposed roots	encroachment exceeds 3x diameter
C80	ACERFRE	*Acer x freemanii*	Freeman's Maple	1	20	20	F	G	G	4	10	ROW	1.5	Preserve	Sprouting	Fully protected
C81		*Malus* sp.	Apple species	1	21	21	F	F	G	1	8	ROW	1.8	Remove		encroachment exceeds 3x diameter
C82		*Malus* sp.	Apple species	1	20	20	F	F	G	2	8	Private	1.8	Remove		encroachment exceeds 3x diameter
C83	ACERPLA	*Acer platanoides*	Norway Maple	1	24	24	G	G	G	4	12	ROW	1.8	Preserve / TPZ reduction		Tree protection reduction. Mitigate via root pruning
C84	ACERPLA	*Acer platanoides*	Norway Maple	1	18	18	G	G	G	3	10	ROW	1.5	Preserve		Fully protected
C85	ACERPLA	*Acer platanoides*	Norway Maple	1	23	23	F	G	G	4	9	ROW	1.8	Preserve	Peeling bark, bark missing at base	Fully protected
C86	ACERPLA	*Acer platanoides*	Norway Maple	1	18	18	F	G	G	3	7	ROW	1.5	Preserve	Seam, moth eggs	Fully protected
C87	ACERPLA	*Acer platanoides*	Norway Maple	1	15	15	F	G	G	2	6	ROW	1.5	Preserve		Fully protected
C88	ACERPLA	*Acer platanoides*	Norway Maple	1	22	22	G	G	G	4	9	ROW	1.8	Preserve	Exposed roots	Fully protected
C89	ACERPLA	*Acer platanoides*	Norway Maple	1	14	14	G	G	G	2	7	ROW	1.5	Preserve		Fully protected
C90	ACERPLA	*Acer platanoides*	Norway Maple	1	15	15	G	G	G	2	7	ROW	1.5	Preserve / TPZ reduction		Tree protection reduction. Mitigate via root pruning
C91	ACERPLA	*Acer platanoides*	Norway Maple	1	17	17	F	G	G	4	8	ROW	1.5	Remove	Peeling bark on trunk	encroachment exceeds 3x diameter
C92	ACERPLA	*Acer platanoides*	Norway Maple	1	18	18	G	G	G	4	9	ROW	1.5	Remove		encroachment exceeds 3x diameter
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Fair (F): tree displays 15-40% deficiency/defect within the given tree assessment criteria (TI,CS,CV)
Poor (P): tree displays greater than 40% deficiency/defect within the given tree assessment criteria (TI,CS,CV)

Legend: Trees to be Retained; Trees to be Preserved; Trees to be Removed; Tree location / grouping; Minimum TPZ reduction / Injury; Minimum TPZ reduction / No Injury

Tree #	Code	Botanical Name	Common Name	Qty.	DBH (cm)	Effective DBH	TI	CS	CV	Dripline Radius (m)	Height (m)	Tree Location / Applicable By-law	Tree Protection Zone (m)	Recommendation	Comments - Health	Comments - Removal/Preservation
C94	ACERPLA	*Acer platanoides*	Norway Maple	1	13	13	G	G	G	2	9	ROW	1.5	Preserve		Fully protected
C95		*Morus alba*	White Mulberry	1	15	15	P	P	F	3	6	ROW	1.5	Preserve	Twisted trunk, topped main branch	Fully protected
C96	ACERPLA	*Acer platanoides*	Norway Maple	1	24	24	G	G	G	5	10	ROW	1.8	Preserve	Exposed roots	Fully protected
C97	ACERPLA	*Acer platanoides*	Norway Maple	1	20	20	F	G	G	3	10	ROW	1.5	Preserve	Slight lean and exposed roots	Fully protected
C98	ACERPLA	*Acer platanoides*	Norway Maple	1	22	22	G	G	G	3	10	ROW	1.8	Preserve	Loose bark	Fully protected
C99	ACERPLA	*Acer platanoides*	Norway Maple	1	14	14	F	G	G	2	8	ROW	1.5	Preserve	Main stem pruned off	Fully protected
C100	ACERPLA	*Acer platanoides*	Norway Maple	1	17	17	G	G	G	3	7	ROW	1.5	Preserve		Fully protected
C101	ACERPLA	*Acer platanoides*	Norway Maple	1	18	18	G	G	G	5	8	ROW	1.5	Preserve	Exposed roots	Fully protected
C102	ROBIPSE	*Robinia pseudoacacia*	Black Locust	1	11	11	G	G	G	3	7	ROW	1.5	Preserve		Fully protected
C103	ACERPLA	*Acer platanoides*	Norway Maple	1	25	25	F	G	G	5	9	Private	1.8	Preserve	Lean, fungus growth	Fully protected
C104	ACERPLA	*Acer platanoides*	Norway Maple	1	15	15	F	G	G	2	8	Private	1.5	Preserve	Lean	Fully protected
C105	ROBIPSE	*Robinia pseudoacacia*	Black Locust	1	18	18	F	G	G	3	8	ROW	1.5	Remove	Growing on pavement	encroachment exceeds 3x diameter
C106	ROBIPSE	*Robinia pseudoacacia*	Black Locust	1	18	±30	F	G	G	3		ROW	1.5	Remove	Growing on pavement	encroachment exceeds 3x diameter
P1		*Pinus nigra*	Austrian Pine	1	±30	±30	G	G	G	3		Private	2.4	Remove		encroachment exceeds 3x diameter
P2		*Pinus nigra*	Austrian Pine	1	±30	±30	G	G	G	3		Private	2.4	Remove		encroachment exceeds 3x diameter
P3		*Pinus nigra*	Austrian Pine	1	±30	±25-30	G	G	G	3		Private	2.4	Remove		encroachment exceeds 3x diameter
P4		*Pinus nigra*	Austrian Pine	1	±25-30	±25-30	G	G	G	3		Private	2.4	Remove		encroachment exceeds 3x diameter
P5		*Pinus nigra*	Austrian Pine	1	±25-30	±30	G	G	G	3		Private	2.4	Remove		encroachment exceeds 3x diameter
P6		*Pinus nigra*	Austrian Pine	1	±30	±30	G	G	G	3		Private	2.4	Remove		encroachment exceeds 3x diameter
P7		*Pinus nigra*	Austrian Pine	1	±30	±30	G	G	G	3		Private	2.4	Remove		encroachment exceeds 3x diameter
P8		*Pinus nigra*	Austrian Pine	1	±30	±40	G	G	G	3		Private	2.4	Remove		encroachment exceeds 3x diameter
P9		*Pinus nigra*	Austrian Pine	1	±40	±35	G	G	G	3		Private	2.4	Remove		encroachment exceeds 3x diameter
P10		*Pinus nigra*	Austrian Pine	1	±35	±35	G	G	F	3		Private	2.4	Remove		encroachment exceeds 3x diameter
P11		*Pinus nigra*	Austrian Pine	1	±35	±35	G	G	F	3		Private	2.4	Remove		encroachment exceeds 3x diameter
P12		*Pinus nigra*	Austrian Pine	1	±35	±35	G	G	G	3		Private	2.4	Remove		encroachment exceeds 3x diameter
P13		*Pinus nigra*	Austrian Pine	1	±30	±30	G	G	G	3		Private	2.4	Remove		encroachment exceeds 3x diameter
P14		*Pinus nigra*	Austrian Pine	1	±30	±30	G	G	G	3		Private	2.4	Remove		encroachment exceeds 3x diameter

TABLE 1: LEGEND

- TREE TO BE RETAINED
- TREE TO BE PRESERVED
- TREE TO BE REMOVED
- TREE PROTECTION ZONE REDUCTION - INJURY
- TREE PROTECTION ZONE REDUCTION - NO INJURY

TREE INVENTORY & PRESERVATION CHART LEGEND

Tree Assessment Criteria:

Trunk Integrity (T.I.): this is an assessment of the trunk for any defects or weaknesses .It is measured on a scale of poor, fair, good.
Canopy Structure (C.S.): this is an assessment of the scaffold branches, unions and the canopy of the tree. This is measured on a scale of poor, fair, good.
Canopy Vigour (C.V.): this is an assessment of the health of the tree and assess the amount of deadwood and the live growth in the crown as compared to a 100% healthy tree. the size, colour and amount of foliage are also considered in this category. This is measured on a scale of poor, fair, good.

Tree Location:

RNFP / TRCA: Stem of tree is located entirely on within the Ravine and Natural Feature Protection by-law
Private: Stem of tree is located entirely on private property
Park: Stem of tree is located entirely within City owned Parkland
City: Stem of tree is located entirely within the municipal right of way

Tree Condition:

G: Good - tree displays less than 15% deficiency / defect within the given tree assessment criteria (TI,CS,CV)
F: Fair - tree displays 15-50% deficiency / defect within the given tree assessment criteria (TI,CS,CV)
P: Poor - tree displays greater than 40% deficiency / defect within the given tree assessment criteria (TI,CS,CV)
D: Dead - tree displays 100% deficiency / defect within the canopy vigour tree assessment criteria

Recommendation:

Retain: tree is in good condition and will not be impacted by construction / grading as the tree is more than 6m the limits of work.
Preserve: tree is in good condition and will not be impacted by construction / grading, although is within proximity to the limits of work and will be protected with tree hoarding
Remove: tree is either in poor condition or dead or will be significantly impacted by grading and construction limits and will not survive.

No.	REVISIONS	BY	DATE	APPR.
3	PRELIMINARY DESIGN REPORT	PM	2021.09.30	–
2	30% DESIGN PDR	PM	2021.06.18	–
1	PRELIMINARY DESIGN	PM	2021.02.19	–

ALL PREVIOUS ISSUES OF THIS DRAWING ARE SUPERSEDED

CLIENT
CITY OF MISSISSAUGA

MUNICIPALITY
MISSISSAUGA

PROJECT TITLE
RATHBURN ROAD & PONYTRAIL DRIVE FROM DIXIE ROAD TO BURNHAMTHORPE ROAD EAST ENVIRONMENTAL ASSESSMENT

SHEET TITLE
TREE PRESERVATION CHARTS

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PM	PM	CB

SCALE 1 : 500 — DATE JANUARY 2021

DRAWING NUMBER 19M-00836-03 — SHEET NUMBER TP-8

FILENAME: C:\Users\mcnamarap\OneDrive - WSP O365\Documents\Mississauga - Rathburn & Ponytrail EA\Drawings\TP-1 to TP-9_Tree Preservation-1PKJS73.dwg

TREE PRESERVATION NOTES AND GUIDELINES

ESTABLISHMENT OF TREE PROTECTION ZONE (TPZ):

- TREE PRESERVATION MEASURES, INCLUDING THE ESTABLISHMENT OF TREE PROTECTION ZONE (TPZ) SHALL APPLY TO THE VEGETATION IDENTIFIED TO BE RETAINED AND PROTECTED. THE TREE PROTECTION ZONE SHALL CONSIST OF TREE PROTECTION FENCING AS PER CITY OF MISSISSAUGA STANDARDS. REFER TO DETAILS ON THIS SHEET
- NO GRADE CHANGES SHALL OCCUR WITHIN TREE PROTECTION ZONE. IN THE EVENT THAT GRADE CHANGES OCCUR EITHER AS A CUT OR FILL SITUATION, THE CONSULTING ARBORIST MUST BE NOTIFIED SO THAT PRECAUTIONS TO PRESERVE THE TREE CAN BE DETERMINED PRIOR TO THE PLACEMENT OF FILL OR EXCAVATION ACTIVITIES.
- EVERY PRECAUTION MUST BE TAKEN TO PREVENT DAMAGE TO TREES AND ROOT SYSTEMS FROM DAMAGE, COMPACTION AND CONTAMINATION RESULTING FROM THE CONSTRUCTION TO THE SATISFACTION OF THE CONSULTING ARBORIST.
- TREES THAT REQUIRE PRUNING TO PERMIT CONSTRUCTION ACTIVITIES WILL BE DONE SO IN ACCORDANCE WITH GOOD ARBORICULTURAL PRACTICES. IN THE EVENT THAT IT IS NECESSARY TO REMOVE ADDITIONAL LIMBS OR PORTIONS OF TREES, AFTER CONSTRUCTION HAS COMMENCED, TO ACCOMMODATE CONSTRUCTION, THE CONSULTING ARBORIST IS TO BE INFORMED AND UNDER THEIR DIRECTION THE REMOVAL IS TO BE EXECUTED CAREFULLY AND IN FULL ACCORDANCE WITH ARBORICULTURAL TECHNIQUES, BY A CERTIFIED ARBORIST.
- ANY DAMAGE TO TREES SUCH AS BROKEN LIMBS, DAMAGE TO ROOTS, OR WOUNDS TO THE MAIN TRUNK OR STEM SYSTEMS ARE TO BE REPORTED TO THE CONSULTING ARBORIST SO THAT THE DAMAGE CAN BE ASSESSED IMMEDIATELY AND MITIGATION CAN BE PROMPTLY IMPLEMENTED.

TREE INJURY:

TYPICALLY TREE ROOTS EXTEND 1.5 TO 3 TIMES BEYOND THE DRIPLINE OF THE TREE AND ARE WITHIN THE TOP 150mm OF THE SOIL. TYPES OF DAMAGE FROM CONSTRUCTION INCLUDE:

- PHYSICAL INJURY
- SOIL COMPACTION
- SEVERING OF ROOTS
- SMOTHERING OF ROOTS
- SPLIT OR BROKEN BRANCHES
- EXCESSIVE PRUNING

SOIL COMPACTION REDUCES PORE SPACE, OXYGEN AVAILABLE TO ROOTS INCREASES CARBON DIOXIDE ACCUMULATION, RESTRICTS ROOT GROWTH AND THE ABILITY TO ABSORB WATER AND NUTRIENTS, AS WELL AS IMPAIRS DRAINAGE.
SMOTHERING OF ROOTS: 90% OF FINE ABSORBING ROOTS ARE WITHIN THE UPPER 150-300mm OF THE SOIL. SMOTHERING WITH THE ADDITION OF SOIL CAN KILL THE ROOTS AND STRESS THE TREE.
PHYSICAL INJURY, SPLIT OR BROKEN BRANCHES HINDER THE TREES ABILITY TO COMPARTMENTALIZE (CLOSE) WOUNDS PROPERLY.

ROOT PRUNING PRACTICES:

- DURING EXCAVATION OPERATIONS IN WHICH THE ROOT AREA IS AFFECTED, THE CONTRACTOR IS TO PRUNE ALL EXPOSED ROOTS CLEANLY. PRUNED ROOT ENDS ARE TO BE NEATLY AND SQUARELY TRIMMED AND THE AREA IS TO BE BACKFILLED WITH CLEAN NATIVE FILL AS SOON AS POSSIBLE TO PREVENT DESICCATION AND PROMOTE ROOT GROWTH. THE EXPOSED ROOTS SHOULD NOT BE ALLOWED TO DRY OUT, AND THE CONTRACTOR SHALL DISCUSS WATERING OF THE ROOTS WITH THE CONSULTING ARBORIST SO THAT THE ROOTS SHALL MAINTAIN OPTIMUM SOIL MOISTURE DURING CONSTRUCTION AND BACKFILLING OPERATIONS, YET SO NOT TO INTERFERE WITH CONSTRUCTION OPERATIONS. BACKFILLING MUST BE WITH CLEAN UNCONTAMINATED TOPSOIL FROM AN APPROVED SOURCE. TEXTURE MUST BE COARSER THAN EXISTING SOILS, AND TO COME INTO CLEAN CONTACT WITH EXISTING SOILS (REMOVE AIR POCKETS, SOD, ETC.)
- TREE ROOTS SHOULD NOT BE EXCAVATED WITHIN THE CRITICAL STRUCTURAL ROOTING AREA. THIS IS THE MINIMUM AREA OF THE ROOT SYSTEM NECESSARY TO MAINTAIN VITALITY OR STABILITY OF THE TREE. TYPICALLY THIS AREA EXTENDS TO THE DRIPLINE OF THE TREE. THE SEVERING OF ONE ROOT CAN CAUSE APPROXIMATELY 5-20% LOSS OF THE ROOT SYSTEM. A REDUCTION OF THIS AREA BY GREATER THAN 30% CAN POSE STABILITY CONCERNS FOR THE TREE.
- A SLOW RELEASE FERTILIZER EG: BONE MEAL OR APPROVED EQUAL TO BE APPLIED TO TREES WHERE ROOT PRUNING OR ROOT DAMAGE HAS OCCURRED. APPLY PER MANUFACTURER'S RECOMMENDATIONS
- ROOTS OVER 2.5cm DIAMETER THAT ARE TO BE CUT SHOULD BE PRUNED RATHER THAN LEFT TORN OR CRUSHED
- AT THE COMMENCEMENT OF CONSTRUCTION PRUNE ROOTS CLEANLY USING ACCEPTABLE ARBORICULTURAL PRACTICES AND IMMEDIATELY BACKFILL WITH APPROPRIATE MATERIAL. THE FOLLOWING ARE GENERAL METHODS OF ROOT PRUNING TO TO UTILIZED WHEN GRADING / CONSTRUCTION WILL OCCUR WITHIN THE DRIPLINE OF TREES:

  1. SOIL EXCAVATION USING SUPERSONIC AIR TOOLS, PRESSURIZED WATER OR HAND TOOLS, FOLLOWED BY SELECTIVE ROOT CUTTING
  2. CUTTING THROUGH THE SOIL ALONG A PREDETERMINED LINE ON THE SURFACE USING TOOL SPECIFICALLY DESIGNED TO CUT ROOTS
  3. MECHANICALLY EXCAVATING (e.g. BACKHOE) THE SOIL AND PRUNING WHAT IS LEFT OF THE EXPOSED ROOTS.
  4. CUTS TO BE MADE WITH HAND PRUNING SHEARS, BY-PASS BLADE, PRUNING SAW. DO NOT USE ANVIL TYPE PRUNERS.

BRANCH PRUNING PRACTICES:

- ALL LIMBS DAMAGED OR BROKEN DURING THE COURSE OF CONSTRUCTION SHOULD BE PRUNED CLEANLY, UTILIZING BY-PASS SECATEURS IN ACCORDANCE WITH APPROVED HORTICULTURAL PRACTICES. SHOULD THERE BE A POTENTIAL RISK OF TRANSFER OF DISEASE FROM INFECTED TO NON-INFECTED TREES; TOOLS MUST BE DISINFECTED AFTER PRUNING EACH TREE BY DIPPING IN METHYL HYDRATE. THIS PRACTICE IS PARTICULARLY IMPORTANT DURING PERIODS OF TREE STRESS AND WHEN PRUNING MANY MEMBERS OF THE SAME GENERA, WITHIN WHICH A DISEASE COULD BE SPREAD QUICKLY (I.E., VERTICILLIUM WILT ON MAPLES OR FIRE BLIGHT ON GENERA OF THE ROSACEA FAMILY).
- ALL PRUNING CUTS SHOULD BE MADE TO A GROWING POINT SUCH AS A BUD, TWIG OR BRANCH, CUT JUST OUTSIDE THE BRANCH COLLAR (THE SWOLLEN AREA AT THE BASE OF THE BRANCH THAT SOMETIMES HAS A BARK RIDGE), AND PERPENDICULAR TO THE BRANCH BEING PRUNED RATHER THAN AS CLOSE TO THE TRUNK AS POSSIBLE. THIS MINIMIZES THE SITE OF THE WOUND. NO STUBS SHOULD BE LEFT. POOR CUT LOCATION, POOR CUT ANGLE AND TORN CUTS ARE NOT ACCEPTABLE.
- EXTENSIVE PRUNING IS BEST COMPLETED BEFORE PLANTS BREAK DORMANCY. PRUNING SHOULD BE LIMITED TO THE REMOVAL OF NO MORE THAN ONE THIRD (1/3) OF THE TOTAL BUD AND LEAF BEARING BRANCHES. PRUNING SHOULD INCLUDE THE CAREFUL REMOVAL OF
  DEADWOOD,
  BRANCHES THAT ARE WEAK, DAMAGED, DISEASED AND THOSE WHICH WILL INTERFERE WITH CONSTRUCTION ACTIVITY,
  SECONDARY LEADERS OF CONIFERS,
  TRUNK AND ROOT SUCKERS,
  TRUNK WATERSPOUTS, AND
  TIGHT V-SHAPED OR WEAK CROTCHES (INCLUDED UNIONS).
- THE CONTRACTOR MUST IMMEDIATELY REPORT ANY DAMAGE TO TREES SUCH AS BROKEN LIMBS, DAMAGE TO ROOTS, OR WOUNDS TO THE MAIN TRUNK OR STEM SYSTEMS SO THAT THE DAMAGE CAN BE ASSESSED IMMEDIATELY.
- THE TREE PROTECTION FENCING WILL BE MAINTAINED UNTIL ALL CONSTRUCTION IS COMPLETED, SOILS ARE STABILIZED AND ALL OF THE EQUIPMENT HAS BEEN REMOVED FROM THE SITE.
- ANY BRANCHES THAT OVERHANG THE WORK AREA AND REQUIRE PRUNING ARE TO BE PRUNED USING GOOD ARBORICULTURAL PRACTICES UTILIZING BY-PASS SECATEURS IN ACCORDANCE WITH APPROVED HORTICULTURAL PRACTICES AND/OR AMERICAN NATIONAL STANDARD (ANSI) A300 (PART 1) - 2008 PRUNING

WORK WITHIN A TREE PROTECTION ZONE:

IF WORK MUST BE CONDUCTED WITHIN A TREE PROTECTION ZONE THE CONTRACTOR SHOULD MINIMIZE SOIL COMPACTION AND MECHANICAL ROOT DAMAGE BY UTILIZING ONE OF THE FOLLOWING FOUR METHODS:

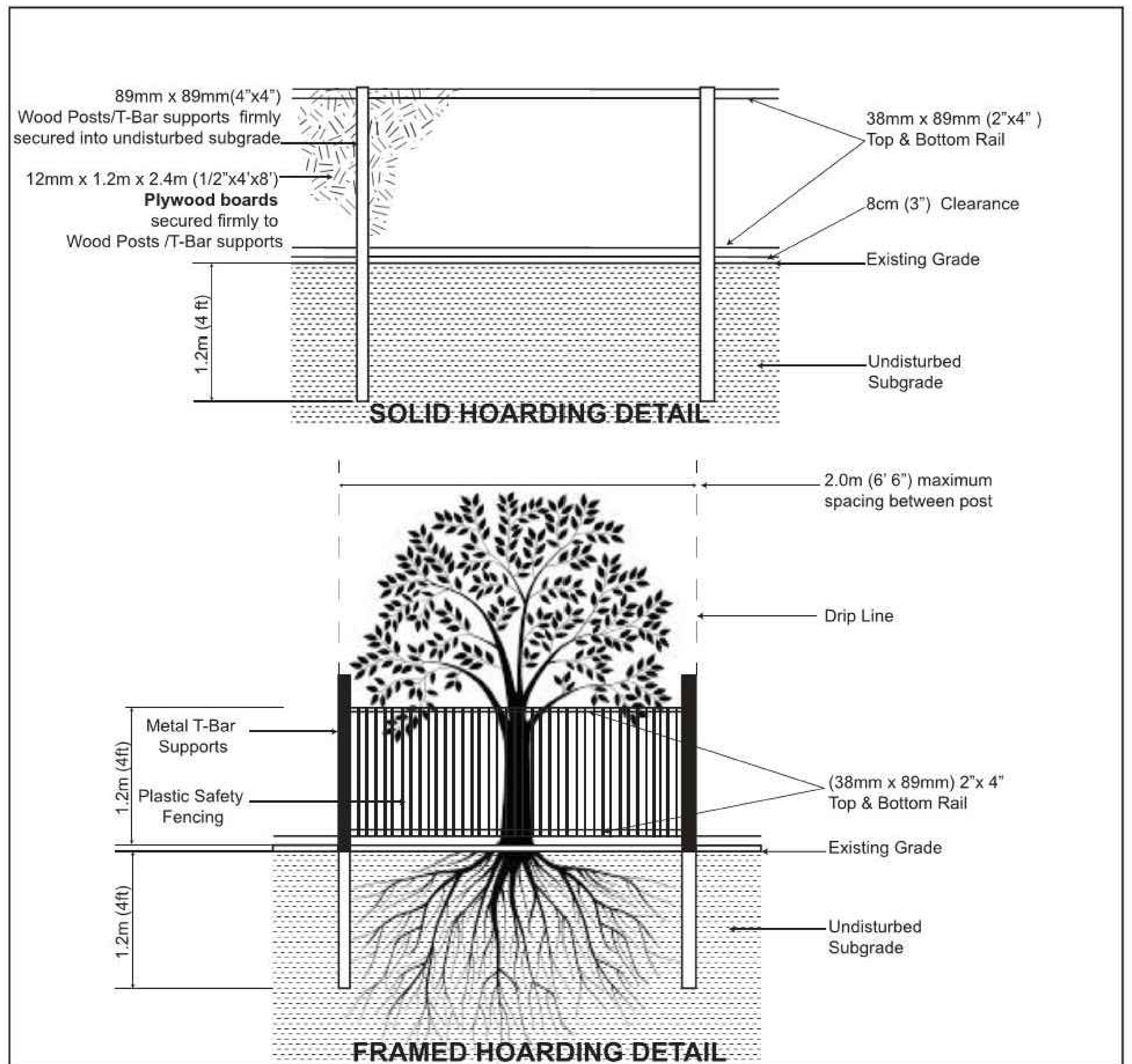
1. APPLYING 150-300mm OF MULCH TO AREA. UPON COMPLETION REMOVE EXCESS MULCH LEAVING A 100mm DEPTH LAYER OF MULCH.
2. LAYING 20mm THICK PLYWOOD OR 100X100mm WOOD BEAMS OVER A 100+MM THICK LAYER OF WOOD CHIP MULCH. UPON COMPLETION REMOVE PLYWOOD AND LEAVE MULCH LAYER IN PLACE.
3. APPLYING 100-150mm DEPTH OF GRAVEL OVER A TAUT, STAKED GEOTEXTILE FABRIC. UPON COMPLETION REMOVE GRAVEL AND GEOTEXTILE.
4. PLACING COMMERCIAL LOGGING OR ROAD MATS ON TOP OF A MULCH LAYER. UPON COMPLETION REMOVE MATS. STONE, GEOTEXTILE, AND MULCH EXCEEDING 100mm THICK WILL BE REMOVED FROM THE TREE PRESERVATION AREA ONCE THE THREAT OF SOIL OR ROOT DAMAGE HAS PASSED.

TREE PROTECTION ZONE:

APPLIES TO TREES LOCATED THE LIMIT OF GRADING OR NOTED OTHERWISE. THESE TREES ARE TO BE PRESERVED AND WILL HAVE SILT / TREE PROTECTION FENCING INSTALLED AT ALONG THE LIMIT OF GRADING / LIMIT OF WORK TO ESTABLISH THE TREE PROTECTION ZONE. ANY DAMAGE TO TREES SUCH AS BROKEN LIMBS, DAMAGE TO ROOTS, OR WOUNDS TO THE MAIN TRUNK OR STEM SYSTEMS ARE TO BE REPORTED TO THE CONSULTING ARBORIST SO THAT THE DAMAGE CAN BE ASSESSED IMMEDIATELY AND MITIGATION CAN BE PROMPTLY IMPLEMENTED. WITHIN A TREE PROTECTION ZONE THERE IS TO BE:

- NO CONSTRUCTION
- NO ALTERING OF GRADE BY ADDING FILL, EXCAVATING, TRENCHING, SCRAPING, DUMPING OR DISTURBANCE OF ANY KIND.
- NO STORAGE OF CONSTRUCTION MATERIALS, EQUIPMENT, SOIL, CONSTRUCTION WASTE OR DEBRIS WITHIN THE DRIP LINE
- NO MOVEMENT OF VEHICLES, EQUIPMENT
- NO PARKING OF VEHICLES OR MACHINERY
- NO DIGGING, BORING
- NO RIGGING CABLES SHALL BE WRAPPED AROUND OR INSTALLED IN TREES
- NO CONTAMINANTS WILL BE PLACED OVER ROOT SYSTEM
- NO CONTAMINANTS WILL BE DUMPED OR FLUSHED WHERE FEEDER ROOTS OF TREES EXIST

TREE PRESERVATION HOARDING DETAIL



NOTES:

1. Hoarding details to be determined following initial site inspection.
2. Private tree hoarding to be approved by Development & Design ; City tree hoarding to be approved by Community Services Dept.
3. Hoarding must be supplied, installed and maintained by the applicant throughout all phases of construction. **Inspection must be conducted by the Development and Design Division prior to removing any/all private hoarding.**
4. Do not allow water to collect and pond behind or within hoarding.
5. **T-bar supports are acceptable alternative to 4x4 posts. U-shaped metal supports will not be accepted.**
6. **Plywood** must be utilized for 'solid' hoarding. OSB/Chipboard will not be accepted for solid hoarding. Plywood sheets must be installed on "construction" side of frame.
7. Applicant is responsible to ensure utility locates are completed within city boulevard prior to installing framed hoarding.

TREE PRESERVATION HOARDING

SCALE : N.T.S DATE : June 2017

MISSISSAUGA

KEY MAP

No.	REVISIONS	BY	DATE	APPR.
3	PRELIMINARY DESIGN REPORT	PM	2021.09.30	--
2	30% DESIGN PDR	PM	2021.06.18	--
1	PRELIMINARY DESIGN	PM	2021.02.19	--

ALL PREVIOUS ISSUES OF THIS DRAWING ARE SUPERSEDED

CLIENT
CITY OF MISSISSAUGA

MUNICIPALITY
MISSISSAUGA

PROJECT TITLE
RATHBURN ROAD & PONYTRAIL DRIVE FROM DIXIE ROAD TO BURNHAMTHORPE ROAD EAST ENVIRONMENTAL ASSESSMENT

SHEET TITLE
TREE PRESERVATION NOTES & DETAILS

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DESIGNED	DRAWN	CHECKED
PM	PM	CB

SCALE	DATE
AS SHOWN	JANUARY 2021

DRAWING NUMBER	SHEET NUMBER
19M-00836-03	TP-9

FILENAME: C:\Users\mcnamarap\OneDrive - WSP O365\Documents\Mississauga - Rathburn & Ponytrail EA\Drawings\TP-1 to TP-9_Tree Preservation-1PKJS73.dwg

APPENDIX

L SAFETY REPORT

TECHNICAL MEMO

TO: Don McLeod, Senior Project Manager. WSP

FROM: Tom Leung, P. Eng., WSP

DATE: **January 20, 2022**

SUBJECT: **19M-00836-03 Rathburn and Ponytrail Drive Existing Safety Performance Report**

INTRODUCTION

As part of the Safety Performance Assessment Report, WSP has conducted a quantitative road safety analysis of the safety performance of eight existing intersections on the Rathburn Road and Ponytrail Drive corridor in Mississauga, Ontario. This analysis was based on the most recent collision data, traffic volumes and physical characteristics for the study area intersections presented in Table 1.

Table 1: Study area intersections on Rathburn and Ponytrail Drive

#	Rathburn/Ponytrail Intersections
1	Burnhamthorpe Rd and Ponytrail Dr
2	Rathburn Rd and Bough Beeches Blvd (east)
3	Rathburn Rd and Bough Beeches Blvd (west)
4	Rathburn Rd and Capilano Ct
5	Rathburn Rd and Garnetwood Chase
6	Rathburn Rd and Ponytrail Dr
7	Rathburn Rd and Rockwood Rd
8	Rathburn Rd and Tapestry Ct

The analysis is being conducted in the following:

- The safety performance of the eight existing intersections is examined to provide a perspective and baseline road safety assessment to prioritize the intersection locations for improvement and to identify intersections with the greatest potential for road safety improvement.

This technical memorandum summarizes the findings from Phase 1 of this analysis only.

APPROACH

The safety analysis approach used in this analysis was the AASHTO Highway Safety Manual (HSM) Predictive Method. This method estimates an expected average collision frequency for each of the existing intersections using regression equations called Safety Performance Functions (SPFs).

An SPF is a relationship between the amount of traffic approaching a particular type of intersection and its safety performance. The City of Mississauga has developed SPF's for several classes of roadways and intersections to estimate expected collision frequencies based on regression analysis of their collision dataset (Equation 1). These SPF's are adjusted as necessary using Collision Modification Factors (CMFs) contained in the HSM – Part C to account for existing intersection features (geometry, lighting, turning lanes, etc.).

Equation 1: The City of Mississauga SPF equation

$$N_{expected} = \alpha \times F_{tot/maj}^{b} \times \left(\frac{F_{min}}{F_{tot}}\right)^{c}$$

Where:

$N_{expected}$ is the number of expected collisions;

F_{maj} is the entering AADT on the major approaches;

F_{min} is the entering AADT on the minor approaches;

F_{tot} is the total entering volume of an intersection which is equal to $F_{maj} + F_{min}$;

α, b, and c are the model parameters of the associated SPF.

RESULTS

The SPF estimates of the total annually expected collision frequency for the existing study area intersections are presented in Table 2.

Table 2: Total annually expected collision frequency – existing intersections

#	Rathburn/Ponytrail Intersections	Number of Legs	Traffic Control Type	Annually Expected Collision Frequency (collision/year)
1	Burnhamthorpe Rd and Ponytrail Dr	4	Signalized	3.83
2	Rathburn Rd and Bough Beeches Blvd (east)	3	Stop Controlled	0.38
3	Rathburn Rd and Bough Beeches Blvd (west)	4	Signalized	1.83
4	Rathburn Rd and Capilano Ct	3	Stop Controlled	0.10
5	Rathburn Rd and Garnetwood Chase	4	Stop Controlled	0.31
6	Rathburn Rd and Ponytrail Dr	3	Signalized	1.60
7	Rathburn Rd and Rockwood Rd	4	Stop Controlled	0.51
8	Rathburn Rd and Tapestry Ct	3	Stop Controlled	0.37

The SPF was then combined with historical collision data from the study area intersections using a weighted Empirical-Bayes procedure. Following HSM equations were used for this purpose:

Equation 2: EB Method analysis - Smoothed number of expected collisions

$$\boldsymbol{N_{smoothed} = w \times N_{expected} + (1 - w) \times N_{observed}}$$

Equation 3: EB Method analysis - Weighted adjustment

$$\boldsymbol{w = \frac{1}{1 + k \times N_{expected}}}$$

Where:

$N_{smoothed}$ is smoothed number of expected collisions;

$N_{expected}$ is the number of expected collisions;

$N_{observed}$ is observed number of collisions at the site;

w is weighted adjustment;

k is overdispersion parameter of the associated SPF.

This procedure overcomes some of the statistical weaknesses associated with collision analyses that arise from relatively small sample sizes and random short-term variability that is typical of collision occurrences. In other words, this procedure transforms the observed collision counts to an expected value based on the long run, without randomness of annual collision occurrence and provides what is termed a “Smoothed SPF Estimate” of annual expected collision frequency. The potential for safety improvement is then determined by comparing the smoothed collision estimates to the expected collision estimates, indicating if analysis location is experiencing more collisions than expected. These results are summarized in Table 3.

Table 3: EB Method results – smoothed expected collision frequency

		A	B	C
#	**Rathburn/Ponytrial Intersections**	**SPF Estimates** **Annually Expected Collision Frequency (collision/year)**	**Observed Collisions** **Average Annually Observed Collision Frequency (collisions/year)**	**Smoothed SPF Estimates** **Annually Expected Collision Frequency (collision/year)**
1	Burnhamthorpe Rd and Ponytrail Dr	3.83	0.80	2.26
2	Rathburn Rd and Bough Beeches Blvd (east)	0.38	0.40	0.40
3	Rathburn Rd and Bough Beeches Blvd (west)	1.83	1.80	1.85
4	Rathburn Rd and Capilano Ct	0.10	0.40	0.12
5	Rathburn Rd and Garnetwood Chase	0.31	0.40	0.31
6	Rathburn Rd and Ponytrail Dr	1.60	0.40	1.06
7	Rathburn Rd and Rockwood Rd	0.51	0.40	0.47
8	Rathburn Rd and Tapestry Ct	0.37	0.41	0.35

FINDINGS

Results summarized in Table 3 suggest that, when the smoothed annual collision frequencies (Column C) are compared to the annual expected collision frequencies (Column A), three of the eight intersections exhibit higher than expected annual collision frequencies. This suggests these intersection locations have some potential for road safety improvement. Of the three underperforming intersections, the Rathburn and Ponytrail Drive appears to offer the greatest potential for road safety improvement.

APPENDIX

M

STAGE 1 ARCHAEOLOGY REPORT

CITY OF MISSISSAUGA

STAGE 1 ARCHAEOLOGICAL ASSESSMENT

RATHBURN ROAD AND PONYTRAIL DRIVE

DECEMBER 09, 2021 ORIGINAL

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DOUGLAS YAHN– P365

STAGE 1 ARCHAEOLOGICAL ASSESSMENT

RATHBURN ROAD EAST AND PONYTRAIL DRIVE

CITY OF MISSISSAUGA

LOTS 1 THROUGH 5 AND A ON CONCESSION 2, NORTH OF DUNDAS IN THE FORMER TOWNSHIP OF TORONTO, PEEL COUNTY, NOW CITY OF MISSISSAUGA, REGIONAL MUNICIPALITY OF PEEL.

ORIGINAL REPORT

PROJECT NO.: 19M-00836-00
DATE: DECEMBER 09, 2021

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Stage 1 Archaeological Assessment:

Rathburn Road East and Ponytrail Drive

Lots 1 through 5 and A on Concession 2, North of Dundas in the former Township of Toronto, Peel County, now City of Mississauga, Regional Municipality of Peel.

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EXECUTIVE SUMMARY

WSP Canada Inc. was retained by the City of Mississauga (the Client) to conduct a Stage 1 Archaeological Assessment for the Municipal Class Environmental Assessment (Class EA) study of the Rathburn Road East and Ponytrail Drive Integrated Road Project. This project includes improvements to the right-of-way of these streets including the sidewalks, pedestrian crossings, cycling facilities, the streetscape and natural features, noise walls, drainage, transit facilities and other road infrastructure features that are to be adapted to current and future use of the study area (Figures 1 and 2).

The current study area consists of approximately 2.5 km of Rathburn Road East from the Dixie Road intersection to Etobicoke Creek as well as the approximately 0.5 km of right-of-way of Ponytrail Drive from Rathburn Road East to Burnhamthorpe Road East. It is situated on Lots 1 through 5 and A on Concession 2, North of Dundas in the former Geographic Township of Toronto, Peel County, now City of Mississauga, Regional Municipality of Peel.

This archaeological assessment was triggered by the Schedule A+ of the Class EA process under the *Environmental Assessment Act* to ensure the Client is compliant with the *Ontario Heritage Act*. The archaeological assessment was carried out during preliminary planning phase. The boundaries of the assessment were provided by the Client at the outset of the assessment (Appendix A).

Archaeological activities were carried out in accordance with the Ministry of Heritage, Sport, Tourism, and Culture Industries' *Standards and Guidelines for Consultant Archaeologists* (MHSTCI, 2011). This study involved a review of documents pertaining to the property including historic maps, local histories, archaeological literature and a property inspection. The property inspection was conducted on November 26th, 2020 and all work was conducted from publicly accessible lands.

Archaeological recommendations have been made based on the background historic research, locations of known or registered archaeological sites, indicators of archaeological potential, and property inspection. These recommendations include:

- Background research and a property inspection determined that the study area has been deeply and extensively disturbed (Figure 7). **No further archaeological assessment is required.**

PROJECT PERSONNEL

WSP

Project Archaeologist	Lara Wood, MA (P1078) *Professional Archaeologist/Previous Licencee*
Field Director	Craig Ramsoomair, MA (P1106) *Professional Archaeologist*
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1 PROJECT CONTEXT

1.1 OBJECTIVES

The objectives of a Stage 1 Archaeological Assessment are as follows:

- To provide information regarding the property's geography, history, relevant previous archaeological fieldwork, and current land conditions;
- To provide a detailed evaluation of the property's archaeological potential; and,
- To recommend appropriate strategies for Stage 2 survey when required.

A property inspection allows the archaeologist to gain first-hand knowledge of the geography, topography, and current conditions of the property that allows for a more confident determination of archaeological potential.

1.2 DEVELOPMENT CONTEXT

WSP Canada Inc. (WSP) was retained by the City of Mississauga (the Client) to conduct a Stage 1 Archaeological Assessment for the Municipal Class Environmental Assessment (Class EA) study of the Rathburn Road East and Ponytrail Drive Integrated Road Project. This project includes improvements to the right-of-way of these streets including the sidewalks, pedestrian crossings, cycling facilities, the streetscape and natural features, noise walls, drainage, transit facilities and other road infrastructure features that are to be adapted to current and future use of the study area (Figures 1 and 2).

The current study area consists of Rathburn Road East from and including the intersection with Dixie Road to Etobicoke Creek (approximately 2.5 km) as well as the right-of-way of Ponytrail Drive from Rathburn Road East to just before Burnhamthorpe Road East (approximately 0.5 km). It is situated on Lots 1 through 5 and A on Concession 2, North of Dundas in the former Geographic Township of Toronto, Peel County, now City of Mississauga, Regional Municipality of Peel.

This archaeological assessment was triggered by the Schedule A+ of the Class EA process under the *Environmental Assessment Act* to ensure the Client is compliant with the *Ontario Heritage Act.* The archaeological assessment was carried out during preliminary planning phase. The boundaries of the assessment were provided by the Client at the outset of the assessment (Appendix A).

Archaeological activities were carried out in accordance with the *Standards and Guidelines for Consultant Archaeologists* (MHSTCI, 2011). This study involved a review of documents pertaining to the property including historic maps, local histories, archaeological literature and a property inspection. The property inspection was conducted on November 26th, 2020 and all work was conducted from publicly accessible lands.

1.3 HISTORICAL CONTEXT

1.3.1 HISTORICAL DOCUMENTATION

The following sections provide a brief outline of the study area's history during the Pre-contact and Post-contact periods to provide a generalized chronological framework in which the archaeological assessment was conducted.

1.3.2 PRE-CONTACT PERIOD

The pre-contact period in Ontario has been reconstructed, primarily, from the archaeological record and interpretations made by archaeologists through an examination of material culture and site settlement patterns. Technological and temporal divisions of the pre-contact period have been defined by archaeologists based on changes to natural, cultural, and political environments that are observable in the archaeological record. It is pertinent to state that although these divisions provide a generalized framework for understanding the broader events of the pre-contact period, they are not an accurate reflection of the fluidity and intricacies of cultural practices that spanned thousands of years. The following presents a sequence of Indigenous land-use from the earliest human occupation following deglaciation to the more recent past based on the following periods as defined by archaeologists:

- The Paleo Period
- The Archaic Period
- The Woodland Period
- The Post-Contact Period

PALEO PERIOD

Paleo period populations were the first to occupy what is now southern Ontario, moving into the region following the retreat of the Laurentide Ice Sheet approximately 11,000 years before present (BP). The first Paleo period populations to occupy southern Ontario are referred to by archaeologists as Early Paleo (Ellis & Deller, 1990).

Early Paleo period groups are identified by their distinctive projectile point morphological types, exhibiting long grooves, or 'flutes', that likely functioned as a hafting mechanism (method of attaching the point to a wooden shaft). These Early Paleo group projectile point types include Gainey (ca. 10,900 BP), Barnes (ca. 10,700), and Crowfield (ca. 10,500) (Ellis & Deller, 1990). By approximately 10,400 BP, Paleo projectile points transitioned to various unfluted varieties, such as Holcombe (ca. 10,300 BP), Hi Lo (ca. 10,100 BP), and Unstemmed and Stemmed Lanceolate (ca. 10,400 to 9,500 BP). These tool types were used by Late Paleo period groups (Ellis & Deller, 1990). Both Early and Late Paleo period populations were highly mobile, participating in the hunting of large game animals. Paleo period sites often functioned as small campsites where stone tool production and maintenance occurred (Ellis & Deller, 1990).

ARCHAIC PERIOD

By approximately 8,000 BP, climatic warming supported the growth of deciduous forests in southern Ontario. These forests introduced new flora and faunal resources, which resulted in subsistence shifts and a number of cultural adaptations. This change is reflected in the archaeological record by new tool-kits that are reflective of a shift in subsistence strategies and has been categorized as the Archaic period.

The Archaic period in southern Ontario is sub-divided into the Early Archaic (ca. 10,000 to 8,000 BP), Middle Archaic (ca. 8,000 to 4,500 BP), and the Late Archaic (ca. 4,500 to 2,800 BP) periods. Generally, in North America, the Archaic period represents a transition from big game hunting to broader, more generalized subsistence strategies based on local resource availability. This period is characterized by the following traits:

- An increase in stone tool variation and reliance on local stone sources,
- The emergence of notched and stemmed projectile point types,
- A reduction in extensively flaked tools,
- The use of native copper,
- The use of bone tools for hooks, gorges, and harpoons,
- An increase in extensive trade networks, and
- The production of ground stone tools and an increase in larger, less portable tools

The Archaic period is also marked by population growth with archaeological evidence suggesting that, by the end of the Middle Archaic period (ca. 4,500 BP), populations had steadily increased in size (Ellis, et al., 1990).

Over the course of the Archaic period, populations began to rely on more localized hunting and gathering territories and were shifting to more seasonal encampments. From the spring into the fall, settlements were focused in lakeshore/riverine locations where a variety of different resources could be exploited. Settlement in the late fall and winter months moved to interior sites where the focus shifted to deer hunting and the foraging of wild plants (Ellis et al., 1990, p. 114). The steady increase in population size and the adoption of a more localized seasonal subsistence strategy led to the transition into the Woodland period.

EARLY AND MIDDLE WOODLAND PERIODS

The beginning of the Woodland period is defined by the emergence of ceramic technology. Similar to the Archaic period, the Woodland period is separated into three timeframes: the Early Woodland (ca. 2,800 to 2,000 BP), the Middle Woodland (ca. 2,000 to 1,200 BP), and the Late Woodland (ca. 1,200 to 350 BP) (Spence et al., 1990; Fox, 1990).

The Early Woodland period is represented in southern Ontario by two cultural complexes: the Meadowood Complex (ca. 2,900 to 2,500 BP), and the Middlesex Complex (ca. 2,500 to 2,000 BP). During this period, the life ways of Early Woodland populations differed little from that of the Late Archaic with hunting and gathering representing the primary subsistence strategies. The pottery of this period is characterized by its relatively crude construction and lack of decoration. These early ceramics exhibit cord impressions, which are likely the result of the techniques used during manufacture rather than decoration (Spence et al., 1990).

The Middle Woodland period has been differentiated from the Early Woodland period by changes in lithic tool forms (e.g. projectile points, expedient tools), and the increased decorative elaboration of ceramic vessels (Spence et al., 1990). Additionally, archaeological evidence suggests the rudimentary use of maize (corn) horticulture by the end of the Middle Woodland Period (Warrick, 2000).

In southern Ontario, the Middle Woodland has been divided into three different complexes based on regional cultural traditions: the Point Peninsula Complex, the Couture Complex, and the Saugeen Complex. These groups are differentiated by sets of characteristics that are unique to regions within the province, specifically regarding ceramic decorations.

The Point Peninsula Complex extends from south-central and eastern Ontario into southern Quebec. The northernmost borders of the complex can be found along the Mattawa and French Rivers. Ceramics are coil constructed with conical bases, outflaring rims, and flat, rounded, or pointed lips. The interior surfaces of vessels are often channelled with a comb-like implement, creating horizontal striations throughout. The exterior is smoothed, or brushed, and decoration generally includes pseudo-scallop stamps or dentate impressions. Occasionally, ceramics will have been treated with a red ochre wash (Spence et al, 1990).

The Saugeen Complex is found generally in south-central Ontario and along the eastern shores of Lake Huron. The Saugeen Complex ceramics are similar in style to Point Peninsula Complex; however, the vessels tended to be cruder than their Point Peninsula counterparts. They were characterized by coil construction with thick walls, wide necks, and poorly defined shoulders. Usually, the majority of the vessel was decorated with pseudo-scallop stamps or dentate impressions, with the latter occurring more frequently at later dates (Spence et al., 1990).

LATE WOODLAND PERIOD

There is much debate as to whether a transitional phase between the Middle and Late Woodland Periods is present in Ontario, but it is generally agreed that the Late Woodland period of occupation begins around 1,100 BP. The Late Woodland period in southern Ontario can be divided into three cultural sub-phases: The early, middle, and late Late Woodland periods. The early Late Woodland is characterized by the Glen Meyer and Pickering cultures and the middle Late Woodland is characterized by the Uren and Middleport cultures. These groups are ancestral to the Iroquoian-speaking Neutral-Erie (Neutral), the Huron-Wendat (Huron), and Petun Nations that inhabited southern Ontario during the late Late Woodland period (Smith, 1990, p. 285).

