Prepared for:

City of Toronto

Metro Hall
20th Floor,
55 John Street,
Toronto, ON, M5V 3C6

Attention: Grace Tesa

Lawrence Park Neighbourhood Investigation of Basement Flooding & Road Improvement Environmental Assessment

Executive Summary

submitted by:

Aquafor Beech Ltd.

January 31st, 2018

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EXECUTIVE SUMMARY

INTRODUCTION

The Lawrence Park Neighbourhood (LPN) study area is located in the central part of the City within Ward 25 – Don Valley West within the West Don River watershed (see Figure ES-1). The study area is roughly bounded by Blythwood Road, Ridgefield Road and Sunnydene Crescent to the south, Mildenhall Road to the north, Mount Pleasant Road to the west, and Bayview Avenue and Valleyanna Road in the east. The distribution of land use within the study area is approximately 70% single and multiple residential, approximately 10% institutional, commercial and industrial, and 20% park area and roadway. A majority of the commercial developments are located adjacent to Bayview Avenue.