The Pickering and Glen Meyer cultures co-existed within southern Ontario during the early Late Woodland period (ca. 1250-700 BP). Pickering territory is understood to encompass the area north of Lake Ontario to Georgian Bay and Lake Nipissing (Williamson, 1990). Glen Meyer is centred around Oxford and Norfolk counties, but also includes the southeastern Huron basin and the western extent is demarcated by the Ekfrid Clay Plain southwest of London, Ontario (Noble, 1975). Villages of either tradition were generally smaller in size (~1 ha) and composed of smaller oval structures, which were later replaced by larger structures in the Late Woodland period. Archaeological evidence suggested a mixed economy where hunting and gathering played an important role, but small-scale horticulture was present, indicating a gradual shift from hunting-gathering to a horticultural economy (Williamson, 1990).

The first half of the middle Late Woodland period is represented by the Uren culture (700-650 BP) and the second half by the Middleport (650-600 BP). Uren and Middleport sites of the middle Late Woodland share a similar distribution pattern across much of southwestern and south-central Ontario. (Dodd et al., 1990). Significant changes in material culture and settlement-subsistence patterns are noted during this short time. Iroquois Linear, Ontario Horizontal, and Ontario Oblique pottery types are the most well-represented ceramic assemblages of the middle Late Woodland period (Dodd et al., 1990). At Middleport sites, material culture changes included an increase in the manufacture and use of clay pipes as well as bone tools and adornments (Dodd et al., 1990; Ferris & Spence, 1995).

The appearance of evidence of small year-round villages, secondary ossuary burials, and what are thought to be semi-subterranean sweat lodges suggest a marked increase in sedentism in southern Ontario during the Uren and Middleport cultures (Ferris & Spence, 1995). The increasing permanency of settlements resulted in the development of small-scale cultivation and a subsequent increased reliance on staple crops such as maize, beans, and squash (Dodd et al., 1990; Warrick, 2000; Ferris & Spence, 1995).

Archaeological evidence from the middle Late Woodland sites also documents increases in population size, community organization and village fissioning, and the expansion of trade networks. The development of trade networks with northern Algonquian peoples has also been inferred from findings at Middleport sites along the northern parts of southwestern and south-central Ontario. These changes resulted in the more organized and complex social structures observed in the late Late Woodland period.

During the late Late Woodland period, village size significantly increased as did the complexity of community and political systems. Villages were often fortified with palisade walls and ranged in size from a few longhouses to over 100 longhouses observed in large villages. Larger longhouses oriented differently than others in the village have been associated with primary familial groups and it has been suggested that longhouses that were located outside of palisade walls may have been for visiting groups for the purposes of trade or social gatherings (Ramsden, 1990). More recent research has indicated that smaller, temporary camp or cabin sites were often used seasonally for the tending of agricultural fields or as fishing camps (Ramsden, 1990). By this time, large-scale agriculture had taken hold, making year-round villages even more practical as a result of the ability to store large crop yields over winter.

The villages in the vicinity of the study area were typically associated with the Huron-Wendat nations who occupied areas as far east as the Trent River and as far west as the Niagara Escarpment. They typically inhabited each village for several decades until the agricultural land was exhausted, and communities moved to more fertile areas. Throughout the fifteenth and sixteenth century, community movement often included northern migrations and the incorporation of multiple smaller villages into larger coalescent villages.

The Huron-Wendat eventually dispersed from the Toronto area in the seventeenth century, during the period of French contact, to settle in their historic homeland of Wendake, which included territory in present-day Simcoe and Grey Counties. Today, "Wendake" is the name of the Huron-Wendat reserve located in Quebec, Ontario, which was formerly known as the village of Huronia. This coalescence and subsequent movement northward was thought to be the result of a number of socio-political factors, including increased conflict with the Haudenosaunee, an increased complexity in political organization, stronger trade relations with northern Algonquian groups, and interactions with early European traders (Ramsden, 1990; Birch, 2012; Ferris & Spence, 1995).

Oral histories of the Michi Saagiig (Mississauga Anishinaabeg) reflect increasing levels of inter-community relationships, integration, and trade between different groups. For example, these oral histories speak to the arrival of, and relationships with, the Huron "corn growers" (Migizi & Kapyrka, 2015, pp. 127-136). In addition to archaeological interpretations, oral histories also provide a valuable contribution to our understanding of the occupation and movement of Indigenous peoples in Ontario. The following oral history, provided by Michi Saagiig elder Gitiga Migizi, speaks to the occupation of this area of southern Ontario by the Anishinaabeg throughout the pre-contact and post-contact periods:

> The traditional homelands of the Michi Saagiig (Mississauga Anishinaabeg) encompass a vast area of what is now known as southern Ontario. The Michi Saagiig occupied and fished the north shore of Lake Ontario where the various tributaries emptied into the lake. Their territories extended north into and beyond the Kawarthas as winter hunting grounds onwhich they would break off into smaller social groups for the season, hunting and trapping on these lands, then returning to the lakeshore in spring for the summer months.
>
> The Michi Saagiig were a highly mobile people, travelling vast distances to procure subsistence for their people. They were also known as the "Peacekeepers" among Indigenous nations. The Michi Saagiig homelands were located directly between two very powerful Confederacies: The Three Fires Confederacy to the north and the Haudenosaunee Confederacy to the south. The Michi Saagiig were the negotiators, the messengers, the diplomats, and they successfully mediated peace throughout this area of Ontario for countless generations.
>
> Michi Saagiig oral histories speak to their people being in this area of Ontario for thousands of years. These stories recount the "Old Ones" who spoke an ancient Algonquian dialect. The histories explain that the current Ojibwa phonology is the 5th transformation of this language, demonstrating a linguistic connection that spans back into deep time. The Michi Saagiig of today are the descendants of the ancient

peoples who lived in Ontario during the Archaic and Paleo periods. They are the original inhabitants of southern Ontario, and they are still here today.

The traditional territories of the Michi Saagiig span from Gananoque in the east, all along the north shore of Lake Ontario, west to the north shore of Lake Erie at Long Point. The territory spreads as far north as the tributaries that flow into these lakes, from Bancroft and north of the Haliburton highlands. This also includes all the tributaries that flow from the height of land north of Toronto like the Oak Ridges Moraine, and all of the rivers that flow into Lake Ontario (the Rideau, the Salmon, the Ganaraska, the Moira, the Trent, the Don, the Rouge, the Etobicoke, the Humber, and the Credit, as well as Wilmot and 16 Mile Creeks) through Burlington Bay and the Niagara region including the Welland and Niagara Rivers, and beyond. The western side of the Michi Saagiig Nation was located around the Grand River which was used as a portage route as the Niagara portage was too dangerous. The Michi Saagiig would portage from present-day Burlington to the Grand River and travel south to the open water on Lake Erie.

Michi Saagiig oral histories also speak to the occurrence of people coming into their territories sometime between 500-1000 A.D. seeking to establish villages and a corn growing economy – these newcomers included peoples that would later be known as the Huron-Wendat, Neutral, Petun/Tobacco Nations. The Michi Saagiig made Treaties with these newcomers and granted them permission to stay with the understanding that they were visitors in these lands. Wampum was made to record these contracts, ceremonies would have bound each nation to their respective responsibilities within the political relationship, and these contracts would have been renewed annually (see Gitiga Migizi and Kapyrka 2015). These visitors were extremely successful as their corn economy grew as well as their populations. However, it was understood by all nations involved that this area of Ontario were the homeland territories of the Michi Saagiig.

The Odawa Nation worked with the Michi Saagiig to meet with the Huron-Wendat, the Petun, and Neutral Nations to continue the amicable political and economic relationship that existed – a symbiotic relationship that was mainly policed and enforced by the Odawa people.

Problems arose for the Michi Saagiig in the 1600s when the European way of life was introduced into southern Ontario. Also, around the same time, the Haudenosaunee were given firearms by the colonial governments in New York and Albany which ultimately made an expansion possible for them into Michi Saagiig territories. There began skirmishes with the various nations living in Ontario at the time. The Haudenosaunee engaged in fighting with the Huron-Wendat and between that and the onslaught of European diseases, the Iroquoian speaking peoples in Ontario were decimated.

The onset of colonial settlement and missionary involvement severely disrupted the original relationships between these Indigenous nations. Disease and warfare had a devastating impact upon the Indigenous peoples of Ontario, especially the large sedentary villages, which mostly included Iroquoian speaking peoples. The Michi Saagiig were largely able to avoid the devastation caused by these processes by retreating to their wintering grounds to the north, essentially waiting for the smoke to clear.

Often times, southern Ontario is described as being "vacant" after the dispersal of the Huron-Wendat peoples in 1649 (who fled east to Quebec and south to the United States). This is misleading as these territories remained the homelands of the Michi Saagiig Nation.

The Michi Saagiig participated in eighteen treaties from 1781 to 1923 to allow the growing number of European settlers to establish in Ontario. Pressures from increased settlement forced the Michi Saagiig to slowly move into small family groups around the present day communities: Curve Lake First Nation, Hiawatha First Nation, Alderville First Nation, Scugog Island First Nation, New Credit First Nation, and Mississauga First Nation. The Michi Saagiig have been in Ontario for thousands of years, and they remain here to this day.

Migizi and Kapyrka pp. 127-136 (2015)

Early contact with European settlers at the end of the Late Woodland period resulted in extensive changes to the traditional lifestyles of most populations inhabiting Ontario including settlement size, population distribution, and material culture. The introduction of European-borne diseases significantly increased mortality rates, resulting in a drastic drop in population size (Warrick, 2000).

1.3.3 POST-CONTACT PERIOD

Early European presence within the study area began as early as 1615 with the travels of the French explorer Etienne Brulé who travelled with the Huron along the major portage route known as the Toronto Carrying Place Trail, which connected Lake Ontario with Lake Simcoe to the north by way of the Humber River and the Holland Marsh. In By the 1650s, the Neutral had been dispersed as a result of increasing conflicts with the Haudenosaunee, and the warfare and disease that had arrived with European colonization. A significant number of the Neutral had also been adopted into Haudenosaunee populations. The large-scale population dispersals gave way for the Haudenosaunee to occupy the territory along the north shore of Lake Ontario where they settled along inland-running trade routes. Due to increased military pressure from the French in the late 1600s, and the return of the Anishinaabe Nations (Ojibwa, Odawa, Potawatomi, and Mississauga) who had previously retreated to the north, the Haudenosaunee abandoned their villages along the north shore of Lake Ontario.

By the 1680s, the Anishinaabeg had returned and re-occupied the land along Lake Ontario, as well as northward beyond the Haliburton Highlands. The Anishinaabeg later participated in a significant number of treaty agreements with the British Crown, establishing the foundation of Euro-Canadian settlement in southern Ontario (Ferris and Spence, 1995).

The land on which the study area is located falls within the boundaries of the Head the Lake Purchase (Treaty No. 14). The Head the Lake Purchase was signed by the Crown and the Mississauga of the Credit First Nation in 1806 and included an area of previously unceded land between the Toronto Purchase (Treaty No. 13) of 1805 and the Brant Tract (Treaty No. 8) ceded in 1797 (Duric, 2017a). Present day cities included within the Head of the Lake Purchase include Mississauga, Oakville, and parts of Burlington.

COUNTY OF PEEL

The County of Peel is a narrow municipality on the western edge of Lake Ontario. To its east was York County, now the Regional Municipality of York and the City of Toronto. To the north are the counties of Wellington, Dufferin, and Simcoe. To the west was former Halton County, now Regional Municipality of Halton.

In 1794, Lieutenant-Colonel John Graves Simcoe oversaw the construction of a roadway called Dundas Street. It was undertaken to improve transportation and communication between the new capital (Town of York) and the western district of the province. This road followed an old First Nations trail that ran from Cataraqui (Kingston) around Lake Ontario to Niagara. In 1798, another military road was opened along another old First Nations trail, which now forms the modern Lakeshore Road. It opened up even more lands to traders and settlers in later years (Riendeau, 1985).

In 1806, the British Crown purchased 84,000 acres from the Mississauga of the Credit First Nation for 1,000 pounds sterling as part of the Head of the Lake Purchase (Treaty No. 14). The goal was to secure more land for 'United Empire Loyalists' who had left America in 1783 after having fought for the British. The newly acquired land constituted a significant portion of the southern part of Peel County where the study area is situated. It was divided into three townships: Nelson Township, Trafalgar Township and Toronto Township. The remainder of Peel County was obtained from the Mississaugas in Treaties 19 (1818), 22 (1820), and 23 (1820) (Mississaugas of the Credit First Nation, 2019; Ministry of Indigenous Affairs, 2019). The area saw some Euro-Canadian immigration after this the Head of the Lake Purchase, but these intial population migrations were halted by the War of 1812. A large influx of Irish settlers came in 1819 which reinvigorated the settlement of Peel County from which it continued to grow (Mika & Mika, 1983, p. 177)

In 1854, the County of Peel was established and was named after Sir Robert Peel, Prime Minister of Great Britain. Originally, the County was united with the County of York, but many inhabitants wanted independent county status. In October of 1866, a vote was taken which favoured separation. Eventually, the Village of Brampton was chosen as the county town. On January 22, 1867, the first county council of Peel met at the newly constructed courthouse in Brampton. At this time, the County of Peel included the Townships of Albion, Caledon, Chinguacousy, Toronto, and Toronto Gore, and the Town of Brampton and the Village of Streetsville (Mika & Mika, 1983).

The Regional Municipality of Peel incorporated on October 15, 1973, and included the City of Brampton, the City of Mississauga, and the Town of Caledon. The City of Mississauga had been formed by the amalgamation of the towns of Port Credit, Streetsville, and Mississauga. By 1980, the population of Peel was 464,500 with 298,000 within Mississauga (Mika & Mika, 1983, p. 180).

TORONTO TOWNSHIP

The original survey of Toronto Township, completed in 1805, was laid out with two concessions north of Base Line (now Eglinton Avenue) and three concessions south to the Lake Ontario lakefront, excluding the reserve lands encompassing the Credit River (Riendeau, 1985). Settlement in the township concentrated around Base Line and Dundas Road. By the 1830s, four distinct villages had developed: Summerville, Dixie, Cooksville, and Erindale (Riendeau, 1985). Communities along the Lakeshore Road to the south were much slower to develop than those along Dundas Street. However, by the end of the 1830s, the community of Port Credit had taken shape along with several communities to the west of the Credit River.

The communities to the west of the Credit River included the hamlet of Burnhamthorpe, named after the birthplace of Lord Horatio Nelson. It was originally named Sandhill but confusion arose with a nearby community of the same name. Centered on the intersection of modern Dixie Road and Burnhamthorpe Road, it was founded as a Methodist Village with the first buildings situated on the northwest corner of the intersection adjacent to an early pioneer cemetery. Burnhamthorpe grew to include a school, a Methodist church, general store, a Sons of Temperance Hall, an Orange Lodge, a steam-powered grist mill, blacksmith, carriage shop, cheese factory, and shoemaker shop (Heritage Mississauga, 2018).

In the latter half of the nineteenth century the population of Toronto Township on a whole began to decline due to the urbanization of larger communities in proximity to the township such as Toronto, Hamilton and Brampton. These larger communities drew people off their farms into the more lucrative factory work and this change in lifestyle marked a change in how the small communities would develop in the township. The villages started to develop as neighbourhoods, rather than developing into small towns. These communities were surrounded by lands used for commercial agriculture which branched out from the wheat industry into livestock and orchards (Riendeau, 1985). After World War I, the area began to develop as suburbs and neighborhoods of Toronto to the east (Riendeau, 1985). By 1969, Lakeview, Cooksville, Erindale, Sheridan, Dixie, Meadowvale Village, and Malton were amalgamated to form the Town of Mississauga (Riendeau, 1985). The population continued to grow quickly and by 1974, the Town of Mississauga to incorporated as the City of Mississauga (Statistics Canada, 2016; Mika & Mika, 1983, p. 180).

1.3.4 STUDY AREA SPECIFIC HISTORY

To reconstruct the historic land use of the study area, G. R. & G. M. Tremaine's 1859 *Map of the County of Peel, Canada West* (Figure 3) and Walker & Miles' 1877 *Illustrated Historical Atlas of the County of Peel, Ontario* (Figure 4) were reviewed to examine whether historic features are located within, or in close proximity to the study area. This analysis contributes to the determination of archaeological potential. Table 1 provides a summary of the review of the historic maps of the study areas.

Table 1: Historical Land Use Summary by Lot and Concession

Concession	Lot	1859 Tremaine Map		1877 Atlas Map	
		Occupants	Features	Occupants	Features
2, North of Dundas St	A	Francis Shaver	N/A	Francis W Shaver	N/A
	1				Structure with Orchard in center
	2	James Wadworth	Northwest-southeast roadway	Estate of James Wadsworth N. R.	Northwest-southeast roadway, orchard in east
	3	James Eakins	Structure labelled Whitehall in southeast	M. H. Aikins M. D.	2 Structures with orchard in southeast, west-east running creek
	4	Charles Doherty	N/A	Charles Doherty	1 Structure, 2 orchards, west-east running creek
	5	Robert Currie (East)	N/A	Robert Currie (East)	Structure and orchard in southeast
		James Eakins (West)	N/A	Geoff Chadwick (West)	Structure and 2 orchards in southeast

The 1859 Tremaine Map only provided minimal property owner information, with the only structure close to the study area being the structure labelled Whitehall on Lot 3. Both Dixie Road and Burnhamthorpe Road were depicted in this map as historical transportation routes. There was also an additional roadway on Lot 2 in the vicinity of Ponytrail Drive. The historical community of Sandhill was located at the intersection of Dixie Road and Burnhamthorpe Road.

The 1877 Walker & Miles map provided more detailed settlement information wherein the study area crossed several features of potential. Many of the property owners were still present from the previous map and most of their associated structures on these lots were oriented towards Burnhamthorpe Road. However, the house and orchard of Francis W. Shaver was situated within the center of his property. It could have been within the study area associated with the eastern branch of Rathburn Road East. Further west, the roadway in the vicinity of Ponytrail Drive was still present. Oriented to this roadway and possibly within the right-of-way of Ponytrail Drive was the orchard of the Estate of James Wadsworth. Following the study area west, the corridor crossed an old creek and over Dixie Road. Both Dixie Road and Burnhamthorpe Road continued to be used as transportation corridors. To the southwest of the study area, the small community of Sandhill at the intersection of these two roads has since been renamed Burnhamthorpe.

To gain a better understanding of more recent land use of the study areas, aerial imagery from 1953 to 1992 was reviewed (University of Toronto, n.d.). **Error! Reference source not found.**Up until the 1960s, the area maintained a predominantly rural and agricultural character, with most of the settlement concentrated on the community of

Burnhamthorpe at the intersection of Dixie Road and Burnhamthorpe Road. By 1962, there are two notable developments (Figure 5): the first is a series of homes constructed on a north-south roadway to the east and parallel to Dixie Road; the other development is the establishment of a quarry in the eastern half of Rathburn Road East study area. The area continued as a quarry until approximately 1977 when the modern layout of the area was established with the construction of the current Ponytrail Drive, Rathburn Road East, and their associated subdivisions and commercial complexes (Figure 6). The aerial imagery from this period depicted extensive grading activities within the right-of-way of Rathburn Road East and Ponytrail Drive. The rest of the suburbs and other building complexes were added over the coming decades, suggesting the area has been subject to deep and extensive disturbance.

1.4 ARCHAEOLOGICAL CONTEXT

1.4.1 CURRENT CONDITIONS

The current study area consists of approximately 2.5 km of Rathburn Road East from the Dixie Road intersection to Etobicoke Creek as well as the approximately 0.5 km of right-of-way of Ponytrail Drive from Rathburn Road East to Burnhamthorpe Road East. It is situated on Lots 1 through 5 and A on Concession 2, North of Dundas in the former Geographic Township of Toronto, Peel County, now City of Mississauga, Regional Municipality of Peel. The study area consists entirely of the roadways and right-of-way-s of Rathburn Road East and Ponytrail Drive. Adjacent properties are heavily urbanized and consist, at varying points, of shopping complexes, low to high density residential areas, hydro-corridors, and park areas.

1.4.2 PHYSIOGRAPHY AND ECOLOGY

The study area is situated within a till plain of the South Slope Physiographic Region. Situated between Lake Ontario and the Oak Ridges Moraine, the South Slope is higher than the glacial Lake Iroquois Plain and extends from the Niagara Escarpment in the west to the Trent River in the east (Chapman & Putnam 1984, p. 172). Around the study area, it is primarily a ground moraine with irregular knolls and hollows with Chinguacousy clay loam soil. Chinguacousy clay loam soil is a grey-brown podzolic that has smooth but gently sloping topography, imperfect drainage, and few stones. Where the study area approaches a former tributary of Etobicoke Creek in the southwest, there is Oneida clay loam soil, which is similar to Chinguacousy soil except that it is moderately sloping and has good drainage (Hoffman & Richards, 1953). These soils are developed on tills which primarily consist of a red and grey shale (Chapman & Putnam, 1983, pp. 173-174). Bookton Sandy Loam, a grey brown podzolic, can also be found in the western part of the study area. It has smooth but gently sloping topography, good drainage, and no stones (Hoffman & Richards, 1953).

These soils lend themselves for use in agriculture. Agriculture on the south slope saw a series of waves. The first settlers favored grain, which eventually was abundant enough to be exported. It was a period of prosperity when stony soils were cleared with horse-drawn machinery and settlers built themselves fieldstone houses from the abundant stones. This lifestyle would be replaced by beef cattle, hogs and dairy butter. Much of the south slope would then become dominated by the shadow of Toronto. First, it became the milk shed of the city, displacing the beef cattle and hogs. Finally, it would be absorbed by the increasing level of urbanization of the Greater Toronto Area (Chapman & Putnam, 1983, p. 174).

Ecoregions are parts of an ecozone, and are characterized by distinctive regional ecological factors including climate, flora, fauna, physiography, soil, water and land usage. The study area lies within the Mixedwood Plains

Ecozone, within the Lake Erie-Lake Ontario Ecoregion (Ecoregion 7E) (Crins et al., 2009). Climatic and geological characteristics for these ecoregions are provided below, along with a brief description of dominant vegetation and wildlife species.

The Lake Erie-Lake Ontario Ecoregion has a hot and moist climate in the summer and cool in the winter, with a mean annual temperature range of 6.3 to 9.4 degrees Celsius. Limestone bedrock of primarily Devonian and Silurian ages underlays the Ecoregion. Surface topography is generally flat and overlain with deep undulating ground moraine deposits. Historic lakes that once occupied the Ecoregion have left substantial glaciolacustrine deposits in many areas (Crins et al., 2009).

The flora and fauna of Ecoregion 7E are the most diverse in Canada. Characteristic mammals, birds, reptiles and fish include white-tailed deer, northern racoon, striped skunk, Virginia opossum, green heron, Virginia rail, Cooper's hawk, eastern kingbird, willow flycatcher, brown thrasher, yellow warbler, common yellowthroat, northern cardinal, savannah sparrow, red-backed salamander, American toad, eastern garter snake, midland painted turtle, longnose gar, channel catfish, smallmouth bass, yellow perch, walleye, northern hog sucker, banded killifish, and spot tail shiner. Ecoregion 7E also contains the majority of Ontario's species at risk due to the vast urbanization and habitat loss. Species at risk in Ecoregion 7E include the Acadian flycatcher, king rail, prothonotary warbler, hooded warbler, spiney softshell turtle, blue racer and small mouthed salamander (Crins et al., 2009).

The Lake Erie-Lake Ontario Ecoregion is associated with the Deciduous Forest Region. However, lands around the study area are comprised primarily of land converted for pasture and agricultural uses (~78%) and urban/developed land (~7%). Forest cover in the remaining areas consists primarily of dense deciduous (10.3%), sparse deciduous (1.0%), and mixed deciduous forest. This limited forest cover means that fires are rare and small within the ecoregion (Crins et al., 2009). Common broad leaved deciduous trees still present in the area include the sugar maple, beech, white elm, basswood, red ash, white oak and butternut. It also marks the northern limit of the tulip-tree, cucumber-tree, pawpaw, red mulberry, Kentucky coffee-tree, black gum, blue ash, sassafras, mockernut hickory, pignut hickory, the black oak and the pin oak. The Deciduous Forest Region also contains black walnut, sycamore and the swamp white oak. Some conifers can be found in the area including the eastern white pine, tamarack, eastern red cedar and the eastern hemlock (Rowe, 1972).

The study area is approximately 150 m southwest of Etobicoke Creek. With the Regional Municipality of Peel on the western banks and the Regional Municipality of York and the City of Toronto on the eastern banks, Etobicoke Creek is under the jurisdiction of the Toronto and Region Conservation Authority (TRCA). With headwaters running from the Oak Ridges Moraine, the creek continues southeast into Lake Ontario. It is about 59 km long and has a drainage area of approximately 21,100 ha. Despite being heavily urbanized with extensive channelling, it is home to over 503 plants and animal species (TRCA, n.d.). It would have been an important center of food, transportation, and potable water for Indigenous and Euro-Canadian populations

1.4.3 PREVIOUS ARCHAEOLOGICAL ASSESSMENTS

A search of the MHSTCI's *Ontario Public Register of Archaeological Reports* indicates there are no archaeological assessments that have been conducted on or within 50 m of the study area.

1.4.4 REGISTERED ARCHAEOLOGICAL SITES

A search of the *Ontario Archaeological Sites Database* indicates that there are three registered archaeological sites within 1 km of the study area (MHSTCI, 2020). The basic information on these sites is provided in Table 2 below.

Table 2: Registered archaeological sites within 1 km of the study area

Borden	Site Name	Time Period	Cultural Affinity	Site Type	Current Development Status
AjGv-24	Merton	Woodland, Late	Iroquoian	Village	-
AjGv-68	John Day	Post-Contact	Euro-Canadian	Cabin	-
AjGv-69	AjGv-69 Site	Post-Contact	Euro-Canadian	Homestead, school, church / chapel	Further work required

- denotes no information listed

* denotes inferences made by author

The Merton Site (AjGv-24) was a Late Woodland village site east of the intersection of Old Burnhamthorpe Road and Burnhamthorpe Road. No further information can be provided as the site was destroyed in 1970 by the construction of townhouses (MHSTCI, 2020). The John Day (AjGv-68) site is a domestic nineteenth Euro-Canadian site excavated as part of the development of the Mississauga Bus Rapid Transit East corridor. Located west of the intersection of Dixie Road and Eastgate Parkway, it has been subject to Stage 2, 3 and 4 excavations but some of the site potentially site remains to the north of the previously excavated area (New Directions Archaeology Ltd, 2011). AjGv-69 is a nineteenth century Euro-Canadian site located at the southwest of the intersection of Burnhamthorpe Road East and Dixie Road. It was partially excavated as part of the construction of a Mississauga Library branch along with some further archaeological work around the extent of the Burnhamthorpe Cemetery to the north (MHSTCI, 2020).

2 FIELD METHODS

2.1 PROPERTY INSPECTION

A property inspection was completed on November 26th, 2020 in order to gain first-hand knowledge of the geography, topography, and current conditions of the study area and to evaluate archaeological potential. The property inspection was conducted from publicly accessible lands and all land conditions encountered across the entirety of the study area were photo-documented. The weather at the time of the assessment was overcast with a temperature of 9°C. Lighting was adequate and the overall conditions were suitable for assessing features of archaeological potential (Images 1-12).

The entirety of the study area was determined to have been extensively previously disturbed by the construction of Rathburn Road East and Ponytrail Drive and their associated right-of-way. The right-of-way consisted of sidewalks and heavily graded and landscaped grassed boulevards. Evidence of extensive ground disturbing activities in these areas includes heavy grading associated with sidewalks and bike paths, electrical utilities, underground water infrastructure (i.e. manholes grates, drains), and other evidence of underground utilities (Images 13-28). Other evidence of previous disturbance includes berms, artificial grading and ditching, drainage culverts, underground parking areas, and bus stop shelters (Image 29-39).

Images of the encountered conditions are provided in Section 7. Photograph locations, directions, and the results of the property inspection are provided on Figure 7.

2.2 INVENTORY OF DOCUMENTATION RECORDS

The following represents all the documentation taken in the field relating to this project and is being retained by WSP:

- 1 page of field notes
- 181 digital photographs in JPG format

3 ANALYSIS AND CONCLUSIONS

3.1 ARCHAEOLOGICAL POTENTIAL

The criteria for determining the level of pre-contact archaeological potential is primarily focused on physiographic variables that include distance and nature of the nearest source/body of water, distinguishing features in the landscape (e.g. ridges, knolls, eskers, wetlands), the agricultural viability of soils, resource availability, and other features which would have made the area more suitable for settlement and occupation. The proximity to historic transportation corridors such as roads, rail and water courses, as well as early Euro-Canadian settlement also contribute to this determination. A more comprehensive list of features indicative of archaeological potential, as outlined in the *Standards and Guidelines for Consultant Archaeologists* (MHSTCI, 2011), can be found in Appendix B.

Although the archaeological and historic settlement histories and physiographic context support that this area would have been used extensively by Indigenous and Euro-Canadian populations, based on the results of the background study and property inspection, the potential for the presence of archaeological resources within the study area is low given the identified previous disturbance.

3.2 CONCLUSION

The study area exhibits several criteria for the presence of Indigenous and Euro-Canadian archaeological potential, including proximity to water sources, historic roadways, and areas of early Euro-Canadian settlement; however, aerial imagery and a property inspection determined that the area has been extensively previously disturbed by modern construction activities. These construction activities are demonstrated by the presence of roadways, modern structures, utilities, grading, ditching, and soil berms. Further evidence of deep and extensive disturbance was demonstrated by the aerial imagery, which documented the use of the eastern part of Rathburn Road East as a quarry throughout much of the early twentieth century before its development as a subdivision.

4 RECOMMENDATIONS

Archaeological activities were carried out in accordance with the *Standards and Guidelines for Consultant Archaeologists* (MHSTCI, 2011). This study involved a review of documents pertaining to the property including historic maps, local histories, archaeological literature and a property inspection. The property inspection was conducted on November 26th, 2020.

Archaeological recommendations have been made based on the background historic research, locations of known or registered archaeological sites, indicators of archaeological potential, and the property inspection. These recommendations include:

- Background research and a property inspection determined that the study area has been deeply and extensively disturbed (Figure 7). **No further archaeological assessment is required.**

5 ADVICE ON COMPLIANCE WITH LEGISLATION

This report is submitted to the Minister of Heritage, Sport, Tourism and Culture Industries as a condition of licensing in accordance with Part VI of the *Ontario Heritage Act*, R.S.O. 1990, c 0.18. The report is reviewed to ensure that it complies with the *Standards and Guidelines for Consultant Archaeologists* (2011) that are issued by the Minister, and that the archaeological fieldwork and report recommendations ensure the conservation, protection and preservation of the cultural heritage of Ontario. When all matters relating to archaeological sites within the project area of a development proposal have been addressed to the satisfaction of the Ministry of Heritage, Sport, Tourism, and Culture Industries, a letter will be issued by the Ministry stating that there are no further concerns with regard to alterations to archaeological sites by the proposed development.

It is an offence under Sections 48 and 69 of the *Ontario Heritage Act* for any party other than a licensed archaeologist to make any alteration to a known archaeological site or to remove any artifact or other physical evidence of past human use or activity from the site, until such time as a licensed archaeologist has completed archaeological fieldwork on the site, submitted a report to the Minister stating that the site has no further cultural heritage value or interest, and the report has been filed in the Ontario Public Register of Archaeological Reports referred to in Section 65.1 of the *Ontario Heritage Act*.

Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48(1) of the *Ontario Heritage Act*. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with Section 48(1) of the *Ontario Heritage Act*.

The *Funeral, Burial and Cremation Services Act*, 2002, S.O. 2002, c.33 requires that any person discovering human remains must notify the police or coroner and the Registrar of Cemeteries at the Ministry of Consumer Services.

Archaeological sites recommended for further archaeological fieldwork or protection remain subject to Section 48 (1) of the Ontario Heritage Act and may not be altered, or have artifacts removed from them, except by a person holding an archaeological licence.

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7 IMAGES

Image 1: Field conditions on east side of Rathburn Road East and right-of-way. Facing northeast.

Image 2: Field conditions on east side of Rathburn Road East and right-of-way. Facing southwest.

Image 3: Field conditions on west side of Rathburn Road East and right-of-way. Facing northeast.

Image 4: Field conditions on north side of Rathburn Road East and right-of-way. Facing west. Note: Grading on east.

Image 5: Field conditions on south side of Rathburn Road East and right-of-way. Facing northeast.

Image 6: Field conditions at Intersection of Rathburn Road East and Ponytrail Drive. Facing southeast.

Image 7: Field conditions on South side of Rathburn Road East and right-of-way. Facing southwest.

Image 8: Field conditions at intersection of Rathburn Road East and Dixie Road. Facing west.

Image 9: Field conditions at intersection of Rathburn Road East and Dixie Road. Facing northwest.

Image 10: Field conditions on east side of Rathburn Road East and right-of-way. Facing northeast.

Image 11: Field conditions on north side of Ponytrail Drive and right-of-way. Facing west.

Image 12: Field conditions on south side of Ponytrail Drive and right-of-way. Facing southeast. Note paving on north and slight grading on south.

Image 13: Example of underground utilities on Rathburn Road East. Facing southwest.

Image 14: Example of underground utilities and artificial grading on Rathburn Road East. Facing northeast.

Image 15: Example of underground utilities on Rathburn Road East. Facing north.

Image 16: Example of underground utilities on Rathburn Road East. Facing northeast.

Image 17: Example of underground utilities and soil berm on Rathburn Road East. Facing southwest.

Image 18: Example of underground utilities and bus shelter on Rathburn Road East. Facing northeast.

Image 19: Example of underground utilities and aritifical grading and ditching on Rathburn Road East. Facing southwest.

Image 20: Example of underground utilities on Rathburn Road East. Facing northeast.

Image 21: Example of underground utilities on Rathburn Road East. Facing southwest.

Image 22: Example of underground utilities and artificial grading on Rathburn Road East. Facing northeast.

Image 23: Example of underground utilities on Rathburn Road East. Facing northeast.

Image 24: Example of underground utilities on Rathburn Road East. Facing southwest.

Image 25: Example of underground utilities and artificial grading on Ponytrail Drive. Facing northwest.

Image 26: Example of underground utilities on Ponytrail Drive. Facing southeast.

Image 27: Example of underground utilities and artificial grading on Ponytrail Drive. Facing northeast. Note: artificial grading to the northeast.

Image 28: Example of underground utilities on Ponytrail Drive. Facing northwest.

Image 29: Example of soil berm and artificial grading on Rathburn Road East. Facing northeast.

Image 30: Example of soil berm and artificial grading on Rathburn Road East. Facing west.

Image 31: Example of soil berm and artificial grading on Rathburn Road East. Facing south.

Image 32: Example of soil berm and artificial grading on Rathburn Road East. Facing north.

Image 33: Example of soil berm and artificial grading on Rathburn Road East. Facing northeast.

Image 34: Example of artificial grading on Rathburn Road East. 2018. Facing northeast.

Image 35: Example of artificial grading on Ponytrail Drive. Facing southeast.

Image 36: Example of drainage culvert on Ponytrail Drive. Facing west.

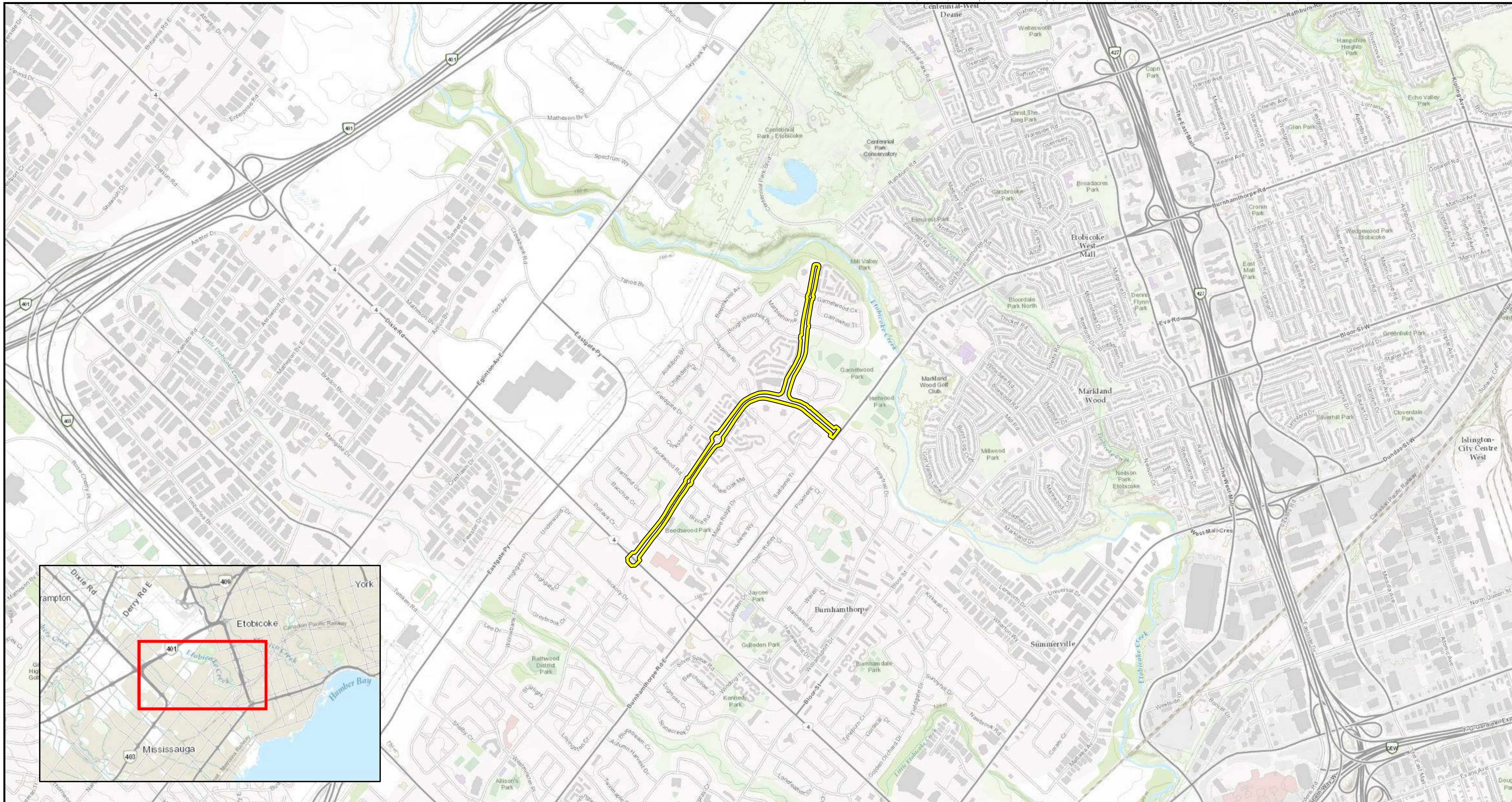
Image 37: Example of drainage culvert on Ponytrail Drive. Facing southeast.

Image 38: Example of underground parking on Rathburn Road East. Facing north.

Image 39: Example of bus shelter on Rathburn Road East. Facing southwest.

8 FIGURES

Service Layer Credit Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance



LEGEND

Study Area

TITLE:
FIGURE 1: PROJECT LOCATION

PROJECT:
STAGE 1 ARCHAEOLOGICAL ASSESSMENT
RATHBURN ROAD EAST AND PONYTRAIL DRIVE

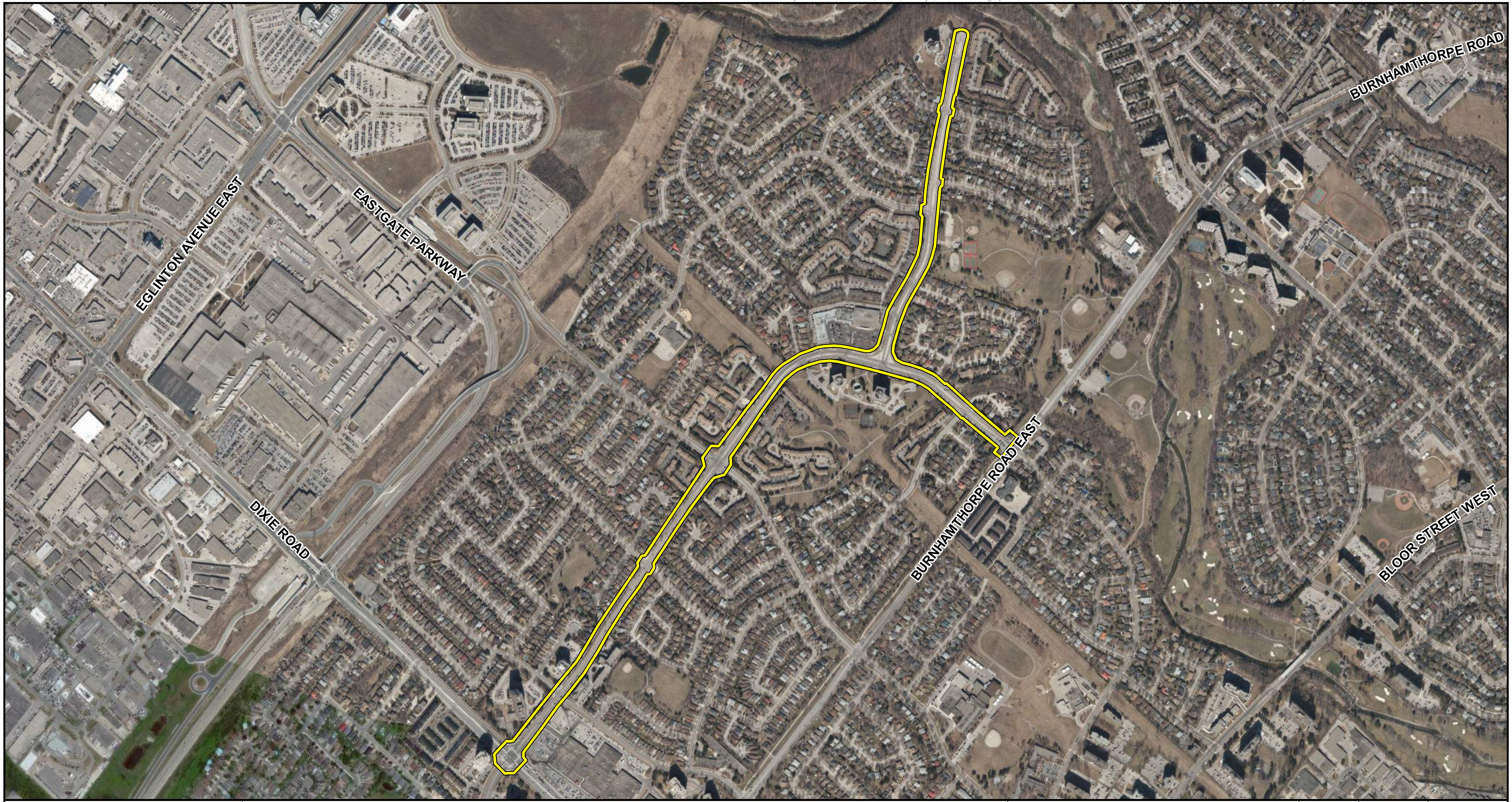
0 500 1,000 m

N

SCALE:	PROJECT NO:	DATE:
1:25,000	19M-00836-00	DECEMBER 2020
DRAWN BY: JAS	CLIENT: CITY OF MISSISSAUGA	
CREDITS:		

Document Path: C:\Users\jason.stephenson\Documents\GIS\2020\RathburnPonytrail\Rthbrn_Fig1_ProjectLocation.mxd

Service Layer Credit Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



wsp

LEGEND

Study Area

TITLE:	FIGURE 2: STUDY AREA
SCALE:	1:10,000
PROJECT NO:	19M-00836-00
DATE:	DECEMBER 2020
DRAWN BY:	JAS
CLIENT:	CITY OF MISSISSAUGA
PROJECT:	STAGE 1 ARCHAEOLOGICAL ASSESSMENT RATHBURN ROAD EAST AND PONYTRAIL DRIVE
CREDITS:	LAND INFORMATION ONTARIO

0 200 400 m

N

Document Path: C:\Users\jason.stephenson\Documents\GIS\2020\RathburnPonytrail\Rthbrn_Fig2_StudyArea.mxd

Service Layer Credit

LEGEND

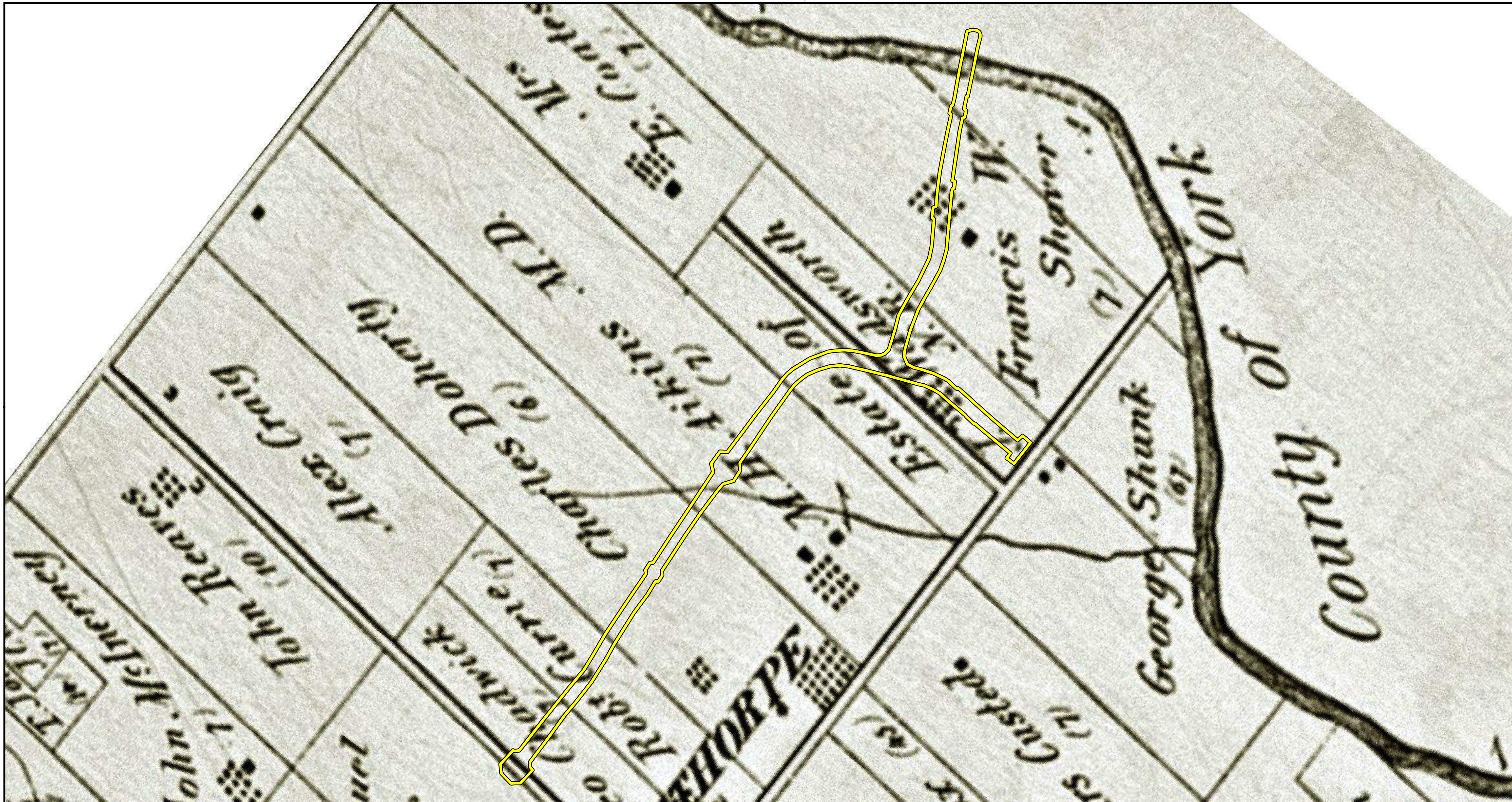
Study Area

TITLE: FIGURE 3: HISTORICAL MAPPING (1859)	SCALE: 1:10,000	PROJECT NO: 19M-00836-00	DATE: DECEMBER 2020
	DRAWN BY: JAS	CLIENT: CITY OF MISSISSAUGA	
PROJECT: STAGE 1 ARCHAEOLOGICAL ASSESSMENT RATHBURN ROAD EAST AND PONYTRAIL DRIVE	CREDITS: TREMAINE (1859)		

0 200 400 m

N

Document Path: C:\Users\jason.stephenson\Documents\GIS\2020\RathburnPonytrail\Rthbrn_Fig3_Historical1860.mxd



LEGEND

Study Area

TITLE: FIGURE 4: HISTORICAL MAPPING (1877)

SCALE:	PROJECT NO:	DATE:
1:10,000	19M-00836-00	DECEMBER 2020
DRAWN BY: JAS	CLIENT: CITY OF MISSISSAUGA	

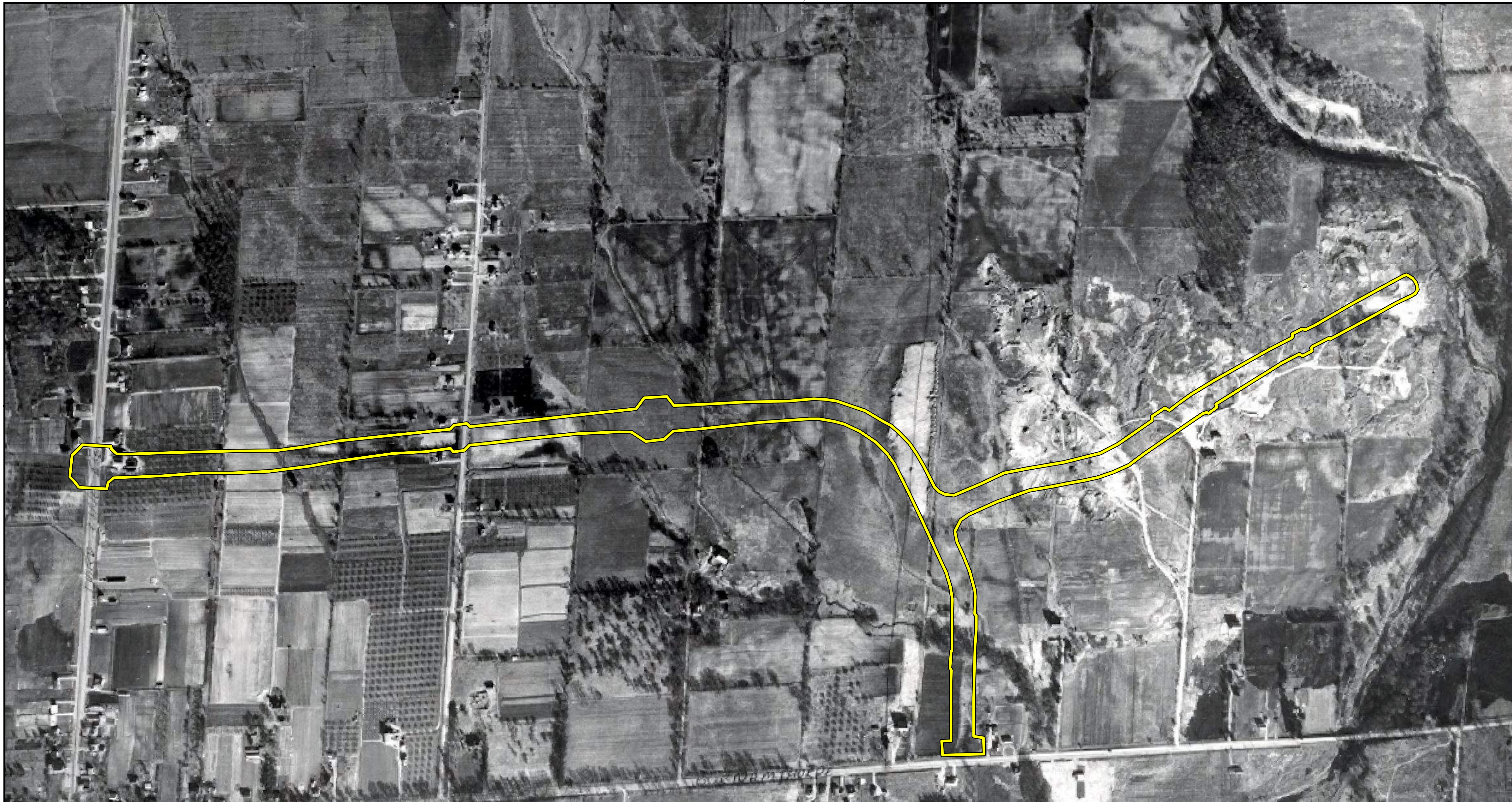
PROJECT: STAGE 1 ARCHAEOLOGICAL ASSESSMENT RATHBURN ROAD EAST AND PONYTRAIL DRIVE

CREDITS: WALKER & MILES (1877)

0 200 400 m

N

Service Layer Credit



LEGEND

Study Area

TITLE:	FIGURE 5: AERIAL IMAGERY (1962)
SCALE:	1:6,500
PROJECT NO:	19M-00836-00
DATE:	DECEMBER 2020
DRAWN BY:	JAS
CLIENT:	CITY OF MISSISSAUGA
PROJECT:	STAGE 1 ARCHAEOLOGICAL ASSESSMENT RATHBURN ROAD EAST AND PONYTRAIL DRIVE
CREDITS:	CITY OF TORONTO ARCHIVES SERIES 12, FLIGHT 1962, PHOTO 80

0 100 200 m

N

Service Layer Credit

LEGEND

Study Area

TITLE:

FIGURE 6: AERIAL IMAGERY (1977)

PROJECT:

STAGE 1 ARCHAEOLOGICAL ASSESSMENT
RATHBURN ROAD EAST AND PONYTRAIL DRIVE

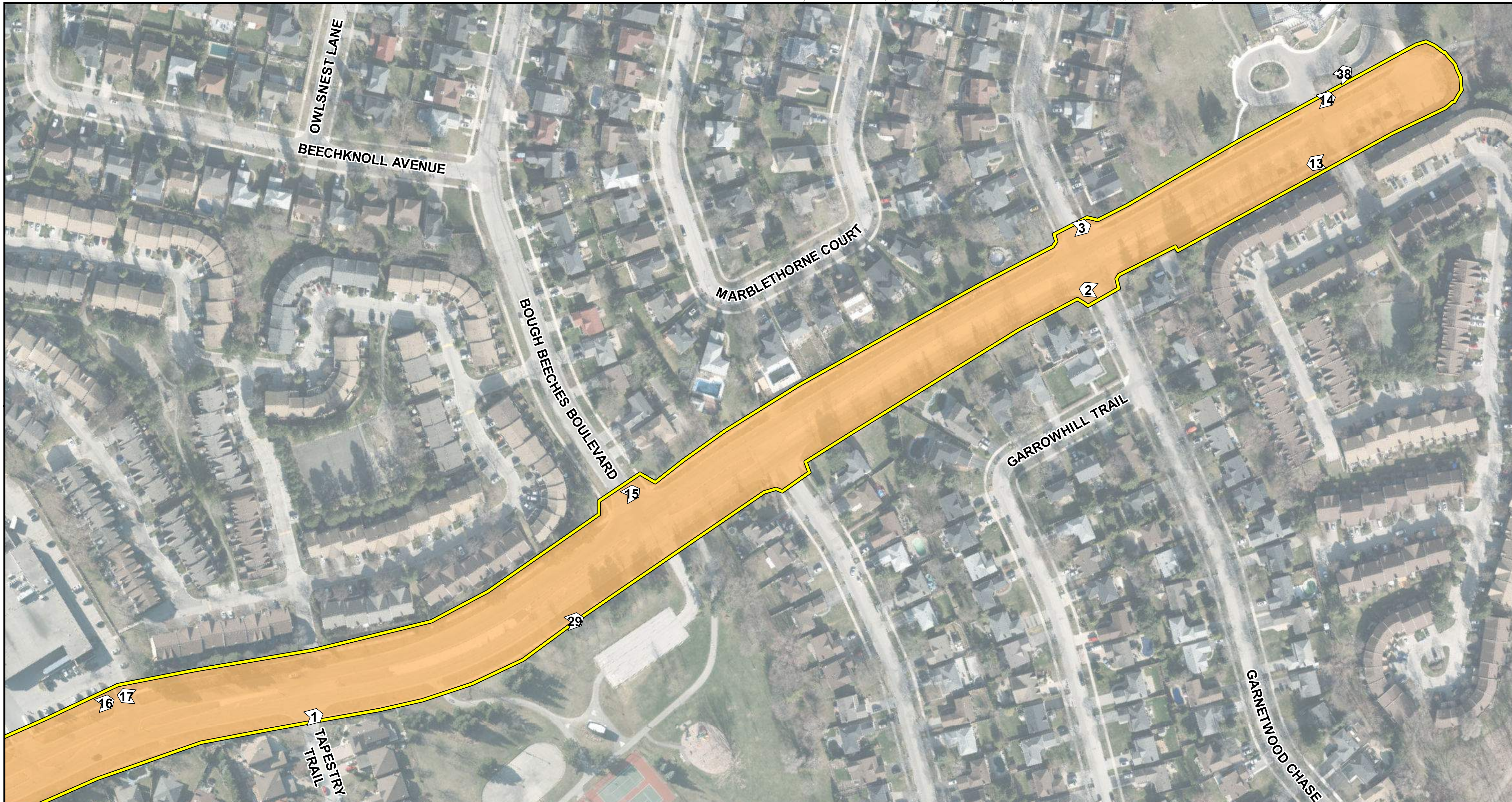
0 100 200 m

SCALE:	PROJECT NO:	DATE:
1:6,500	19M-00836-00	DECEMBER 2020
DRAWN BY:	CLIENT:	
JAS	CITY OF MISSISSAUGA	

CREDITS:

CITY OF TORONTO ARCHIVES
SERIES 12, FLIGHT 1977,
PHOTO 24 & 25

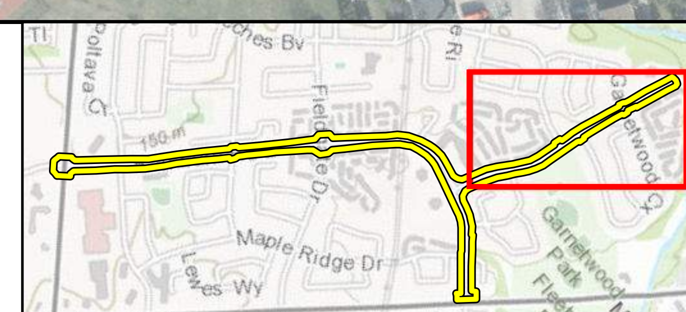
Service Layer Credit Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



wsp

LEGEND

- Study Area
- Disturbed - No Further Assessment Required
- Photograph Location



TITLE: FIGURE 7a: ASSESSMENT RESULTS

PROJECT: STAGE 1 ARCHAEOLOGICAL ASSESSMENT RATHBURN ROAD EAST AND PONYTRAIL DRIVE

0 40 80 m

SCALE:	PROJECT NO:	DATE:
1:2,000	19M-00836-00	DECEMBER 2021
DRAWN BY: JAS	CLIENT: CITY OF MISSISSAUGA	

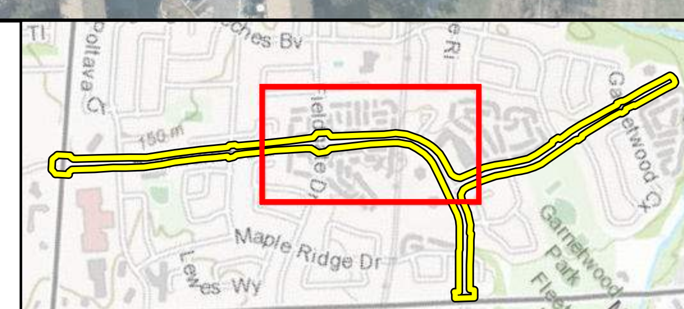
CREDITS: LAND INFORMATION ONTARIO

Document Path: C:\Users\jason.stephenson\Documents\GIS\2020\RathburnPonytrail\Rthbrn_Fig7_Results.mxd

Service Layer Credit Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

LEGEND

- Study Area
- Disturbed - No Further Assessment Required
- Photograph Location



TITLE: FIGURE 7b: ASSESSMENT RESULTS

PROJECT: STAGE 1 ARCHAEOLOGICAL ASSESSMENT RATHBURN ROAD EAST AND PONYTRAIL DRIVE

0 40 80 m

SCALE:	PROJECT NO:	DATE:
1:2,000	19M-00836-00	DECEMBER 2021
DRAWN BY: JAS	CLIENT: CITY OF MISSISSAUGA	

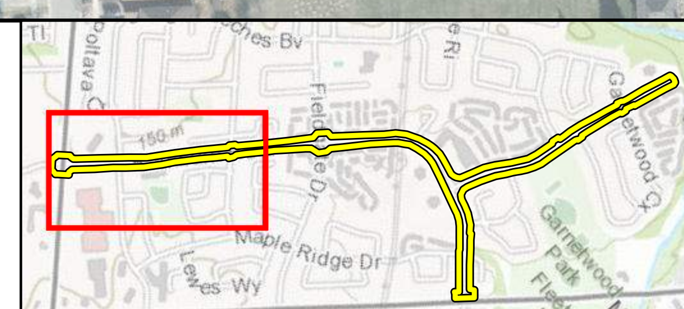
CREDITS: LAND INFORMATION ONTARIO

Document Path: C:\Users\jason.stephenson\Documents\GIS\2020\RathburnPonytrail\Rthbrn_Fig7_Results.mxd

wsp

LEGEND

- Study Area
- Disturbed - No Further Assessment Required
- Photograph Location

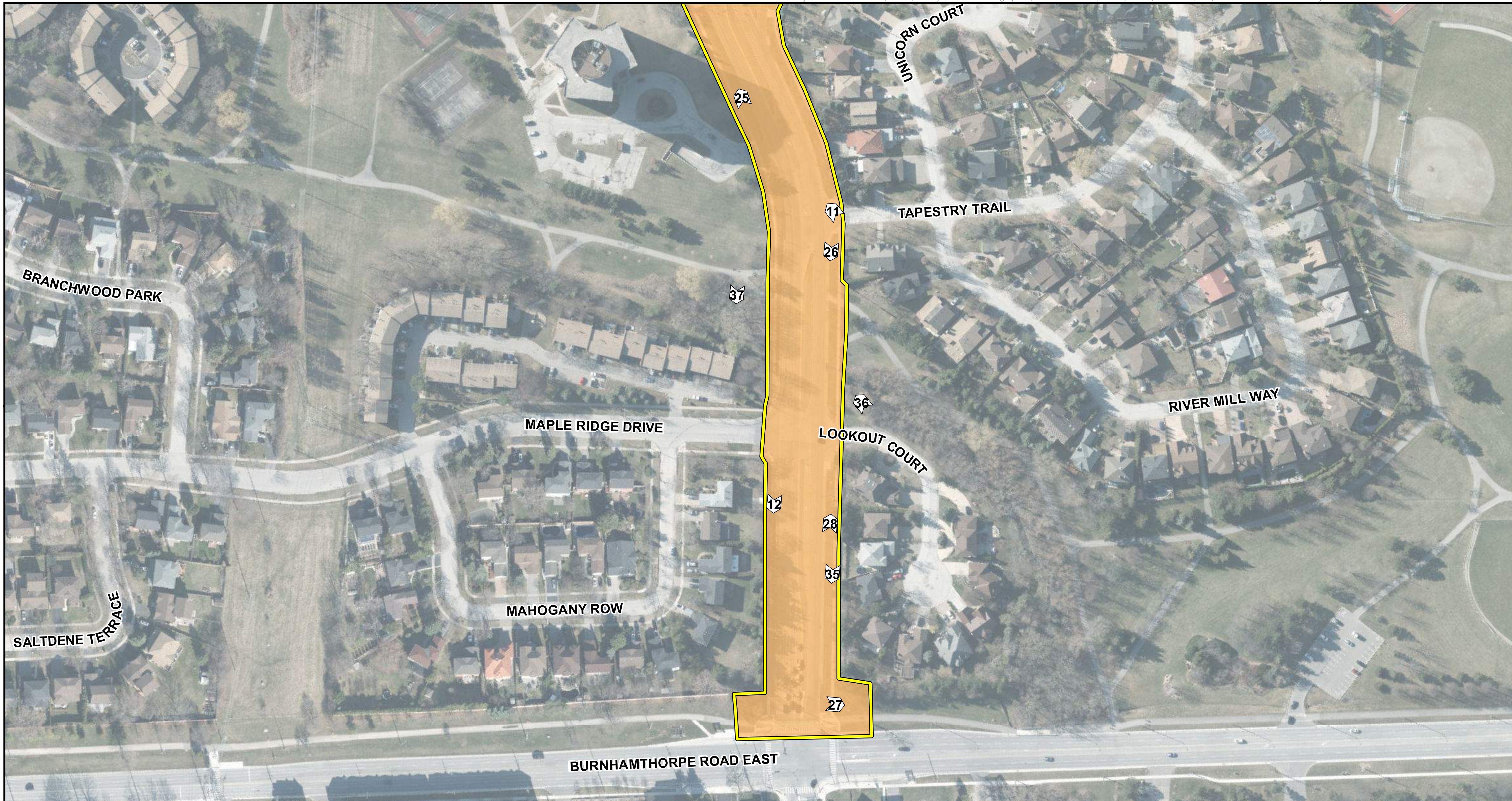


TITLE:	FIGURE 7c: ASSESSMENT RESULTS
SCALE:	1:2,000
PROJECT NO:	19M-00836-00
DATE:	DECEMBER 2021
DRAWN BY:	JAS
CLIENT:	CITY OF MISSISSAUGA
PROJECT:	STAGE 1 ARCHAEOLOGICAL ASSESSMENT RATHBURN ROAD EAST AND PONYTRAIL DRIVE
CREDITS:	LAND INFORMATION ONTARIO

0 40 80 m

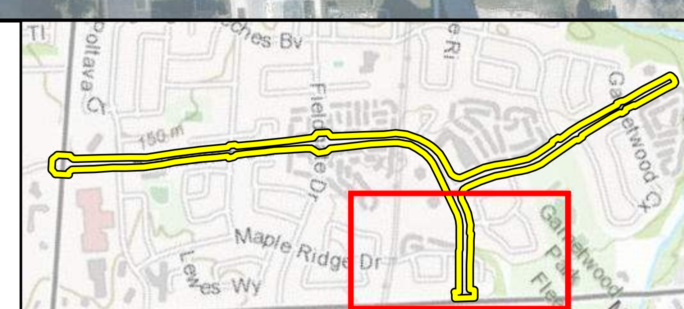
Document Path: C:\Users\jason.stephenson\Documents\GIS\2020\RathburnPonytrail\Rthbrn_Fig7_Results.mxd

Service Layer Credit Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



LEGEND

- Study Area
- Disturbed - No Further Assessment Required
- Photograph Location



TITLE:
FIGURE 7d: ASSESSMENT RESULTS

SCALE: 1:2,000
PROJECT NO: 19M-00836-00
DATE: DECEMBER 2021
DRAWN BY: JAS
CLIENT: CITY OF MISSISSAUGA

PROJECT:
STAGE 1 ARCHAEOLOGICAL ASSESSMENT
RATHBURN ROAD EAST AND PONYTRAIL DRIVE

CREDITS:
LAND INFORMATION ONTARIO

0 40 80 m

Document Path: C:\Users\jason.stephenson\Documents\GIS\2020\RathburnPonytrail\Rthbrn_Fig7_Results.mxd

APPENDIX

A CLIENT MAP

Figure 1: Study Area – Rathburn Road and Ponytrail Drive Integrated Road Project

APPENDIX

B

FEATURES OF ARCHAEOLOGICAL POTENTIAL

APPENDIX

FEATURES INDICATING ARCHAEOLOGICAL POTENTIAL

The following are features or characteristics that indicate archaeological potential:

- Previously identified archaeological sites.
- Water sources:
- Primary water sources (lakes, rivers, streams, creeks).
- Secondary water sources (intermittent streams and creeks, springs, marshes, swamps).
- Features indicating past water sources (e.g. glacial lake shorelines, relic river or stream channels, shorelines of drained lakes or marshes, cobble beaches).
- Accessible or inaccessible shoreline (e.g. high bluffs, swamp or marsh fields by the edge of a lake, sandbars stretching into marsh).
- Elevated topography (e.g. eskers, drumlins, large knolls, plateaux).
- Pockets of well-drained sandy soil, especially near areas of heavy soil or rocky ground.
- Distinctive land formations that might have been special or spiritual places, such as waterfalls, rock outcrops, caverns, mounds, and promontories and their bases.
- Resource areas, including:
  - Food or medicinal plants (e.g. migratory routes, spawning areas, prairie).
  - Scarce raw materials (e.g. quartz, copper, ochre, or outcrops of chert).
  - Early Euro-Canadian industry (e.g. fur trade, logging, prospecting, mining).
- Areas of early Euro-Canadian settlement. These include places of early military or pioneer settlement (e.g. pioneer homesteads, isolated cabins, farmstead complexes), early wharf or dock complexes, pioneer churches and early cemeteries.
- Early historical transportation routes (e.g. trails, passes, roads, railways, portage routes).
- Property listed on a municipal register or designated under the Ontario Heritage Act or that is federal, provincial or municipal historic landmark or site.
- Property that local histories or informants have identified with possible archaeological sites, historic events, activities, or occupations

SOURCE

Section 1.3. Ministry of Heritage, Sport, Tourism, and Culture Industries. (2011). *Standards and Guidelines for Consultant Archaeologists.* Toronto, Ontario: Queen's Printer for Ontario.

APPENDIX

N

PIC SUMMARY REPORTS

Rathburn Road East and Ponytrail Drive Integrated Road Project

City of Mississauga

PUBLIC INFORMATION CENTRE SUMMARY REPORT

May 2021

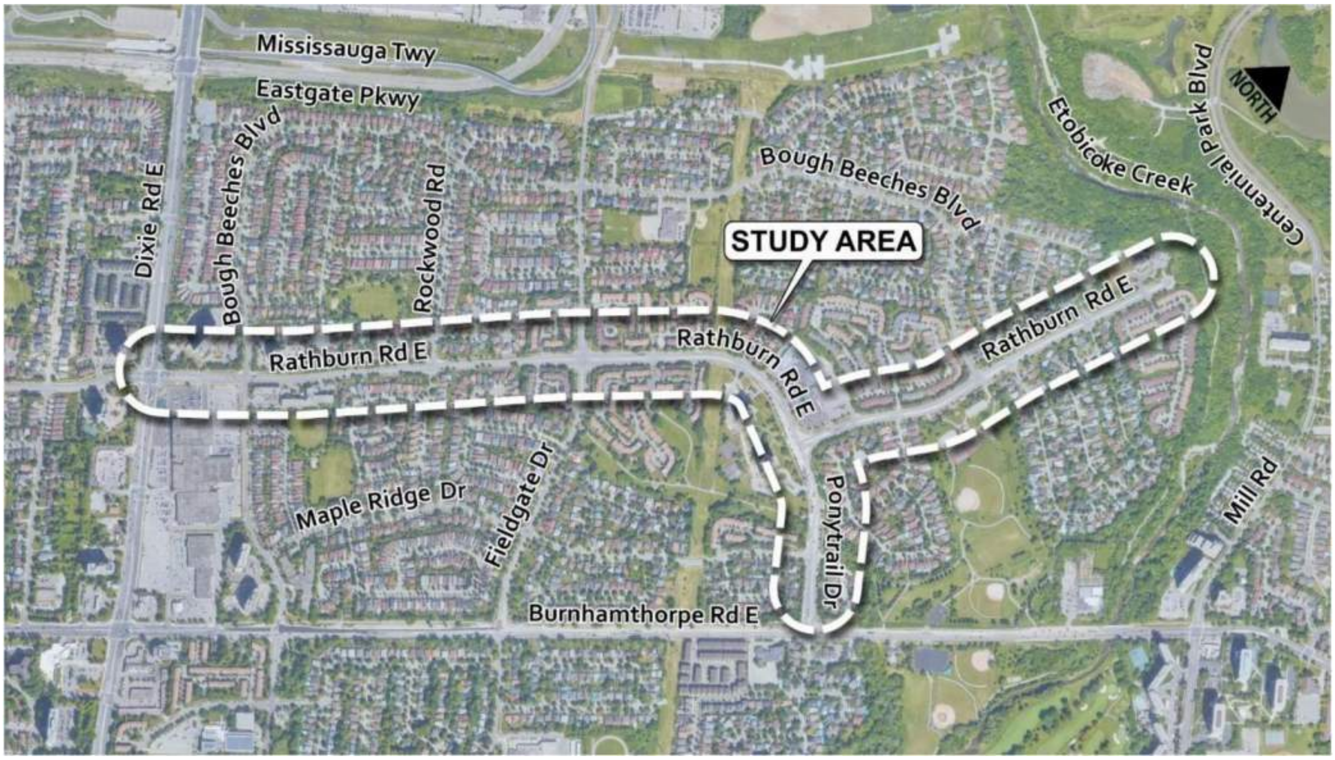
TABLE OF CONTENTS

1. INTRODUCTION

The City of Mississauga is undertaking the Rathburn Road and Ponytrail Drive Integrated Road Project in accordance with the Schedule ‘A+’ Municipal Class Environmental Assessment (EA) process. The limits for the proposed road improvements are on:

- Rathburn Road East from Dixie Road to Etobicoke Creek; and,
- Ponytrail Drive from Rathburn Road East to Burnhamthorpe Road East.

Study Area Map



The City has planned for road resurfacing of Rathburn Road East and Ponytrail Drive as part of the City's 2021 and 2022 Road Resurfacing Program.

The purpose of the Rathburn Road East and Ponytrail Drive Integrated Road Project is to explore and integrate opportunities for the implementation of active transportation facilities and operational improvements on these road segments, such as bike lanes, noise walls, intersection improvements, etc. These proposed improvements will create a safer, more comfortable and more sustainable environment for all road users, including pedestrians, cyclists and transit users.

The study is classified as a Schedule A+ project and is considered exempt from the requirements of the Environmental Assessment Act. While public engagement event is not a mandatory requirement for pre-approved Schedule A+ projects, members of the public are to be advised prior to its implementation. The City has carried out a comprehensive PIC to engage members of the public to provide input related to the Rathburn Road and Ponytrail Integrated Road Project.

This report documents Public Information Centre, which was posted on the City of Mississauga’s website for the project website on January 22, 2021 at: www.mississauga.ca/rathburn-ponytrail.

2. PURPOSE OF THE PUBLIC INFORMATION CENTRE

Due to the circumstances caused by the COVID-19 pandemic, the Public Information Centre (PIC) was held exclusively online.

The purpose of the online PIC was to:

- Provide an overview of the study purpose and study area;
- Identify the opportunities and considerations for improvements along the Study corridors;
- Provide an overview of the applicable policies;
- Review the existing conditions in the study area;
- Identify the opportunities for improvement for Rathburn Road and Ponytrail within the Study area;
- Present the design concept alternatives and preliminary preferred design concept; and,
- Provide the next steps and how to provide comments.

The formal review period was between January 22, 2021 and February 12, 2021; members of the public were asked to provide comments by February 12, 2021.

3. PIC DISPLAYS, FORMATS, PUBLICATION DATE AND PUBLICATION LOCATIONS

Public Information Centre Formats

The PIC was prepared and published in two digital formats on the study website:

1. A PDF of the PIC display boards; and,
2. A video presentation of the display boards with narration.

Public Information Centre Displays and Video Presentation

The City published the PIC display boards for the Rathburn Road East and Ponytrail Drive EA Study on January 22, 2021. There was a total of 25 boards. See **Attachment A** for a copy of the PIC display boards, and **Attachment B** for the PIC video presentation script.

The display boards were in compliant with the Accessibility for Ontarians with Disabilities Act (AODA). The City of Mississauga would provide physical copies of the PIC materials upon request should an individual or group require it; no requests were received.

Public Information Centre Display Panels and Video Presentation Publication

The online Public Information Centre was published as noted below.

Date Published	**Friday, January 22, 2021**
Formal Viewing and Comment Period	**Friday, January 22, 2021 – February 5, 2021 (extended until February 12, 2021)**
Project Webpage and Video Publication URL Address	www.mississauga.ca/rathburn-ponytrail
Display Panels Publication URL Address	https://www.mississauga.ca/wp-content/uploads/2021/01/21130434/Rathburn-Ponytrail-Virtual-PIC-AODA.pdf

Members of the public were invited to provide comments by completing an online comment form and/or to email additional comments to the City. Please refer to **Section 5** and **Section 6** of this Summary Report for more details on the received comments.

4. NOTIFICATION

Notice of Public Information Centre (PIC) Postcard

A copy of the Notice of PIC (postcard format) is included in **Attachment C**.

General Public

The City of Mississauga notified general members of the public of the online PIC by way of advertisement on Councillor Fonseca's social media platforms. The City also posted the Notice of Public Information Centre on the Study webpage which was on the City's website on December 18, 2020.

Property Owners Within the Study Catchment Area

WSP distributed the Notice of PIC to all property owners within the defined catchment area via mail on December 18, 2020. The mailing list for the property owners are on file with the City.

Rockwood Ratepayers' Association

WPS distributed the Notice of PIC to the Rockwood Ratepayers' Association via email on December 18, 2020. See **Attachment D** for a copy of the email.

Agencies and Utility Companies

WSP distributed the Notice of PIC to Technical Agencies and Utility Companies and via email on December 18, 2020. See **Attachment E** for a copy of the email template and the mailing lists.

The Ministry of the Environment, Conservation and Parks

WSP distributed the Notice of PIC and the Streamlined EA Project Information Form to the Ministry of the Environment, Conservation and Parks' (MECP) "Streamlined EAs" email address via email on December 18, 2020.

While Schedule A+ studies are exempt, MECP's Streamlined EA Project Information Form had "Schedule A+" as an option; as such, the form and Notice of PIC was provided to MECP for their information.

See **Attachment F** for a copy of the email and the Project Information Form.

5. COMMENT FORMS AND ENGAGEMENT STATISTICS

Comment Forms

Electronic comment forms were provided on the Study's project webpage. Comments were also being accepted and received via email to the City's Project Manager Rory O'Sullivan at Rory.OSullivan@mississauga.ca.

The comment period that was initially published was from January 22, 2021 to February 5, 2021. At the request of the Rockwood Ratepayers' Association, the comment period was extended until February 12, 2021; the project webpage was updated to reflect this extension.

Video Engagement Statistics

As of March 1, 2021, the video of the PIC presentation reported the following audience interaction:

Views	468
Likes	5
Dislikes	1

Comments Received

Following the comment period, which ended on February 12, 2021, the City received a total of 60 written comments:

Comments Received from the Public, including the Ratepayers' Association	**54**
Received through the Comment Form	*19*
Received via email	*30*
Received as part of a submission from the Rockwood Homeowners' Association	*5*
Comments Received from Agencies and Utility Companies	**6**
Received via email	*6*

6. SUMMARY OF FEEDBACK

General Public and Rockwood Homeowners' Association Feedback

The following summarizes the main concerns and interests expressed by the comments received from the general public, including from the Rockwood Ratepayers' Association and its executive and general members.

Table 2: Common Themes and Key Messages Frequently Noted

Common Themes	Key Messages Frequently Noted from the Received Comments
General	General requests to be added to the mailing list were received. General inquiries regarding the timeline of the Study and/or construction of the project were noted.
Support for the Study	General support for the preliminary preferred Alternative 3 were noted. Additionally, there are received comments that notes support for the preliminary preferred cycling facilities, including the types of preferred cycling facilities, as well as the reduction the road from 4 to 2 lanes, landscaping and complete street design.
Concerns for pedestrian safety and pedestrian crossing locations	General concerns about safety for all road users in the Study area. For example, pedestrian safety, including safe pedestrian crossing within the Study area, as well as speeding. There are requests / suggestions to the Project Team to provide consideration to: • Illuminated overhead lights, warning signs countdowns and pedestrian push buttons; • Crosswalk or stop signs at various pedestrian crossings/intersections; • A crosswalk and/or pedestrian crossing at various locations, including at Bough Beeches to Garnetwood Park, Ponytrail Drive and Shaver Trail, and Rathburn Road and Tapestry Trail; • A new signalized intersection with at Rathburn Road and Rockwood Road.
Concerns for cycling safety and the maintenance of cycling infrastructure	General concerns about the safety of cyclists. Comments noted include: • Concerns about whether cyclists will abide to the rules;

Common Themes	Key Messages Frequently Noted from the Received Comments
	• Inquiries as to how snow removal will be carried out with cycling facilities.
Concerns about the geometry of the preliminary preferred Alternative 3	General comments received that noted inquiries about: • Whether the preliminary design will to minimize any straight-line portions • Whether the Project Team is considering a bridge connecting Rathburn Road East over Etobicoke Creek; • If the City will repave the concrete; • Whether the Project Team has considered the proposed development on Ponytrail Drive across from Tapestry Trail in the Study; • Request to provide consideration to indent bus stops into the roadway; • Request to provide consideration to traffic sensing operations; • Request to provide consideration to raised cycling facilities; • Inquiry regarding the justification for about connecting the cycling facilities east of Fieldgate Drive; • Inquiry as to whether intersections are proposed to be "smart".
Concerns for the preliminary preferred landscape plan and the aesthetics of bollards on the cycling facilities	General concerns that the preliminary preferred landscape plan may not beautify the streetscape enough. Requests / suggestions to the Project Team to provide consideration to have more mature landscaping in the median, such as trees or shrubs. Concerns about the aesthetics of the bollards of the preliminary preferred Alternative 3.
Preference for Alternative 1, Alternative 2, or the "Do Nothing" alternative.	Comments that show preference to other presented Alternatives. Comments include: • Concerns about cyclist safety; • Concerns regarding the longevity of bollards; • Inquiry about the assessment of alternatives.
Inquiry regarding parking and the Bus Route	Inquiries about whether parking is included/considered in this Study. Further, there are inquiries about what the future bus routes will be.
Support for a roundabout	Requests / suggestions to the Project Team to provide consideration to roundabouts in the Study area. Comments have noted the benefits of roundabouts.
Concerns about future traffic congestion	Concerns that the removal of some or all of the dedicated turning lanes may result in traffic congestion. There are inquiries received about the existing and future traffic volumes in the Study area, as well as the traffic flow. Concerns about congestion that may result from reducing the roadway from 4 lanes to 2 lanes.

Common Themes	Key Messages Frequently Noted from the Received Comments
Concerns about noise walls and concerns about their location	Opposition to noise walls and concerns that they are not aesthetically pleasing and may damage tree. Further, there are comments that indicate that noise walls are not needed. Requests / suggestions to the Project Team to provide consideration to provide noise walls along Ponytrail Drive to Burnhamthorpe Road.
Opposition to the Study	General opposition to the Study and/or its implementation were received. There are some concerns and opposition to the funding of the Study by tax dollars.

The received comments from the general public and from agencies were categorized based in their support of the Integrated Road Project, which is summarized in the following table. The full responses are attached in **Attachment G**.

Table 1: Summary of Support from Received Responses

Level of Support	Responses Received out of 55 Total Responses	Percentage
No Response	4	7.3%
Agree	11	20.0%
Agree with Comments	27	49.1%
Against	15	27.3%

See **Attachment G** for all the individual comments received and responses provided to the general public and to the Rockwood Homeowners' Association.

The Rockwood Homeowners' Association conducted an independent survey that was distributed to its members; neither the City of Mississauga nor WSP was involved. A copy of the survey results is on file with the City of Mississauga.

<u>Agencies and Utility Companies Feedback</u>

The following summarizes the main concerns and interests expressed by the comments received from Agencies and Utility Companies:

- Confirmation there are no underground utility infrastructure within the Study area;
- Confirmation of the comment period;
- Inquiries about the preliminary designs and the type of proposed cycling infrastructure;
- Inquiries about the considerations given to pedestrian crossing locations on Rathburn Road East.

All comments and responses are provided in **Attachment G.**

Attachment A

Public Information Centre Display Boards

Rathburn Road East and Ponytrail Drive Integrated Road Project

Public Information Centre (ONLINE)

January 22, 2021

MISSISSAUGA

ABOUT THIS PUBLIC INFORMATION CENTRE

Due to the current circumstances caused by the COVID-19 pandemic, this Public Information Centre (PIC) is being held exclusively online, with the information presented in this document.

Please **take your time** and read through the display material.

The Project Team is available to answer any of your questions. Please fill out a Comment Sheet available on the City's website at www.mississauga.ca/rathburn-ponytrail between **January 22 to February 5, 2021,** or contact the City's Project Manager directly with your questions or comments, or call **311**:

Rory O'Sullivan, M.Sc, P.Eng, PMP
Transportation Project Engineer
City of Mississauga Transportation & Works Department
201 City Centre Drive, Suite 800
Mississauga ON L5B 2T4
Rory.Osullivan@mississauga.ca

PURPOSE OF THIS PUBLIC INFORMATION CENTRE

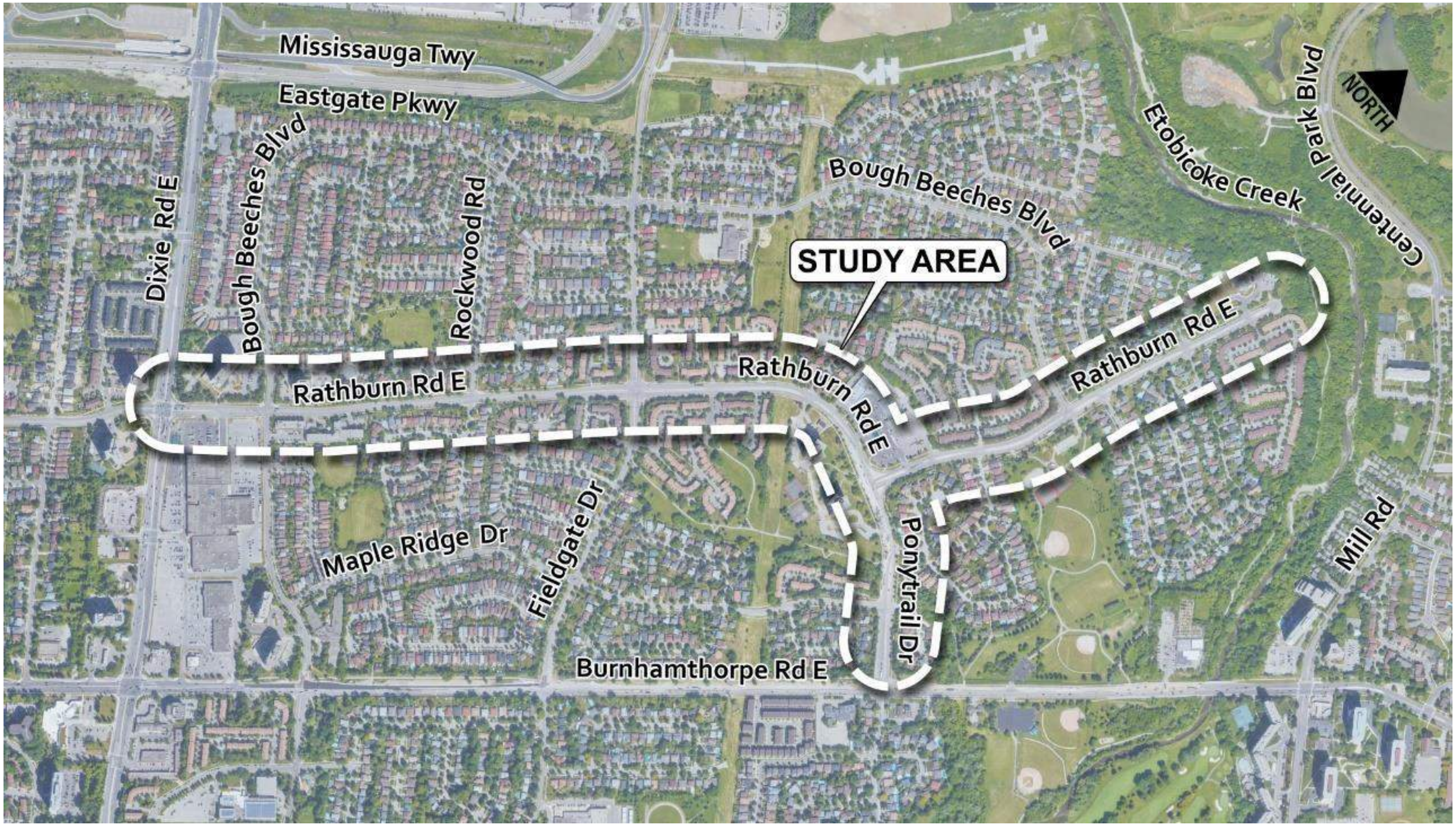
- Study Purpose and Study Area
- Opportunities and Considerations
- Planning and Policy Context
- Existing Conditions
- Opportunities for Improvements
- Design Concepts Alternatives and Preliminary Preferred Design Concept
- Next Steps and How to Provide Comments

MISSISSAUGA

STUDY PURPOSE

- Road resurfacing is planned for Rathburn Road East and Ponytrail Drive.
- This is an opportunity to undertake other planned changes and improvements to the roads.
- City wants to create a complete street that is safe for all road users, including pedestrians, cyclists and transit users.

STUDY AREA



Mississauga Twy
Eastgate Pkwy
Bough Beeches Blvd
Dixie Rd E
Rockwood Rd
Bough Beeches Blvd
Etobicoke Creek
Centennial Park Blvd
NORTH
STUDY AREA
Rathburn Rd E
Rathburn Rd E
Rathburn Rd E
Rathburn Rd E
Maple Ridge Dr
Fieldgate Dr
Ponytrail Dr
Mill Rd
Burnhamthorpe Rd E

OPPORTUNITIES AND CONSIDERATIONS

Opportunities

- ✓ Road resurfacing provides an opportunity to re-evaluate use of the roadway
- ✓ Balance all users' needs of the roadway including vehicles, cyclists, pedestrians, and transit
- ✓ Improve safety

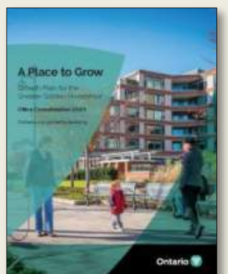
Considerations

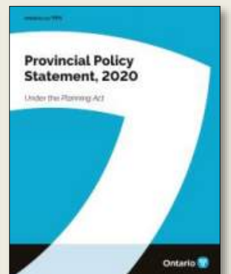
- ✓ Accommodate all modes of transportation within limited right-of-way
- ✓ Ensure adequate traffic operations maintained
- ✓ Reliability of transit service
- ✓ Consider adjacent land uses and connectivity of all modes of transportation

PLANNING AND POLICY CONTEXT

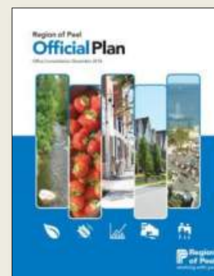
Provincial, Regional and local planning policy documents from different municipal bodies and agencies support this Study.

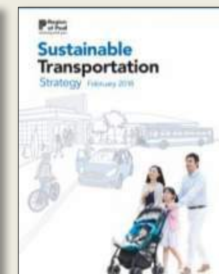
Provincial Plans



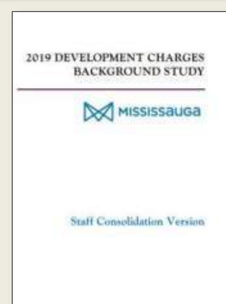


Regional Plans

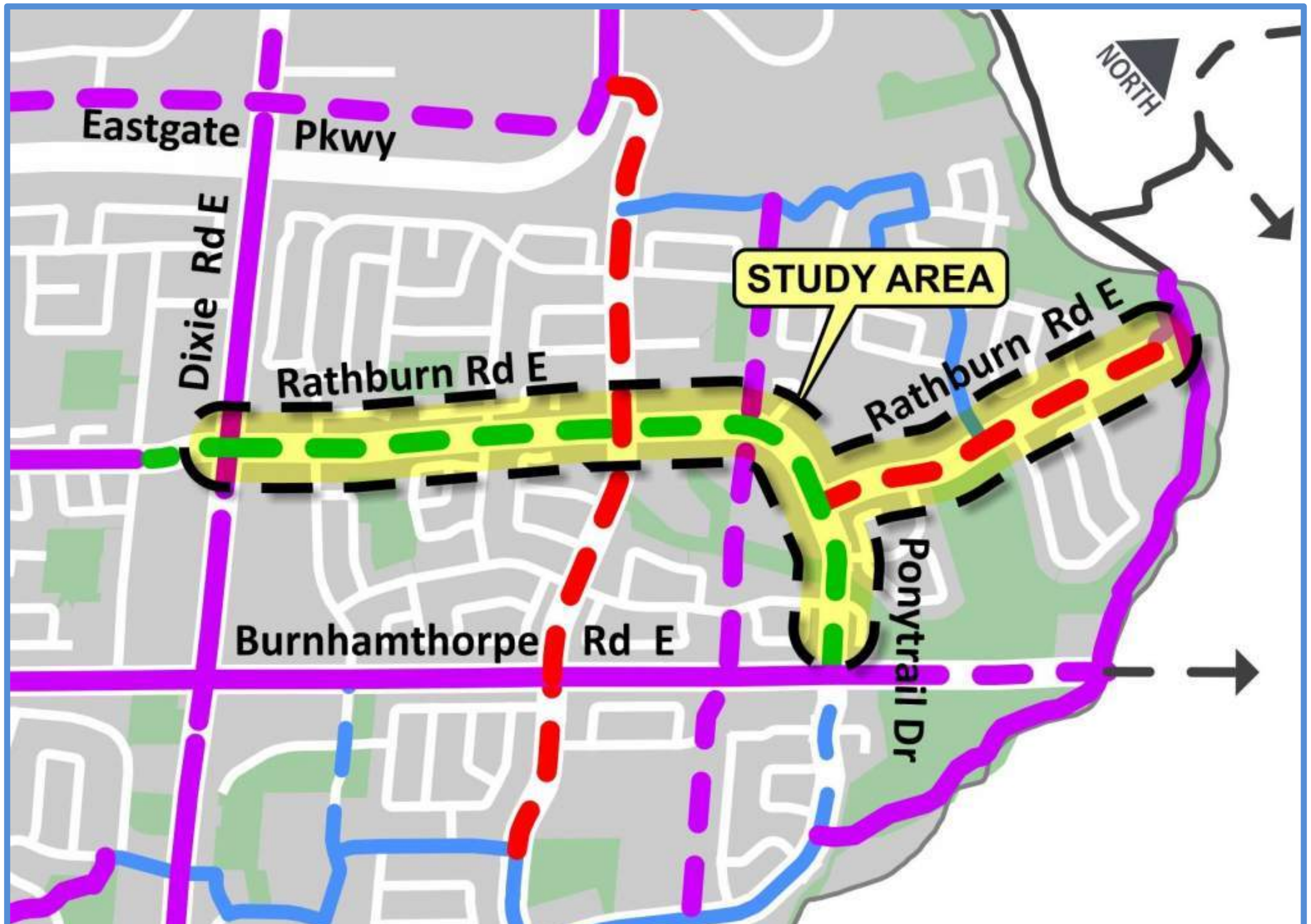




Municipal Plans



MISSISSAUGA CYCLING MASTER PLAN (2018)



Existing Facilities

- Bike Lane
- Paved Shoulder
- Shared Route
- Multi-Use Trail
- Connecting Trail
- Regional Connection

Proposed Facilities

- Cycle Track/Separated Bike Lane
- Bike Lane
- Paved Shoulder
- Shared Route
- Multi-Use Trail
- Regional Connection
- Major Barrier Crossing

The Cycling Master Plan identifies: cycle tracks/separated bike lanes on Rathburn Road East from Dixie Road to Ponytail Drive and on Ponytrail Drive from Rathburn Road East to Burnhamthorpe Road East; and, bike lanes on Rathburn Road East from Ponytrail Drive to Etobicoke Creek.

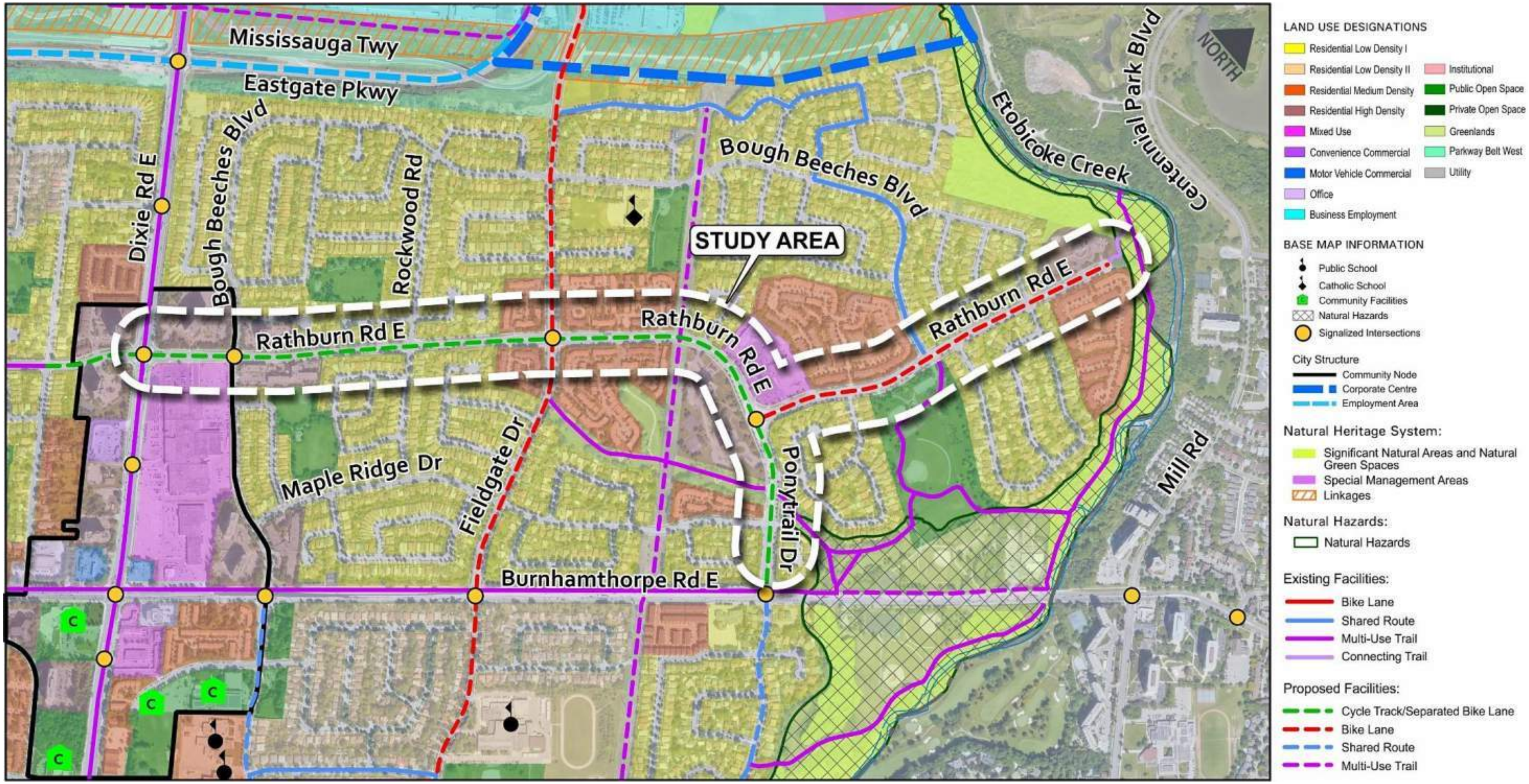
Source: Mississauga Cycling Master Plan (2018), Figure 15: Proposed Cycling Network

TYPES OF CYCLING FACILITIES

On-road separated bike lane with bollards and a buffer area

In-boulevard cycle track adjacent to curb

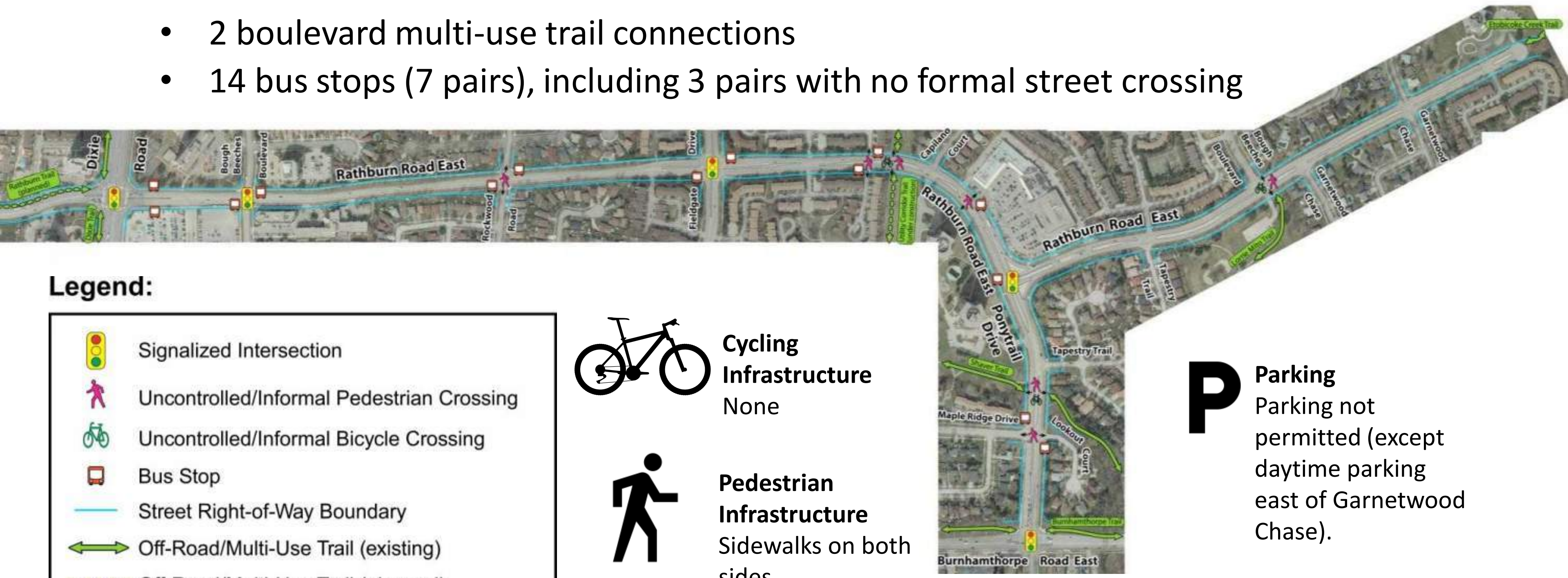
STUDY AREA OVERVIEW



EXISTING CORRIDORS

The Study corridors include:

- Numerous commercial and residential driveways
- 3 uncontrolled trail crossings
- 4 off-road trail connections
- 2 boulevard multi-use trail connections
- 14 bus stops (7 pairs), including 3 pairs with no formal street crossing



Legend:

- Signalized Intersection
- Uncontrolled/Informal Pedestrian Crossing
- Uncontrolled/Informal Bicycle Crossing
- Bus Stop
- Street Right-of-Way Boundary
- Off-Road/Multi-Use Trail (existing)
- Off-Road/Multi-Use Trail (planned)

Cycling Infrastructure
None

Pedestrian Infrastructure
Sidewalks on both sides

Parking
Parking not permitted (except daytime parking east of Garnetwood Chase).

EXISTING CORRIDORS

Rathburn Road East / Ponytrail Drive (Dixie Road to Burnhamthorpe Road)

- 2 lanes in each direction / Not divided
- Large trees in boulevard; Right-of-way width: 30 m

- 2 lanes in each direction / divided by median
- Right-of-way width: 30 – 35m

Legend:

- Signalized Intersection
- Uncontrolled/Informal Pedestrian Crossing
- Uncontrolled/Informal Bicycle Crossing
- Bus Stop
- Street Right-of-Way Boundary
- Off-Road/Multi-Use Trail (existing)
- Off-Road/Multi-Use Trail (planned)

Dixie Road to Fieldgate Drive

Fieldgate Drive to Burnhamthorpe Road

EXISTING CORRIDORS

Rathburn Road East (Ponytrail Drive to end of Cul-de-Sac at Etobicoke Creek)

- 2 lanes in each direction / divided by median
- Terminates at the Etobicoke Creek
- Connections to Etobicoke Creek Trail and Lorrie Mito Trail
- Right-of-way width: 30 – 35m

Legend

- Signalized Intersection
- Uncontrolled/Informal Pedestrian Crossing
- Uncontrolled/Informal Bicycle Crossing
- Bus Stop
- Street Right-of-Way Boundary
- Off-Road/Multi-Use Trail (existing)
- Off-Road/Multi-Use Trail (planned)

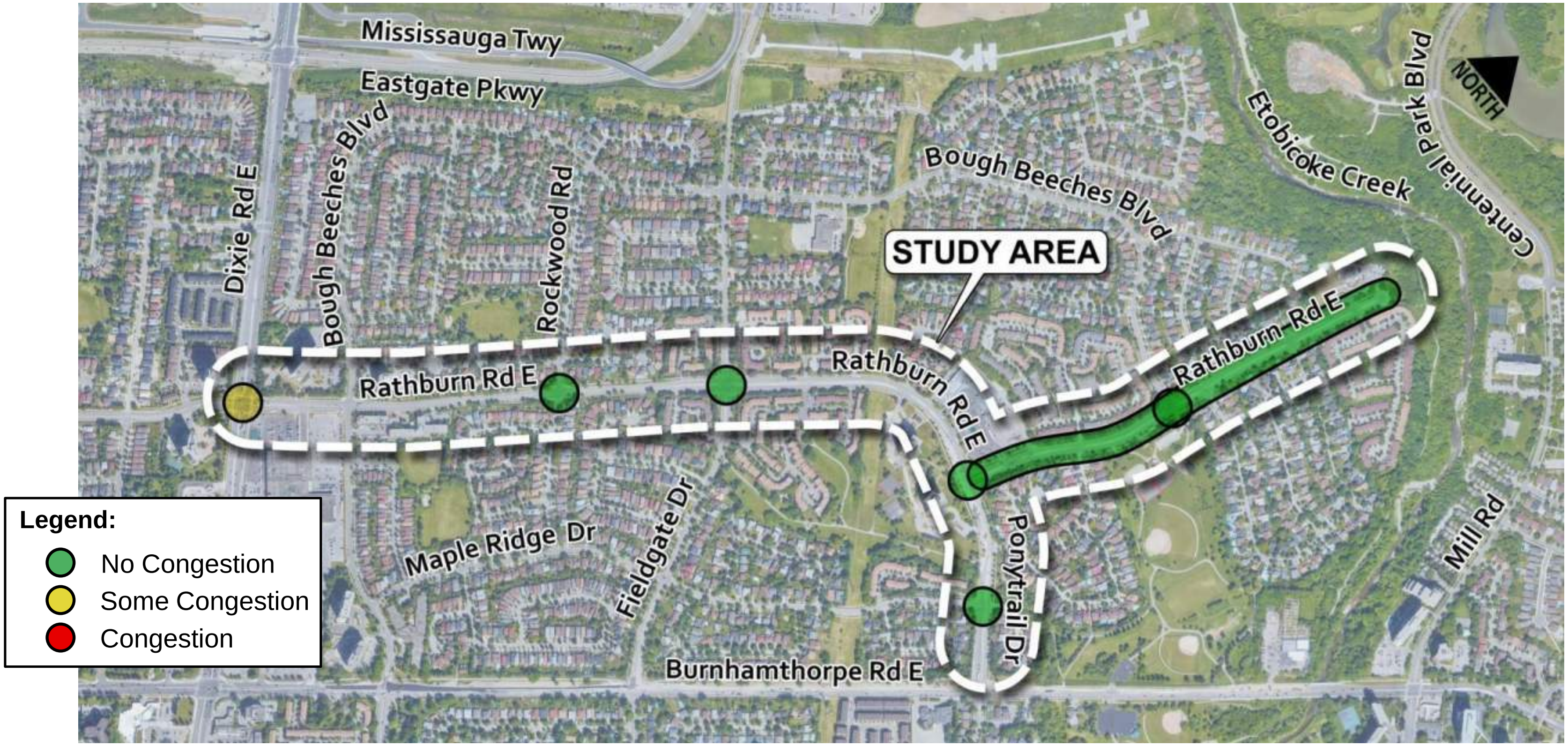
Ponytrail Drive to Etobicoke Creek

TRAFFIC ANALYSIS – EXISTING CONDITIONS

Traffic analysis completed to assess existing traffic operation at intersections where there are opportunities for improvements.

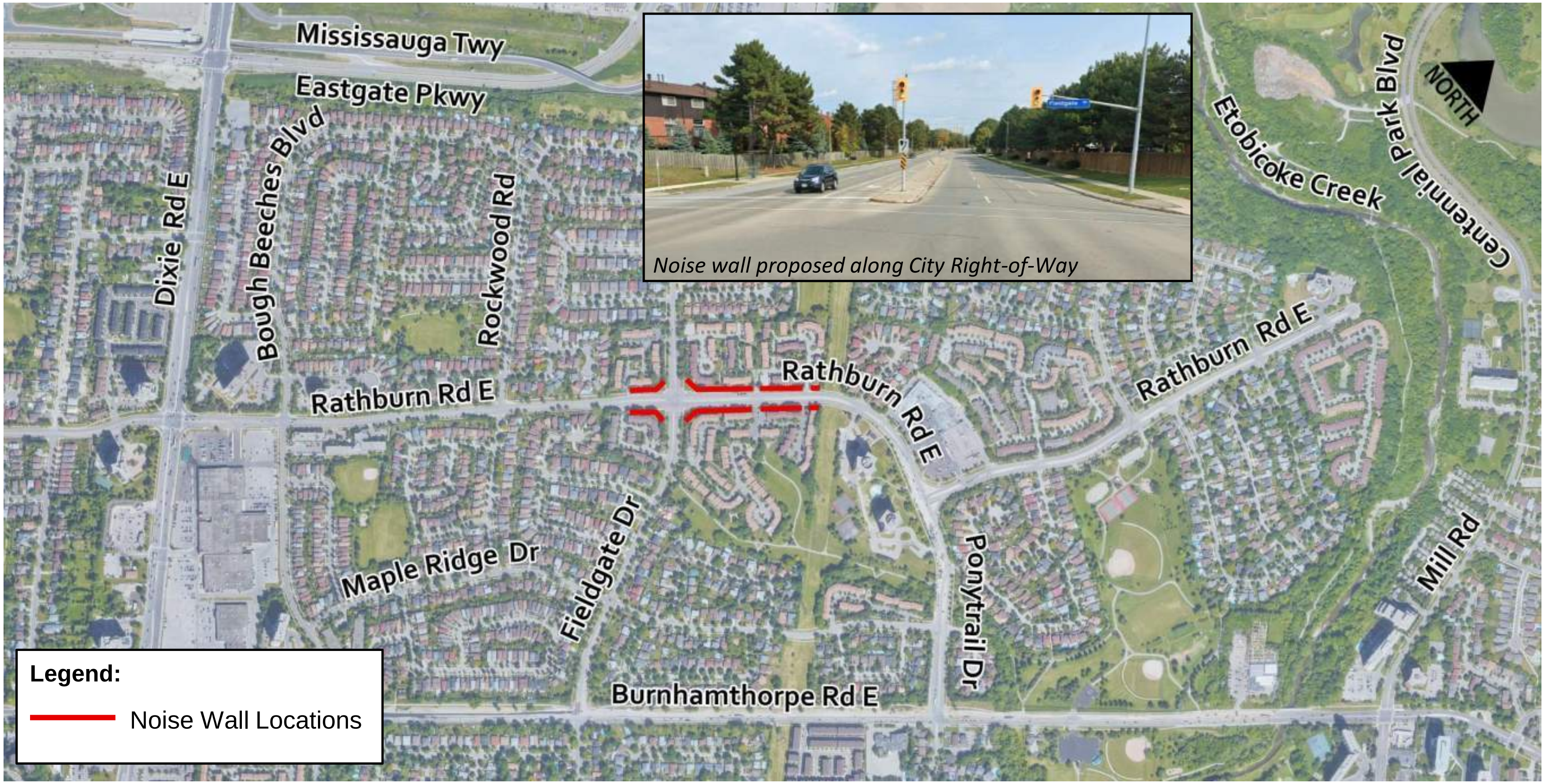
TRAFFIC ANALYSIS – FUTURE CONDITIONS (2041)

Traffic analysis completed to assess future traffic operation at intersections with proposed improvements (e.g. remove dedicated right-turn lane).



There will be no significant changes to traffic operation.

DESIGN CONSIDERATIONS – NOISE WALL



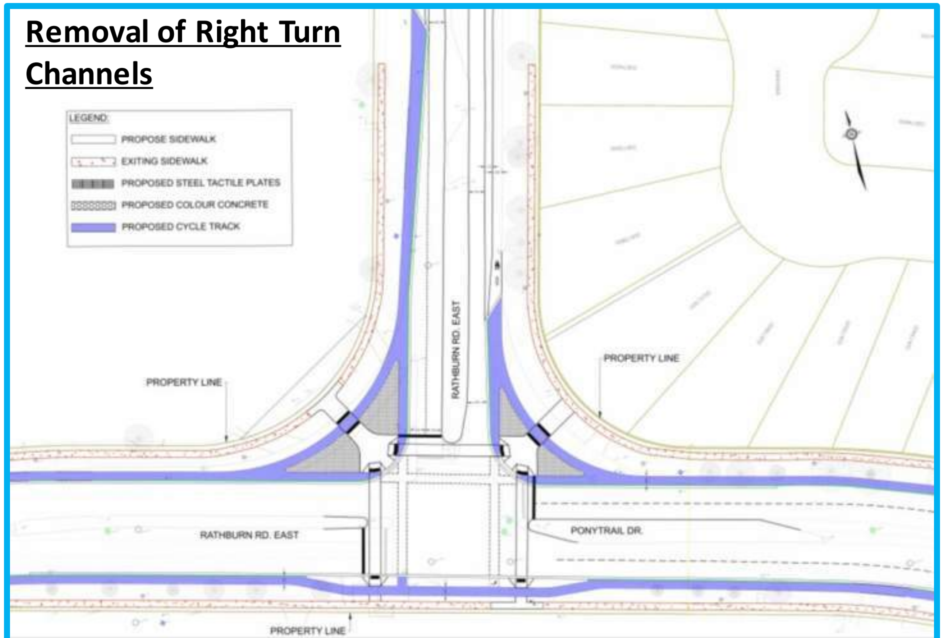
DESIGN CONSIDERATIONS

RATHBURN ROAD EAST / PONYTRAIL DRIVE INTERSECTION

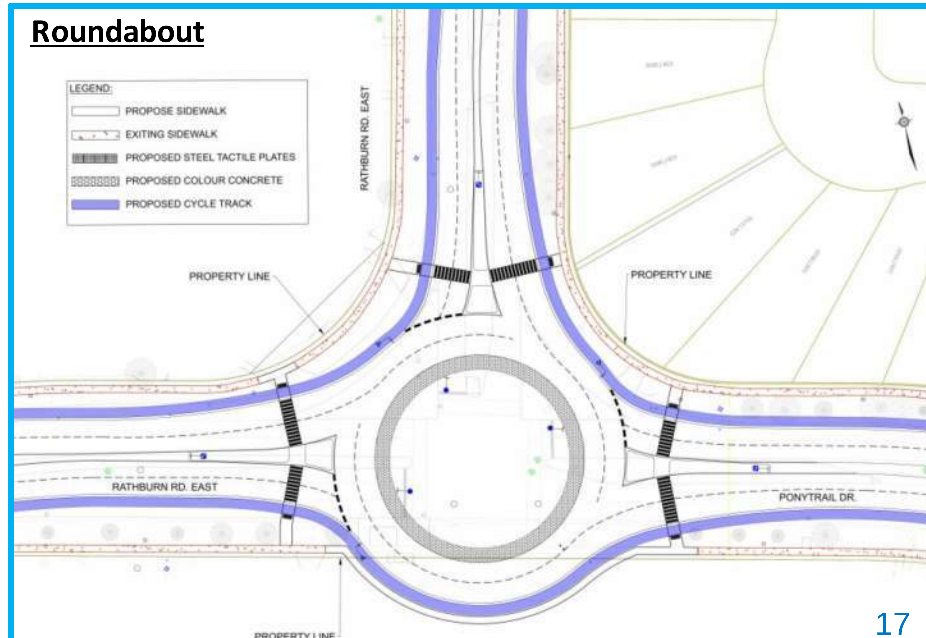
The project team has reviewed the 2 options as referenced below and has determined that the roundabout option is **not recommended** for the following reasons:

- Cost;
- Property Requirements;
- Community is unfamiliar with multi-lane roundabouts; and
- Complex environment for pedestrians and cyclists crossing multi-lane roundabout.

Removal of Right Turn Channels



Roundabout



POTENTIAL PEDESTRIAN CROSSING IMPROVEMENTS

Refuge Island

Pedestrians have to wait for a gap in traffic to cross.

A refuge island would give pedestrians a safe spot to wait mid-crossing, so they can concentrate on crossing one direction of traffic at a time. The island may also act to slow down traffic.

This is more feasible on streets that already have a wide median or centre turn lane.

Pedestrian Crossover

Pedestrians have priority in the crossing, and vehicles must yield to them.

The crossing may be raised to act as a speed bump, and slow down traffic.

The City of Mississauga is piloting these in several locations, but currently restricts their usage to 2-lane roads.

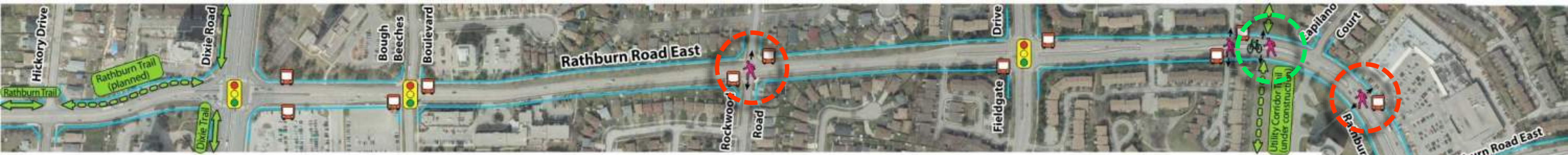
Signalized Crossing

Pedestrians have a traffic signal to give them priority when crossing.

More suitable for multi-lane and/or high-traffic roads.

PEDESTRIAN CROSSING LOCATIONS EVALUATION

Rathburn Road East / Ponytrail Drive (Dixie Road to Burnhamthorpe Road)



Legend:

- Signalized Intersection
- Uncontrolled/Informal Pedestrian Crossing
- Uncontrolled/Informal Bicycle Crossing
- Bus Stop
- Street Right-of-Way Boundary
- Off-Road/Multi-Use Trail (existing)
- Off-Road/Multi-Use Trail (planned)
- No change to pedestrian crossing facilitates
- New pedestrian crossing facility

The Project Team reviewed the pedestrian crossing opportunities within the limits of the study based on the following criteria:

- Safety
- Potential pedestrian travel paths / crossing locations
- Traffic Operations
- Width of Road
- Proximity to signalized road crossings
- Budget

The Project Team has identified the hydro corridor as a location to provide a signalized pedestrian crossing.

The City will continue to monitor the pedestrian movements within the corridor for future potential additional crossings.

PEDESTRIAN CROSSING LOCATIONS EVALUATION

Rathburn Road East (Ponytrail Drive to end of Cul-de-Sac)

The Project Team reviewed the pedestrian crossing opportunities within the limits of the study based on the following criteria:

- Safety
- Potential pedestrian travel paths / crossing locations
- Traffic Operations
- Width of Road
- Proximity to signalized road crossings
- Budget

The City will continue to monitor the pedestrian movements within the corridor for future potential additional crossings.

Rathburn Road / Bough Beeches Boulevard Intersection

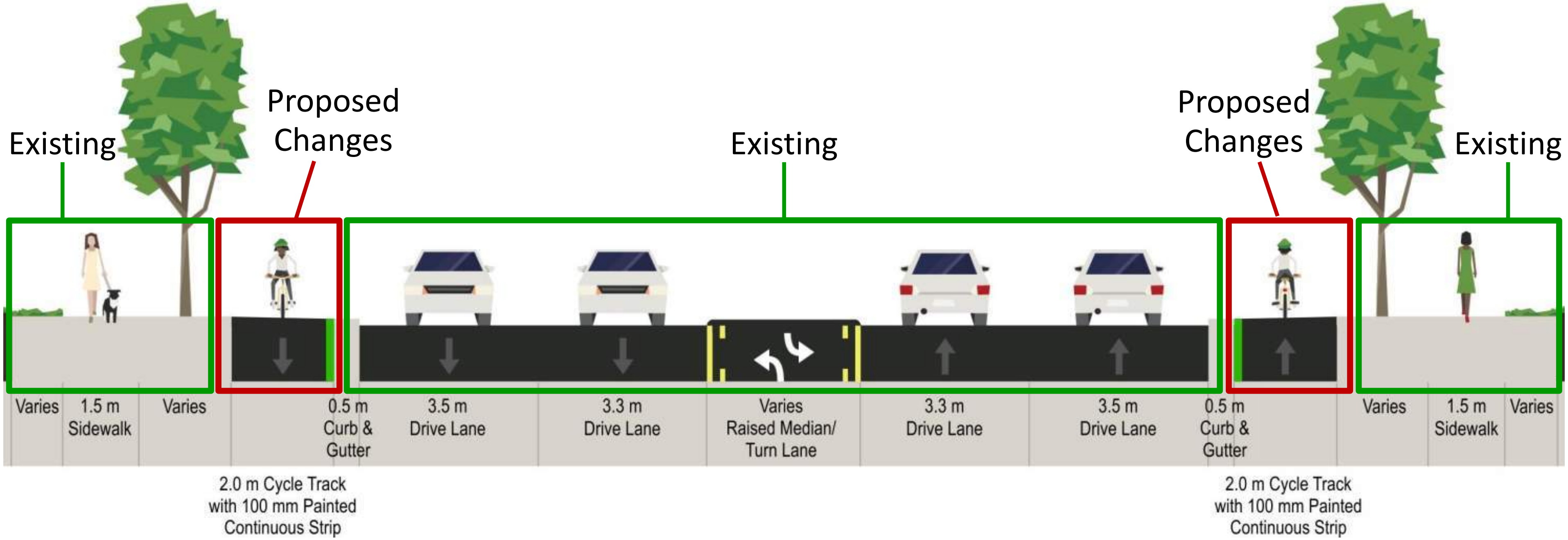
- Proposed 'Stop' Signs at all approaches

PREFERRED PRELIMINARY DESIGN CONCEPT

RATHBURN ROAD EAST / PONYTRAIL DRIVE (Dixie Road to Burnhamthorpe Road)

- Cyclists will be in the boulevard, behind the curb with some separation from the sidewalk and pedestrians.
- Existing 4 lanes of traffic and left turning lanes to remain following pavement rehabilitation.

In-boulevard cycle track

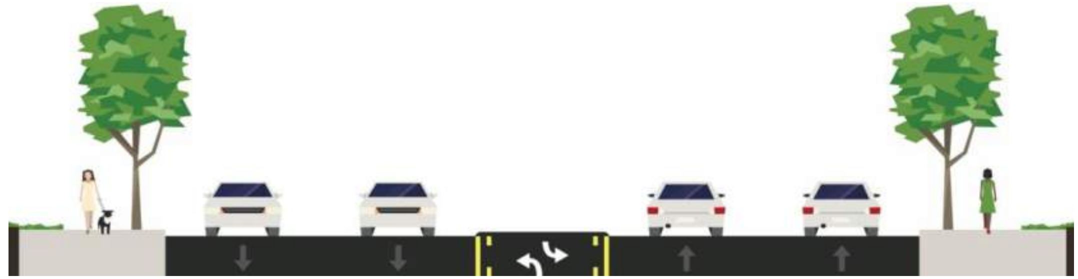


DESIGN CONSIDERATIONS

RATHBURN ROAD EAST (Ponytrail Drive to End of Cul-de-sac)

Do Nothing

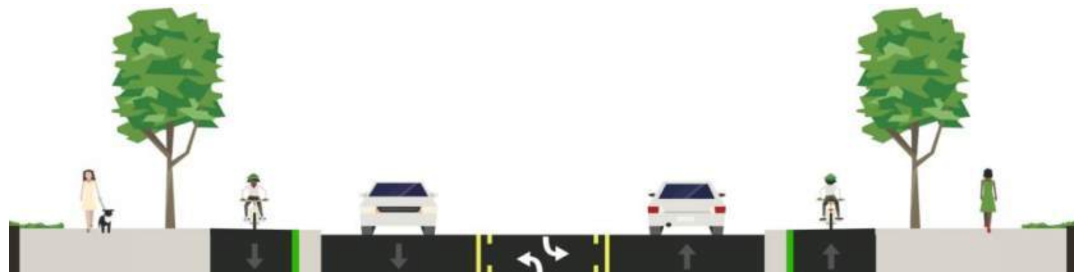
No changes to the existing cross-section
Maintain existing traffic lanes and whatever pedestrian / cycling facilities, and landscaping exist



Alternative 1

One Way Cycle Tracks

- Cyclists will be off road.
- Cyclists will be physically separated from vehicles/pedestrians.



Alternative 2

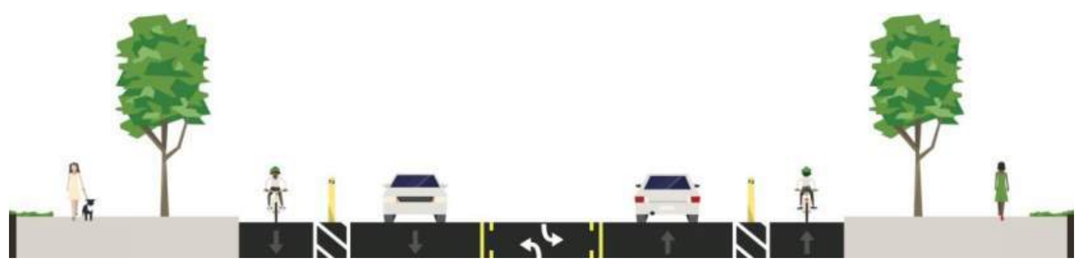
Two Way Cycle Track / Multi-Use Trail

- Cyclists will be in the boulevard, behind the curb with some separation from the sidewalk and pedestrians.

Alternative 3

Separated Bike Lanes

- Cyclists will be on-road.
- Cyclists will be separated from traffic by a buffer and bollards.
- Cyclists will be physically separated from pedestrians.



ASSESSMENT OF ALTERNATIVES

RATHBURN ROAD EAST (Ponytrail Drive to End of Cul-de-sac)

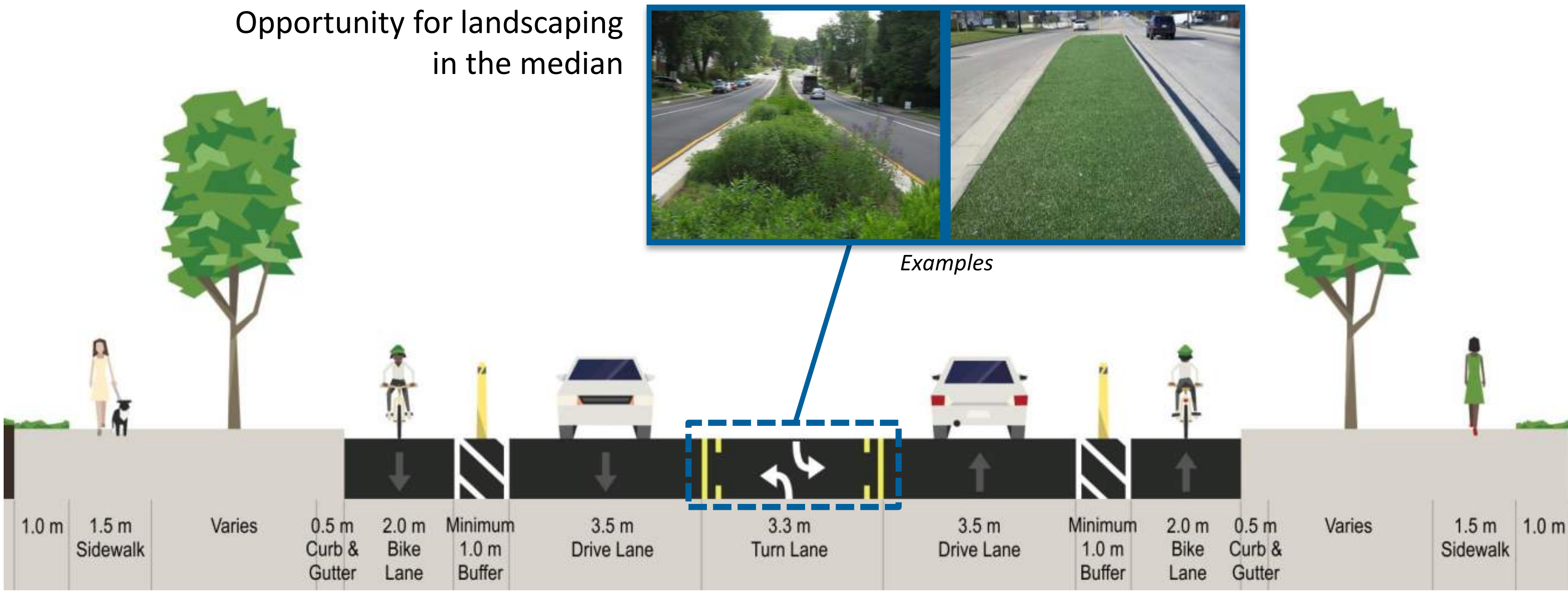
Criteria	Do Nothing	Alternative 1	Alternative 2	Alternative 3
	• 4 lanes • No bike lanes	• 2 lanes • In-boulevard Cycle Tracks • 1 way / each direction	• 2 lanes • 2 way Cycle Tracks / Multi Use Trail • Physically Separated from Vehicles	• 2 lanes • On Road Bike Lanes • 1 way / each direction
Socio Economic	🔴	🟡	🟡	🟢
Traffic and Transportation	🔴	🟢	🟢	🟢
Urban Design	🟡	🟡	🟡	🟡
Utilities	🟡	🟡	🔴	🟡
Costs	🟢	🟠	🔴	🟡

Most Benefit / Least Impacts 🟢 🟡 🟠 🔴 Least Benefit / Most Impacts

Preliminary Preferred

PRELIMINARY PREFERRED DESIGN CONCEPT

(ALTERNATIVE 3) - RATHBURN ROAD EAST (Ponytrail Drive to End of Cul-de-sac)



Note: Preliminary Preferred Design Concept will be subject to refinement based on input from members of the public, stakeholders and technical agencies.

Overall, Alternative 3 is the most consistent with the City's Cycling Master Plan's vision and is less expensive compared to the other alternatives.

NEXT STEPS AND
HOW TO PROVIDE YOUR FEEDBACK

Following this PIC the Project Team will:

- Review public and agency comments
- Incorporate refinements to the preliminary plan based on public feedback
- Initiate the Detailed Design and Tender Documentation process
- Construction timing will be subject to funding availability and priorities

Your comments are welcome at any time throughout the project.

The online comment sheet will be available until **February 5, 2021** to allow us to incorporate critical information into the final stages of the study.

Attachment B

Public Information Centre Video Presentation Script

Rathburn Road East and Ponytrail Drive Integrated Road Project

Public Information Centre Script (January 22, 2021)

Slide 1 – Title Slide

Hello and welcome to the online Public Information Centre, or "PIC" for short, for the Rathburn Road East and Ponytrail Drive Integrated Road Improvement Project.

Thank you for taking the time to watch this presentation and learn more about this study! Your input is extremely valuable to us.

Slide 2 – About this Public Information Centre

Due to the current circumstances caused by the COVID-19 pandemic, this Public Information Centre (PIC) is being held exclusively online, with the information presented in this document.

Please take your time to read through the display material. To view the display boards on a PDF file, rather than in this video presentation format, please visit www.mississauga.ca/rathburn-ponytrail.

We invite you to provide any comments you may have by February 5, 2021. You may provide your comments by submitting a Comment Sheet available at www.mississauga.ca/rathburn-ponytrail. Or, you can contact the City Project Manager listed at the bottom of this slide.

Slide 3 – Purpose of this Public Information Centre

The purpose of this PIC is to:

- Provide an overview of the study purpose and study area;
- Opportunities and considerations for improvements along the study corridors;
- Provide an overview of the applicable policies;
- Review the existing conditions in the study area;
- Identify the opportunities for improvement for Rathburn Road and Ponytrail within the study area;
- Present the design concept alternatives and preliminary preferred design concept; and
- Next steps and how to provide comments

Slide 4 – Study Purpose

The City has planned for road resurfacing of Rathburn Road East and Ponytrail Drive as part of the 2021 and 2022 Annual Resurfacing program. This provides an opportunity to explore and integrate opportunities for active transportation facilities, as well as any operational improvements on these segments (for example, noise walls, intersection improvements, etc.). The proposed improvements will create a safer, more comfortable and more environmentally-sustainable environment for all road users including pedestrians and cyclists, as well as transit users.

Slide 5 –Study Area

The project study area includes Rathburn Road East, from Dixie Road to Etobicoke Creek, and Ponytrail Drive, from Rathburn Road East to Burnhamthorpe Road East.

Rathburn Road East and Ponytail Drive are designated as Major Collector roads and a key transportation link for local movement of people within the Rockwood Village neighbourhood in the City of Mississauga. Rathburn Road East and Ponytrail Drive connects to both Dixie Road and Burnhamthorphe Road East.

Within the Study area, Rathburn Road East and Ponytrail Drive have a posted speed limit of 50 km per hour.

The oldest section of Rathburn Road is east of Fieldgate Drive which was built in 1976. Over the years, Rathburn Road has gone through extensions and improvements and is in its current configuration since 1990.

Slide 6 – Opportunities and Issues

As part of the upcoming road resurfacing program, the City identified an opportunity to re-evaluate and implement roadway changes to balance the needs of all road users and improve safety. By completing these projects simultaneously, rather than staggering the construction of the road resurfacing work and other improvements, it will decrease the amount of construction and disturbance to residents and road users within and adjacent the Study area.

Through this Study, it has considered constraints within the Study area, including the ability to accommodate all modes of transportation within the limited right-of-way, as well as ensuring adequate traffic operations maintenance, the reliability of transit services and the adjacent land uses and connectivity for all modes of transportation.

Slide 7 – Planning and Policy Context

The implementation of a complete street design, including cycling facilities, is consistent with, and supported by provincial, regional and local plans and policies. Here are a number of the relevant documents.

For example, the *Provincial Policy Statement*, *A Place to Grow*, Cycle On and the 2041 Regional Transportation Plan provides provincial direction that encourages sustainable modes of transportation in suburban and urban settings.

At the regional level, the Region of Peel's Official Plan, Sustainable Transportation Strategy and Let's Move Peel promotes active transportation, and encourages and supports building safer and more environmentally-sustainable streets.

Finally, the City of Mississauga's policy plans, which include the Official Plan, the Cycling Master Plan, the Transportation Master Plan, the Strategic Plan, the Development Charges Background Study and the MiWay Five Year Transit Service Plan, all support the implementation of safe and comfortable travel for all road users, including in active transportation.

Slide 8– Mississauga Cycling Master Plan

The City of Mississauga's Cycling Master Plan, which was adopted by City Council in 2018, was completed with four major goals:

1. Improve safety for cycling;
2. Build a connected, convenient and comfortable bicycle network;
3. Increase the number of cycling trips in Mississauga; and
4. Foster a culture of cycling.

The City is envisioned to be a place where people choose to cycle for recreation, fitness and daily transportation needs. Cycling will become a way of life that supports vibrant, safe and connected communities and enhances our overall health and quality of life.

The Cycling Master Plan presents a recommended cycling network for the City of Mississauga that will meet the needs of cyclists of all ages and abilities, and support the vision of Mississauga as a city where people choose to cycle for recreation, fitness and daily transportation needs.

The Cycling Master Plan identifies cycletracks / separated bike lanes on Rathburn Road East from Dixie Road to Ponytrail Drive and on Ponytrail Drive from Rathburn Road East to Burnhamthorpe Road East.

The Cycling Master Plan also proposes bike lane cycling facilities on Rathburn Road East from Ponytrail Drive to Etobicoke Creek.

Slide 9 – Types of Cycling Facilities

The types of cycling facilities that have been identified and considered for Rathburn Road and Ponytrail include on-road separated bike lanes, and in-boulevard cycle tracks.

On-road separated bike lanes, are bicycles lanes on the road but separated from vehicular traffic by a buffer. The example on this slide shows the bike lane separated from vehicular traffic by bollards.

In-boulevard cycle tracks are bike facility that are in the boulevard area behind the curb of the road. The example on this slide shows the cycle track behind the curb, and highlighted by coloured concrete.

These types of cycling facilities have been considered best practice locally, nationally and internationally.

Slide 10 – Existing Conditions

This map illustrates the different types of land use in the study area.

From the plan, you can see that there is a multitude of land uses within and adjacent to Study area, including residential (in yellow and in coral), mixed use (in light magenta), (commercial in dark purple), open space and greenlands (in green) and office (in light purple). The Study considers the road users who are travelling to and from these land uses, who will be using driving or walking or cycling on Rathburn Road East and Ponytrail Drive.

The connection to Etobicoke Creek trail as well as connections to other existing and proposed cycling facilities and trail facilities are being considered.

Given the adjacent land uses, and the need to support all modes of transportation, a complete street design approach has been applied when considering improvements to Rathburn Road East and Ponytrail Drive.

Slide 11 – Existing Corridors

Those of you who are local area residents may be familiar with the study area already. This figure illustrates the existing road and signal faculties on Rathburn Road East and Ponytrail Drive within the Study area. The Study corridor include:

- Numerous commercial and residential driveways
- 3 uncontrolled trail crossings – Utility Trail Crossing and Lorrie Mito Trail on Rathburn Road East, and Shaver Trail on Ponytrail Drive
- 4 off-road trail connections – Utility Trail Crossing and Lorrie Mito Trail on Rathburn Road East, and Shaver Trail and Etobicoke Creek Trail on Ponytrail Drive
- 2 boulevard multi-use trail connections – Dixie Road and Burnhamthorpe Road East
- 14 bus stops (7 pairs), including 3 pairs with no formal street crossing

Slide 12 – Existing Corridors

This figure illustrates the existing rights-of-way widths, the number of lanes and the location of the median on Rathburn Road East and Ponytrail Drive between Dixie Road and Burnhampthorpe Road. In general, the rights-of-way widths range from 30 metres to 35 metres. Within the rights-of-way, there are two lanes in each direction, which some segments that have a wide centre median. There are large trees in the wider boulevard on Rathburn Road East from Dixie Road to Fieldgate Drive.

Slide 13 – Existing Corridors

This figure illustrates the existing rights-of-way widths, the number of lanes, the location of the median, and connections to trails on Rathburn Road East between Ponytrail Drive and Etobicoke Creek. In general, the right-of-way varies from 30 metres to 35 metres. There are two lanes in each direction, which are divided by a wide centre median. Rathburn Road East terminates at the Etobicoke Creek, where there is a connection to Etobicoke Creek Trail.

Slide 14 – Traffic Analysis – Existing Conditions

A traffic analysis was completed to look at the existing and traffic future conditions of Rathburn Road and Ponytrail within the study area. This allows us to understand how the corridors are operating and how the proposed improvements to the road may impact the operating conditions in the future.

As shown on this aerial photo, from west to east, the key intersections on Rathburn Road East and Ponytrail Drive that were assessed are as follows:

1. Rathburn Road East and Dixie Road
2. Rathburn Road East and Fieldgate Drive
3. Rathburn Road East and Ponytrail Drive
4. Ponytrail Drive and Maple Ridge Drive/Lookout Cort
5. Rathburn Road East and Bough Beeches Boulevard East

The green circles and green segment indicate that there is no congestion under existing conditions.

Improvements to these intersections were proposed with the safety of the pedestrians and cyclists in mind while maintaining vehicular traffic flows at an acceptable level. The improvements considered include the removal of channelized right turn lanes or dedicated right turn lanes to reduce the crossing length for pedestrian at the intersection and reduce conflict between cars and pedestrians.

Slide 15 – Traffic Analysis – Future Conditions

As a continuation from the previous slide, this figure looks at the operation of the intersections with the proposed improvements at the respective intersections, and for the road segment of Rathburn Road East from Ponytrail Drive to Etobicoke Creek.

The proposed intersection and road segment improvements are intended to provide safe and convenient crossing opportunities at intersections, as well as to better support active transportation use. The safety features that are being introduced include the removal of channelized right turn lanes, adjusting curbs and dedicated cycling lanes through the intersections.

From west to east, these are the proposed roadway improvements for the following intersections:

1. At Rathburn Road East and Dixie Road: the removal of channelized right turns from all the approaches
2. At Rathburn Road East and Fieldgate Drive: the removal of dedicated right turn lanes in the eastbound and westbound directions
3. Rathburn Road East and Ponytrail Drive: the removal of channelized right runs from the westbound and southbound directions
4. Ponytrail Drive and Maple Ridge Drive/Lookout Court: the removal of dedicated right turn lane in the eastbound direction
5. Rathburn Road East and Bough Beeches Boulevard East: operating with an “all-way” stop control

The results of the modelling under future conditions with the proposed improvements at the intersections and with signal optimization, indicated that all the intersections will not have any congestion. This is represented with the green circles at the intersections. The only exception is at the Dixie Road and Rathburn Road East intersection where we are seeing some congestion in the model, which is represented by the yellow circle at this intersection.

The proposed improvements for the road segment of Rathburn Road East, from Ponytrail Drive to Etobicoke Creek, is to reduce from a 4-lane to 2-lane cross-section with provisions of bicycle lanes in both directions.

Based on the traffic analysis, it indicated that the proposed improvements at the respective intersections and reduction of Rathburn Road from 4 to 2 lanes east of Ponytrail Drive, would not result in congestion along the corridor.

Slide 16 – Design Considerations – Noise Walls

The design team will be looking at ways to improve the aesthetics of the corridor by considering urban design elements that can be incorporated to create more vibrant and inviting environment.

The City recently completed a noise assessment for both road corridors and identified gaps in the noise wall infrastructure. As seen in this aerial figure, the identified gaps include all four quadrants at the intersection of Rathburn Road and Fieldgate Drive. The type of noise wall will be developed as the design progresses and will be selected from the City's approved products list

Noise walls can provide an audible reduction in roadway traffic noise to residences directly behind the barrier. Noise barriers can be designed to be aesthetically pleasing from both the roadway and property owner sides of the barrier.

Slide 17 – Design Considerations – Roundabouts

The project team looked at different intersection designs to provide vehicular, cyclists and pedestrians movements through the Rathburn Road East and Ponytrail Drive intersection. A 2 lane roundabout with in boulevard cycle and pedestrian facilities was considered but ultimately maintaining the conventional intersection and removing the channelized right turn lanes and providing separate facilities for cycling and pedestrians was chosen as the preferred option.

The “Removal of Right Turn Channels” alternative is less costly and has no impacts to adjacent properties. Another factor was that the community may be unfamiliar with Multi-lane roundabouts and therefore would create a more complex environment for pedestrians and cyclists crossing the multi-lane roundabout.

Slide 18 – Potential Pedestrian Crossings Improvements

To improve the safety and comfort for pedestrians, several types of pedestrian crossing design were considered including refuge islands, pedestrian crossovers or signalized crossings.

Refuge islands provide pedestrians a safe spot, to concentrate on crossing one direction of traffic at a time. Pedestrian crossovers provide pedestrians priority, while vehicles must yield to them. Finally, signalized crossing are the popular crossing designs that provide pedestrians with priority while crossing when they are given the traffic signal to cross.

Slide 19 – Pedestrian Crossing Locations Evaluation

After a review of where pedestrians may travel or cross Rathburn Road and Ponytrail Drive, the project team carried out an evaluation of where pedestrian crossing locations may be improved. The criteria included in the evaluation include safety, where pedestrians will most likely cross the road, traffic operations, width of the road, proximity to signalized road crossing and costs.

This Figure shows which locations on Rathburn Road East and Poyntrail Drive were considered for the pedestrian crossing evaluation.

Based on the findings, a signalized pedestrian crossing at the recently constructed multi-use trail within the hydro corridor between Fieldgate Drive and the Rathburn Road East / Ponytrail intersection is proposed.

Slide 20 – Pedestrian Crossing Locations Evaluation

This Figure shows the location on Rathburn Road East east of Poyntrail Drive where a pedestrian crossing evaluation was carried out.

The recommended improvements is a proposed all-way stop condition at the intersection of Rathburn Road East and Bough Beeches Boulevard.

Slide 21 – Preferred Preliminary Design Concept

In addition to identifying locations for pedestrian crossing improvements, improvements for cyclists on Rathburn Road East / Ponytrail Drive were also reviewed. This Figure illustrates the preferred preliminary design concept and where there are proposed changes to the road cross section.

A one way 2 metre wide cycle track is proposed on each side of the boulevard. The cycle tracks are separated from vehicular traffic by the curb and gutter and are physically separated from the pedestrian traffic by a wide boulevard.

In this cross section, the green boxes indicate that the existing sidewalks and roadway will remain in the preferred preliminary design concept. The red boxes indicate where the proposed 2 metre wide cycle tracks will be located in the boulevard.

Slide 22 – Design Considerations

For Rathburn Road East, east of Ponytrail Drive, findings in the traffic analysis indicated that traffic volumes are very low in this area. There are opportunities to reduce the number of lanes on the road and provide cycling facilities within the existing road right-of-way.

This Figure illustrates the design alternatives that were considered.

The first alternative is “Do Nothing” which is the existing cross section of the road with no changes.

The next three design alternatives all proposed a reduction from 4 lanes to 2 lanes:

Alternative 1 proposes a one way, 2 metre wide cycle track and side walk on each side of the boulevard. This alternative proposes a left-turn lane to replace the existing a raised concrete median, in order to provide access to side streets. There will be landscaping between the cycle tracks and the sidewalks.

Alternative 2 proposes a two way cycle track / multi-use trail in the boulevard physically separated from both vehicular traffic and pedestrians. This alternative would require a complete reconstruction of the roadway. The centre left-turn lane will provide access to side streets. This alternative proposes landscaping between the vehicular lanes and the boulevard cycle tracks on the east side, and between the cycle tracks and the sidewalks on the west side.

Alternative 3 proposes an on-road bike lanes on both sides of the road. In this alternative, the cyclists are separated from vehicular traffic by a painted buffer on the road complete with collapsible bollards. The cyclists are physically separated from pedestrians. This alternative provides an opportunity to create some landscaping on the existing median with low-lying shrubs and / or grass.

Slide 23 – Assessment of Alternatives

The Alternatives were assessed utilizing the following criteria:

- Socio-Economic or how it impacts the existing surroundings and provides or improves the complete street approach
- Traffic and Transportation or how it affects vehicular traffic and benefits all corridor users
- Urban Design or available opportunities for aesthetic improvements
- Utilities or impacts to existing infrastructure
- Costs

Based on the assessment of alternatives, Alternative 3 ranked the best overall when considering all the criteria. It was identified as the preliminary preferred design concept.

Slide 24 – Preliminary Preferred Design Concept (Alternative 3)

Overall, Alternative 3 is the most consistent with the City's Cycling Master Plan's vision and is less expensive compared to the other alternatives. It is the preliminary preferred design concept and will be subject to refinement based on input from members of the public, stakeholders and technical agencies.

As shown in the graphic, there is an opportunity to create some landscaping on the existing median with low-lying shrubs and / or grass.

Slide 25 – Next Steps and How to Provide your Feedback

What are some of your comments on the improvements proposed for pedestrians and cyclists on Rathburn Road East and Ponytrail Drive?

We encourage you to submit any comments or questions to the project team by **February 5, 2021**. You can use the comment form on the webpage for the PIC. Should you wish to provide comments in another way, please contact the City Project Manager listed in the PIC display board or on the Project website.

Following this Public Information Centre, the Project Team will:

- Review and respond to questions and comments, tracking all feedback.
- Review the design in light of comments received and make design refinements as needed.
- Initiate the Detailed Design and Tender Documentation process

The construction timing will be subject to funding availability and priorities

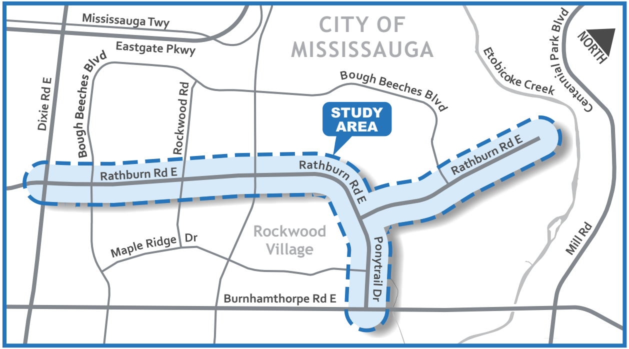
Thank you for watching this video presentation and for your interest in the Rathburn Road and Ponytrail Drive Integrated Road Project! We appreciate your time and interest in the Study.

Attachment C

Notice of Public Information Centre

RATHBURN ROAD EAST AND PONYTRAIL DRIVE

INTEGRATED ROAD PROJECT



VISIT OUR ONLINE PUBLIC INFORMATION CENTRE

The City of Mississauga has initiated a study to facilitate the planning and preliminary design for corridor improvements on:

1. **Rathburn Road East; and**
2. **Ponytrail Drive**

GET INVOLVED

Please join us in reviewing the study background, existing conditions and the preliminary plan for various improvements to the Rathburn Road and Ponytrail Drive road corridors, starting Friday, January 22, 2021.

www.mississauga.ca/rathburn-ponytrail

MISSISSAUGA

The City is keeping the community safe by complying with regional and provincial guidelines, supporting physical distancing, and postponing in person public meetings. Engagement for essential and priority projects continues online paired with universally accessible methods.

RATHBURN ROAD EAST AND PONYTRAIL DRIVE

INTEGRATED ROAD PROJECT

CANADA POST POSTES CANADA
00.00
3542460 J15@T 104949 NE014 000188 0226
L6J 4A5 2019.02.26

The online Public Information Centre Package is available for review and comment from **January 22 to February 5, 2021**, at:

www.mississauga.ca/rathburn-ponytrail

Label
(exact size)

Please share your comments via the online comment form.

For more information, please visit us at the study website above, or contact City's Project Manager, Rory O'Sullivan, directly with your questions or comments: **Rory.OSullivan@mississauga.ca** or at **311**

MISSISSAUGA

Attachment D

Rockwood Homeowners’ Association Cover Email

Falcone, Olivia

From: Falcone, Olivia
Sent: December-18-20 10:00 AM
To: joe.silva@bell.net
Cc: McLeod, Don; Rory O'Sullivan
Subject: City of Mississauga – Rathburn Road and Ponytrail Drive Integrated Road Project – Notice of Online Public Information Centre
Attachments: Rathburn Rd and Ponytrail Dr EA Study - Notice of PIC Postcard.pdf

Hello,

The City of Mississauga is undertaking a Schedule A+ Municipal Class Environmental Assessment Study for:

- Rathburn Road East from Dixie Road to Etobicoke Creek; and,
- Ponytrail Drive from Rathburn Road East to Burnhamthorpe Road East.

The City of Mississauga will provide an online Public Information Centre (PIC) package to review the study background, existing conditions and the preliminary plan for various improvements on these road corridors, and to seek input on these topics. Please refer to the attached postcard and the study website for more information. The PIC package can be found at www.mississauga.ca/rathburn-ponytrail starting on **January 22, 2021**, and will be available for review and comment until **February 5, 2021**.

You are receiving this email as you have been identified as the representative of the Rockwood Ratepayers' Association. If you are no longer the appropriate contact for the Rockwood Ratepayers' Association, please forward this email to the main contact and advise us at your earliest convenience.

If you have any questions, comments or concerns, you can reach the project team by contacting the City's Project Manager listed in the postcard.

Sincerely,

Olivia Falcone, B.ES
Transportation Planner

Planning | Transportation

T: +1 905 829 6250

610 Chartwell Road, Suite 300
Oakville, Ontario
L6J 4A5 Canada

wsp.com

Attachment E

Agencies and Utility Companies Cover Email Template and Mailing List

Falcone, Olivia

From: Falcone, Olivia
Sent: December-18-20 9:50 AM
To: daniel.sadler@mississauga.ca; stephanie.smith@mississauga.ca; sleiba@mbot.com; keith.hamilton@dpcdsb.org; Bianca.Bielski@peelsb.com; tom.howe@dpcdsb.org; paul.callanan@peelregion.ca; peter.dundas@peelregion.ca; Dana.Banke@peelregion.ca; robert.orr@peelpolice.ca; tim.beckett@mississauga.ca; asha.saddi@peelregion.ca; christina.marzo@peelregion.ca; bernadette.sniatenchuk@peelregion.ca; arthur.lee@peelregion.ca; Michael.Collens@ontario.ca; Terri.Cowan@metrolinx.com; sally.renwick@ontario.ca; maria.jawaid@ontario.ca; trevor.bell@ontario.ca; karla.barboza@ontario.ca; jackie.burkart@trca.ca; municipalplanning@enbridge.com; engineeringadmin@powerstream.ca; circulations@wsp.com; telusutilitymarkups@Telecon.ca; Utility.Circulations@Zayo.com; SecondaryLandUse@HydroOne.com; jennifer.davey@opp.ca; graham.mcpherson@rci.rogers.com
Cc: McLeod, Don; Rory O'Sullivan
Subject: City of Mississauga – Rathburn Road East and Ponytrail Drive Integrated Road Project – Notice of Online Public Information Centre
Attachments: Rathburn Rd and Ponytrail Dr EA Study - Notice of PIC Postcard.pdf

Hello,

The City of Mississauga is undertaking a Schedule A+ Municipal Class Environmental Assessment Study for:

- Rathburn Road East from Dixie Road to Etobicoke Creek; and,
- Ponytrail Drive from Rathburn Road East to Burnhamthorpe Road East.

The City of Mississauga will provide an online Public Information Centre (PIC) package to review the study background, existing conditions and the preliminary plan for various improvements on these road corridors, and to seek input on these topics. Please refer to the attached postcard and the study website for more information. The PIC package can be found at www.mississauga.ca/rathburn-ponytrail starting on **January 22, 2021**, and will be available for review and comment until **February 5, 2021**.

If this study falls under the jurisdiction of another representative of your office, please forward this email to them and advise us at your earliest convenience.

If you have any questions, comments or concerns, you can reach the project team by contacting the City's Project Manager listed in the postcard.

Sincerely,

Olivia Falcone, B.ES
Transportation Planner

Planning | Transportation

wsp

T: +1 905 829 6250

610 Chartwell Road, Suite 300
Oakville, Ontario
L6J 4A5 Canada

wsp.com

Mr. Dan Sadler
Supervisor Accessibility Planning
Mississauga Accessibility Advisory Committee
daniel.sadler@mississauga.ca

Ms. Stephanie Smith
Legislative Coordinator
Mississauga Cycling Advisory Committee
stephanie.smith@mississauga.ca

President and CEO
Mississauga Board of Trade
CEO@mbot.com

Ms. Stephanie Cox
Dufferin-Peel Catholic District School Board
stephanie.cox@dpcdsb.org

Mr. Steve Hare
Manager of Planning Services
Peel District School Board
Steve.Hare@peelsb.com

Ms. Wendy Dobson
Student Transportation of Peel Region
Wendy.dobson@peelsb.com

Mr. Paul Callanan
Director
Peel Public Health Environmental Health
paul.callanan@peelregion.ca

Chief Peter Dundas
Director of Ambulance and Emergency Programs
Peel Regional Paramedic Services
peter.dundas@peelregion.ca

Mr. Dana Banke
Supervisor, Risk and Audit
Peel Regional Paramedic Services
Dana.Banke@peelregion.ca

Inspector Rob Orr
Peel Regional Police Road Safety Services
robert.orr@peelpolice.ca

Tim Beckett
Fire Chief
Mississauga Fire and Emergency Services
tim.beckett@mississauga.ca

Ms. Asha Saddi
Technical Analyst
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Ms. Christina Marzo
Regional Municipality of Peel
christina.marzo@peelregion.ca

Ms. Bernadette Sniatenchuk
Regional Municipality of Peel
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Mr. Arthur Lee
arthur.lee@oeelregion.ca

Mr. Michael Collens
Senior Associate
Ministry of Municipal Affairs and Housing Municipal
Michael.Collens@ontario.ca

Ms. Terri Cowan
Third Party Projects Officer
Metrolinx
Terri.Cowan@metrolinx.com

Ms. Sally Renwick
Team Lead
Ministry of Natural Resources and Forestry
sally.renwick@ontario.ca

Ms. Maria Jawad
Aurora District
Ministry of Natural Resources and Forestry
maria.jawaid@ontario.ca

Karla Barboza
Ministry of Heritage, Sport, Tourism and Cultural Industries
karla.barboza@ontario.ca

Jackie Burkart
Senior Planner, Development Planning
Toronto and Region Conservation Authority
jackie.burkart@trca.ca

Jennifer Davey
Ontario Provincial Police
jennifer.davey@opp.ca

Intake Team
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SecondaryLandUse@HydroOne.com

Intake Team
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municipalplanning@enbridge.com

Intake Team
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engineeringadmin@powerstream.ca

Intake Team
Rogers
yorkcirculations@rci.rogers.com

Intake Team
Bell Canada
circulations@wsp.com

Indira Sharma
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telusutilitymarkups@Telecon.ca

Intake Team
Zayo Utilities
Utility.Circulations@Zayo.com

Attachment F

MECP Cover Email and Project Information Form

Falcone, Olivia

From: Falcone, Olivia
Sent: December-18-20 9:26 AM
To: eanotification.cregion@ontario.ca
Cc: McLeod, Don; Rory O'Sullivan
Subject: City of Mississauga – Municipal Class EA – Rathburn Road East and Ponytrail Drive
Attachments: Streamlined EA Project Information Form.xlsx; Rathburn Rd and Ponytrail Dr EA Study - PIC Postcard Notice.pdf

Hello,

Please see attached for the Streamlined Environmental Assessment (EA) Project Information Form, and the Notice of Online Public Information Centre, for the Schedule A+ Municipal Class EA Study of Rathburn Road and Ponytrail Drive, located in the City of Mississauga.

The City of Mississauga will provide an online Public Information Centre (PIC) package to review the study background, existing conditions and the preliminary plan for various improvements on these road corridors, and to seek input on these topics. Please refer to the attached postcard and the study website for more information. The PIC package can be found at www.mississauga.ca/rathburn-ponytrail starting on **January 22, 2021**, and will be available for review and comment until **February 5, 2021**.

If you have any questions, comments or concerns, you can reach the project team by contacting the City and WSP Project Managers listed in the postcard.

Sincerely,

Olivia Falcone, B.ES
Transportation Planner

Planning | Transportation

T: +1 905 829 6250

610 Chartwell Road, Suite 300
Oakville, Ontario
L6J 4A5 Canada

wsp.com
Please consider the environment before printing...

What to do:
Step 1: Look for the type of EA project in column B that applies to you.
Step 2: Complete columns C to J for that project.
Step 3: Send this form in Excel format to the MECP regional office email address where the project is located.
MECP regional office email addresses are listed at www.ontario.ca/page/preparing-environmental-assessments

	Class EA/Streamlined EA	Proponent Name	Proponent Contact	Project Name	Project Schedule	Project Type	Project Location	MOECC Region	Project Initiation Date
1	CO - Remedial flood and erosion control projects								
2	GO Transit - Class EA								
3	Hydro One - Minor transmission facilities								
4	MEA - Class EA for municipal infrastructure projects	City of Mississauga	Rory O'Sullivan, M.Sc., P.Eng., PMP Transportation Engineer City of Mississauga Transportation & Works Department 201 City Centre Drive, Suite 800 Mississauga ON L5B 2T4 Rory.OSullivan@mississauga.ca	Rathburn Road and Ponytrail Drive Integrated Road Project	Schedule A+	Municipal road projects	Mississauga, City of	Central	18/12/2020
5	Ministry of Infrastructure - Public work								
6	MNDM - Activities of the Ministry of Northern Development and Mines under the Mining Act								
7	MNRF - Provincial parks and conservation reserves								
8	MNRF - Resource stewardship and facility development projects								
9	MTO - Provincial transportation facilities								
10	O. Reg. 101/07 - Waste management projects								
11	O. Reg. 116/01 - Electricity projects								
12	OWA - Waterpower projects								
		Enter the proponent's name.	Enter the name and email address of the person who the MECP should contact about your project. This should be the same contact person who is listed on the notice.	Enter the project name as it appears on the notice.	Select the project schedule from the drop-down menu.	Select the project type from the drop-down menu.	Select the name of the municipality or unorganized/unsurveyed area where your project is located from the drop-down menu.	Select the MECP region from the drop-down menu. Read the "MECP regions" worksheet to find the MECP region where your project is located.	Enter the date that the streamlined EA process was initiated (e.g. notice of commencement). This date may be when the project notice was first published.

Attachment G

Correspondence Record

CITY OF MISSISSAUGA
RATHBURN ROAD EAST AND PONYTRAIL DRIVE INTERGRATED ROAD PROJECT
SCHEDULE ‘A+’ ENVIRONMENTAL ASSESSMENT STUDY

Correspondence Record

May 3, 2021

Table of Contents

PROPERTY OWNERS / GENERAL PUBLIC

Notification Date: January 6, 2020

The following table includes the public comments only, comments have been formatted and spelling errors corrected, otherwise the content is "as submitted".

#	Date/ Method	Name	Address / Email	Comments	Response Date/ Method	Feedback 1- No response 2- Agree 3- Agree but with some comments 4- Against	WSP Comments/Response
PO-01	December 22, 2020	Nancy Holloway	holloway1951@gmail.com	Hello Rory, I am interested in this project and would like to be added to the email list for updates. Thank you and happy holidays. Nancy	December 23, 2020 Email from City	1	Hi Nancy, Thank you for your interest in the Rathburn Road and Ponytrail Drive Integrated Road Project. We have added you to the study mailing list and we look forward to your input as the study proceeds. Happy Holidays, Rory
PO-02	March 10, 2020	Peter Day Forwarded to Project Team from the Rockwoond Homeowner's Association	ppnnday@gmail.com	Please find attached ideas for the re-imagining of Rathburn East of Ponytrail. My family has lived in the area for 30+ years and have seen a variety of traffic and pedestrian issues in the area. Of primary concern is the intersection of Rathburn and Tapestry Trail (the street I live on). As there are no sidewalks on Tapestry a number of concerns are related to traffic flow through the area. A number of people who are late or impatient turn left from Rathburn to Tapestry (even though there is a sign prohibiting the turn). This creates issues with pedestrians having to dodge traffic, especially in the winter months. Another major issue is the crossing of Rathburn from 1951 Rathburn. I have witnessed a number of closecalls with dog walkers, strollers, school buses especially in the morning or at dusk. I hope you find some of my proposal useful. I f you can't read the attachment or need further clarification please e-mail me at this address. Respectfully yours Peter Ps. check your email address shown on recent Rockwood Times. Missing 'u'	December 22, 2020 Email from City	3	Hi Mr. Day, I am the City Lead for the Rathburn Road/Ponytrail Drive Integrated project. I was forwarded the below email you had sent to the Rockwood Homeowners' Association as many of the issues are related to this project. In case you are not familiar, the Rathburn Road Integrated Road Project was initiated a few months ago by the City and is seeking to make a number of improvements for all road users, including pedestrians and cyclists, along Rathburn Road East from Dixie Road to Etobicoke Creek and along Ponytrail Drive from Rathburn Road East to Burnhamthorpe Road East. The project will follow a comprehensive planning and design process to deliver infrastructure improvements along Rathburn Road and Ponytrail Drive while protecting the established and proposed residential communities and businesses within the study area. The improvements planned for both corridors include pavement rehabilitations well as the construction of new cycling facilities, pedestrian crossings, transit infrastructure and intersection safety improvements. I have reviewed the comments you provided on the sketch attached to your original email and would like to offer the following responses: 1. Roundabout at Ponytrail Drive Intersection – The City is investigating possible improvements to the Rathburn Road/Ponytrail Drive Intersection including a roundabout alternative. 2. Provide pedestrian crosswalk opposite 1951 Rathburn - The City is assessing opportunities for additional pedestrian crossing facilities along the Rathburn Road East corridor, including a new crossing opposite 1951 Rathburn . 3. Improve safety at Rathburn Road/Tapestry Trail intersection – A road safety performance assessment of project area is being undertaken as part of the Rathburn Road Integrated Road Project and this will include a review of intersection safety improvements based on

							Ontario and North American best practices, especially with regards to Vision Zero infrastructure initiatives. 4. Two lane traffic with centre turn lane – The City is considering changes to the Rathburn Road cross section, east of Ponytrail Drive. A traffic study is underway to confirm the feasibility of reducing the number of travel lanes from four to two. 5. Provide parking on the Rathburn Road Cul De Sac – Changes to parking on Rathburn Road East is not being considered as part of the Integrated Road Project. Please note that parking on the cul de sac could interfere with the turning movements of buses and emergency vehicles. We will be holding an online Introductory Public Information Centre (PIC) for the project that will run from January 22 to February 5, 2021. The event will be hosted on the Rathburn Road and Ponytrail Drive Integrated Road Project website (www.mississauga.ca/rathburn-ponytrail) and will include some further updates on the issues you have raised above and also provide you with an opportunity to provide further feedback to the Project Team. In the meantime if you require any clarifications on my above responses or have any further questions about the project please let me know. Regards, Rory
	December 23, 2021 Email	Peter Day	ppnnday@gmail.com	Thank you for the update. Just one thing to add.... traffic calming speed bumps to eliminate speeding problems and "RACING"!!! Racing at night has been a problem for the last 20+ years. Have a great holiday season and looking forward to the uncoming year...Cheers!	January 7th 2021 Email from City	3	Hi Mr. Day, City Staff recently completed a speed study on Rathburn Road East which confirmed the speeding concerns raised by local residents. The City's current traffic calming policy only provides for the installation of traffic calming devices on local and minor collector roadways. Rathburn Road East is classified as a major collector roadway and therefore is not suitable for physical traffic calming measures due to potential negative impact on traffic movement and safety. Instead City Staff have requested that Peel Regional Police concentrate enforcement efforts in the area as scheduling and manpower permit. In addition City Staff will arrange for "Speed Awareness" device to be installed in the area to help educate and raise awareness of the operating speeds. City Staff are also hopeful that a reduction in the number of travel lanes and travel lane widths on Rathburn Road east of Ponytrail Drive, which is being planned as part of the Integrated Project, will influence vehicle operating speeds and help combat some of the speeding concerns for this area. Let me know if you have any further questions. Regards, Rory
	January 7th	Peter Day	ppnnday@gmail.com		January 8th 2021 Email from City	3	Hi Mr. Day, Given the current classification of Rathburn Road, City policy does not permit introduction of traffic calming devices even on a trial basis. The City is currently undertaking a Changing Lanes Study that is looking at developing a new City wide road classification system, to be included in Mississauga's Official Plan. It may be possible to revisit this issue in the future if this study recommends a revised classification for this section of Rathburn Road. Further information on the Changing Lanes Study can be found here. Regards,

							Rory
PO-03	December 23, 2021 Email	Frederico Turner	federicoturner@gmail.com	Dear Rory, I would like to be included on the mailing list for the study/project. Best regards, Federico Turner		1	Hello Mr. Turner. Thank you for your email. Your contact information has been added to our mailing list for future project notices. Please note that the City will be holding a further online Public Information Centre (PIC#2) for the project in early/mid June to present the preliminary preferred plan for the project. This will be online in-person meeting and the public will be able to join the meeting online or by telephone. The City will issue a notice to you a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public will also be able to visit the project website a couple of weeks in advance of the meeting to obtain further details of the meeting and learn more about the City's plans for the Rathburn Road/Ponytrail Drive road corridors. We look forward to receiving further comments from you as the project proceeds. Sincerely, Rory O'Sullivan
PO-04	December 29, 2021	Robert Smith	rjbobsmith811@outlook.com	Hello Mr. O'Sullivan: I recently received a card in the mail concerning this project. I have read the online package and you are to be congratulated for your hard work. Can you tell me what the anticipated start and completion dates would be for this project? Does this project include the repaving of Rathburn Road from Ponytrail to the Etobicoke Creek area? Regards, Bob Smith	January 8, 2021 Email from City	2	Hi Bob, Happy New Year to you. The Integrated Road Project will include pavement rehabilitation of Rathburn Road from Ponytrail to the Etobicoke Creek. Construction of the project is anticipated to commence towards the and of 2021 and be completed in 2022, subject to the approval of the project's capital budget by City Council. Please note we are still at the preliminary design stage and a detailed construction schedule has not yet been developed for the project. We will be moving forward with detail design for the project this Spring and will have a better understanding of the construction schedule at this time. Let me know if you have any further questions. Regards, Rory
PO-05	January 22, 2021	Steve Pozgaj	steve.pozgaj@rogers.com	Hello. Thank you for the opportunity to comment on the Rathburn Road East and Ponytrail Drive Integrated Road Project. While I am not a cyclist, my granddaughters most certainly are, so the overall appeal of this proposal I find quite positive. My only issue is with the proposal regarding the roundabout ... Specifically, I take umbrage with points (3) and (4), i.e. • Community is unfamiliar with multi-lane roundabouts; and • Complex environment for pedestrians and cyclists crossing multi-lane roundabout		3	Dear Mr. Pozgai, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. The alternatives for a roundabout and a conventional intersection were considered during the study. The roundabout alternative was not preferred primarily as it would have greater direct impact to existing private properties due to the larger footprint associated with a roundabout. Also when reviewing the overall life cycle cost of a potential roundabout, it was considered to be less economically desirable compared to a conventional intersection due to the implementation costs including construction, design, and utility relocations. Please note that the City will be holding a further online Public Information Centre (PIC#2) for the project in early/mid June to present the preliminary preferred plan for the project. This will be online in-person meeting and the public will be able to join the meeting online or by telephone. The City will issue a notice to the public a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public will also be able to visit the project

				These points sound, to my reading, as if you are saying that we who live here are too stupid to manage a roundabout. Seriously? When so many small towns throughout Ontario have already implemented roundabouts for decades, we in Mississauga are too stupid to utilize them? I would bet a significant number of beers that a large percentage of motorized residents has experienced roundabouts at some point. As to complexity, last winter I was in the Stouffville area, and they have a four-prong roundabout on a major Ontario highway. This three-prong proposal hardly compares in complexity. I beg to differ with your conclusion here. Roundabouts have tremendous benefit! They ... • slow down traffic - here, in particular, the "racers" often zooming on Rathburn for the Burnhamthorpe lights • diminish pollution - no more useless idling at a red light • diminish fuel usage - again, no more useless idling at a red light • improve traffic flow - no more bottlenecking/surging at a red/green light • improve urban optics - they give a softer "English country village" feel • improve safety overall - no overhead light standards to tumble onto people/cars in inclement weather • provide cost savings over lifetime of use - no electricity needed for traffic light controls With best regards, I urge you to reconsider your superficial assessment of the benefit of roundabouts. Steve Pozgaj			website a couple of weeks in advance of the meeting to obtain further details of the meeting and learn more about the City's plans for the Rathburn Road/Ponytrail Drive road corridors. Please do not hesitate to contact me if you have any further comments or questions. Thank You, Rory O'Sullivan
PO-06	January 22, 2021	Janet Tsuji	tsujijanet@gmail.com	Sorry Rory, As a homeowner in the Rathburn Road/Ponytrail Drive, I am outraged by what appears to be a huge waste of taxpayer dollars. I do not feel that this project is necessary Janet Tsuji		4	Dear Ms. Tsuji, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. The various planned improvements for Rathburn Road East and Ponytrail Drive all supported by current City plans and policies. In particular, the project is seeking to advance the City's Vision Zero policy and reduce serious injuries by prioritizing the safety and access of our most vulnerable road users. The City has planned for road resurfacing along Rathburn Road and Ponytrail Drive as part of the 2021 and 2022 Annual Resurfacing program. This has provided an opportunity to identify and implement various Vision Zero safety improvements along the road corridors including new pedestrian crossings, new cycling facilities and intersection improvements. The bundling of these projects into a single construction contract will reduce the overall construction cost of the improvements and the nuisance/fatigue for local residents.

							Please note that the City will be holding a further online Public Information Centre (PIC#2) for the project in early/mid June to present the preliminary preferred plan for the project. This will be online in-person meeting and the public will be able to join the meeting online or by telephone. The City will issue a notice to the public a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public will also be able to visit the project website a couple of weeks in advance of the meeting to obtain further details of the meeting and learn more about the City's plans for the Rathburn Road/Ponytrail Drive road corridors. Please do not hesitate to contact me if you have any further comments or questions. Thank you, Rory O'Sullivan
PO-07	January 24, 2021	Donna Porfirio	porfirios@live.ca	Hello, Please Consider the shaver trail to have curb cuts for the Bike crossing On Ponytrail as its currently dangerous with oncoming traffic to get off your bike and lift. Thank you, Donna Porfirio		2	Dear Ms. Porfirio, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. The preliminary preferred plan is proposing improvements to the refuge island crossing on Ponytrail Drive at the Shaver Trail that will include additional curb cuts. Please note that the City will be holding a further online Public Information Centre (PIC#2) for the project in early/mid June to present the preliminary preferred plan for the project. This will be online in-person meeting and the public will be able to join the meeting online or by telephone. The City will issue a notice to the public a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public will also be able to visit the project website a couple of weeks in advance of the meeting to obtain further details of the meeting and learn more about the City's plans for the Rathburn Road/Ponytrail Drive road corridors. Please do not hesitate to contact me if you have any further comments or questions. Thank you, Rory O'Sullivan
PO-08	January 23, 2021	Natalie Halff	n.halff@rogers.com	Good morning, I reviewed the on-line PIC noted above and wish to express 100% support for this project. I am a long-time Mississauga resident who walks, drives and cycles regularly. I have become a cycling advocate due to the woefully poor infrastructure in this city. The Cycling Master Plan promotes implementation of cycling infrastructure during road rehabilitation projects such as this, and is supported by numerous other city master plans (Transportation, Environment, etc.). Funding is available and city council has endorsed all master plans. This project is an excellent opportunity and in fact is critical to CONNECTING city roads with Etobicoke Creek Trail and the MUT's on Dixie and Burnhamthorpe, which are major transportation corridors. The low volume of traffic and lower speed limits in this area make it ideal for cyclists. Removing right turn lanes will allow better use of public space. I completely support installing on-road bike lanes WITH BOLLARDS (very important for safety; painted lines offer no protection); I would also support the alternative of separated cycle tracks.		2	Dear Ms. Halff, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. The preliminary design plan for the Rathburn Road and Ponytrail Drive Integrated Project is subject to Council approval. The local Councilor has been actively engaged with the project from the outset and is working with City staff to ensure the project reflects existing City plans and policies while also addressing concerns of the local community. The final design will include safety measures such as line painting at driveway crossings to alert cyclist and motorists of the potential conflict. These measures will follow the recommendations of the Ontario Traffic Manual and City standards for cycle tracks and on-street bike lanes as applicable. Please note that the City will be holding a further online Public Information Centre (PIC#2) for the project in early/mid June to present the preliminary preferred plan for the project. This will be online in-person meeting and the public will be able to join the meeting online or by telephone. The City will issue a notice to the public a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public will also be able to visit the project website a couple of weeks in advance of the meeting to obtain further details of the meeting and learn more about the City's plans for the Rathburn Road/Ponytrail Drive road corridors Please do not hesitate to contact me if you have any further comments or questions. Thank you, Rory O'Sullivan

				One barrier to this plan is the number of driveways, as anywhere vulnerable road users - pedestrians and cyclists - have to cross paths with cars creates a potentially dangerous conflict point. MORE IMPORTANTLY, driveway users are sure to raise opposition to this plan as it requires them to stop and look before speeding ahead. The way Mississauga was originally built, prioritized the car, and this must change - the mentality of residents must change - if we are to become a world class city that allows for safe, active transportation. Given our history, there is sure to be opposition from a few local residents, and their councilor will likely support them as voters, so I am very concerned that this plan may be abandoned or compromised to the point that the goals and ideals it embodies are lost. I have seen this pattern again and again in Mississauga, and it is devastating. It will be very important for the local councilor to be educated and encouraged to support this plan so they are able to deflect the anticipated criticism. All of council has supported the Cycling Master Plan and related plans outlined above, and they have approved significant funding to build cycling infrastructure (approx. $5 million/year), yet when it comes to following through on these plans, they buckle and cave to short-term interests. The city has not met any goals in the CMP since it's creation in 2018, and millions of dollars have gone unspent - this is not progress. We need LEADERSHIP on this issue. I am infuriated to see numerous lengthy studies such as this done at significant cost to taxpayers only to be abandoned for short-term political gain. I will follow this study and look forward to the city following through in it's implementation. Thank you, Natalie Halff			
PO-09	December 29, 2020	Robert Smith	rjbobsmith811@outlook.com	Hi Rory, Are any new traffic circles part of this project? Regards, Bob Smith		1	Dear Mr. Smith, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. The alternatives for a roundabout and a conventional intersection were considered during the study. The roundabout alternative was not preferred primarily as it would have greater direct impact to existing private properties due to the larger footprint associated with a roundabout. Also when reviewing the overall life cycle cost of a potential roundabout, it was considered to be less economically desirable compared to a conventional intersection due to the implementation costs including construction, design, and utility relocations. Please note that the City will be holding a further online Public Information Centre (PIC#2) for the project in early/mid-June to present the preliminary preferred plan for the project. This will be online in-person meeting and the public will be able to join the meeting online or by telephone. The City will issue a notice to the public a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public will also be able to visit the project

							website a couple of weeks in advance of the meeting to obtain further details of the meeting and learn more about the City's plans for the Rathburn Road/Ponytrail Drive road corridors Please do not hesitate to contact me if you have any further comments or questions. Thank you, Rory O'Sullivan
PO-10	January 26, 2020	Martha Derry	marthaderry@gmail.com	Hello, I'm a Rathburn east /east of Ponytrail resident... I have reviewed the online slide presentation this evening. There was a previous consideration for extending the bus route to run east down Rathburn Rd east to end of road by ravine and loop back around.... is that still a potential consideration in this road improvement plan? The roads, curbs and medians are a definite eye sore for sometime now, so looking forward to the proposed improvements. Thank you, Martha		3	Dear Ms. Derry, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. MiWay held a Public Information Centre (PICs) in October 2019 to gather input on the preferred terminus for a truncated Route 20. Two options were presented: truncate the route at the end of Rathburn Road east by the ravine or connect to Burnhamthorpe Road and truncate the route on Mill Road in Toronto. Through the PICs, overwhelming support emerged to maintain a connection to Burnhamthorpe Road so that customers will have access to Route 26 and Route 76 which provide direct service to Islington Subway Station. Given this, MiWay currently have no plans to extend Route 20 along Rathburn Road East. The scope of Rathburn Road and Ponytrail Drive Integrated Road Project will include the replacement of all curbs along Ponytrail Drive and Rathburn Road. Furthermore the Project Team has also developed a preliminary landscape plan to enhance both road corridors. We will be holding an additional online community meeting (PIC#2) in early/mid-June to update the public on the final preliminary preferred plan for the project, including the proposed landscaping improvements. The online meeting will be hosted by the City on our WebEx Meetings platform and residents will also be able to join the meeting online or by telephone. The City will issue a notice to residents a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public can also visit the project website (www.mississauga.ca/rathburn-ponytrail) a couple of weeks in advance of the meeting to obtain further details and learn more about the City's plans for the Rathburn Road corridor. Please do not hesitate to contact me if you have any further comments or questions. Thank you, Rory O'Sullivan
PO-11	January 26, 2021	Beth Patterson	beth.patterson@sympatico.ca	Hello, I reviewed the online PIC package for Rathburn-Ponytrail and had a few questions. 1. It is not clear to me what the benefit is of removing existing dedicated right turn lanes particularly at Dixie Rd. Is it because it would interfere with the proposed bike lanes? 2. Pedestrian Crossings - I support having one at the Hydro Corridor. Had you considered having one at Rathburn Rd East and Rockwood Rd (between Fieldgate and Dixie Road)? There are alot of walkers in this area - particularly with the COVID19 lockdowns. This would be another convenient way of getting across the road vs dodging the cars.	8th of March	2	Hi Beth, Thank you for your interest in the Rathburn Road and Ponytrail Drive Integrated Road Project. The removal of the channelized right turn lanes at the Rathburn Road/Dixie Road and Rathburn Road/Ponytrail Drive intersections will reduce the crossing distance for pedestrians, minimizes conflicts between vehicles, pedestrians and cyclists and slows vehicles making right turn. These improvements are in support of the Vision Zero Framework that was adopted by the City in 2018. Please note that channelized right turn lanes on Dixie Road will be replaced with traditional right turn lanes and any changes at this intersection are subject approval by the Region of Peel. The Project Team reviewed potential pedestrian crossing alternatives for the intersection of Rathburn Road and Rockwood Road intersection and confirmed that a pedestrian crossover would not be appropriate on Rathburn Road due to traffic volumes and road width. Dedicated traffic signals are also not warranted at this intersection based on available traffic data and safety information available at the time of the review. City staff will continue to monitor the intersection for opportunities in the future to provide pedestrian crossing facilities at this location. The construction schedule for the project has not yet been confirmed however City staff anticipate construction will commence no later than 2022 subject to the approval of the project's capital

				3. Timing - is the roadwork timeline dependant on the building of the proposed new condos at the "Longo's Plaza" on Rathburn Rd East. Has this been factored into the budget forecast? Thank you Beth Patterson			budget by City Council. At this time I am not aware of any potential delay to the project schedule based on the proposed new condos on Rathburn Rd East. Thanks again for comments and If you have any further questions on the Rathburn Road and Ponytrail Drive Integrated Road Project please don't hesitate to reach out to me.
PO-12	January 26, 2021	Mary Shum	maryneufeld@rogers.com	Afternoon Mr. O'Sullivan, I believe I met you last February at the BCC when the proposed changes were open to discuss and post-it note comments on the map. My apologies, I did try the link to send comments however I did not want to create a new email account. I have lived at 2120 Rathburn Road E for 12 years, my back yard faces the green entrance to the creek yellow stairs. This part of Rathburn has rarely been used by bicycles. The majority of bikes enter the park off Burnhamthorpe Road or by Maple Ridge Drive. Currently on weekends lately, and largely many days in the summer, people drive and park along the road here to walk down into the ravine. Visitors to the townhouse and apartment building also park on the street. There is very low traffic volume on this part of Rathburn. I would like to offer my opinion of "No Change" to the existing design, and that the concreate islands become "green". My main reason is the lack of bikes using this direction to access the creek via the stairs, pedestrians do. Having bike lanes would not be practical. Sincerely, Mary Shum		4	Dear Ms. Shum, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. The improvements being considered are consistent with the City's Cycling Master Plan and the City's vision for complete streets and multi-modal approach to roadway design. The proposed active transportation facilities on Rathburn Road and Ponytrail Drive will will form part of a larger City wide cycling network that will ultimately provide for the extension of cycle track/separated bike lanes all the way to Creditview Road The Project Team has developed a preliminary landscape plan to enhance both road corridors. We will be holding an additional online community meeting (PIC#2) in early/mid-June to update the public on the final preliminary preferred plan for the project, including the proposed landscaping improvements. The online meeting will be hosted by the City on our WebEx Meetings platform and residents will also be able to join the meeting online or by telephone. The City will issue a notice to residents a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public can also visit the project website (www.mississauga.ca/rathburn-ponytrail) a couple of weeks in advance of the meeting to obtain further details and learn more about the City's plans for the Rathburn Road corridor. Please do not hesitate to contact me if you have any further comments or questions. Thank you, Rory O'Sullivan
PO-13	January 26, 2021	Marc Hurbert	marchubert1@gmail.com	Rory, I am in support of your proposed changes. When is the earliest that construction could be completed? Marc Hubert		2	Dear Mr. Hubert, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. The construction schedule for the project has not yet been confirmed however City staff anticipate construction will commence in 2022 and completed sometime in 2023. This is subject to a number of considerations including approval of the project's capital budget by City Council.Please do not hesitate to contact me if you have any further comments or questions. Thank you, Rory O'Sullivan
PO-14	January 27, 2021	Bruce Matthews	bgmatthews@rogers.com	Thank you for the opportunity to provide feedback on the Rathburn Road and Ponytrail Drive Integrated Road Project. I read with fascination the contents of		3	Dear Mr. Matthews,

				the website and specifically the information package. It is evident that a great deal of research and thought went into the proposed changes. I am a resident of one of the townhouse complexes located at Rathburn Road and Fieldgate Drive. My wife and I have lived here for almost 20 years, and we regularly drive and walk along the roads within the study area. To begin, I am glad to see that resurfacing of Rathburn/Ponytrail from Burnhamthope to Dixie will be happening. It is long overdue. I agree that this resurfacing presents an excellent opportunity to reconsider the road design elements for the study area. I fully support the proposed design elements for the portion of Rathburn Road from Ponytrail Drive to the end of the cul-de-sac. The originally planned bridge over Etobicoke Creek to connect to Rathburn Road in Etobicoke is neither necessary nor desirable. The connections across Etobicoke Creek at Bloor, Burnhamthorpe, Eglinton, and Matheson are more than adequate. As the city is no doubt aware, that dead-end portion of Rathburn is something of a speedway for the residents and others who live in or service the building and townhouse complex at the extreme east end of the road. That's a major risk for pedestrians who live in the area and those who make use of Garnetwood Park. Converting this stretch to one lane in each direction, with dedicated bike lanes in each direction and an all-way stop at Bough Beeches Blvd., is perfect! The only other consideration not specifically mentioned in the materials would be to minimize the straight line portions of this section of the road. There is currently a gentle curve just east of Ponytrail and before Bough Beeches, but the portion from Bough Beeches to the end of the cul-de-sac is straight. Perhaps the new design could incorporate some gentle curves to support slower speeds. For the main stretch of Rathburn/Ponytrail from Burnhamthorpe to Dixie, I support the bulk of the proposed design elements. A roundabout at Rathburn & Ponytrail would have been nice, but I understand the limitations as described. I assume this will be a "smart" intersection with the various sensors to drive the signaling. Further, I am very glad to see the proposed removal of the slip roads for the right hand turns at that intersection. The addition of dedicated bike lanes above the curb level makes sense. My only concern about that part of the proposal is the addition of a noise wall along Rathburn at the townhouses at Fieldgate. The trees and existing wood fencing that currently exist at the Rathburn-facing			Thank you for your detailed response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. To minimize property impacts the alignment of Rathburn Road between Ponytrail Drive and its cul-de-sac will generally remain the same as existing. It is anticipated however that reducing the number and the width of the travel lanes on Rathburn Road will result in lower operating speeds The Project Team is currently developing a preliminary design for the new noise wall at the intersection of Rathburn Road and Fieldgate. While the details for the wall type and location are still being confirmed, the City typically defaults to concrete noise walls similar to the adjacent walls on Rathburn Road. Please note that the City is in discussion with the various condos boards at the moment and will only construct new noise walls at this location with their support. The construction schedule for the project has not yet been confirmed however City staff anticipate construction will commence in 2022 and completed sometime in 2023. This is subject to a number of considerations including approval of the project's capital budget by City Council. Please note there will be an additional online community meeting (PIC#2) in early/mid-June to update the public on the final preliminary preferred plan for the project, The online meeting will be hosted by the City on our WebEx Meetings platform and residents will also be able to join the meeting online or by telephone. The City will issue a notice to residents a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public can also visit the project website (www.mississauga.ca/rathburn-ponytrail) a couple of weeks in advance of the meeting to obtain further details and learn more about the City's plans for the Rathburn Road corridor. Please do not hesitate to contact me if you have any further comments or questions. Thank you, Rory O'Sullivan

				portions of these townhouse complexes create a pleasant esthetic and a real sense of neighbourhood. I assume the proposed noise wall would look like the solid barriers that now exist on either side of Rathburn from Rockwood Road east to the townhouses. In my view, these walls are ugly to begin with, they do not weather well (making them even uglier), and they create a "tunnel" effect ("nothing to see here") along the road that will encourage higher speeds by traffic on Rathburn. I am also concerned about where these walls would be located as this was not specified on the website or in the information package. Will they replace the existing wood fences? Will they be placed closer to Rathburn Road? Will any of the large pine trees along this stretch have to be removed? More information about this element of the proposal is needed. As a resident of one of these townhouse complexes, I have no issues or concerns about noise from Rathburn Road. While my unit does not back directly onto Rathburn, the front of my unit has a wide, unobstructed, line-of-sight to Rathburn via one of the driveways to the complex. Do I hear traffic on Rathburn? Yes. Is it a problem? No. Lastly, the other missing information from the website and information package relates to timing. When will the design elements be finalized? When will work commence and how long will it take to complete? Thank you again for the opportunity to provide this input. This project will significantly impact my neighbourhood and it appears that it will be largely for the better. Will the website be updated and maintained after the consultation period? It would be a great way to communicate finalized plans and schedule info. Regards, Bruce Matthews			
PO-15	January 28, 2021	Mario Manicini	mariomancini@sympatico.ca	Hi Rory, First of all, I would like to say thank you for providing the detailed proposal presentation which includes 'Rathburn Road East (Ponytrail Drive to End of Cul-de-sac)'. This is the area I am providing feedback on. I must say that after waiting 2 years for a proposal, I find this both underwhelming and lacking in creativity. If we are being directed to only consider Alternative #3, it would be very disappointing. I thought the intent was the make the area more attractive for pedestrians and cyclists to enjoy?		4	Dear Mr. Mancini, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. The Project Team has reviewed the feedback from PIC#1 and is proposing to make a number of adjustments to the final preliminary preferred design to address concerns of the local community, where possible. These adjustments include providing cycle tracks instead of cycle lanes on Rathburn Road, east of Ponytrail Drive. The Project Team has also finalized the preliminary landscape plan to enhance the corridor, including Rathburn Road east of Ponytrail Drive. We will be holding an additional online community meeting (PIC#2) in early/mid June to update the public on the proposed changes and present the final preliminary preferred plan for the project. The online meeting will be hosted by the City on our WebEx Meetings platform and residents will also be able to join the meeting online or by telephone. The City will issue a notice to residents a couple of weeks in advance of the meeting that will provide further instructions on how to

				This design (Alternative #3) does not bring any esthetic enhancement to the area. In fact, the opposite is true as the yellow collapsible bollards would introduce an eye soar! The only visual enhancement in this proposal is, "the opportunity to create some landscaping on the existing median with low-lying shrubs and/or grass." Really? Honestly, this simple tweak should have/could have been done long ago! I never understood why the median was never completed with grass or low-lying shrubs in the first place, instead of concrete and weeds. I would have expected that a proposal to enhance the area would at least introduce some mature trees in the median. Of the 3 Alternatives provided, my preference would be Alternative #1 (no bollards) with landscaping on the existing median which would include mature trees. I'm hoping we will have the opportunity for further discussions on these proposals which would include an explanation of the Assessment of Alternatives. Specifically the Socio Economic criteria, "How it impacts the existing surroundings and provides or improves the complete street approach." I would like to understand why Alternative #3 which includes yellow bollards (eye soars in my opinion) would be rated higher in the Socio Economic 'Most Benefits/Least Impacts' scale than Alternative #1. Again, thank you for the presentation and proposed options and looking forward to further discussions. Kind regards, Mario Mancini			participate. The public can also visit the project website (www.mississauga.ca/rathburn-ponytrail) a couple of weeks in advance of the meeting to obtain further details and learn more about the City's plans for the Rathburn Road corridor. Please do not hesitate to contact me if you have any further comments or questions. Thank you, Rory O'Sullivan
PO-16	January 28, 2021	Ken Mak	kmak24@gmail.com	Hello Mr. O'Sullivan, My name is Ken Mak and I live at 1951 Rathburn Road East, between Ponytail and Etobicoke Creek. It is great that we are looking to improve the Rathburn Road East area and thank you for giving residents the opportunity to be a part of the process. I reviewed the information package and overall I like the proposed design to reduce the street to 2 lanes and include separated bike lanes (Alternative 3). Here are my comments for consideration: - In your traffic analysis, I agree that there is low traffic volume going through Rathburn Road East between Ponytail and the Creek. Because of the low volume though, I've noticed that vehicle speeds tend to be higher on this road.		3	Dear Mr. Mak, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. To minimize property impacts the alignment of Rathburn Road between Ponytrail Drive and its cul-de-sac will generally remain the same as existing. It is anticipated however that reducing the number and the width of the travel lanes on Rathburn Road will result in lower operating speeds and improve the overall safety Further, while there are no recommendations at this time for a pedestrian crossing at Tapestry Trail, the project team is reviewing the potential opportunity at Shaver Trail for a refuge island type crossing. The preliminary design will be updated accordingly if it is identified as feasible and will be reviewed by City staff. Please note that the City will be holding a further online Public Information Centre (PIC#2) for the project in early/mid-June to present the preliminary preferred plan for the project. This will be online in-person meeting and the public will be able to join the meeting online or by telephone. The City will issue a notice to the public a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public will also be able to visit the project

				- I often cross Rathburn Road with my family (two young kids) across from Tapestry Trail to get to Garnetwood Park, and we're very concerned with how fast vehicles drive on this part of the road. - Because there is a slight bend on this stretch of the road, it is hard to see the vehicles coming. Often times the road looks clear, so our family starts to cross the road. Then suddenly there is a speeding car driving from the east end of Rathburn, which leads us to either go back or run across the road (depending on how far we've gone). This has me very concerned for the safety of my family, and other neighbours in my townhouse complex have expressed the same sentiment. - I hope that reducing the road to 2 lanes and adding a new pedestrian cross at Bough Beeches Blvd will help reduce vehicle speeds. - That said, there are two entrances to Garnetwood Park from Rathburn Road East: one right beside Tapestry Trail and the other across from Bough Beeches Blvd. - I understand you are proposing a pedestrian crossing at the Bough Beeches entrance to the park, so I'm wondering if there have been any considerations in having another pedestrian crossing by the other entrance closer to Tapestry Trail? I think there's value in having another pedestrian crossing there given the amount of people I've seen crossing the road in my 10 years of living in the area. Anyway, I hope you take these comments into consideration and that they are helpful. Thank you again for the opportunity. Good luck with the project! Thanks, Ken			website a couple of weeks in advance of the meeting to obtain further details of the meeting and learn more about the City's plans for the Rathburn Road/Ponytrail Drive road corridors Please do not hesitate to contact me if you have any further comments or questions. Thank you, Rory O'Sullivan
PO-17	January 28, 2021	Gord Watson	grampygord@icloud.com	Looks like we are going to spend a lot of time, money and inconvenience to the advantage of the 9 bicycle riders per day using this route! And, that includes me! The obvious answer here is to build a bridge at the end of rathburn east over the Etobicoke creek. That maybe cheaper and would address the congestion we deal with daily at Ponytrail Dr and Burnhamthorpe! I see no mention of that in this video! I've lived on ponytrail for almost 50 yrs and often think I've spent a couple years of my life sitting there waiting for the light to change! At Ponytrail south of Burnhamthorpe we need a right turn lane for those heading east.		4	Dear Mr. Watson, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. The various planned improvements for Rathburn Road East and Ponytrail Drive are all supported by current City plans and policies. The proposed active transportation facilities on Rathburn Road and Ponytrail Drive will serve local residents and also form part of a larger City wide cycling network that will ultimately provide for the extension of cycle track/separated bike lanes all the way to Creditview Road.. Etobicoke Creek is the municipal boundary between City of Toronto and City of Mississauga. Per City of Mississauga Official Plan, there are currently no plans for the extension of Rathburn Road to cross Etobicoke Creek. The construction of a westbound right turn lane at the intersection of Burnhamthorpe Road and Ponytrail Drive requires the widening of an existing large culvert on Burnhamthorpe Road. This is

				The recent reconstruction made it worse! Time to re-think this whole project to the advantage of those of us that live in the area!!			outside the scope of this project but the Project Team will review opportunities to optimize the signal timing and improve the overall operations of the intersection. Please note that the City will be holding a further online Public Information Centre (PIC#2) for the project in early/mid-June to present the preliminary preferred plan for the project. This will be online in-person meeting and the public will be able to join the meeting online or by telephone. The City will issue a notice to the public a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public will also be able to visit the project website a couple of weeks in advance of the meeting to obtain further details of the meeting and learn more about the City's plans for the Rathburn Road/Ponytrail Drive road corridors Please do not hesitate to contact me if you have any further comments or questions. Thank you, Rory O'Sullivan
PO-18	January 30, 2021	Amanda Rodrigues	manda.rodrigues@live.com	Hello, I read the consultation website for this project with great interest! Please add me to your contact list for updates; my backyard faces Rathburn where the proposed new noise wall area will go and we would like to stay up to date with consultations and info. Thanks, Amanda		2	Dear Ms. Rodrigues. Thank you for contacting the Project Team. Your contact information has been added to our mailing list. The City will be holding a further online Public Information Centre (PIC#2) for the project in early/mid June to present the preliminary preferred plan for the project. This will be online in-person meeting and the public will be able to join the meeting online or by telephone. The City will issue a notice to residents a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public will also be able to visit the project website (www.mississauga.ca/rathburn-ponytrail) a couple of weeks in advance of the meeting to obtain further details of the meeting and learn more about the City's plans for the Rathburn Road/Ponytrail Drive road corridors. We look forward to receiving further comments from you as the project proceeds. Sincerely, Rory O'Sullivan
PO-19	January 31, 2021	Kate Mason	p0108555@pdsb.net	I can see how much work has gone into this presentation. Well done. I love the idea of having plenty of trees planted in our neighbourhood. As I drive down Rathburn toward Longo's one cannot deny the lovely display they new trees there will make they are older. The city needs more trees so with the new road and road layouts this would be a wonderful opportunity to plant and enrich our Rockwood with colour and of course good for the environment. Bike lanes should be physically away from cars and pedestrians and protected. Yours sincerely, Kate Mason		2	Dear Ms. Mason, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. The Project Team has reviewed the feedback from PIC#1 and is proposing to make a number of adjustments to the final preliminary preferred design to address concerns of the local community, where possible. These adjustments include providing cycle tracks instead of cycle lanes on Rathburn Road, east of Ponytrail Drive. The Project Team has also finalized the preliminary landscape plan to enhance the corridor, including Rathburn Road east of Ponytrail Drive. We will be holding an additional online community meeting (PIC#2) in early/mid June to update the public on the proposed changes and present the final preliminary preferred plan for the project. The online meeting will be hosted by the City on our WebEx Meetings platform and residents will also be able to join the meeting online or by telephone. The City will issue a notice to residents a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public can also visit the project website (www.mississauga.ca/rathburn-ponytrail) a couple of weeks in advance of the meeting to obtain further details and learn more about the City's plans for the Rathburn Road corridor. Please do not hesitate to contact me if you have any further comments or questions. Thank you,

							Rory O'Sullivan
PO-20	January 31, 2021	Margherita Cosentino	maggie.cosentino1@gmail.com	Hi Rory, As a planner living in Ward 3 with young kids - I want the road design to included dedicated bike lanes both directions so I can bike to the Etobicoke Creek trail and into Toronto. I hope the bike lanes will be built to accommodate high volumes of cyclists because cycling will eventually become the preferred mode of transportation in the future. Kudos to your team - I am happy to see a complete streets approach is being used to guide the design. Thank You, Margherita C.		2	Dear Ms. Cosentino, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. Your comments and observations about bike lanes have been duly noted and It adds to the rationale for undertaking the improvements Please note that the Project Team has reviewed the feedback from PIC#1 and is proposing to make a number of adjustments to the final preliminary preferred design to address concerns of the local community, where possible. These adjustments include providing cycle tracks instead of cycle lanes on Rathburn Road, east of Ponytrail Drive. We will be holding an additional online community meeting (PIC#2) in early/mid June to update the public on the proposed changes and present the final preliminary preferred plan for the project. The online meeting will be hosted by the City on our WebEx Meetings platform and residents will also be able to join the meeting online or by telephone. The City will issue a notice to residents a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public can also visit the project website (www.mississauga.ca/rathburn-ponytrail) a couple of weeks in advance of the meeting to obtain further details and learn more about the City's plans for the Rathburn Road corridor. Please do not hesitate to contact me if you have any further comments or questions. Thank you, Rory O'Sullivan
PO-21	January 31, 2021	Clovis Capitani	clovis.capitani@gmail.com	Dear Rory We went thru the information package for the Rathburn Ponytrail improvement. Please find below our feedback: We are in favour of alternative #3 for the bike lane design We agree to add the Rathburn / Bough Beeches Intersection, it will be a major improvement for safety But we disagree about the noise wall addition. It is to us not of a value due to the low traffic we experience as stated in your presentation. We also think that it is a mistake not to improve the pedestrian crossing on Ponytrail and Shaver trail: it is currently not equipped with signalization, painted strips and proper way to protect ourselves while crossing. There is nothing to slow the car as well which makes it very dangerous to cross. Best regards, Clovis Capitani.		3	Dear Mr. Capitani, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. A Noise Assessment has confirmed that noise walls are warranted near the intersection of Rathburn Road and Fieldgate based on City's noise policy. Please note however that the City will only construct these new noise walls at this location if it is supported by the adjacent residents and respective condo boards. The Project Team also reviewed various pedestrian crossing alternatives at the Shaver Trail crossing It was confirmed that a pedestrian crossover would not be appropriate on Ponytrail Drive due to traffic volumes and road width. Dedicated traffic signals are also not warranted at this location based on available traffic data and safety information available at the time of the review. Instead, the Project Team has proposed to improve the existing uncontrolled crossing at this location by reducing the crossing distance and ensuring drop curbs are installed across the entire crossing. City staff will also continue to monitor this location for opportunities to provide dedicated traffic signals in the future. We will be holding an additional online community meeting (PIC#2) in early/mid June to update the public on the proposed changes and present the final preliminary preferred plan for the project. The online meeting will be hosted by the City on our WebEx Meetings platform and residents will also be able to join the meeting online or by telephone. The City will issue a notice to residents a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public can also visit the project website (www.mississauga.ca/rathburn-ponytrail) a couple of weeks in advance of the meeting to obtain further details and learn more about the City's plans for the Rathburn Road corridor. Please do not hesitate to contact me if you have any further comments or questions. Thank you, Rory O'Sullivan

PO-22	January 31, 2021	Heikki Hyvarinen	heke789@gmail.com	Dear Mr. O'Sullivan, I have reviewed the information package about Rathburn Road and Ponytrail Drive Integrated Road Project. Thank you for the level of detail that your team has provided to the public prior to the execution of the project. I wanted to bring to your attention my concern about the informal pedestrian crossing at Rockwood Road and Ratburn Road intersection. Bus stops at each side of Ratburn Road generate a lot of pedestrian traffic and pedestrians are forced to cross four lanes of traffic there. Rathburn Road traffic moves at this intersection regularly at 60 km/h, and unfortunately I see speeding taking place at this section of Rathburn Road much too often as well. If a pedestrian ended up getting hit the outcome would be very serious. I understood from the Public Information Centre that there are no plans to introduce signals in this intersection. I agree that full signals may not be needed at this intersection, but I would ask you to consider having illuminated overhead lights/warning signs and pedestrian push buttons to increase pedestrian safety. Sincerely, Heikki Hyvarinen		3	Dear Mr. Hyvarinen, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. The Project Team reviewed potential pedestrian crossing alternatives for the intersection of Rathburn Road and Rockwood Road intersection and confirmed that a pedestrian crossover would not be appropriate on Rathburn Road due to traffic volumes and road width. Dedicated traffic signals are also not warranted at this intersection based on traffic data and safety information available at the time of the review. City staff will continue to monitor the intersection for opportunities in the future to provide pedestrian crossing facilities at this location. Please note that the City will be holding a further online Public Information Centre (PIC#2) for the project in early/mid-June to present the preliminary preferred plan for the project. This will be online in-person meeting and the public will be able to join the meeting online or by telephone. The City will issue a notice to the public a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public will also be able to visit the project website a couple of weeks in advance of the meeting to obtain further details of the meeting and learn more about the City's plans for the Rathburn Road/Ponytrail Drive road corridors Please do not hesitate to contact me if you have any further comments or questions. Thank you, Rory O'Sullivan
PO-23	January 31, 2021	Mary Ellen and Michael Hubert	momstheboss1@rogers.com	Hello, I was unable to locate the Online Comment form, so instead copied the email address into email. Overall, we like the plan and are pleased to see in-boulevard cycle lanes along Rathburn (in the area east of Dixie) and the divided/bollard style seem appropriate for the section to the creek from Ponytrail. One comment regarding the median planting along the section from Ponytrail to the creek. The presentation suggests grass or shrubs, which, over time turn brown, get littered and shrubs turn scrubby and unattractive. We'd like to suggest some hardy perennial planting, perhaps similar to what is planted at Garnetwood Park, not far from this section in terms of the ability to be maintained at the same time. Further, having seen innovative ideas that Oakville has done with their Oakville Blooms initiative, why not encourage local businesses to be involved in sponsorship or at minimum, offer ideas as to the planting? Sheridan Nurseries is literally a stone's throw away and may agree to participate if cost is a factor for the city. The only other comment is about the pedestrian signalling at the hydro corridor. This signalling should be on-demand only but caution as to the operation		3	Dear Ms. Mary Ellen and Mr. Michael Hubert, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. Your comments and observations about the streetscaping and pedestrian signaling at the hydro corridor has been duly noted and will be considered by the Project Team as they finalize the preliminary design plan for the project. We will be holding an additional online community meeting (PIC#2) in early/mid-June to update the public on the final preliminary preferred plan for the project, including the proposed landscaping improvements. This will be online in-person meeting and the public will be able to join the meeting online or by telephone. The City will issue a notice to the public a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public will also be able to visit the project website a couple of weeks in advance of the meeting to obtain further details of the meeting and learn more about the City's plans for the Rathburn Road/Ponytrail Drive road corridors Please do not hesitate to contact me if you have any further comments or questions. Thank you, Rory O'Sullivan

				should be considered. This corridor is on a bend in the road and those unfamiliar with the area may come around the corner (although may not be at great speed due to the previous light) and fail to recognize the signaling in time. Just a thought... Otherwise, we like the look of this plan. Mary Ellen and Michael Hubert			
PO-24	January 27, 2021	Mark Lesiak	marojale@gmail.com	Hi Rory, Thank you for the opportunity to provide feedback on the Rathburn Road and Ponytrail Drive Integrated Road project. I am a resident at 2120 Rathburn Rd E, so I make use of these roads daily for driving, almost daily for walking, and for cycling in the warmer months. I am happy to see the changes coming, as I have had several near-miss incidents along these roads, almost always with drivers not stopping when and where they are supposed to. After reviewing the PIC content, I have a couple comments and questions. A comment regarding the roundabout at the Rathburn and Ponytrail intersection: It is disappointing to see the last two reasons that a roundabout is not recommended. They have been proven safer in many studies. I don't think community unfamiliarity with the concept should be a big factor in road planning decisions, the community will adjust to the new conditions. The roundabout at Square One Dr and Duke of York seems to have been very effective for the traffic flow and aesthetics of that area, but I know that one is a single lane only. I do understand the increased cost and property impacts. A question regarding the cul-de-sac end of Rathburn Rd E: This area sees a large amount of parking with people accessing the Etobicoke Creek trail. I have seen it full on both sides all the way to Garnetwood Chase in nicer weather, with cars frequently parked in the no parking area in the cul-de-sac. Nothing is mentioned in this PIC to address parking there, and it's especially relevant with the road being reduced to two lanes and bike lanes. I would be interested in more drawings and information as it becomes available, and would be happy to provide more feedback if it's wanted. Thanks, Mark Lesiak		3	Dear Mr. Lesiak, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. You are correct about the potential safety benefits associated with roundabouts. However, a conventional intersection was ultimately selected in this case based on cost and property considerations. . As you noted parking is prohibited in the cul de sac area and enforcement is usually the preferred approach in this scenairo , The Project Team is also reviewing options to reduce the size of the cul de sac and provide dedicated parking bays are along Rathburn Road between the cul de sac and Garnetwood Chase. It is hoped that these measures will deter vehicles parking in the cul de sac. We will be holding an additional online community meeting (PIC#2) in early/mid June to update the public on the proposed changes and present the final preliminary preferred plan for the project. The online meeting will be hosted by the City on our WebEx Meetings platform and residents will also be able to join the meeting online or by telephone. The City will issue a notice to residents a couple of weeks in advance of the meeting that will provide further instructions on how to participate.. Please do not hesitate to contact me if you have any further comments or questions. Thank You, Rory O'Sullivan
PO-25	February 1, 2021	Dale Biason	rha.executive@gmail.com	Hello Councillor and Mr O'Sullivan The Board met last night to discuss the Rathburn and Ponytrail redevelopment. As we were given no	February 2, 2021 From City	3	Dear Ms. Mary Ellen and Mr. Michael Hubert, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team.

				advanced information as to what would be presented, the very short deadline has put us at a disadvantage in responding to the proposal within the allotted timeline. We are therefore requesting an additional week to send a communication to our residents, in order to confirm that the opinion we provide conclusively reflects those of our residents. We will guarantee the community feedback not later than February 12th. A delay in giving our response would not have been necessary if instead, as per several requests, this information had been shared with us prior to the date it was posted publicly. It is also worth noting that many residents paid absolutely NO attention to the mailer, and as it arrived long before the link was active, forgotten. As this project will have a profound impact on our community, we believe that this needs to be fully vetted and that the community should have the final say in what works best for the residents of Rockwood. While the City may have a vision, it should be a vision that the neighbourhood shares and embraces as an improvement and not an encumbrance. Surely, an additional week to ensure that everyone in Rockwood Village has a clear understanding of the proposal and can voice their opinions is more than reasonable.. We would appreciate your prompt reply. Regards Dale Biason			Your comments and observations about the streetscaping and pedestrian signaling at the hydro corridor has been duly noted and will be considered by the Project Team as they finalize the preliminary design plan for the project. We will be holding an additional online community meeting (PIC#2) in early/mid-June to update the public on the final preliminary preferred plan for the project, including the proposed landscaping improvements. This will be online in-person meeting and the public will be able to join the meeting online or by telephone. The City will issue a notice to the public a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public will also be able to visit the project website a couple of weeks in advance of the meeting to obtain further details of the meeting and learn more about the City's plans for the Rathburn Road/Ponytrail Drive road corridors Please do not hesitate to contact the Project Team if you have any further comments or questions. Thank you, Rory O'Sullivan
PO-26	February 3, 2021	Victoria Preston	victoria198@hotmail.com	Good afternoon Rory, I am pleased to hear about beautifying and increasing the safety of Rathburn from Ponytrail to the creek. I have a young family and crossing over Rathburn (closest to the creek)from Garnetwood is extremely dangerous. Can the city put a crosswalk or stop sign there as well? Drivers speed up from the apartment building and townhouses at the end of Rathburn going towards Ponytrail. We requested a speed study on Garnetwood about 6-7 years ago. One of the suggestions was to put a "no right hand turn" sign for drivers coming from the dead end on Rathburn to not turn right onto Garnetwood. We have increased traffic and speeders coming along the tight turn by our house. The city did paint a line separating the two lanes but drivers now ignore it. One day there will be a head on collision there. We are pleased though that the city will be changing the four lanes of traffic on Rathburn towards the creek down to two lanes. Regards,		3	Dear Victoria, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. The Project Team has confirmed that a cross walk or stop sign is not warranted at the intersection of Rathburn Road and Garnetwood Chase at this time based on the results of the traffic and safety studies. City staff will continue to monitor the intersection for opportunities in the future to provide pedestrian crossing facilities at this location. As you noted we are proposing to reduce the number of travel lanes on Rathburn Road east of Ponytrail Drive. The preliminary preferred plan is also recommending tighter curb radii at the Rathburn Road and Garnetwood Chase intersection. These improvements will reduce crossing distances for pedestrians and also promote lower vehicle operating speeds at the Rathburn Road and Garnetwood Chase intersection Please note we will be holding an additional online community meeting (PIC#2) in early/mid June to update the public on the project and present the final preliminary preferred plan for the project. The online meeting will be hosted by the City on our WebEx Meetings platform and residents will also be able to join the meeting online or by telephone. The City will issue a notice to residents a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public can also visit the project website (www.mississauga.ca/rathburn-ponytrail) a couple of weeks in advance of the meeting to obtain further details and learn more about the City's plans for the Rathburn Road corridor Please do not hesitate to contact me if you have any further comments or questions.

				Victoria (Resident on Garnetwood chase)			Thank You, Rory O'Sullivan
PO-27	February 3, 2021	Brian Halverson	JB.Halverson@sympatico.ca	Rory Having reviewed the presentation regarding the Rathburn-Ponytrail project I want you to know that the recommendations that have been made look reasonable. I do, however have a couple of points/questions that I think are useful. The first relates to the noise walls proposed for the area of the Rathburn/Fieldgate intersection. Currently the boulevard grass areas in this section are generally maintained by the landscape contractors who are hired by the townhouse condominiums on either side of the road. They do a very good job of keeping the grass and weeds under control due to their relatively frequent visits to cut within the townhouse boundary areas. Further east along Rathburn however (east of Bough Beeches) where houses back onto the street and yards are fenced we have a situation where the boulevard areas are maintained by city staff. This results in much less frequent cutting and significant weed growth in the summer, particularly between the sidewalks and the fences. Will this become the case along the new noise barriers or will some agreement be reached with the townhouse developments in question to have them continue to maintain these boulevard areas? If not, then I expect we will see conditions similar to those further east. As to the redesign of the section of Rathburn east of Ponytrail, I wholeheartedly agree with the proposed option. It should be effective in stopping the speeding/racing that takes place there and general improve the aesthetics of the roadway. I would like to see shrubs on the median but worry about the maintenance of such and the alternative if whatever is planted there is regularly plowed under by snow clearance activity in the winter. In any event, greenery of any type would be better than the concrete islands that are in place today (and the weeds that grow up along the edges and the interior cut lines)! The main question that I have with this eastern proposal deals with the very eastern end of the roadway. Currently there is a large turning area at the head of the stairs leading down to the Etobicoke Creek Trail. This area regularly has multiple cars parked around its curb areas as people use the stairs to access the Trail (both walkers and cyclers). Will there be parking		3	Dear Brian, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. We are still reviewing the proposed noise wall on Rathburn Road, including its final location, with the various condo boards. Once the location has been confirmed we will able to establish the maintenance responsibilities for the existing boulevard. Please note will only proceed with construction of these walls if it supported by the respective condo boards. The City plans to maintain the existing parking regime on Rathburn Road. Parking will continue to be prohibited on the cul de sac but dedicated parking bays will be provided on Rathburn Road between the cul de sac and the intersection with Garnetwood Chase The Project Team is also developing a landscape plan to enhance the road corridors that will create more vibrant and inviting environment for all of the road users. Details of this plan will shared with the public at a further online community meeting (PIC#2) in early/mid June. The online meeting will be hosted by the City on our WebEx Meetings platform and residents will also be able to join the meeting online or by telephone. The City will issue a notice to residents a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public can also visit the project website (www.mississauga.ca/rathburn-ponytrail) a couple of weeks in advance of the meeting to obtain further details and learn more about the City's plans for the Rathburn Road corridor Please do not hesitate to contact me if you have any further comments or questions. Thank You, Rory O'Sullivan

				provided in this area as part of the redesign? It appears to me that having bicycle lanes on the curb sides might preclude this. That is my feedback. Hopefully it has been useful. Respectfully, Brian Halverson 4161 Marblethorne Court			
PO-28	February 3, 2021	Mark Sexsmith	marksexsmith@icloud.com	Bus stops should be indented from the roadway to minimize traffic congestion and maximize safety. New bus stops should have proper shelters (by the Plaza at the least). Traffic lights at Rathburn/Ponytrail intersection should have better traffic sensing operation.		3	Dear Mark, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. MiWay have requested on-street bus stops on Rathburn Road and Ponytrail Drive, to minimize delays' to their bus service, The Project Team is also working with MiWay to improve existing transit facilities along Rathburn Road and Ponytrail Drive, including the provision of new bus stop shelters. The pavement rehabilitation on Ponytrail Drive will include the replacement of traffic signal detection loops. The Project Team will also review opportunities to optimize the signal timing at the intersection to improve the overall operations of the intersection. Please note we will be holding an additional online community meeting (PIC#2) in early/mid June to update the public on the project and present the final preliminary preferred plan for the project. The online meeting will be hosted by the City on our WebEx Meetings platform and residents will also be able to join the meeting online or by telephone. The City will issue a notice to residents a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public can also visit the project website (www.mississauga.ca/rathburn-ponytrail) a couple of weeks in advance of the meeting to obtain further details and learn more about the City's plans for the Rathburn Road corridor Please do not hesitate to contact me if you have any further comments or questions. Thank You, Rory O'Sullivan
PO-29	February 4, 2021	Sandi Lebed	sandi.lebed@gmail.com	I don't think the creation of cycling lanes is necessary on Rathburn Rd. E and Ponytrail. The city has no money and there is nothing in this presentation that gives the cost and where this money is coming from. We should keep the dedicated right hand turn at Longos and the right hand turn from Rathburn to Ponytrail and perhaps put a pedestrian crosswalk where those right hand turns are and then pedestrians are controlled by the stop lights. That is the extent of the cost the city and we taxpayers should incur. Sandra Lebed 4169 Garrowhill Trail		4	Dear Sandra, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. The various planned improvements for Rathburn Road East and Ponytrail Drive are all supported by current City plans and policies. The proposed active transportation facilities on Rathburn Road and Ponytrail Drive will serve local residents and also form part of a larger City wide cycling network that will ultimately provide for the extension of cycle track/separated bike lanes all the way to Creditview Road. The estimated construction cost for the improvements is one of the key factors being considered when developing the preliminary plan. It is hoped that by bundling the various improvements into a single construction project that we can deliver the proposed improvements as cost effectively as possible. The Project Team has reviewed the feedback from PIC#1 and is proposing to make a number of adjustments to the final preliminary preferred design to address concerns of the local community, where possible. These adjustments include reducing the impact to right turning vehicles, We will be holding an additional online community meeting (PIC#2) in early/mid June to update the public on the proposed changes and present the final preliminary preferred plan for the project. The online meeting will be hosted by the City on our WebEx Meetings platform and residents will also be able to join the meeting online or by telephone. The City will issue a notice to residents a

							couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public can also visit the project website (www.mississauga.ca/rathburn-ponytrail) a couple of weeks in advance of the meeting to obtain further details and learn more about the City's plans for the Rathburn Road corridor. Please do not hesitate to contact me if you have any further comments or questions. Thank You, Rory O'Sullivan
PO-30	February 4, 2021	Sandy Evans	sandra.joan.evans@gmail.com	I just reviewed the Rathurn-Ponytrail project proposal. Thank you! It looks like Mississauga is taking cyclists into consideration. I was pleased with the proposal since the Rathburn between Ponytrail and the Etobicoke Creek currently looks horrible with the black curbs. I think your proposal will certainly improve the esthetics. The only small concern I have is I am a bit worried about eliminating the dedicated right turn lane from Ponytrail onto the Rathubrun Road but maybe it will be OK.		3	Dear Sandy, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. The Project Team has reviewed the feedback from PIC#1 and is proposing to make a number of adjustments to the final preliminary preferred design to address concerns of the local community, where possible. These adjustments include reducing the impact to right turning vehicles, We will be holding an additional online community meeting (PIC#2) in early/mid June to update the public on the proposed changes and present the final preliminary preferred plan for the project. The online meeting will be hosted by the City on our WebEx Meetings platform and residents will also be able to join the meeting online or by telephone. The City will issue a notice to residents a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public can also visit the project website (www.mississauga.ca/rathburn-ponytrail) a couple of weeks in advance of the meeting to obtain further details and learn more about the City's plans for the Rathburn Road corridor. Please do not hesitate to contact me if you have any further comments or questions. Thank You, Rory O'Sullivan
PO-31	February 4, 2021	Marylee Farrugia and Randy Rason	maryleefarrugia@sympatico.ca	Good evening Rory, We reside at 1881 Unicorn Court in Mississauga and have lived at this location for approximately 30 years. Over the past few years, there has been increasing traffic and noise in the area and as you are aware, there are also approved plans underway for additional density with the introduction of two new high rise condo towers (Chelsea on the Green - each tower to have 12 storeys with 153 suites) facing onto Rathburn Road East near Tapestry that is situated behind our backyard. We note that the online PowerPoint presentation identifies noise walls to be installed at the intersection of Fieldgate Dr. and Rathburn Rd. Given this intersection is in the middle of the Rathburn-Ponytrail Study area, it would seem logical that the same volume of traffic (noise) coming into that intersection or exiting that intersection is travelling to either exit point ie Rathburn and Dixie or Ponytrail and Burnhamthorpe. We can attest to the increased noise and airborne dirt in our backyard that backs onto Ponytrail over the past few years. We recommend that the noise wall be extended along Ponytrail to Burnhamthorpe to account for cut-through traffic from Dixie to Burnhamthorpe.		3	Dear Marylee Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. City staff have reassessed the noise impacts to your property and have confirmed that installation of new noise wall barrier is warranted based on City noise wall policy. Staff from the City's noise wall group will be reaching out to you in the coming month with some additional details and to confirm you support for the construction of the wall. I can confirm that the scope of project will include the replacement of all curbs along Ponytrail Drive and Rathburn Road. The Project Team has also developed a preliminary landscape plan which is based on many of the considerations you have outlined in your below email. We will be holding an additional online community meeting (PIC#2) in early/mid-June to update the public on the final preliminary preferred plan for the project, including the proposed landscaping improvements. The online meeting will be hosted by the City on our WebEx Meetings platform and residents will also be able to join the meeting online or by telephone. The City will issue a notice to residents a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public can also visit the project website (www.mississauga.ca/rathburn-ponytrail) a couple of weeks in advance of the meeting to obtain further details and learn more about the City's plans for the Rathburn Road corridor. Please do not hesitate to contact me if you have any further comments or questions. Thank You, Rory O'Sullivan

				Also, we recommend that all existing centre islands/medians in the roadways have their curbs properly remediated following the recent Regional sewer infrastructure work. I would encourage the Planners to find a design to green them with trees and other green environmental sustainable vegetation on all existing islands that: 1. are vital to pedestrian and vehicle safety when crossing the road 2. help reduce the noise from traffic 3. help with storm water run off and management 4. will create an aesthetically pleasing design that will help serve as the gateways that define the neighbourhood and Mississauga overall. Thank you for the opportunity to comment on the proposed plan. We trust that serious consideration will be given to our comments. If you have any questions regarding our comments, please do not hesitate to contact us at 905 629 1904. Marylee Farrugia & Randy Rason			
PO-32	February 5, 2021	Lorne Swan	lswan@demstrat.com	Referencing the Study Information Package, here are my comments. P 17 I agree with eliminating the right turn channel from the cul-de-sac portion of Rathburn onto westbound Rathburn so long as two traffic lanes are maintained to the intersection so that right turning vehicles are not impeded by left turning vehicles waiting for a green light. I disagree with eliminating the right turn channel from Ponytrail onto Rathburn, unless a separate right turn lane is added, similar to that on westbound Burnhamthorpe at Ponytrail. Otherwise, a vehicle that is not turning right stopped at a red light in the right lane delays those behind who intend to turn right. Loss of that right turn channel without a compensating right turn lane will lead to increased traffic on Tapestry Trail as people use it to avoid delays at the Ponytrail/Rathburn intersection. P 19 I strongly oppose a “signalized crossing” for pedestrians at the multi-use trail on the hydro lands but would support the ultimate installation of a “pedestrian crossover”. I’m not sure of the reason for Mississauga’s reticence to use these on four lane roads - they are all over Toronto. There are two problems with a signalized crossing. First, the light shows red for traffic much longer than is needed for most people to make the crossing, thus unnecessarily delaying traffic long after the pedestrian has crossed. Second, at most times of the day when traffic on		3	Dear Ms. Swan, Thank you for your detailed response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. The various planned improvements for Rathburn Road East and Ponytrail Drive are all supported by current City plans and policies. The proposed active transportation improvements east of Fieldgate will serve residents in the area and provide a more direct connection to the larger City wide cycling network that will ultimately extend all the way to Creditview Road. The Project Team did consider various pedestrian crossing alternatives for the Hydro corridor crossing. The City does not typically provide pedestrian crossover facilities on our major collector or arterial roadways in accordance with Ontario’s best practices. Furthermore the expected traffic volumes and crossing distances at this location would also make a pedestrian crossover less desirable. Following the feedback we received from PIC#1 we are proposing to make a number of adjustments to the final preliminary preferred design to address concerns of the local community, where possible. These adjustments include providing a westbound dedicated right turn lane at the Rathburn Road and Ponytrail Drive intersection; and providing cycle tracks instead of cycle lanes on Rathburn Road, east of Ponytrail Drive. We will be holding an additional online community meeting (PIC#2) in early/mid-June to update the public on the proposed changes and present the final preliminary preferred plan for the project. The online meeting will be hosted by the City on our WebEx Meetings platform and residents will also be able to join the meeting online or by telephone. The City will issue a notice to residents a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public can also visit the project website (www.mississauga.ca/rathburn-ponytrail) a couple of weeks in advance of the meeting to obtain further details and learn more about the City’s plans for the Rathburn Road corridor. Please do not hesitate to contact me if you have any further comments or questions.

				Rathburn is not particularly heavy, the time it takes for the light to change after the button is pushed is long enough that most people won't wait for the light if they have a clear way to cross. And then when the light does finally change, there is no-one to cross. At this point, no one has any idea how much use will be made of the new hydro trail, so until that can be measured, a refuge island would be perfectly adequate with upgrade to a crossover if and when volumes require. P 20 An "all way" stop at Bough Beeches would go some way towards reducing traffic speeds on the cul-de-sac portion of Rathburn. P 21 No serious concerns about this part of the proposal between Dixie and Fieldgate, although without an extension of the bicycle right-of-way westward on Rathburn from Dixie, it seems to be rather orphaned. There is little justification for continuing that eastward from Fieldgate. The vast majority of people who will be using this will be travelling either to or from the Garnetwood/Fleetwood/Etobicoke Creek park system or the Burnhamthorpe bicycle path, all of which can be easily reached using the existing Mitoff (not Mito as your maps show!) or Shaver Trails which are much safer than any road sharing facility. Although not part of this study, that assumes that a bicycle lane is added to Fieldgate (as shown on page 8) to make both those connections and to the Tahoe transit stop and the schools south of Burnhamthorpe. PP 22-24 Based on traffic volumes, observed bicycle traffic and the width of the road, I see no purpose for adding bicycle lanes to this section of Rathburn. As mentioned above, most bicycle traffic in this area will be going to or coming from the Garnetwood/Fleetwood/Etobicoke Creek park system or the Burnhamthorpe bicycle path. These are all essentially east-west movements. This part of Rathburn runs at right angles to that traffic and therefore has little potential for significant bicycle traffic. The one limited exception to this is the access to the Etobicoke Creek trail, but this involves lugging your bicycle up or down a long flight of stairs. East-west bicycle traffic is best accommodated using the existing Shaver, Mitoff or Burnhamthorpe bicycle trails and one on this part of Rathburn would add little usefulness to that. Having made my opinion clear on that matter, let me address the options which would apply if the city insists on installing such a facility on this part of Rathburn. Alternative 2 is by far the least dangerous to cyclists. Consider the following:			Thank You, Rory O'Sullivan

				Vehicle access points: East side residential: Tapestry Trail, Garnetwood Chase (and access to Garrowhill Trail) and 2121 Rathburn (total of about 300 residential unit) West side residential: 1951 Rathburn, Garnetwood Chase and 2021 Rathburn (total of about 375 residental units) East side non-residential: Parking lot at Garnetwood Park (holds up to 40 vehicles) West side non-residential: two very busy entrance/exit points to Kingsbury Plaza, Bough Beeches Blvd. Residential accesses on the west side are about 25% higher than on the east side, but more significantly, the volume of non-residential traffic is enormously greater on the west side. Turning directions: Traffic turning into the roadway at the various access points is doing so from a full stop in most cases and yielding the right of way otherwise. This will apply to virtually all traffic heading south (towards Ponytrail). On the other hand, exiting into these access points is done by only slowing from normal speed sufficiently to make the turn safely, thus at a higher speed than those entering. This applies to virtually all vehicles heading north (towards the cul-de-sac). Left turns are more dangerous as they require attention to oncoming vehicles as well as pedestrians, while right turns are only concerned with pedestrians. As shown in the access data above, the frequency of left turns vs right turns for northbound residential traffic is 25% higher on the west side, but for non-residential (the plaza and Bough Beeches) it is very significantly higher. Statistically then, cyclists will be in much greater danger at vehicle access points in a bicycle lane on the west side than on the east side. This danger can be ameliorated by putting both directions of bicycle traffic on the east side. Incidentally, this would also provide direct access to Garnetwood Park and onwards from both directions without having to cross Rathburn. One other consideration is snow clearing. Having the bicycle lanes only on one side will only require special removal of snow on the east side of the street; on the west side, it can be plowed off onto the boulevard as is now the practice. Lorne Swan (31-1951 Rathburn Rd E)			
PO-33	February 5, 2021	Josh Rypan	hudsynsloanelogan@gmail.com	Hello,		3	Dear Mr. Rypan,

				I would like to provide some feedback regarding this project. After reviewing the video and documents I approve these changes happening to the street and area. However, I do have a couple of concerns, one that has been passed over and two that haven't been brought up at all. First, I think it is very important to have a new intersection with lights at the corners of Rathburn Rd and Rockwood Rd. Having young children myself along with a growing number of children living in the area south of Rathburn Rd on Rockwood Rd, we cross to the north side of Rathburn Rd to get to Sts. Martha & Mary School. Also, as I drive daily on these roads I see numerous people crossing at this location, probably because the next closest safe crossings are 400m in each direction. There are also bus stops at this location, another reason why people are constantly crossing at this intersection. I think it would be the safest action for the city to install lights at this intersection. Next, I think it would be in the safest interest of both pedestrians and drivers to have the walking countdowns where traffic lights are installed. Currently they do not exist at the Rathburn Rd and Fieldgate Rd location, as well as at the Rathburn Rd E and Ponytrail Dr location. Numerous times I have crossed at the Rathburn Rd and Fieldgate Rd intersection with my children only to find the lights changing red too quickly for us to safely cross. If this is happening to us, I suspect it is happening to many other families and children who are living in the immediate area. And lastly, the timing of the lights heading southbound on Ponytrail Dr and heading eastbound on Burnamthorpe Rd; the wait times at these lights seem way longer than the norm. I take this route daily and always seem to be waiting forever at these lights while there is never any east/west bound traffic on Burnamthorpe Rd. These lights are also timed the same no matter what time of day it is during the weekdays. I have noticed on the weekends that these times do adjust to change a little quicker which should be the way on the weekdays too. There is hardly the amount of traffic east/west bound on Burnamthorpe to justify waiting so long at these lights. Vehicles are constantly making a westbound turn on Burnamthorpe just to then do a u-turn and head eastbound knowing how long these lights take to change which creates a huge potential for an accident. Being a first responder myself in a busy area, I see a lot of accidents first hand that happen at intersections and roadways all the time. A lot of the times these accidents can be easily avoidable by proper city			Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. At this time, new traffic signals are not warranted at the Rathburn Road and Rockwood Road intersection based on the results of the traffic and safety analysis completed by the Project Team. The City will continue to monitor this location for opportunities to provide dedicated traffic signals in the future. All improvements to signalized intersections will be AODA compliant. The Project Team will also review potential changes to signal timing at the Ponytrial Drive and Burnhamthorpe Road intersection to to improve the overall operations of the intersection. Please note we will be holding an additional online community meeting (PIC#2) in early/mid-June to update the public on the the final preliminary preferred plan for the project. The online meeting will be hosted by the City on our WebEx Meetings platform and residents will also be able to join the meeting online or by telephone. The City will issue a notice to residents a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public can also visit the project website (www.mississauga.ca/rathburn-ponytrail) a couple of weeks in advance of the meeting to obtain further details and learn more about the City's plans for the Rathburn Road corridor. Please do not hesitate to contact me if you have any further comments or questions. Thank You, Rory O'Sullivan

				planning. Please take these suggestions under serious consideration as you make your decision on the future safety of my neighbourhood for my family and friends. Thank you, Josh Rypan 4152 Colfax Crt, Mississauga L4W 4C9			
PO-34	February 5, 2021	Rojnica, Lillian	l.rojnica@sympatico.ca	The stretch of Rathburn Rd. East of Ponytrail has always been very attractive with the wide road and Garnetwood Park on the south side. I am concerned about the alternative (3) which involves creation of bike lanes separated from traffic by bollards. These bollards are UGLY. They would also present a challenge to cleaning snow from the path in the winter, where they could easily be damaged. Please consider one of the other alternatives. In planning for congestion in the future, was there consideration of the sizeable development planned on Ponytrail Dr. across from Tapestry Trail? Thank you for your consideration, Lilly Rojnica		4	Dear Mr. Rojnica, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. A traffic study was completed as part of the overall study to look at the existing and traffic future conditions of Rathburn Road and Ponytrail. This analysis included the proposed redevelopment of 1850 Rathurn Road (Chelsea on the Green development) The Project Team has reviewed the feedback from PIC#1 and is proposing to make a number of adjustments to the final preliminary preferred design to address concerns of the local community, where possible. These adjustments include reducing the impact to right turning vehicles, and providing cycle tracks instead of cycle lanes on Rathburn Road, east of Ponytrail Drive. The Project Team has also finalized the preliminary landscape plan to enhance the corridor, including Rathburn Road east of Ponytrail Drive. We will be holding an additional online community meeting (PIC#2) in early/mid June to update the public on the proposed changes and present the final preliminary preferred plan for the project. The online meeting will be hosted by the City on our WebEx Meetings platform and residents will also be able to join the meeting online or by telephone. The City will issue a notice to residents a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public can also visit the project website (www.mississauga.ca/rathburn-ponytrail) a couple of weeks in advance of the meeting to obtain further details and learn more about the City's plans for the Rathburn Road corridor. Please do not hesitate to contact me if you have any further comments or questions. Thank You, Rory O'Sullivan
PO-35	February 5, 2021	Dwayne T	windough2000@hotmail.com	Hi Rory, I think bike lanes on Rathburn Rd E is a great idea. Thanks, Dwayne		2	Dear Mr. T, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. Please note we will be holding an additional online community meeting (PIC#2) in early/mid-June to update the public on the final preliminary preferred plan for the project. The online meeting will be hosted by the City on our WebEx Meetings platform and residents will also be able to join the meeting online or by telephone. The City will issue a notice to residents a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public can also visit the project website (www.mississauga.ca/rathburn-ponytrail) a couple of weeks in advance of the meeting to obtain further details and learn more about the City's plans for the Rathburn Road corridor. Please do not hesitate to contact me if you have any further comments or questions. Thank You, Rory O'Sullivan
PO-36	February 5, 2021	Mehta, Rahul	winterseeking@gmail.com	Hello Rory,		3	Dear Mr. Mehta,

				Let me start by noting there was no "comment sheet" available on the project website despite the presentation claiming as such - why? I've attached a screenshot regarding this. My suggestion would be to extend the consultation by a week and include the form that was supposed to be available on the site. My feedback: Regarding Rathbun Road terminus: - Begin or accelerate planning with Toronto to connect the road across the border. If the city is serious about its claims of "connected communities", "building the grid", "reducing congestion" and providing a more "frequent", "grid-based" transit system, with better connections to surrounding cities, then this is one of the most obvious candidates to connect, asap. Regarding intersections: - Replace intersections with roundabouts, the arguments made against them are neither fair nor accurate, save the greater size of the intersection (although total impermeable area, to be maintained and resurfaced at high cost, is actually reduced). Considering the success of roundabouts (with massive lifetime cost savings, rapid adoption, ease of use for all modes and reduced incidence of collision and high speed) in the city and across Southern Ontario, it is concerning that a proper analysis is not done. I can say this with confidence because the exact same argument, consistently against, has been copied and pasted for multiple road projects in recent years. Is proper planning and examination of best practices taking place, or does NIMBYism passed down from Council and staff managers take precedent? - Intersections, regardless of design, should be fully protected intersections for walking and cycling. NACTO provides design guidelines on this as City staff and consultants may be unfamiliar (based on the fact that we have zero in the entire GTHA, despite the clear benefits)... Regarding cycling facilities: - Option 3 diminished the quality, structure, safety and ease of maintenance of the cycling facilities, proposing road-level painted lanes with weak and bland flexi-posts as opposed to raised and protected cycle-tracks with a curb and artistically designed barrier. One doesn't need to look far to see consistent high quality cycling infrastructure being deployed, with wonderful local art on concrete barriers, maintained all winter, in Toronto, by the dozens of kilometers. Mississauga still has zero cycletracks, despite three decades of promises. This proposal is rejecting already approved guidelines for such			Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Apologies for the confusion with the comment sheet on the project website. Your feedback is very important to the City and project team. The City of Mississauga Official Plan does not provide for the extension of Rathburn Road across the Etiobicoke Creek, The City will continue to review this position as part of our long range planning considerations but the Project Team is not aware of any immediate changes at this time. The alternatives for a roundabout and a conventional intersection were considered during the study. The roundabout alternative was not preferred primarily as it would have greater direct impact to existing private properties due to the larger footprint associated with a roundabout. Also when reviewing the overall life cycle cost of a potential roundabout, it was considered to be less economically desirable compared to a conventional intersection due to the implementation costs including construction, design, and utility relocations. The Project Team has reviewed the feedback from PIC#1 and is proposing to make a number of adjustments to the final preliminary preferred design to address concerns of the local community, where possible. These adjustments include cycle tracks instead of cycle lanes on Rathburn Road, east of Ponytrail Drive. The Project Team has also finalized the preliminary landscape plan to enhance the corridor, including Rathburn Road east of Ponytrail Drive. We will be holding an additional online community meeting (PIC#2) in early/mid June to update the public on the proposed changes and present the final preliminary preferred plan for the project. The online meeting will be hosted by the City on our WebEx Meetings platform and residents will also be able to join the meeting online or by telephone. The City will issue a notice to residents a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public can also visit the project website (www.mississauga.ca/rathburn-ponytrail) a couple of weeks in advance of the meeting to obtain further details and learn more about the City's plans for the Rathburn Road corridor. Please do not hesitate to contact me if you have any further comments or questions. Thank You, Rory O'Sullivan

				facilities on this road and that is unacceptable. Raised and fully protected and maintained cycletracks are a must - there are literally thousands of precedents for this better option yet we continue to drag our feet as laggards giving those who walk and cycle less than even a minimum grid. Regarding median and curbside landscaping: - Every effort should be made to plant trees which can grow tall and narrow, with dense and deep roots, along either side of the road and in the stretches of median where plants, as opposed to pavement, can exist. Trees can not only live but thrive in medians, given correct soil cell construction, permeable curbs (salt is pushed to opposing margins, so chemical contamination can actually be a very minor to nil source of stress), correct choice (drought and pollution tolerant) of native tree species and diverse understory perennial shrubs, grasses and flowers that can help clean and nourish the soil. Again, like most other suggestions above, these upgrades exist and are becoming increasingly common as part of new developments in the GTA (especially Hamilton and Toronto, as well as older versions along streetcar lines) following guidelines of LID. Maximizing tree cover on our streets has obvious short and long-term benefits, yet our street trees in Mississauga are stunted, rare and most suffer terrible salt pollution. This does not need to be the case, so let's start doing better and building more climate resilient cool streets, now and forever forward. Regarding fence upgrade/installation: - I recommend the replacement or addition of living "bio-fences" made of inter-woven trees and shrubs instead of wooden or concrete (emissions intensive and high cost) fences, for this project and as a best practice for all fences built on soil, moving forward. The City itself has supported pilot projects in the past and studies exist on the costs and benefits. If we haven't given it a fair assessment then it deserves one. Sincerely, Rahul Mehta			
PO-37	February 6, 2021	Jim Hester	jhester4165@gmail.com	Apologies that this feedback is later than the Feb 5th cut off date. I appreciate the video presentation. It gave a thorough overview of the project, the design and decision process. I understand that there are cost constraints. However, as a resident of the area, I would prefer: Roundabout at Rathburn and Ponytail. I know its more money. People can learn how to navigate.		3	Dear Mr. Hester, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. The alternatives for a roundabout and a conventional intersection were considered during the study. The roundabout alternative was not preferred primarily as it would have greater direct impact to existing private properties due to the larger footprint associated with a roundabout. Also when reviewing the overall life cycle cost of a potential roundabout, it was considered to be less economically desirable compared to a conventional intersection due to the implementation costs including construction, design, and utility relocations.

				For any boulevard landscaping please no grass. Perennial shrubs and tall grasses. Raised bike paths verus path with plastic reflective sticks. As a cyclist I believe the raised paths are safer. I appreciate cost is a factor but as noted in the presentation. The roadway has been as is for 45 years. Its likely whatever design we use here will be set this way for a similar period of time. Thanks again, Jim Hester			The Project Team has reviewed the feedback from PIC#1 and is proposing to make a number of adjustments to the final preliminary preferred design to address concerns of the local community, where possible. These adjustments include cycle tracks instead of cycle lanes on Rathburn Road, east of Ponytrail Drive. The Project Team has also finalized the preliminary landscape plan to enhance the corridor, including Rathburn Road east of Ponytrail Drive. We will be holding an additional online community meeting (PIC#2) in early/mid June to update the public on the proposed changes and present the final preliminary preferred plan for the project. The online meeting will be hosted by the City on our WebEx Meetings platform and residents will also be able to join the meeting online or by telephone. The City will issue a notice to residents a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public can also visit the project website (www.mississauga.ca/rathburn-ponytrail) a couple of weeks in advance of the meeting to obtain further details and learn more about the City's plans for the Rathburn Road corridor. Please do not hesitate to contact me if you have any further comments or questions. Thank You, Rory O'Sullivan
PO-38	February 5, 2021	David Street	davidfstreet48@gmail.com	I would like to thank RHA for bringing this to my attention. First of all, I would like to remind Councillor Fonseca of her commitment at various RHA meetings to restore the Rockwood Community to the beautiful area it once was before the water & sewage pipe lines were installed. I understood the roads, curbs, boulevards & sidewalks were the number one priority to be addressed & repaired. I trust this is still in order. I do not recall any previous discussions on these excessive bike lanes. Listening to the lady presenting this proposal, one thing that caught my interest was that she mentioned was that there are no major concerns in this discussed area regarding bicycles & vehicular confrontations. There seems to be a major priority by the city on bicycle traffic in this area which I do not see when walking this addressed area, which I do frequently. I do foresee more vehicles on these roads in the future as Bell & T. D. return to form after the pandemic. I also see more traffic as a result of the new condos at Audubon Blvd. & Fieldgate Dr. & of course with the proposed high rise & condos going in across from the Kingsbury Plaza. I wonder what number of vehicle traffic versus bicycle traffic there is & will be on these discussed roads in the future? One of my major concerns is whether bicycles will respect all the proposals the city is planning. As we know, bikers are vehicles when they want to be, pedestrians when they want to be and sometimes bikers when they want to be. I have never seen a biker respect the bike lights at Burnamthorpe & Ponytrail or the other 2 similar lights that I have seen bikers access.		4	Dear Mr. Street, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. The various planned improvements for Rathburn Road East and Ponytrail Drive are all supported by current City plans and policies. The proposed active transportation facilities on Rathburn Road and Ponytrail Drive will serve local residents and also form part of a larger City wide cycling network that will ultimately provide for the extension of cycle track/separated bike lanes all the way to Creditview Road. They will also improve safety and reduce serious injuries for our most vulnerable road users, including pedestrian, in accordance with the City's Vision Zero policy. Please note that a traffic study was completed as part of the overall study to confirm that the proposed improvements can accommodate the existing and traffic future conditions of Rathburn Road and Ponytrail. This analysis included the proposed redevelopment of 1850 Rathurn Road (Chelsea on the Green development) The Project Team has reviewed the feedback from PIC#1 and is proposing to make a number of adjustments to the final preliminary preferred design to address concerns of the local community, where possible. These adjustments include reducing the impact to right turning vehicles, and providing cycle tracks instead of cycle lanes on Rathburn Road, east of Ponytrail Drive. We will be holding an additional online community meeting (PIC#2) in early/mid June to update the public on the proposed changes and present the final preliminary preferred plan for the project. The online meeting will be hosted by the City on our WebEx Meetings platform and residents will also be able to join the meeting online or by telephone. The City will issue a notice to residents a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public can also visit the project website (www.mississauga.ca/rathburn-ponytrail) a couple of weeks in advance of the meeting to obtain further details and learn more about the City's plans for the Rathburn Road corridor. Please do not hesitate to contact me if you have any further comments or questions. Thank You, Rory O'Sullivan

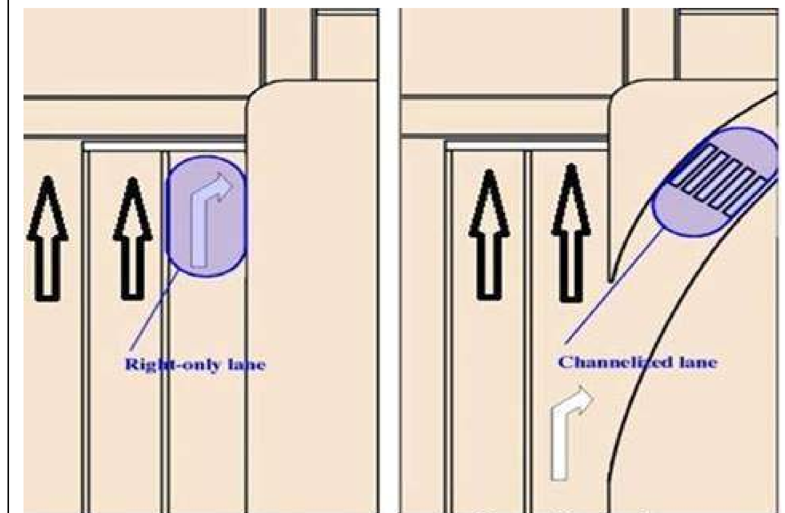
				One thing that really does concern me is the removal of right turn lanes at the major intersections mentioned. This will definitely slow the movement of traffic & create more concern for all parties. Listening to the presentation & proposals I could not help but feel the responsibility of this proposal takes a lot of space away from vehicles, puts a a lot of onus & responsibility on the vehicle & driver but does not seem to put any of that on the bike or biker. One must remember that a lot of bikers are not old enough to have drivers licences & do not really respect or understand the rules of the road. Bottom line, it appears that the city is putting a lot of emphasis on bicycle traffic resulting in compromising vehicle traffic, which there is definitely a lot more of. I am sure when the city listens to the home owners of Rockwood, they will do the correct thing as they did when the speed bumps were proposed. David Street 4257 Marblethorne Court			
PO-39	February 5, 2021	Boris Swedak	boris.swedak@sympatico.ca	Hello to All Dave and I chatted at length this morning, we came to the conclusions that he has outlined in this memo attached. I fully endorse all of these concerns he has identified. An additional area we were at a loss to understand is the installation of the traffic circle at Rathburn/Ponytrail which will soon be subjected to an increase of volume once the condominiums at the high rise at this location and at Dixie/Rathburn are built. These roundabouts are best suited at rural or low volume intersections in lieu of signals, It is also quite naïve to exclude the fact that employees of Bell as well as other Eglinton/Eastgate area companies attempting to gain access to Burnhamthorpe Rd will now reroute to Rathburn Rd once calming devices are employed on Fieldate Dr. It would best suit the residents of Mississauga and capital budget to wonder why this proposal is even being considered. Councilor Fonsecsa should keep her promise to restore the entire right of way which has been impacts by sewer/watermain/sewer replacement over the past number of years. I would appreciate if Councillor Fonceca would get the project manager to call me as well as having this email and Dave Street's forwarded to her to be made as a response to the comments from residents. Boris Swedak		4	Dear Mr. Swedak, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. The various planned improvements for Rathburn Road East and Ponytrail Drive are all supported by current City plans and policies. The proposed active transportation facilities on Rathburn Road and Ponytrail Drive will serve local residents and also form part of a larger City wide cycling network that will ultimately provide for the extension of cycle track/separated bike lanes all the way to Creditview Road and connections to other cycling facilities. They will also improve safety and reduce serious injuries for our most vulnerable road users in accordance with the City's Vision Zero policy. The Project Team has reviewed the feedback from PIC#1 and is proposing to make a number of adjustments to the final preliminary preferred design to address concerns of the local community, where possible. These adjustments include reducing the impact to right turning vehicles, and providing cycle tracks instead of cycle lanes on Rathburn Road, east of Ponytrail Drive. The Project Team has also finalized the preliminary landscape plan to enhance the corridor, including Rathburn Road east of Ponytrail Drive. We will be holding an additional online community meeting (PIC#2) in early/mid June to update the public on the proposed changes and present the final preliminary preferred plan for the project. The online meeting will be hosted by the City on our WebEx Meetings platform and residents will also be able to join the meeting online or by telephone. The City will issue a notice to residents a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public can also visit the project website (www.mississauga.ca/rathburn-ponytrail) a couple of weeks in advance of the meeting to obtain further details and learn more about the City's plans for the Rathburn Road corridor. Please do not hesitate to contact me if you have any further comments or questions. Thank You, Rory O'Sullivan

PO-40	February 9, 2021	Jonathan Giggs	jonathangiggs@bell.net	Rory – I have reviewed the Study Materials and watched the video. I support the proposed redesign of the streets. Not mentioned was the traffic volume today on those roads, and the average speed. I suspect that there is considerable speeding in off-peak hours do to the wide right-of-way, and is very inhospitable to cyclists, pedestrians and vulnerable road users. I am encouraged at the care with the entrances to Multi-Use Trails. Currently very unsafe. I assume that the local residents will be against all of this and will wish to retain the extra lanes on Rathburn Road East from Ponytrail Drive to the Etobicoke Creek, and the channelized right turn lanes. If Mississauga is serious about safety for all users and Vision Zero, these changes are imperative and cannot be compromised. Jonathan Giggs		2	Dear Mr. Giggs, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. Please note that the City will be holding a further online Public Information Centre (PIC#2) for the project in early/mid June to present the preliminary preferred plan for the project. This will be online in-person meeting and the public will be able to join the meeting online or by telephone. The City will issue a notice to the public a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public will also be able to visit the project website a couple of weeks in advance of the meeting to obtain further details of the meeting and learn more about the City's plans for the Rathburn Road/Ponytrail Drive road corridors. Thank You, Rory O'Sullivan
PO-41	February 11, 2021	Tyler MacDougall	tymacd1@gmail.com	Rory The plans for the rathburn are an exciting update for the area. While alternative 3 has many positives I am somewhat concerned with the longevity and aesthetic of the deliniators. Based on what I have seen in other jurisdictions the deliniators are easily damaged leaving just the base bolted to the asphalt which becomes a bit of a hazard for bikers while the segregation is lost. If proceeding with the alternative hope that adequate consideration is given to the type and longevity of the deliniators possibly moving from the flexible posts to something with more appeal and permanency Look forward to the project moving forward Tyler MacDougall		3	Dear Mr. MacDougall, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. The Project Team has reviewed the feedback from PIC#1 and is proposing to make a number of adjustments to the final preliminary preferred design to address concerns of the local community, where possible. These adjustments include providing cycle tracks instead of cycle lanes on Rathburn Road, east of Ponytrail Drive. We will be holding an additional online community meeting (PIC#2) in early/mid-June to update the public on the proposed changes and present the final preliminary preferred plan for the project. The online meeting will be hosted by the City on our WebEx Meetings platform and residents will also be able to join the meeting online or by telephone. The City will issue a notice to residents a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public can also visit the project website (www.mississauga.ca/rathburn-ponytrail) a couple of weeks in advance of the meeting to obtain further details and learn more about the City's plans for the Rathburn Road corridor. Please do not hesitate to contact me if you have any further comments or questions. Thank You, Rory O'Sullivan
PO-42	February 11, 2021	James Hayes	hayes.james@me.com	Dear Mr. O'Sullivan, We are homeowners who reside on Fieldgate Drive near the study area of the Rathburn Road and Ponytrail Drive Integrated Road Project. We are generally pleased with the project proposals but have a few comments and concerns about the Project as follows: 1. We noticed that, at approx. 6:13–7:45 and 8:42–9:53 of the virtual public information centre video, your team referenced a "Mississauga Cycling Master Plan (2018)" map that showed a proposed bike lane on Fieldgate Drive between Haven Glenn and Eastgate		3	Dear Mr. Hayes, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. The proposed cycling improvements on Fieldgate Drive are not part Rathburn Road East and Ponytrail Drive Integrated Road Project. While these improvements are part of the Cycling Master Plan, the City currently has no plans to construct these improvements. If this changes in the future the City would undertake extensive consultation with the public prior to construction. The provision of new noise wall at the intersection of Rathburn Road and Fieldgate is currently being reviewed by the Project Team. The City will only construct new noise walls at this location if it is supported by the various condo boards and will seek to minimize any impacts to existing trees at this location.

				Parkway. Are we correct in understanding is that this proposed bike lane does not form part of the Rathburn/Ponytrail Project and is not presently being considered as a modification to Fieldgate Drive? Will there be a consultation on this bike lane before it is approved? As residents of Fieldgate Drive, we feel that we do not yet have enough information to be able to properly comment on the installation of a bike lane on Fieldgate Drive and so we do not want a bike lane to be installed on Fieldgate Drive at this time. 2. With regard to the noise walls proposed along Rathburn Road: there are several healthy, mature evergreen trees along that stretch of Rathburn Road (and at the corners of Fieldgate Drive) and we are concerned that the process of installing noise walls would damage or remove those trees. We do not support the installation of noise walls if doing so would damage or remove any of those trees. We also do not think that noise walls are strictly necessary along this stretch because there are no noise walls within the majority of the rest of the study area. 3. With regard to the “preliminary preferred design concept” for Rathburn Road East from Ponytrail Drive to the end of the cul-de-sac: a. We prefer the “Alternative 1” design for one-way cycle tracks over the “Alternative 3” design for separated bike lanes. Both appear to require the boulevard to be extended into what is currently the road, but the bollards of Alternative 3 would be a relatively unsightly way of separating cyclists from road traffic compared to the one-way tracks of Alternative 1. The one-way tracks would look better, would be more consistent with the cycle tracks on the rest of Rathburn Road (the cycle tracks would simply continue around the corner of Rathburn Road at Ponytrail Drive), and appear to be safer for cyclists and drivers. b. We require more information on the proposed median landscaping including how it would look and how regularly it would be maintained. Are trees being considered for the median landscaping, and if so, would it be possible for these to be evergreens? If the choice is grass or a plain concrete surface, we would prefer concrete (which does not need regular maintenance). 4. Our neighbourhood community first raised concerns about Rathburn Road because, at the conclusion of a water main project, several concrete curbs and medians were removed/tarred and painted with yellow lines. This left the road in an ugly and dangerous state. We were assured in the early phases of the Rathburn/Ponytrail Project that these medians			The Project Team has reviewed the feedback from PIC#1 and is proposing to make a number of adjustments to the final preliminary preferred design to address concerns of the local community, where possible. These adjustments include providing cycle tracks instead of cycle lanes on Rathburn Road, east of Ponytrail Drive. The Project Team has also finalized the preliminary landscape plan to enhance the corridor, including improvements to the median op Rathburn Road and Ponytrail Drive. We will be holding an additional online community meeting (PIC#2) in early/mid-June to update the public on the proposed changes and present the final preliminary preferred plan for the project. The online meeting will be hosted by the City on our WebEx Meetings platform and residents will also be able to join the meeting online or by telephone. The City will issue a notice to residents a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public can also visit the project website (www.mississauga.ca/rathburn-ponytrail) a couple of weeks in advance of the meeting to obtain further details and learn more about the City’s plans for the Rathburn Road corridor. Please do not hesitate to contact me if you have any further comments or questions. Thank You, Rory O’Sullivan

				would be remade with concrete. Could you please confirm that this will be done? Thank you for your time and consideration of our feedback. Sincerely, The Hayes Family 905 625 0561			
PO-43	February 11, 2021	Dale Biason	rha.executive@gmail.com	Good Afternoon As discussed, we asked our community for feedback on your proposed plan to redevelop Rathburn Rd and Ponytrail. We sent out a survey to our members asking for their input as to your proposal. We receive slightly less than 100 responses. Some of our members advised that they have also sent their feedback to you or Councilor Fonseca directly. We have also included all emails we have received for your review. We have attached our survey, the summary of the results, the RHA response, based on the survey results and the additional written comments we received. We apologize that the survey is a rough draft as it no longer live. If possible we will send you a better copy tomorrow. It appears clear that our community is not in favour of the overall purpose of the proposal. In hindsight, the community engagement we requested on several occasions, but were denied, declined or ignored, may have been beneficial in explaining the real objectives of this plan. We look forward to discussing your next steps and how we might work together to achieve a more favourable response from Rokwood Village. Regards Dale Biason		4	Dear Ms. Biason, Thank you for providing the RHA's comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. The goal of the Integrated Road Project is to improve coordination of City road projects, reduce construction costs, and construction nuisance/fatigue for local residents through the bundling of various road improvement projects. The planned pavement rehabilitation on Rathburn Road East and Ponytrail Drive provided the opportunity to implement other planned operational improvements, including cycling, transit, safety and drainage along the road corridors. The various planned improvements are all supported by current City plans and policies, including Vision Zero; they will create a safer, comfortable and sustainable environment for all road users including pedestrian, cyclists and transit passengers. <u>Cycling Improvements</u> The City does not have a standard volume or warrant that triggers the requirement for new cycling facilities. Instead, when considering cycling infrastructure, we generally look at a range of factors including: • Infrastructure identified in the City's Cycling Master Plan • Internal and external stakeholder requests and feedback • Connecting cycling infrastructure to create a convenient and comfortable city wide bicycle network • Designing cycling infrastructure for all ages and abilities • Improving safety for all road users including cyclists. The proposed the cycling improvements are not intended to replace the Shaver of the Mitoff Trail facilities. Instead, it is hoped that the proposed active transportation improvements will complement these facilities and serve residents in the area by creating a larger City wide cycling network that will ultimately provide for the extension of cycle track/separated bike lanes all the way to Creditview Road and connections to other cycling facilities. <u>Traffic Concerns</u> The proposed Rathburn Road East and Ponytrail Drive Integrated Road improvements does not include any changes to the lane configuration along Ponytrail Drive and the right turn lanes at the Maple Ridge and Burnhamthorpe intersections will be maintained. To protect vulnerable road users the City had proposed the removal of the channelized right turn lanes at the intersection of Ponytrail Drive and Rathburn Road. However, based on feedback we received from PIC#1, we have modified this proposal to replace the channelized right turn lane with standard right turn lanes instead. This will provide for right

turning traffic vehicles, including delivery trucks at the intersection, while also improving the safety for pedestrian and cyclists.



The Project Team did review various pedestrian crossing alternatives at the Shaver Trail crossing. It was confirmed that a pedestrian crossover would not be appropriate on Ponytrail Drive due to traffic volumes and road width. Dedicated traffic signals are also not warranted at this location based on available traffic data and safety information available at the time of the review. Instead, the Project Team has proposed to improve the existing uncontrolled crossing at this location by reducing the crossing distance and ensuring drop curbs are installed across the entire crossing. City staff will also continue to monitor this location for opportunities to provide dedicated traffic signals in the future.

<u>Redesign of Rathburn East of Ponytrail to Cul-de-Sac</u>

As previously mentioned it is hoped that the cycling improvements on Rathburn Road east will serve local residents in the area by improving access to a future wider City wide cycling network. However based on the feedback we received from PIC#1 we proposing to make a number of adjustments to the final preliminary preferred design for this section of Rathburn Road East. This includes providing a two-way cycle track, on the south side of Rathburn Road, instead of on road cycle lanes and removing the concrete median entirely. This approach will provide an opportunity to provide enhanced landscaping features, including a tree lined cycle track, in the south boulevard.

In addition to the improved landscaping features the preliminary preferred plan is also recommending the introduction of low impact development (LID) facilities at two locations along this section of Rathburn Road East. These types of facilities help to increase the stormwater infiltration and works with nature to manage stormwater as close to its source as possible. The removal of the concrete medians will also reduce the hard surface area along Rathburn Road east and further reduce excess runoff to the existing storm sewer network.

							The project team did consider various options for the Rathburn Road and Bough Beeches intersection. Based on the results of the traffic and safety studies a signalized intersection is not warranted. A stop controlled intersection in conjunction with a reduction in the number of lanes on Rathburn Road will improve the safety for pedestrian crossing at this location. City staff will continue to monitor the intersection for opportunities in the future to provide signals at this location. <u>Noise Walls</u> We note the RHA members objection to noise walls at the Rathburn Road. While these noise walls have been shown to be warranted based on the City's current noise policy they will only be constructed if they are supported by the impacted property owners. City staff are consulting with the condo boards and property owners to confirm if they support the new noise walls. <u>MiWay</u> The Project Team is also working with MiWay to improve existing transit facilities along Rathburn Road and Ponytrail Drive, including the provision of new bus stop shelters all the way to Burnhamthorpe Road. MiWay staff have also provided the following reply in response to the your concerns about the Route 20 service: *"In line with the strategic direction of the MiWay Five plan (2016-2020), annual changes for 2020 sought to complete the transit network including a proposed June 2020 service change that included the truncating of Route 20 – Rathburn to no longer service Islington Subway Station and provide more reliable service while reducing duplication. This proposed service change was presented at our Public Information Centres (PICs) in October 2019 to gather input on the preferred terminus of the Route where two options were presented: truncate the route at the end of Rathburn Road or connect to Burnhamthorpe Road and truncate the route on Mill Road in Toronto. Through the PICs, overwhelming support emerged to maintain a connection to Burnhamthorpe Road so that customers will have access to Route 26 and Route 76 which provide direct service to Islington Subway Station.* *Following the PICs, MiWay staff have analyzed the Route's updated ridership and trends, reviewed and synthesized customer and operator feedback, and undertook an operational assessment of the proposed service change. Through this analysis, we have encountered some operational concerns related to the terminating of the route at either location. We are actively working to resolve and/or find alternative solutions for a suitable anchor point that provides the necessary connections for customers and as well, provides the necessary facilities for bus operations. Based on existing ridership demand, service on Route 20 will continue to connect to Burnhamthorpe Road and Ponytrail Drive so that connections can be made to Route 26 and 76.* *Additionally, MiWay is also participating in ongoing conversations with Metrolinx and the TTC on service integration opportunities that may impact the path and anchor point of the Route 20"* Councillor Fonseca has requested City staff to update the RHA and the public on the proposed changes since PIC #1 and present the final preliminary preferred plan for the project. Based on this reqeust we will be hosting a further online public meeting (PIC #2) on our WebEx meetings platform in early June. The City will issue a notice to the public a couple of weeks in advance of the meeting that will provide further instructions on how to participate. In advance of this meeting City Staff will also meet with the RHA executive and

							attend the RHA AGM to provide information on the preliminary preferred plan and answer any further questions you may have. In the meantime, please do not hesitate to contact me if you have any further comments or questions. Thanks, Rory
PO-44	February 16, 2021	Sandy Von Sengbusch	vonsengbusch@hotmail.com	Hi Rory, Can you please add me to the mailing list for the Rathburn Road and Ponytrail Drive Integrated Road project? My two cents is that I'd like to see a crosswalk from Bough Beeches to Garnetwood Park along Rathburn Rd E instead of an all way stop. Thanks, Sandy von Sengbusch (Claypine Rise)		3	Hello Ms. Von Sengbusch. Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. A traffic analysis completed by the Project Team has confirmed that a new all way stop configuration is warranted at the intersection of Rathburn Road East and Bough Beeches. Please note the City will be holding an additional online community meeting (PIC#2) in early/mid June to update the public on the proposed changes and present the final preliminary preferred plan for the project. The online meeting will be hosted by the City on our WebEx Meetings platform and residents will also be able to join the meeting online or by telephone. The City will issue a notice to residents a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public can also visit the project website (www.mississauga.ca/rathburn-ponytrail) a couple of weeks in advance of the meeting to obtain further details and learn more about the City's plans for the Rathburn Road corridor. Your contact information has been added to our mailing list for future project notices. Please do not hesitate to contact me if you have any further comments or questions. Sincerely, Rory O'Sullivan
PO-45	February 5, 2021	Miriam Gortnar	miriam@jancoxmetal.com	- do all the staff who will approve this project live in the Rockwood area to understand the traffic flows - the existing intersection of Burnhamthorpe and Ponytrail that was reconfigured to allow for the bicycle lane was designed poorly - 90 – 95% of vehicles cannot make a proper right hand turn from Burhamthorpe W. to Ponytrail N - sidewalk out to far into roadway - buses can barely make a right hand turn also, even with the centre island reconfigured - right turn lane from Ponytrail N to Rathburn E should not be eliminated - this would cause a backlog of traffic along Ponytrail if there is a red light in the intersection of Ponytrail and Rathburn - pre-Covid times, traffic from 7:30 am to approx 9:00 am along Ponytrail to Burhamthorpe E is congested – often have to wait for two lights to make left turn		4	Dear Ms. Gortnar, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. The various planned improvements for Rathburn Road East and Ponytrail Drive, including cycling improvements, are all supported by current City plans and policies. The final design will ensure that the most vulnerable road users are protected and constructed in accordance with the applicable standards and the City's Vision Zero policy. The City does not have a standard volume or cost "threshold" that triggers the requirement for new cycling facilities. Instead, when considering cycling infrastructure, we generally look at a range of factors including: • Infrastructure identified in the City's Cycling Master Plan • Internal and external stakeholder requests and feedback • Connecting cycling infrastructure to create a convenient and comfortable city wide bicycle network • Designing cycling infrastructure for all ages and abilities • Improving safety for all road users including cyclists. The City is not considering any physical changes to the Burnhamthorpe and Ponytrail Drive intersection at this time as work was completed here in 2018. However, the Project Team will

				- line-up of cars is often to Rathburn Rd - same during 3:30 pm to 6:00 pm - many individuals who work in the area of Eastgate and Eglinton cut through on Rathburn and Ponytrail to Burnhamthorpe to have access to Hwy 427 - with the proposed added residential development (now on hold) across from Kingsbury Plaza, this will add to more traffic and more congestion with bike lanes - with the new bike lane on Burhamthorpe Road, has a daily usage study been completed to justify the cost – if so, where can we obtain this information – if not, why not - living in this area since 1972, the existing bike lane and proposed new lanes on Ponytrail and Rathburn are a complete waste of taxpayer dollars as the usage is so very low – almost none - this will only create more traffic congestion in this area - the odd cyclist I have seen, uses Burnhamthorpe Road NOT the bike lane - Mississauga was not designed for bike usage in this area - costs would be better utilized to upgrade Garnetwood and Fleetwod Parks - property taxes in the Rockwood area are extremely high with little services provided - taxpayer dollars should be respected - costs should be justified because the - existing proposals do not, other than re-paving and crosswalk upgrades Miriam Gortnar			review opportunities to optimize the signal timing at the intersection to improve the overall operations of the intersection. The Project Team has is also proposing to make a number of adjustments to the final preliminary preferred design to address concerns of the local community, where possible. These adjustments include providing a dedicated north bound right turn lane at the Rathburn Road and Ponytrail Drive intersection, The City will be holding an additional online community meeting (PIC#2) in early/mid-June to update the public on the proposed changes and present the final preliminary preferred plan for the project. The online meeting will be hosted by the City on our WebEx Meetings platform and residents will also be able to join the meeting online or by telephone. The City will issue a notice to residents a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public can also visit the project website (www.mississauga.ca/rathburn-ponytrail) a couple of weeks in advance of the meeting to obtain further details and learn more about the City's plans for the Rathburn Road corridor. Please do not hesitate to contact me if you have any further comments or questions. Thank you, Rory O'Sullivan
PO-46	February 5, 2021	Larissa Velitchko	larik7@yahoo.com	Hello Rory, We live at corner of Dixie and Rathburn Rd. We do not have any problem now with road and traffic. But it will be, if you remove dedicated right-turn lane and do on-road separate bike lane with bollards and buffer area. You can start this lane after Food Basic. Here live many seniors, who use a car, not a bicycle. Why you want to waste money, specially in this difficult time for people, government and municipality? Please REMOVE intersection Dixie/Rathburn from your plan. Noise wall is not necessary too for low traffic road. But better ask people, who live there. Thank you to ask us		4	Dear Velitchko family, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. The various planned improvements for Rathburn Road East and Ponytrail Drive, including cycling improvements, are all supported by current City plans and policies. The final design will ensure that the most vulnerable road users are protected and constructed in accordance with the applicable standards and the City's Vision Zero policy. A traffic analysis was completed to review the existing and future traffic conditions of Rathburn Road and Ponytrail within the study area to understand how the corridors are operating and how the proposed improvements to the road may impact the operating conditions in the future. The analysis confirmed that proposed improvements, including at the Dixie Road intersection, can be accommodated while maintaining vehicular traffic flows at an acceptable level. The inclusion of new noise wall at the intersection of Rathburn Road and Fieldgate is currently being reviewed by the Project Team. The City will only construct new noise walls at this location if it is supported by the various condo boards.

				- Velitchko Family			The Project Team has reviewed the feedback from PIC#1 and is proposing to make a number of adjustments to the final preliminary preferred design to address concerns of the local community, where possible. These adjustments include reducing the impact to right turning vehicles, and providing cycle tracks instead on-road separate bike lane with bollards on Rathburn Road, east of Ponytrail Drive. We will be holding an additional online community meeting (PIC#2) in early/mid June to update the public on the proposed changes and present the final preliminary preferred plan for the project. The online meeting will be hosted by the City on our WebEx Meetings platform and residents will also be able to join the meeting online or by telephone. The City will issue a notice to residents a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public can also visit the project website (www.mississauga.ca/rathburn-ponytrail) a couple of weeks in advance of the meeting to obtain further details and learn more about the City's plans for the Rathburn Road corridor Further, prior to this assignment, a Noise Assessment was completed, which identified gaps in the noise wall infrastructure. Noise walls can provide an audible reduction in roadway traffic noise to residences directly behind the barrier. Noise barriers can be designed to be aesthetically pleasing from both the roadway and property owner sides of the barrier. The type of noise wall will be developed as the design progresses and will be selected from the City's approved products list. Please do not hesitate to contact me if you have any further comments or questions. Thank you, Rory O'Sullivan
PO-47	February 3, 2021	Jonathan Zammit	jzammit04@hotmail.com	Hello Rory, Thank you for making these documents available and allowing the public to provide their feedback on this project. This project is desperately needed as the temporary paving works installed after the sewer project from a few years back are starting to deteriorate, making the area look really rundown, shotty, and unsafe for those using the roadways and sidewalks. After reviewing the slides, I have two points of feedback I would like to submit for the Rathburn Rd East (Etobicoke Creek terminus) portion of the integrated road: • The centre median must incorporate some type of landscaping. Whether it be planter boxes or some low maintenance shrubs, landscaping cannot be left out. The current concrete medium is vast, open, and dull looking. Not to mention, it is full of cracks and chips which is expected given our freeze and thaw climate. Would hate to see this same mistake repeated. Thus, on the final design documents, I am hoping some creative and aesthetically pleasing natural landscaping is added to the centre median for this portion of the project. • Bike Lane Design - a good idea to incorporate, but not too happy about it		3	Dear Mr. Zammit, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. The Project Team has reviewed the feedback from PIC#1 and is proposing to make a number of adjustments to the final preliminary preferred design to address concerns of the local community, where possible. These adjustments include providing cycle tracks instead of cycle lanes on Rathburn Road, east of Ponytrail Drive. The Project Team has also finalized the preliminary landscape plan to enhance the corridor, including Rathburn Road east of Ponytrail Drive. We will be holding an additional online community meeting (PIC#2) in early/mid June to update the public on the proposed changes and present the final preliminary preferred plan for the project. The online meeting will be hosted by the City on our WebEx Meetings platform and residents will also be able to join the meeting online or by telephone. The City will issue a notice to residents a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public can also visit the project website (www.mississauga.ca/rathburn-ponytrail) a couple of weeks in advance of the meeting to obtain further details and learn more about the City's plans for the Rathburn Road corridor. A construction schedule for the project is still being confirmed at this time. Given the complexity of the project City staff anticipate construction will commence sometime in 2022 and be completed in 2023. Please note this is subject to a number of considerations including funding approval by City Council. The Project Team is developing a landscape plan to enhance the road corridors that will create more vibrant and inviting environment for all of the road users. Details of this plan will shared with the public at a further online community meeting (PIC#2) in early/mid-June. Please do not hesitate to contact me if you have any further comments or questions. Thank You,

				resulting in the lane reduction in each direction. However, if it must be integrated into the design, I am hoping to see the bike lane segregated from the main roadway with a raised curb or barrier of some sort. Please ensure that the yellow pilons are used sporadically as having the street lined with those items on either side will result in a terrible look for the roadway and surrounding neighbourhood. Overall, the project design looks great, including the Rathburn Rd and Ponytrail Drive portions. Again, I cannot stress the importance of seeing this project commence this spring/summer for this neighbourhood as the current state of the roadworks are marginal at best and in their current form, present numerous safety risks to the children and residents of this neighbourhood. Thank you again. Please feel free to reach out with any questions or additional clarity needed in relation to my comments above. If I could also request to be added to any sort of project distribution list for news and updates regarding this specific project, it be greatly appreciated. Thank you. Jonathan Zammit 4285 Garnetwood Chase 416-801-1426			Rory O'Sullivan
PO-48	February 2, 2021	Earl Close	earlclose@gmail.com	Rory, Just wanted to give some feedback. I like this design and the added benefits to all-modes of transportation and safety. I appreciate the 2m cycle track, the removal of some dedicated right turn lanes, and the pedestrian crossings. I would like to offer my support for Alternative #1 as I think this offers more protection for cyclists, keeps road debris from cars off the track, and offers a better solution for winter snow removal. I must say I am very much against the "Do Nothing" option - this is not how a city grows. Thanks, Earl Close		2	Hello Mr. Close. Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. The Project Team has reviewed the feedback from PIC#1 and is proposing to make a number of adjustments to the final preliminary preferred design to address concerns of the local community, where possible. These adjustments include the provision of cycle tracks instead of cycle lanes on Rathburn Road, east of Ponytrail Drive. We will be holding an additional online community meeting (PIC#2) in early/mid June to update the public on the proposed changes and present the final preliminary preferred plan for the project. The online meeting will be hosted by the City on our WebEx Meetings platform and residents will also be able to join the meeting online or by telephone. The City will issue a notice to residents a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public can also visit the project website (www.mississauga.ca/rathburn-ponytrail) a couple of weeks in advance of the meeting to obtain further details and learn more about the City's plans for the Rathburn Road corridor. Please do not hesitate to contact me if you have any further comments or questions. Thank You, Rory O'Sullivan
PO-49	December 23, 2021	Catherine Renaud	cathrenaud58@gmail.com	Please add me to your mailing list for the Rathburn Ponytrail Integrated Road Project. Thank you Rory.		1	Hello Ms. Renaud. Thank you for contacting the Project Team. Your contact information has been added to our mailing list for future project notices.

							We will be holding an additional online community meeting (PIC#2) in early/mid June to update the public on the proposed changes and present the final preliminary preferred plan for the project. The online meeting will be hosted by the City on our WebEx Meetings platform and residents will also be able to join the meeting online or by telephone. The City will issue a notice to residents a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public can also visit the project website (www.mississauga.ca/rathburn-ponytrail) a couple of weeks in advance of the meeting to obtain further details and learn more about the City's plans for the Rathburn Road corridor. Sincerely, Rory O'Sullivan
PO-50	February 7, 2021	Grant Dunbar	*Submitted as part of PO-43*	Thanks for the link to the Rathburn Ponytrail project I completed the survey and would like to say, for safety of cyclists, considering all the accident and injuries to cyclists, then why would the City Cycle plan not create an off road cycle and walking path where possible, the city plan favours on road which is why cyclist are hit by automobiles. The proposed option for Rathburn and Ponytrail intersection is going to be a busy pedestrian intersection with new high raise and shopping. Speeding on Rathburn Road from Etobicoke creek to Ponytrail is not being addressed unless a speed bump or full stop sign is used at Boughbeeches Road. I am in favor of the round about which is a form of traffic calming at Ponytrail and Rathburn Road East because of the extra traffic from the new high rise building. Thank you again Rockwood Home Owners Grant		4	Dear Mr. Dunbar, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. The various planned improvements for Rathburn Road East and Ponytrail Drive, including cycling improvements, are all supported by current City plans and policies. The final design will ensure that the most vulnerable road users are protected and constructed in accordance with the applicable standards and the City's Vision Zero policy. The alternatives for a roundabout and a conventional intersection were considered during the study. The roundabout alternative was not preferred primarily as it would have greater direct impact to existing private properties due to the larger footprint associated with a roundabout. Also when reviewing the overall life cycle cost of a potential roundabout, it was considered to be less economically desirable compared to a conventional intersection due to the implementation costs including construction, design, and utility relocations. The Project Team has reviewed the feedback from PIC#1 and is proposing to make a number of adjustments to the final preliminary preferred design to address concerns of the local community, where possible. These adjustments include cycle tracks instead of cycle lanes on Rathburn Road, east of Ponytrail Drive. The Project Team has also finalized the preliminary landscape plan to enhance the corridor, including Rathburn Road east of Ponytrail Drive. We will be holding an additional online community meeting (PIC#2) in early/mid June to update the public on the proposed changes and present the final preliminary preferred plan for the project. The online meeting will be hosted by the City on our WebEx Meetings platform and residents will also be able to join the meeting online or by telephone. The City will issue a notice to residents a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public can also visit the project website (www.mississauga.ca/rathburn-ponytrail) a couple of weeks in advance of the meeting to obtain further details and learn more about the City's plans for the Rathburn Road corridor. Please do not hesitate to contact me if you have any further comments or questions. Thank You, Rory O'Sullivan
PO-51	February 5, 2021	Normenia Sousa	normenia.sousa@outlook.com *Submitted as part of Item PO-43*	Thank you for the email. I just submitted my feedback. I oppose to cycle lanes. It is a huge safety concern for everyone including the cyclists, increase in insurance and it is ugly. Toronto as gone from Toronto the good to Toronto the ugly.		4	Dear Ms. Sousa, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. The various planned improvements for Rathburn Road East and Ponytrail Drive are all supported by current City plans and policies. The final design will ensure that the most vulnerable road users are protected and constructed in accordance with the applicable standards and the City's Vision Zero policy.

							The Project Team is also developing a landscape plan to enhance the road corridors that will create more vibrant and inviting environment for all of the road users. Details of this plan will shared with the public at a further online community meeting (PIC#2) in early/mid June. The online meeting will be hosted by the City on our WebEx Meetings platform and residents will also be able to join the meeting online or by telephone. The City will issue a notice to residents a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public can also visit the project website (www.mississauga.ca/rathburn-ponytrail) a couple of weeks in advance of the meeting to obtain further details and learn more about the City's plans for the Rathburn Road corridor. Please do not hesitate to contact me if you have any further comments or questions. Thank You, Rory O'Sullivan
PO-52	February 5, 2021	Monique van Prooijen	93-1755 Rathburn Rd E Mississauga *Submitted as part of Item PO-43*	I am in favour of the proposals to add cycling lanes as outlined, especially all the way to west of Dixie, to join up with the multi-use trail there. On p 22, I like alternatives 1 and 3 – you prefer 3, that's ok. On page 20, you propose a stop sign at Bough Beeches. I often walk there and don't think that's necessary at all; to increase safety, a refuge island would help and would be sufficient. Taking out the right turn lanes is concerning since they help move rush hour traffic. I think not having these would be quite detrimental to rush hour traffic. On page 16, you envision a noise wall. I live in one of those co-ops and at last year's meeting we voted against noise walls – not sure if the main reason was cost of simply because they are ugly and boring. Given it's in your plans, I expect it'll come up again at this year's meeting. Any changes at the intersection of Burnhamthorpe and Ponytrail Drive? The left hand turn light onto Burnhamthorpe east could use some help – the red light is so long many drivers give up and make a U-turn on Burnhamthorpe west to go east.	No	3	Dear Ms. Van Prooijen, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. A traffic analysis completed by the Project Team has confirmed that a new all way stop configuration is warranted at the intersection of Rathburn Road East and Bough Beeches. Based on the feedback received from PIC#1the Project Team is proposing to make a number of adjustments to the final preliminary preferred design to address concerns of the local community, where possible. These adjustments include reducing the impact to right turning vehicles. The inclusion of new noise wall at the intersection of Rathburn Road and Fieldgate is currently being reviewed by the Project Team. The City will only construct new noise walls at this location if it is supported by the various condo boards. There are no physical changes proposed for the Burnhamthorpe Road and Ponytrail Drive intersection, however the City will review opportunities to optimize the signal timing at the intersection. Please note we will be holding an additional online community meeting (PIC#2) in early/mid June to update the public on the proposed changes and present the final preliminary preferred plan for the project. The online meeting will be hosted by the City on our WebEx Meetings platform and residents will also be able to join the meeting online or by telephone. The City will issue a notice to residents a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public can also visit the project website (www.mississauga.ca/rathburn-ponytrail) a couple of weeks in advance of the meeting to obtain further details and learn more about the City's plans for the Rathburn Road corridor Please do not hesitate to contact me if you have any further comments or questions. Thank You, Rory O'Sullivan
PO-53	February 11, 2021	Mark Trotter	markctrotter@gmail.com *Submitted as part of Item PO-43*	Bike lanes on Rathburn to the end of the cul-de-sac would mean ending them at the top of a staircase and would not give access to the Etobicoke Creek trail below unless bikes were carried down the staircase. A pedestrian crossing at shaver trail where it crosses Ponytrail would be a great option as many cyclists use this point to access the Etobicoke Creek trail. It would also likely slow cars down as many drive too fast around the corner when heading towards		4	Dear Mr. Trotter, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. The various planned improvements for Rathburn Road East and Ponytrail Drive are all supported by current City plans and policies. The proposed active transportation improvements will serve residents in the area and form part of a larger City wide cycling network that will ultimately provide for the extension of cycle track/separated bike lanes all the way to Creditview Road and connections to other cycling facilities.

				Burnhamthorpe often making crossing at this point quite dangerous for both cyclists and pedestrians. Mark Trotter			The Project Team reviewed various pedestrian crossing alternatives at the Shaver Trail crossing It was confirmed that a pedestrian crossover would not be appropriate on Ponytrail Drive due to traffic volumes and road width. Dedicated traffic signals are also not warranted at this location based on available traffic data and safety information available at the time of the review. Instead, the Project Team has proposed to improve the existing uncontrolled crossing at this location by reducing the crossing distance and ensuring drop curbs are installed across the entire crossing. City staff will also continue to monitor this location for opportunities to provide dedicated traffic signals in the future. Please note we will be holding an additional online community meeting (PIC#2) in early/mid June to update the public on the proposed changes and present the final preliminary preferred plan for the project. The online meeting will be hosted by the City on our WebEx Meetings platform and residents will also be able to join the meeting online or by telephone. T he City will issue a notice to residents a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public can also visit the project website (www.mississauga.ca/rathburn-ponytrail) a couple of weeks in advance of the meeting to obtain further details and learn more about the City's plans for the Rathburn Road corridor Please do not hesitate to contact me if you have any further comments or questions. Thank You, Rory O'Sullivan
PO-54	February 5, 2021	Norm	Norm4203@gmail.com *Submitted as part of Item PO-43*	Dear Sir... I would like to comment on your proposed plan for Rathburn and Ponytrail. I thought that the plan was to do some resurfacing, curb and boulevard restoration and hopefully reduce the traffic on Rathburn. This was a complete surprise. I like the idea of a new look on Rathburn E. to the Creek. However, if you put the bike lanes along there, which are not necessary, the look of guard rails would not be appealing or blend into our neighbourhood. Plantings in the Boulevards would be nice, definitely not grass. Maybe this is an opportunity for the city to practice what it preaches and use gardens, you told us about years ago, that require minimal maintenance. I do not see why we need more cycle routes. We have a lot already and another one is coming soon. The ones we have now are pretty safe and connect us all around the community. The only problem is that sometimes it is difficult crossing Ponytrail to get from one trail to the other. The question is who do you expect to use them, us or people from outside the area? I disagree with removing the right turns anywhere. I am not sure about the accuracy of your traffic studies. We do have lineups now and the traffic seems to get worse every year. Trucks turning north onto Rathburn at Burnhamthorpe are having problems. Will this be a benefit for pedestrians when trucks are turning into Longo's?		4	Dear Norm, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. The various planned improvements for Rathburn Road East and Ponytrail Drive are all supported by current City plans and policies. The proposed active transportation facilities on Rathburn Road and Ponytrail Drive will serve local residents and also form part of a larger City wide cycling network that will ultimately provide for the extension of cycle track/separated bike lanes all the way to Creditview Road and connections to other cycling facilities. They will also improve safety and reduce serious injuries for our most vulnerable road users in accordance with the City's Vision Zero policy. Improvements to the existing transit facilities along Rathburn Road and Ponytrail Drive is proposed as part of the Integrated Road Project. The Project Team is aware of plans by MiWay to truncate the Route 20 service at Burnhamthorpe Road. The Project Team understands that MiWay are continuing to review these plans and will provide an update to the public once a suitable terminus has been selected that provides the necessary connections for customers and facilities for bus operations. The Project Team has reviewed the feedback from PIC#1 and is proposing to make a number of adjustments to the final preliminary preferred design to address concerns of the local community, where possible. These adjustments include reducing the impact to right turning vehicles, and providing cycle tracks instead of cycle lanes on Rathburn Road, east of Ponytrail Drive. The Project Team has also finalized the preliminary landscape plan to enhance the corridor, including Rathburn Road east of Ponytrail Drive. We will be holding an additional online community meeting (PIC#2) in early/mid June to update the public on the proposed changes and present the final preliminary preferred plan for the project. The online meeting will be hosted by the City on our WebEx Meetings platform and residents will also be able to join the meeting online or by telephone. The City will issue a notice to residents a couple of weeks in advance of the meeting that will provide further instructions on how to participate. The public can also visit the project website (www.mississauga.ca/rathburn-ponytrail) a couple of weeks in advance of the meeting to obtain further details and learn more about the City's plans for the Rathburn Road corridor.

				It is nice that you have a plan for people who use bikes but what about the people who take buses? MIway The bottom line is that this looks like a costly project to bring people through our neighbourhood on their bikes. There are already routes along Burnhamthorpe they can use to access our trails or even access the Creek. Norm, Maple Ridge Dr.			Thank You, Rory O'Sullivan

TECHNICAL AGENCIES

Notification Date: January 6, 2020

The following table includes the public comments only, comments have been formatted and spelling errors corrected, otherwise the content is "as submitted".

#	Date/ Method	Name / Agency	Address / Email	Comments	Response Date/ Method	WSP Comments/Response
TAC-01	December 21, 2020	Indira Sharma Telecon	telusmobilitymarkups@Telecon.ca	TELUS has no underground infrastructure in the area of your proposed work. Permit expires six(6) months from approval date. Indira Sharma		*No response needed.*
TAC-02	January 4, 2020	Asha Saddi Peel Region	Asha.Saddi@peelregion.ca	Hi Rory, Thank you for the attached email regarding the Schedule A+ EA for road improvements on Rathburn Road/Ponytrail Drive. Please note that the Region of Peel will require at least a three weeks review period for the online PIC materials. We should be able to let you have comments/questions by February 12 and look forward to reviewing the online PIC package when it becomes available on January 22. Also, you can include me as the contact person at the Region of Peel for this EA. Kind regards, Asha Saddi		*No response needed.*
TAC-03	January 4, 2020	Phil Arbeau Zayo Utilities	utility.circulations@zayo.com	Good afternoon, Zayo has no existing plant in the area indicated in your submission. No markup and no objection. Thank you. Phil Arbeau		*No response needed.*
TAC-04	November 3, 2020	Rory O'Sullivan	Rory.OSullivan@mississauga.ca	Hi Manvir, I would like to introduce the Rathburn Road/Ponytrail Drive Integrated Road project to you. This project will be looking at various roadway improvements, including new cycling facilities, along the Rathburn Road and Ponytrail Drive corridors between Dixie Road and Burnhamthorpe Road. I have attached a sketch above showing the approximate project limits which includes the Rathburn Road/Dixie Road intersection. We expect that we will need to make some modifications to this intersection in order to connect the new cycling facilities to the existing infrastructure on the west side of Dixie Road. The City has retained WSP to assist in the preparation of a preliminary design and we are hoping to be in a position to commence construction on the project towards the end of 2021. Please note we don't expect any MCEA being required for the project as the improvements fall under Schedule A+ classification and as such would be considered exempt from the EAA. Given potential impacts to the Rathburn Road/Dixie Road intersection we would like to confirm the Region requirements for the project. Are you the best person to coordinate Region input/feedback on the project? Regards, Rory	Manvir Tatla Manvir.tatla@peelregion.ca	Hi Manvir, Happy New to you. See my responses below in blue. Are the proposed cycling facilities to be on-road or in-boulevard? In boulevard cycle tracks are planned for Rathburn Road between Dixie and Ponytrail Drive Are you able to provide a high level sketch as to what the City has in mind for the Dixie/Rathburn intersection? This work is still in progress however we are interested in removing the channelized right turn lanes at the intersection to accommodate the cycle tracks and improve safety for cyclist and pedestrians at the intersection. Can you confirm that this is something the Region would be willing to consider/support subject to the findings of the traffic report? Please confirm that the City, as the proponent of the works, will be funding any proposed changes to the Dixie/Rathburn intersection. The improvements at the intersection will also benefit Region AT infrastructure. Given this the City would obviously appreciate any support the Region can provide with these improvements. I think I mentioned that construction for this section of the project will not likely commence until 2022. Given this would the Region be open to cost sharing some/all of the AT improvements at the intersection? I am happy to arrange a call on this if you wanted to discuss further.

#	Date/ Method	Name / Agency	Address / Email	Comments	Response Date/ Method	WSP Comments/Response
TAC-05	February 2, 2021	Hydro One	SecondaryLandUse@HydroOne.com	Please see the attached for Hydro One's Response. Hydro One Networks Inc		*No response needed.*
TAC-06	February 24, 2021	Matthew Aymar	matthew.aymar@peelregion.ca	Hi Don and Rory, I am a research and policy analyst with the Region of Peel - Public Health and I attended the Rathburn / Ponytrail Design Review meeting earlier this week. Public health works quite carefully with our colleagues in transportation on EA's and it was great to learn more about the design considerations for this project. I had one question that I didn't get to ask given we were so tight on time. Don mentioned we could send additional questions/comments through email so here's what I'm wondering: Have you considered locating the proposed pedestrian crossing on Rathburn Road East along the hydro corridor at Capilano Court instead? This would provide more direct access to residents of the Forest Park Circle Apartment and the new condo building in development adjacent to it – Chelsea on the Green. If the crossing is along the hydro corridor then I fear residents of these buildings may opt for crossing midblock on Rathburn Road East when making the trip to the strip mall (where there is also a transit stop) directly across the street to the east (instead of doubling back to this new crossing). Would appreciate hearing your thoughts on this. Thanks, Matthew Aymar		Dear Mr. Aymar, Thank you for your response and comments regarding the Rathburn Road East and Ponytrail Drive Integrated Road Project. Your feedback is very important to the City and project team. The location project team reviewed potential pedestrian destinations and associated improvements in the study area. Based on findings of the review, it was noted that there will be larger north south movement anticipated at the new hydro corridor trail location. As such, the City is expecting that the hydro corridor trail to be used by children and parents to access Saints Martha & Mary Separate School. The proposed signalized crossing and the existing signalized crossing at the Rathburn Road and Ponytrail Drive intersection should accommodate all anticipated pedestrian movements from the Forest Park Circle and Chelsea on the Green Apartment complex. All comments and input will be reviewed and considered prior to the final recommendation. Please do not hesitate to contact the Project Team if you have any further comments or questions. Thank You, Rory O'Sullivan

APPENDIX

O PRELIMINARY COST ESTIMATES

City of Mississauga
Active Transportation Facilities and Integrated Road Improvements

Rathburn Road East - Dixie Road to Cul de Sac
Ponytrail Drive - Rathburn Road to Burnhamthorpe Drive

Preliminary Construction Cost Estimate (Janurary 2022)

	Item	Description	Unit	Quantity	Unit Cost	Total	Comments	Cost Sharing: LID	Noisewall	Culvert	Cycling	Pavement	Street Lighting
		Part A - General											
General	1.01	Construction Layout	L.S.	1	$ 65,000.00	$ 65,000.00	Cost Sharing based on percentage of total in Parts B-E	$ 899.35	$ 15,828.55	$ 1,217.12	$ 22,817.45	$ 23,637.96	$ 599.57
	1.02	Supply, Place and Maintain Project Signs	ea	6	$ 400.00	$ 2,400.00	Cost Sharing based on percentage of total in Parts B-E	$ 33.21	$ 584.44	$ 44.94	$ 842.49	$ 872.79	$ 22.14
	1.03	Maintenance of Traffic	L.S.	1	$ 75,000.00	$ 75,000.00	Cost Sharing based on percentage of total in Parts B-E	$ 1,037.71	$ 18,263.71	$ 1,404.37	$ 26,327.83	$ 27,274.57	$ 691.81
	1.04	Supply and Install Field Office for City Staff	L.S.	1	$ 20,000.00	$ 20,000.00	Cost Sharing based on percentage of total in Parts B-E	$ 276.72	$ 4,870.32	$ 374.50	$ 7,020.75	$ 7,273.22	$ 184.48
	1.05	Erosion and Sediment Control	L.S.	1	$ 50,000.00	$ 50,000.00	Cost Sharing based on percentage of total in Parts B-E	$ 691.81	$ 12,175.81	$ 936.25	$ 17,551.88	$ 18,183.05	$ 461.20
	1.06	Supply, Install and Maintain Tree Protection Fence	m	1800.0	$ 20.00	$ 36,000.00	Cost Sharing based on percentage of total in Parts B-E	$ 498.10	$ 8,766.58	$ 674.10	$ 12,637.36	$ 13,091.79	$ 332.07
		Subtotal (Part A - General excluding contingency)				$ 248,400.00		$ 3,436.90	$ 60,489.42	$ 4,651.27	$ 87,197.76	$ 90,333.38	$ 2,291.27
		15% contingency (Part A)				$ 37,260.00		$ 515.53	$ 9,073.41	$ 697.69	$ 13,079.66	$ 13,550.01	$ 343.69
		SubTotal (Part A - General)				**$ 285,660.00**		**$ 3,952.43**	**$ 69,562.83**	**$ 5,348.96**	**$ 100,277.43**	**$ 103,883.39**	**$ 2,634.96**
Road and Boulevard Works		**Part B - Road and Boulevard Works**											
		Removals											
	2.01	Remove and Dispose of Existing Concrete Curb and Gutter (All Types)	m	9750	$ 5.00	$ 48,750.00						$ 48,750.00	
	2.02	Remove and Dispose of Existing Concrete Sidewalk, Median, Bus Pad	m2	5570	$ 10.00	$ 55,700.00					$ 55,700.00		
	2.03	Removal of Asphalt Pavement (Full Depth) (Roadways, Driveways, Medians, Islands, Curb)	m2	65560	$ 5.00	$ 327,800.00						$ 327,800.00	
	2.04	Remove Existing Paving Stone	m2	20	$ 50.00	$ 1,000.00					$ 1,000.00		
	2.05	Tree Removals	ea	79	$ 250.00	$ 19,750.00					$ 19,750.00		
	2.06	Relocate Mailbox	ea	1	$ 50.00	$ 50.00					$ 50.00		
	2.07	Remove Existing Signs	ea	74	$ 120.00	$ 8,880.00					$ 8,880.00		
		Roadworks											
	2.08	Earth Excavation (Road)	m3	33850.0	$ 12.00	$ 406,200.00						$ 406,200.00	
	2.09	Earth Excavation (Cycle Track)	m3	3100.0	$ 12.00	$ 37,200.00					$ 37,200.00		
	2.10	Stripping Topsoil	m2	7200	$ 10.00	$ 72,000.00	(150mm average depth)				$ 72,000.00		
	2.11	HL3 (40mm) Surface Course Asphalt - Roadway (Std No. 2220.010)	t	4840.0	$ 110.00	$ 532,400.00	50mm depth - assume full replacement of asphalt					$ 532,400.00	
	2.12	HL8 (100mm) Base Course Asphalt - Roadway (Std No. 2220.010)	t	12100.0	$ 100.00	$ 1,210,000.00	100mm depth (2 lifts of 50mm) - assume full replacement of asphalt					$ 1,210,000.00	
	2.13	HL3 (40mm) Surface Course Asphalt - Cycle Track	t	1025	$ 110.00	$ 112,750.00	Per Std No. 2240.080 and 2240.081				$ 112,750.00		
	2.14	HL8 (60mm) Base Course Asphalt - Cycle Track	t	1535	$ 100.00	$ 153,500.00	Per Std No. 2240.080 and 2240.081				$ 153,500.00		
	2.15	Tack Coat and Power Sweeping	m2	48320.0	$ 0.50	$ 24,160.00						$ 24,160.00	
	2.16	Supply, Place and Compact Granular 'A' for Roadway	t	3100	$ 20.00	$ 62,000.00	Assumes 25mm over entire roadway for fine grading.					$ 62,000.00	
	2.17	Supply, Place and Compact Granular 'A' for Cycle Track	t	7100	$ 20.00	$ 142,000.00					$ 142,000.00		
	2.18	Commercial Driveway Entrance (40mm HL3, 110mm HL8, 400mm Gran A)	m2	485	$ 65.00	$ 31,525.00					$ 31,525.00		
	2.19	Concrete Sidewalk, 130mm Thickness including 100mm Granular A material per Std No. 2240.010	m2	3500	$ 70.00	$ 245,000.00					$ 245,000.00		
	2.20	Concrete Sidewalk, 180mm Thickness, including 100mm Granular A material per Std No. 2240.010	m2	50	$ 100.00	$ 5,000.00					$ 5,000.00		
	2.21	Bus Pad, 180mm thickness as per Std No. 2250.010 and 225.020	m2	715	$ 100.00	$ 71,500.00					$ 71,500.00		
	2.22	Concrete Median	m2	825	$ 85.00	$ 70,125.00						$ 70,125.00	
	2.23	Concrete Curb and Gutter - All Types (OPSD 600.040, 600.080, Std No. 2230.010)	m	8100	$ 100.00	$ 810,000.00						$ 810,000.00	
	2.24	Supply and Install Retaining Concrete Toe Wall per OPSD 3120.100	m	25	$ 240.00	$ 6,000.00					$ 6,000.00		
	2.25	Install Paver Stone	m2	12	$ 100.00	$ 1,200.00					$ 1,200.00		
	2.26	Supply and Install Tactile Warning Surface Indicators	ea	570	$ 300.00	$ 171,000.00					$ 171,000.00		
	2.27	Sign Installation	ea	74	$ 300.00	$ 22,200.00					$ 22,200.00		
	2.28	Noisewall Installation	m	1100	$ 2,400.00	$ 2,640,000.00			$ 2,640,000.00				
	2.29	Permanent Durable Pavement Markings - Symbols and Arrows	ea	71.0	$ 110.00	$ 7,810.00						$ 7,810.00	
	2.30	Permanent Durable Pavement Markings - Cycle Track Symbols	ea	80.0	$ 110.00	$ 8,800.00					$ 8,800.00		
	2.31	Permanent Durable Pavement Markings - 363 Broken White, 10cm	m	4580.0	$ 6.00	$ 27,480.00						$ 27,480.00	
	2.32	Permanent Durable Pavement Markings - Solid White 10cm	m	1115.0	$ 7.00	$ 7,805.00						$ 7,805.00	
	2.33	Permanent Durable Pavement Markings - 363 Broken Yellow, 10cm	m	340.0	$ 6.00	$ 2,040.00						$ 2,040.00	
	2.34	Permanent Durable Pavement Markings - Solid Yellow 10cm, Roadway	m	2245.0	$ 7.00	$ 15,715.00						$ 15,715.00	
	2.35	Permanent Durable Pavement Markings - Solid Yellow, 10cm, Cycle Track	m	890.0	$ 7.00	$ 6,230.00					$ 6,230.00		
	2.36	Permanent Durable Pavement Markings - Ladder cross walk, (10cm, 60cm Solid White lines w/ spacing of 1.2m)	m	455.0	$ 35.00	$ 15,925.00						$ 15,925.00	
	2.37	Permanent Durable Pavement Markings - Ladder cross walk, (10cm, 30cm Solid White lines w/ spacing of 0.6m)	m	92.0	$ 25.00	$ 2,300.00						$ 2,300.00	
	2.38	Permanent Durable Pavement Markings - Sharks Teeth, white triangle, 60x90cm w/ 30cm gap	m	18.0	$ 25.00	$ 450.00					$ 450.00		
	2.39	Permanent Durable Pavement Markings - Sharks Teeth, white triangle,30x45cm w/ 30cm gap	m	70.0	$ 45.00	$ 3,150.00					$ 3,150.00		
	2.40	Permanent Durable Pavement Markings - Stop Bars, 60cm	m	250.0	$ 35.00	$ 8,750.00						$ 8,750.00	
	2.41	Permanent Durable Pavement Markings - Stop Bars, 30cm	m	16.0	$ 20.00	$ 320.00						$ 320.00	
	2.42	Permanent Durable Pavement Markings - Green Continuity Strip, 10cm as per Std No. 2240.082	m	1845.0	$ 8.00	$ 14,760.00					$ 14,760.00		
	2.43	Permanent Durable Pavement Markings - Painted Yellow Line Delineating Bus Load Zone, 10cm on concrete as per Std. No. 2240.083	m	77.0	$ 7.00	$ 539.00					$ 539.00		
	2.44	Permanent Durable Pavement Markings - Elephants Feet, 20x20 cm as per Std. No. 2240.082	m	245.0	$ 20.00	$ 4,900.00					$ 4,900.00		
	2.45	Permanent Durable Pavement Markings - Elephants Feet, 40x40 cm as per Std. No. 2240.082	m	655.0	$ 25.00	$ 16,375.00					$ 16,375.00		
		SubTotal (Part B - Road and Boulevard Works excluding contingency)				$ 7,431,039.00		$ -	$ 2,640,000.00	$ -	$ 1,211,459.00	$ 3,579,580.00	$ -
		15% contingency (Part B)				$ 1,114,655.85		$ -	$ 396,000.00	$ -	$ 181,718.85	$ 536,937.00	$ -
		SubTotal (Part B - Road and Boulevard Works)				**$ 8,545,694.85**		**$ -**	**$ 3,036,000.00**	**$ -**	**$ 1,393,177.85**	**$ 4,116,517.00**	**$ -**
Watermain, Sewers and Utilities		**Part C - Watermain and Sewers**											
	3.01	Removal of Culverts and Storm Sewers	m	141.0	$ 30.00	$ 4,230.00						$ 4,230.00	
	3.02	Removal of CB MH, All Sizes	m	70.0	$ 250.00	$ 17,500.00						$ 17,500.00	
	3.03	Relocate Fire Hydrant	ea	5	$ 2,500.00	$ 12,500.00					$ 12,500.00		
	3.04	Supply and Install Manholes (All Sizes) parging frame and grate and finall adjustment to finish grade.	ea	3.0	$ 4,000.00	$ 12,000.00						$ 12,000.00	
	3.05	Supply and Install 600x600 Catch Basins and connect to existing storm lead including new pipe to complete the connection, parging frame and grate and finall adjustment to finish grade.	ea	64.0	$ 2,500.00	$ 160,000.00	Depending on condition - existing CB's could potentialy be re-used.					$ 160,000.00	
	3.06	Supply and Install 600x1450 Double Catch Basins and connect to existing storm lead including new pipe to complete the connection, parging frame and grate and finall adjustment to finish grade.	ea	6.0	$ 3,200.00	$ 19,200.00						$ 19,200.00	
	3.07	Adjust Frames and Covers for Existing CB's and MH'sto Match Asphalt Elevation	ea	84.0	$ 500.00	$ 42,000.00						$ 42,000.00	
	3.08	Supply and Install 300mm Dia. PVC Storm Sewer, Type I, Class 3 Bedding, Granular Backfill	m	60.0	$ 250.00	$ 15,000.00						$ 15,000.00	
	3.09	Supply and Install 1800mm Dia. Concrete Culvert, Class 3 Bedding, Granular Backfill	m	58.0	$ 3,500.00	$ 203,000.00				$ 203,000.00			
	3.10	Low Impact Development Measures	LS	150000.0	$ 1.00	$ 150,000.00	To be determined during Detailed Design	$ 150,000.00					
	3.11	Subdrains as per Std No. 2220.040	m	6200.0	$ 15.00	$ 93,000.00						$ 93,000.00	
	3.12	Supply and Install Fire Hydrant	ea	2	$ 6,000.00	$ 12,000.00					$ 12,000.00		
	3.13	Adjust Water Valve	ea	66	$ 400.00	$ 26,400.00					$ 26,400.00		
	3.14	Adjust Gas Valve	ea	6	$ 400.00	$ 2,400.00					$ 2,400.00		
	3.15	Adjust Valve Chamber	ea	6	$ 650.00	$ 3,900.00					$ 3,900.00		
		SubTotal (Part C - Watermain, Sewers and Utilities excluding contingency)				$ 773,130.00		$ 150,000.00	$ -	$ 203,000.00	$ 57,200.00	$ 362,930.00	$ -
		15% contingency (Part C)				$ 115,969.50		$ 22,500.00	$ -	$ 30,450.00	$ 8,580.00	$ 54,439.50	$ -
		SubTotal (Part C - Watermain, Sewers and Utilities)				**$ 889,099.50**		**$ 172,500.00**	**$ -**	**$ 233,450.00**	**$ 65,780.00**	**$ 417,369.50**	**$ -**
Electrical Works		**Part D - Electrical Works**											
	4.01	Lighting installation including poles, luminaires, direct buried cable (per pole) (Poles Required to Illuminate by New AT facilites)	LS / pole	97	$ 10,000.00	**$ 970,000.00**					$ 970,000.00		
	4.02	Lighting installation including poles, luminaires, direct buried cable (per pole)	LS / pole	10	$ 10,000.00	**$ 100,000.00**							$ 100,000.00
	4.03	Signalized Intersection	ea	4	$ 250,000.00	**$ 1,000,000.00**					$ 1,000,000.00		
	4.04	Pedestrian Signal	ea	3	$ 135,000.00	**$ 405,000.00**					$ 405,000.00		
		SubTotal (Part D - Electrical Works excluding contingency)				**$ 2,475,000.00**		$ -	$ -	$ -	$ 2,375,000.00	$ -	$ 100,000.00
		15% contingency (Part D)				**$ 371,250.00**		$ -	$ -	$ -	$ 356,250.00	$ -	$ 15,000.00
		SubTotal (Part D - Electrical Works)				**$ 2,846,250.00**		**$ -**	**$ -**	**$ -**	**$ 2,731,250.00**	**$ -**	**$ 115,000.00**
Landscape		**Part E - Landscape**											
	5.01	Supply and install decorative paving - stamped and coloured concrete	m2	900	$ 120.00	**$ 108,000.00**						$ 108,000.00	
	5.02	Supply and install sod, including 150mm topsoil	m2	10850	$ 11.50	**$ 124,775.00**					$ 124,775.00		
	5.03	Supply and install ornamental planting beds, including mulch and all appurtenances (shrubs and perennials)	m2	59	$ 90.00	**$ 5,287.50**					$ 5,287.50		
	5.04	Supply and install deciduous trees	ea	104	$ 700.00	**$ 72,800.00**						$ 72,800.00	
		SubTotal (Part E - Landscape)				**$ 310,862.50**		$ -	$ -	$ -	$ 130,062.50	$ 180,800.00	$ -
		15% contingency (Part E)				**$ 46,629.38**		$ -	$ -	$ -	$ 19,509.38	$ 27,120.00	$ -
		SubTotal (Part E - Landscape)				**$ 357,491.88**		**$ -**	**$ -**	**$ -**	**$ 149,571.88**	**$ 207,920.00**	**$ -**
Utilities and Property		**Part F - Utilities and Property**											
	6.01	Utility Relocations	LS	1	$ 150,000.00	**$ 150,000.00**					$ 150,000.00		
	6.02	Property (1315 Bough Beeches Boulevard)	ha	0.0040	$ 3,000,000.00	**$ 12,000.00**					$ 12,000.00		
		SubTotal (Part F - Utilities and Property)				**$ 162,000.00**		$ -	$ -	$ -	$ 162,000.00	$ -	$ -
		15% contingency (Part F)				**$ 24,300.00**		$ -	$ -	$ -	$ 24,300.00	$ -	$ -
		SubTotal (Part F - Landscape)				**$ 186,300.00**		**$ -**	**$ -**	**$ -**	**$ 186,300.00**	**$ -**	**$ -**
		Sub Total (Part A-F)				**$ 13,110,496.23**		**$ 176,452.43**	**$ 3,105,562.83**	**$ 238,798.96**	**$ 4,626,357.15**	**$ 4,845,689.89**	**$ 117,634.96**
		Detailed Design (7%)				**$ 917,734.74**							
		Contract Administration (10%)				**$ 1,311,049.62**							
		Grand Total				**$ 15,339,280.58**							

APPENDIX

P

MIWAY STOPS MODIFICATION MEMO

Memorandum

To:	Rory O'Sullivan, T&W/Transportation Projects
From:	Jacqueline Elias, MiWay
Date:	September 21, 2020
Subject:	RE: Rathburn Road and Ponytrail Drive Integrated Road Project - MiWay Comments

The following memo outlines MiWay's transit requirements to be considered as part of the Rathburn Road and Ponytrail Drive Integrated Road Project.

Impacts to existing stops:
Please be advised that there are existing transit stops with concrete pedestrian pads (and shelters at some locations) located along Rathburn Road and Ponytrail Drive that will be affected by this project. MiWay would like the opportunity to review those drawings when available.

After a review of existing stops along Rathburn Road and Ponytrail Drive, MiWay will not be removing or consolidating any stops based on existing ridership, stop spacing, adjacent land-uses and previous community feedback. The recommended stop improvements are noted below; any improvements to relocate or replace stop markers will be undertaken by MiWay. Please note that all existing transit infrastructure impacted by this project is to be reinstated as per MiWay Standards.

Table 1: Stop Improvements

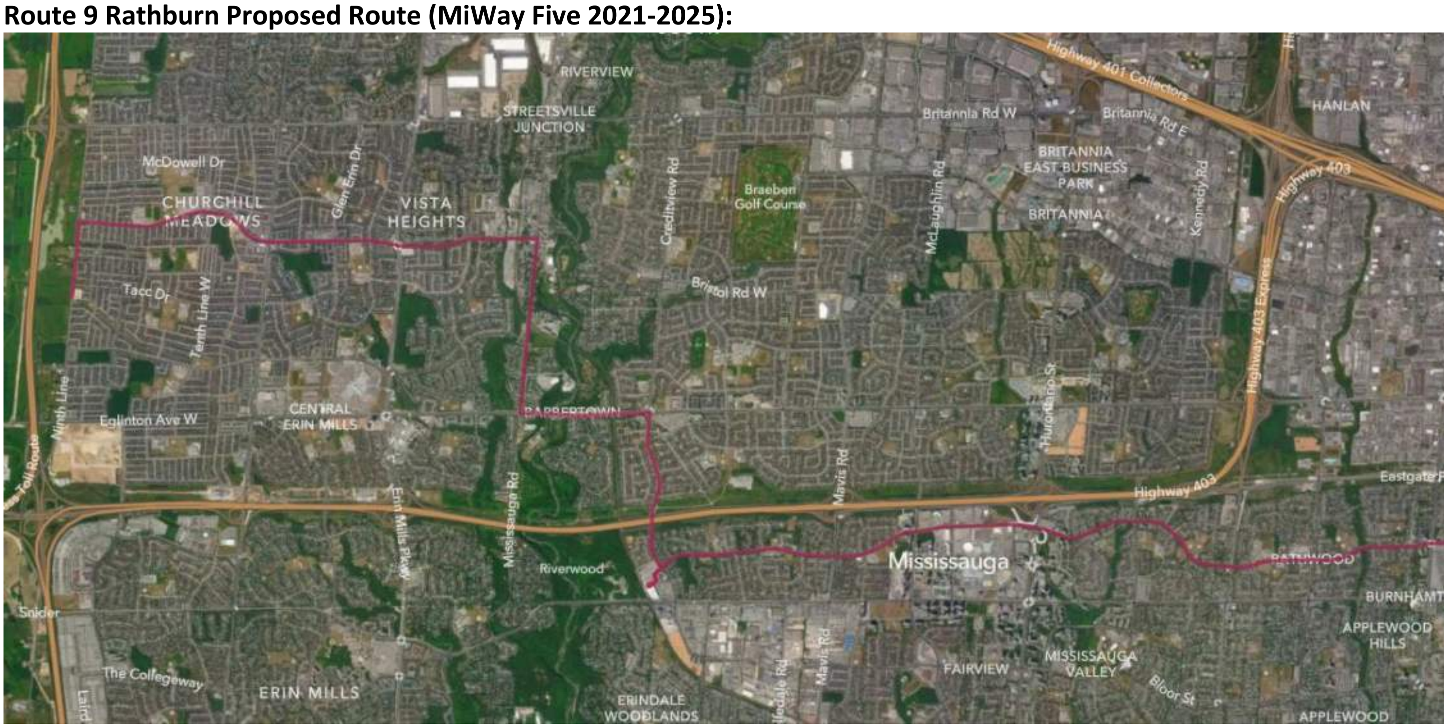
Stop ID	Description	Existing Infrastructure	Routes	Recommended Improvements
		Eastbound		
1529	Rathburn Rd At Bough Beeches Blvd	Shelter, landing pad adjacent to sidewalk, bus stop marker on signal pole, garbage bin	20	New stop marker and post
1530	Rathburn Rd At Rockwood Rd	Shelter, landing pad, sidewalk connection, bus stop marker on signal pole, garbage bin	20	New stop marker and post
1531	Rathburn Rd At Fieldgate Dr	Shelter, landing pad, sidewalk connection, bus stop marker on post	20	No change
1532	Rathburn Rd West Of Capalano Crt	Shelter, landing pad, sidewalk connection, bus stop marker on post, garbage bin	20	No change
1533	Rathburn Rd At Ponytrail Dr	Shelter, landing pad, dual sidewalk connection, bus marker on signal pole	20	New landing pad and sidewalk connections as per MiWay standards
1590	Ponytrail Dr At Maple Ridge Dr	Stop marker on utility pole	20	New stop marker and post

Westbound				
1534	Ponytrail Dr At Lookout Crt	Shelter, landing pad, sidewalk connection, bus marker on signal pole	20	No change
1535	Rathburn Rd East Of Capilano Crt	Shelter, landing pad, sidewalk connection, bus marker on signal pole, garbage bin	20	New sidewalk connection as per MiWay standards
1536	Rathburn Rd West Of Capilano Crt	Landing pad adjacent to sidewalk, bus stop marker on signal pole	20	No change
1537	Rathburn Rd At Fieldgate Dr	Shelter, landing pad, sidewalk connection, bus stop marker on post	20	Move stop marker post closer to stop
1538	Rathburn Rd At Rockwood Rd	Shelter, landing pad, sidewalk connection, bus stop marker on post, garbage bin	20	No change
1539	Rathburn Rd At Bough Beeches Blvd	Shelter, landing pad adjacent to sidewalk, marker on signal pole, garbage bin	20	Relocate bus stop post closer to curb or beside shelter

Affected MiWay Routes:
The MiWay route 20 services the proposed project area and has standard (40') buses operating on this route. Within the peak hour this will impact approximately 4 buses.

MiWay has future plans to explore a bus loop at the east end of Rathburn road in the next MiWay Five 2021-2025 Service Plan which would explore the cancellation of Route 20 but extension of Route 9 to cover Rathburn into that TTC bus loop.

Route 9 Rathburn Proposed Route (MiWay Five 2021-2025):



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Consideration for Potential Impacts and Mitigation during Construction:
Please be advised that MiWay has guidelines for transit stops that will be impacted by works. These guidelines are noted below for your reference and for inclusion into the Project Report as necessary:

Temporary Transit Stops:

- The function of this bus stop is to be maintained and shall remain in its current location. Should maintaining this stop not be feasible due to construction impacts, a temporary bus stop location shall be proposed.

- An alternative stop location shall be provided as close to the original stop location as possible. In consultation with MiWay's Infrastructure Management staff, a barrier-free, accessible temporary stop with connections to the existing sidewalk shall be provided.

- MiWay requires a 15 metre longitudinal clearance from the proposed stop marker (stop marker indicates where a bus comes to a stop) to provide safe access for passengers exiting from the back doors of a 40ft and 60ft bus. The requested 15 metre clearance shall be free of all trees and grates (or any other street furniture).

- Convenient and accessible pedestrian linkages are to be provided between the existing sidewalk network and MiWay services/stops. Pedestrian walkway connections to the existing municipal sidewalk are necessary to ensure accessibility, reduce walking time and encourage transit use.

- Where a temporary stop is required for less than one month, a hard gravel landing surface (bus stop pad) shall be provided. A level asphalt or concrete bus stop pad surface meeting accessibility requirements shall be provided at temporary bus stops locations that will be in place for more than one month.

- Where the temporary bus stop is replacing an existing bus stop with a shelter, a shelter shall be provided at temporary bus stops locations existing for more than four months.

Infrastructure Costs:

- The cost of any boulevard improvements/reinstatement, including any impact to MiWay infrastructure, as necessary to accommodate this construction shall be borne by the contractor.

- Please be advised that all costs associated with the removal and reinstatement of existing transit shelters will be the responsibility of the proponent with the work being completed by MiWay's Shelter Contractor. Payment for relocating a transit shelter must be arranged directly with the shelter contractor prior to the shelter being removed and/or relocated. MiWay's Infrastructure Management Team coordinates stop and shelter relocations and must be contacted at least two weeks prior to the commencement of construction.

- The applicant is to be advised that all costs associated with the relocation and/or reinstatement of the transit infrastructure mentioned above (bus bay, shelter) will be the responsibility of the proponent.

Lane Disruptions (lane widths)

- Please be advised that full road closures will not be supported by MiWay.

- Information on possible lane reductions must be communicated to MiWay staff as per MiWay's Standard Notification schedule.

- For all roadways that are serviced by MiWay routes, please be advised that MiWay requires lane widths of 3.5 metres.

Standard Transit Drawings:

- The applicant is advised that MiWay's standard drawings are available on-line as part of the Standard Drawings Manual for the Transportation and Works Department, City of Mississauga (Available at: http://www.mississauga.ca/portal/business/transit)

Contact Information:

- Should any road/boulevard works (including lane disruptions) impact existing transit infrastructure (stops or shelters) or service (routes), the applicant is required to contact MiWay's Infrastructure Management Section at 905 615-3200 ext. 3825 or MiWay Infrastructure MiWay.Infrastructure@mississauga.ca at least two weeks prior to submission of the Road Occupancy Permit (ROP), and include information on the proposed traffic management plans.

APPENDIX

Q COMMENT TRACKING LOG

COMMENTS AND RESPONSES TRACKING LOG

Item	Email Subject Title	Last Response Date	Date Received	Description	Utililty/ City Comment	WSP Response	City Response	WSP Response	City Response	Status
MiWay										
1				Stop #1529 Rathburn Rd.	Stop 1529 has a shelter; please add shelter pad so that it is clearly visible as the shelter pad will also need to be reconstructed as part of this project.	Per our Meeting on May 19 Shelter pad will remain at the same location. Could MiWay clarify comment on drawings attached, should we be showing a new concrete shelter pad at the same location?	If the shelter/shelter pad is impacted by the project (i.e. requires removal and reinstatement), it should be shown on the plan as a concrete pad at the same location.	Understood, WSP will show shelter pads as being reconstructed since grading impacts will be determined as part of the detail design phase		Closed
2				Stop #1539 Rathburn Rd.	Stop 1539 has a shelter; please add shelter pad so that it is clearly visible as the shelter pad will also need to be reconstructed as part of this project.	Per our Meeting on May 19 Shelter pad will remain at the same location. Could MiWay clarify comment on drawings attached, should we be showing a new concrete shelter pad at the same location?	If the shelter/shelter pad is impacted by the project (i.e. requires removal and reinstatement), it should be shown on the plan as a concrete pad at the same location.	Understood, WSP will show shelter pads as being reconstructed since grading impacts will be determined as part of the detail design phase		Closed
3				Stop #1532 Rathburn Rd.	Stop 1532 Rathburn Rd West Of Capalano Crt has a shelter; please clearly show shelter pad as it will need to be reconstructed as part of this project	Shelter opening to be facing sidewalk, concrete has been shown in the plans, WSP will add dimensions to the plan. Could MiWay confirm this is sufficient?	This is not sufficient. At this location, the shelter should open toward the sidewalk, however the minimum width from the edge of the landing pad to the shelter still needs to be 1.22m as per MiWay Standards 2250.050. Alternatively, the landing pad can be extended so that the 15m landing pad starts to the west of the shelter (19m total length for landing pad and shelter pad); the shelter would still open toward the sidewalk.	WSP has increased the length of the concrete pad to 19m.		Closed
4				Stop #1534 Ponytrail Dr.	Landing pad and shelter pad are not as per MiWay Standard. Please revise. The tree will have to be removed as part of this project.	Most recent design complied with MiWay Constrained standard No. 2240.083. WSP has updated the layout to match MiWay (preferred) Standard No. 2240.085. WSP proposes that the bell handwell be relocated to avoid having pavement markings on lid.	No further comments.			Closed
5	Updated Plan	2021-09-17	2021-08-09	Stop #1535	For stop#1535, could you please confirm the distance from the intersection? The distance should be in accordance with MiWay Standard 2260.020 (attached).	In regards to stop # 1535, the distance from the edge of sidewalk ramp at the intersection to the edge of landing pad is 19m, see sketch attached. I was basing the design on the City and MiWay standard drawing 2240.085, see attached. Standard 2240.085 shows a distance of 4.0m minimum from the edge of ramp at the intersection to the edge of landing pad. In the sketch attached you will see, in red lines, what the transit stop would look like with a 4m offset from the edge of the sidewalk ramp to the edge of the landing pad vs what was originally proposed. Could you confirm if standard 2240.085 is preferred over the 2260.020.	Thanks for the clarification, maybe having the dimensions may help. Is it the sidewalk, 2.1m for the shelter, 2m for the platform and then the reduced cycle track? If the cycle track needs to be reduced either way, could we have the cycle track bend behind the shelter (i.e. sidewalk, reduced cycle track, shelter platform)? I don't recall if the reduced cycle track was part of the conversation last time.	See attached Alternative 1 and 2 with the dimensions for clarification. •Alt1: o1.5m sidewalk – 2.1m Shelter pad – 2.0m Landing pad - 1.5m cycle track (reduced) – curb and gutter •Alt 2: o1.5m sidewalk - 1.5m cycle track (reduced) – 2.1m shelter – 2.0m landing pad - curb and gutter oThis option would have the tactile plates on the sidewalk	Please keep the stop as is (Alternative 1).	Closed
6			2021-09-15	Additional comments on plans	Stop #1536 (west of Hydro corridor)Should the bus stop design here mirror the bus stop on the south side in order to accommodate a bus shelter?	MiWay approved layout. Final layout can be confirmed during detail design				Closed
City of Mississauga										
7				West Leg of Dixie Intersection	I recall discussion at the TAC meeting for inclusion of cross rides on west side of the intersection	WSP to add cross ride and cross walks on west leg.				Closed
8				Bough Beeches Blvd. Garnetwood Park Entrance	Should similar bend down treatment for cycletrack as the other intersections be applied here	Plans have been updated.				Closed
9				Section Between the two Garnetwood intersections	Why is concrete median being provided between Garnetwood Chase intersections?	Per City's direction, raised median has been removed and pavement marking median shown in the plans.				Closed
10				Garnetwood Chase	Side street name missing	Plans have been updated.				Closed
11			2021-06-04	Cul-De-Sac	Eliminate property impact by realigning the cul de sac	Horizontal alignment changed to maintain all infrastructure within the ROW. Due to the ROW constraint a 2.0m sidewalk was not feasible per City's Sandard No. 2240.040. A 1.8m sidewalk was provided and shown in the plans to avoid property impacts.				Closed
12				Cul-De-Sac	Should curb build out be provided here to reinforce no parking on cul de sac?	Curb Build out has been provided, refer to updated plans.				Closed
13				Rathburn Rd. to Cul-De-Sac	Add raised bike/ped crossing with yield triangles on inbound side. Replace outer stop bar and replace with lane guide line, so drivers can better judge waiting area.	Plans have been updated.				
14	RE: Cul-de-sac layout	2021-06-02	2021-06-02	Cul-De-Sac	Preference is to provide sidewalk on outside of cul de sac	Plans have been updated.				Closed
15	RE: Updated Plan	2021-06-09	2021-06-04	Property Impact	There is a property impact with the sidewalk at the cul de sac. Did you look at bending the cul de sac to make room for the sidewalk?	Plans have been updated.				Closed
16	RE: Updated Plan	2021-06-09	2021-06-04	Ped Crossing at Tapestry Trail	Ped crossing should be moved to opposite the park entrance? May extend the median to provide an uncontrolled crossing for now.	Plans have been updated.				Closed
17	RE: Updated Plan	2021-06-09	2021-06-04	RTL on Burnhamthorpe	Taper length for RTL quite long, should use lower range and maximise the storage length	Taper revised to start immediately after curb return to maximize storage length. Taper length per TAC				
18	RE: Updated Plan	2021-06-09	2021-06-04	Rathburn Rd. East of Ponytrail	Should not have two-way LTL	Plans have been updated.				Closed
19	FW: Storm Sewer Review	2021-06-15	2021-03-31	SWM Memo Stormwater Facilities	Stormwater Facilities: Table 3-1 and 3-2 show Area unit as m2. Please revise to hectares accordingly.-	Modified in report	WSP's updates to the storm sewer component are adequate for preliminary design purposes.			Closed
20	FW: Storm Sewer Review	2021-06-15	2021-03-31	SWM Memo Stormwater Facilities	An additional table after Table 3-2 should be added which shows the difference in areas pre-development to post-development for each catchment ID.	Added in report	WSP's updates to the storm sewer component are adequate for preliminary design purposes.			Closed

21	FW: Storm Sewer Review	2021-06-15	2021-03-31	SWM Memo Stormwater Facilities	3.Appendix A states that a Time of Concentration of 10min should be used as a minimum, whereas 15min is stated as per Section 2 of the SWM Memo and the City's Storm Drainage Design Requirements. Please revise accordingly	Appendices have been modified.	WSP's updates to the storm sewer component are adequate for preliminary design purposes.			Closed
22	FW: Storm Sewer Review	2021-06-15	2021-03-31	SWM Memo Stormwater Facilities	Appendix A provides water quality storage requirement calculations for the entire catchment areas, whereas the report states that the storage requirements are only needed for the additional impervious areas. In addition to the total storage volumes for the full catchment area, please ensure consistency and show the calculations in the Appendix for the storage requirements for the additional impervious areas only	Only additional impervious areas are required. Appendices have been modified to reflect this.	WSP's updates to the storm sewer component are adequate for preliminary design purposes.			Closed
23	FW: Storm Sewer Review	2021-06-15	2021-03-31	SWM Memo Stormwater Facilities	In Table 5-1, please add a column which states the additional impervious area	Added	WSP's updates to the storm sewer component are adequate for preliminary design purposes.			Closed
24	FW: Storm Sewer Review	2021-06-15	2021-03-31	SWM Memo Storm Sewer Infrastructure	Memo Section 6 – Pg. 8: The second paragraph reads, "The rainfall intensity values were taken from as-built design sheets. 63.5 mm/hr (approximate 2-year storm event) has been assumed as it is an average intensity for all the runoff calculations." What does this mean? It is noted that a rainfall intensity of 2.5 in/hr (63.5 mm/hr) has been applied to the majority sub-catchments in the Existing Conditions capacity analysis, however, in the storm drainage plan documents package "Rathburn Road East and Ponytrail Drive - Storm Drainage Plan Records [CoM].pdf" provided by the City in September 2020, the design intensity for all storm sewers in this area corresponds to the City's 10-yr IDF parameters. Please revise the capacity analysis accordingly	The proposed condition capacity analysis is done using 10 year IDF parameters as shown in below table. where as for the existing conditions we assumed the intensity as 63.5 mm/hr due to missing data for some of the segments such as Outfall MH-122, MH-70,MH-169, MH-181, MH-50, However u/s segments of Outfall MH-122,MH-70 requires no upgrades as these segments have the capacity to take runoff generated using the latest city standards. Since the proposed conditions are governing the upgrades for storm sewers, the assumption of 63.5 mm/hr when analyzing the existing conditions doesn't have any impact on the storm sewers upgrades. Comment added in corresponding location in the report *email includes table of IDF parameters*	WSP's updates to the storm sewer component are adequate for preliminary design purposes.			Closed
25	FW: Storm Sewer Review	2021-06-15	2021-03-31	SWM Memo Storm Sewer Infrastructure	Appendix B – Storm Sewer Design Sheet: In both storm sewer design charts, it is noted that many inverts at the maintenance holes have been assumed. The sewer system which outlets to MH 70 was reviewed as a sample to consider whether this information was made available to the Consultant. By review of storm sewer as-constructed plan & profile drawings C-13700 and C-13701 provided by City on 2020/12/15, invert elevations are available for all maintenance holes for which assumptions were made (MH 65, 66, 67, and 68). Please revise both storm sewer design charts to reflect the invert elevations that can be obtained from the as-constructed plan & profile drawings.	Addressed and updated	WSP's updates to the storm sewer component are adequate for preliminary design purposes.			Closed
26	FW: Storm Sewer Review	2021-06-15	2021-03-31	SWM Memo Storm Sewer Infrastructure	Appendix B – Storm Sewer Design Sheet: In the Existing Conditions design chart, Imperial units of acres and inches are used. Please modify the chart such that metric units are used i.e. hectares and mm.-	Addressed and updated	WSP's updates to the storm sewer component are adequate for preliminary design purposes.			Closed
27	FW: Storm Sewer Review	2021-06-15	2021-03-31	SWM Memo Storm Sewer Infrastructure	Appendix B – Storm Sewer Design Sheet: In the Existing Conditions design chart, the capacity value (m3/s) for each pipe segment is not included; only 'Flow/Capacity (%)' is provided. Please include a column for the capacity value (m3/s).	Addressed and updated	WSP's updates to the storm sewer component are adequate for preliminary design purposes.			Closed
28	FW: Storm Sewer Review	2021-06-15	2021-03-31	SWM Memo Storm Sewer Infrastructure	Appendix B – Storm Sewer Design Sheet: In addition to Table 6-1, please include a third storm sewer design chart that shows the capacity calculations for proposed road conditions, while maintaining existing storm sewer infrastructure.	Addressed and updated	WSP's updates to the storm sewer component are adequate for preliminary design purposes.			Closed
29	FW: Storm Sewer Review	2021-06-15	2021-03-31	SWM Memo Storm Sewer Infrastructure	Appendix C – Storm Sewer Profile: Please provide information describing the hydraulic conditions that were simulated at each of the five outfalls as part of the HGL and EGL analysis.	The analysis is done using the flow as an input to the storm sewer gems model, the flow is estimated using rational method and the calculations are shown in Appendix-B, HGL and EGL are shown in Appendix-C along with storm sewer profiles. Since the all the outfalls are connecting to the manholes there are no boundary conditions applied/required.	WSP's updates to the storm sewer component are adequate for preliminary design purposes.			Closed
30	FW: Storm Sewer Review	2021-06-15	2021-03-31	LID Memo Stormwater Facilities	An additional table after Table 3-2 should be added which shows the difference in areas pre-development to post-development for each catchment ID.	Added in report	WSP's updates to the storm sewer component are adequate for preliminary design purposes.			Closed
31	FW: Storm Sewer Review	2021-06-15	2021-03-31	LID Memo Stormwater Facilities	Please include a table which summarizes the required quantity and quality storage volumes for each catchment area.	Added table in section 5.	WSP's updates to the storm sewer component are adequate for preliminary design purposes.			Closed
32	FW: Storm Sewer Review	2021-06-15	2021-03-31	LID Memo Stormwater Facilities	Catchments 100 and 200 require additional stormwater quality control, however the proposed LID location is within Catchment 200 only. Was there any LID opportunity found in Catchment 100?	As part of the scope of work, the City clearly identified two locations for LID assessment (not located within catchment 100) which we followed and assessed.	WSP's updates to the storm sewer component are adequate for preliminary design purposes.			Closed
33	FW: Storm Sewer Review	2021-06-15	2021-03-31	LID Memo Stormwater Facilities	Section 6 of the LID Memo states that cross-sections of Ponytrail Drive are provided in Exhibit 3, however these are not included. Please clarify.	Cross sections are located at the bottom right corner of Exhibit 3 for illustrative purposes. Detailed full scale cross sections will be part of the roadway drawing sets.	WSP's updates to the storm sewer component are adequate for preliminary design purposes.			Closed
34	FW: Storm Sewer Review	2021-06-15	2021-03-31	LID Memo Stormwater Facilities	Please provide reasoning on how the potential LID location was selected. Was the topography of the site considered to ensure that the LID would be able to receive adequate stormwater runoff?	The City identified the potential LID locations to be assessed as part of the statement of work.	WSP's updates to the storm sewer component are adequate for preliminary design purposes.			Closed
35	FW: Storm Sewer Review	2021-06-15	2021-03-31	LID Memo Stormwater Facilities	Can a magnified aerial image of the proposed LID location be provided?	It can be provided – however the locations are estimations for this stage of the design and the exact locations should be confirmed during later design stages.	WSP's updates to the storm sewer component are adequate for preliminary design purposes.			Closed

36	FW: Storm Sewer Review	2021-06-15	2021-03-31	LID Memo Stormwater Facilities	Appendix B states that a Time of Concentration of 10min should be used as a minimum, whereas 15min is stated as per Section 2 of the SWM Memo and the City's Storm Drainage Design Requirements. Please revise accordingly	Appendices have been modified.	WSP's updates to the storm sewer component are adequate for preliminary design purposes.			Closed
37	RE: Noise Wall	2021-06-15	2021-05-04	Preliminary LS plan	See consolidated comments on the noise wall drawings.	Revised noisewall drawing sent on June 3				Closed
38	RE: Noise Wall	2021-06-15	2021-06-15	Noise Wall	Senior Managers concerned about property cost required for noise wall. Is it possible to confirm the extent and ball park costs of utility relocations that wold be required if the noise wall was located 1ft inside the property line?	Cost estimate to for utility relocations was provided for analysis. The evaluation of the noisewall location is discussed within the PDR				Closed
39	AADT for Ponytrail	2021-07-20	2021-02-12	AADT for Ponytrail	Provide AADT number for Ponytrail	The estimated AADT for Ponytrail Drive between Burnhamthorpe Road and Maple Ridge Drive is 2031: 16,700 vehicles 2041: 18,000 vehicles				Closed
40	AADT for Ponytrail	2021-07-20	2021-02-12	AADT for Ponytrail	(July 20) Would it be possible to obtain similar AADT numbers for 2031 and 20141 for Fieldgate north and south of Rathburn Road?	(Aug 04) 2031: North = 6200, South = 3600 2041: North = 6700, South = 3800				Closed
41	FW: Rathburn Road - Property Enquiry	2021-07-20	2021-07-20	Cul de Sac Easement	As discussed yesterday the City does not have an easement at the Rathburn Road cul de sac. Based on this please update the design to try and avoid the property impact at this location.	Plans have been updated.				Closed
42	RE: Revised DC	2021-07-20	2021-07-12	Follow-up on median treatment		City comment was "center median as opposed to two way left (throughout)" and we interpreted this as a raised median. If we want to be consistent, I note that there are raised medians (grass) along this section of Rathburn on the north side of the northern Garnetwood Chase, at Tapestry Trail and the approach to the Ponytrail intersection. Please let us know your preferred treatment.	Our forestry group has indicated that their preference would be to provide an asphalt median lane at this location based on maintenance considerations.			Closed
43	RE: Rathburn Rd at Ponytrail: NE Corner	2021-08-10	2021-08-10	Rathburn Rd at Ponytrail: NE Corner	How big would the curb radius need to be in order to accommodate the turn from the 1st through lane on Ponytrail Drive?	1.Largest radii required to accommodate the turn from the 1st through lane would be larger than 18m (~22m to clear the back tires without jumping the curb),see sketch attached. Some of the cons as you already know; large Radii would promote faster turns for the more common/smaller vehicle type negotiating the turn, not be favorable for pedestrians and cyclist. Large radii also increases the crossing distance for pedestrians. 2.We found that providing an offset of 1.8m over 30m with a 10m radius would accommodate the turn from the 1st through lane, see sketch above. I did try various iterations of the layout with different offsets and radii (1.0m & 1.5m offsets, 10m, 12m,15m, 18m radii). The 1.8m offset with 10m radius combination was found to accommodate the WB 20 turn from the 1st through lane, shorten the pedestrian crossing distance and provide a tighter radius that promotes slower turning movement for the smaller size vehicles negotiating the turn.	Project Team - The turning movement was analysed and concluded that a large truck can make this turn by encroaching on adjacent lanes and this was deemed acceptable.			Closed
44	Rathburn Road Integrated Project Plan	2021-09-17	2021-09-13	Stop #1537	It does look like there is room for a preferred layout at this location	I think we discussed this stop in a previous meeting on May 19th and it was determined that there wasn't enough room to fit in the preferred option at this location, see attached sketch	Thanks for the clarification, maybe having the dimensions may help. From the image below, is it the sidewalk, 2.1m for the shelter, 2m for the platform and then the reduced cycle track? If the cycle track needs to be reduced either way, could we have the cycle track bend behind the shelter (i.e. sidewalk, reduced cycle track, shelter platform)? I don't recall if the reduced cycle track was part of the conversation last time.	No problem. See attached Alternative 1 and 2 with the dimensions for clarification. •Alt1: o1.5m sidewalk – 2.1m Shelter pad – 2.0m Landing pad - 1.5m cycle track (reduced) – curb and gutter •Alt 2: o1.5m sidewalk - 1.5m cycle track (reduced) – 2.1m shelter – 2.0m landing pad - curb and gutter oThis option would have the tactile plates on the sidewalk.	Thanks for the clarification. Please keep the stop as is (Alternative 1).	Closed
6			2021-09-15	Additional comments on plans	Build short 2.5 m wide asphalt extension, to tie into planned trail extension west. (NW quadrant of Dixie Road)	Plans have been updated.				Closed
7			2021-09-15	Additional comments on plans	Extend Asphalt paths for multi-use trail and cycle tracks top the curb depressions on west side of Dixie Road.	Plans have been updated.				Closed
8			2021-09-15	Additional comments on plans	Crossride is not required on east leg of Dixie Road, this would not be a normal cycling movement here.	Crossing added based on TAC stake holders meeting. Peel Region staff requested crossings at all four quadrants.				Closed
9			2021-09-15	Additional comments on plans	Can the cycle track crossing and crosswalk on south leg of Bough Beeches be moved back, so the cycle track has a bend out, like on the north leg?	Not possible due to utility and property constraints.				Closed
7		I	2021-09-15	Additional comments on plans	More detail for offset crossing at Shaver Trail should be shown	Plans have been updated.				Closed
8			2021-09-15	Additional comments on plans	Add asphalt connection to existing park trail southbound	Area to be finalized in detail design				Closed
9	Landscape Plan	2021-09-27	2021-09-23	Trees impacted by noisewall	There is a bunch of private trees that would be impacted by the new noise wall in this location. I don't t think these were captured on the survey but you can see them on street view	We did not pick up these trees in our survey since they are beyond the ROW and behind private fencing. As we finalize the landscape plans, WSP will add a note in this location to the effect of "Impacts to existing trees on private property along the fenceline to be confirmed as part of the detail design process"	City good with this approach			Closed

APPENDIX

R SUE (LEVEL B)

SCALE 1:250

SHEET 1 OF 8

SCALE 1:250
SHEET 2 OF 8

SCALE 1:250
SHEET 3 OF 8

SCALE 1:250
SHEET 4 OF 8

SCALE 1:250

SHEET 5 OF 8

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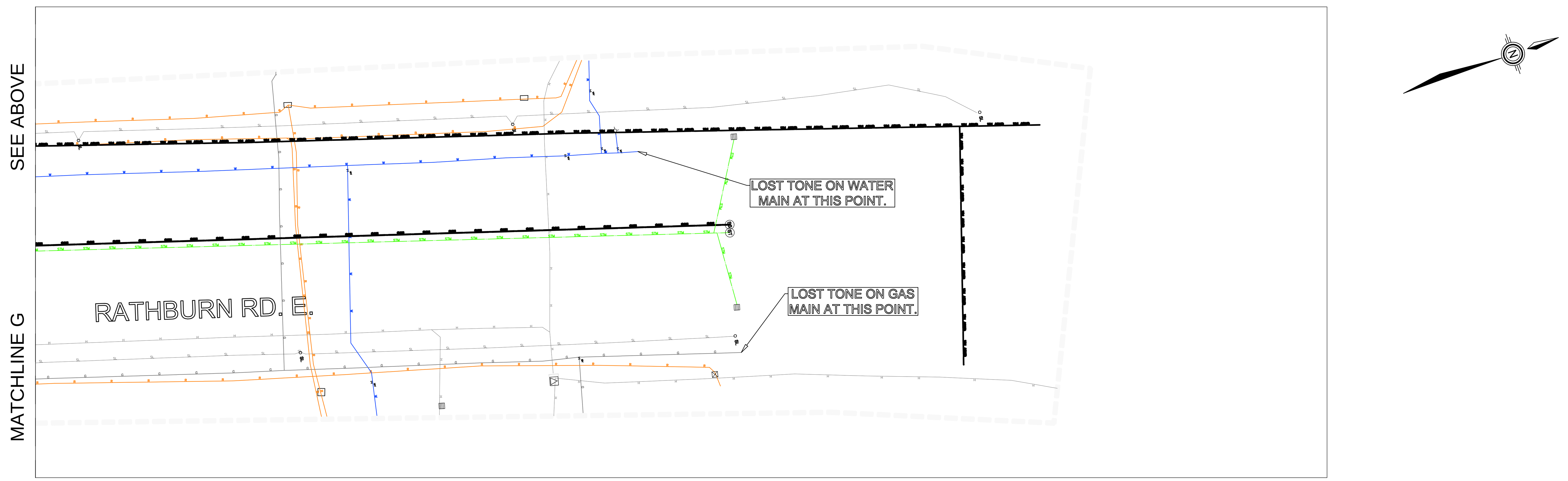
SHEET 6 OF 8



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SHEET 7 OF 8

SCALE 1:250
SHEET 8 OF 8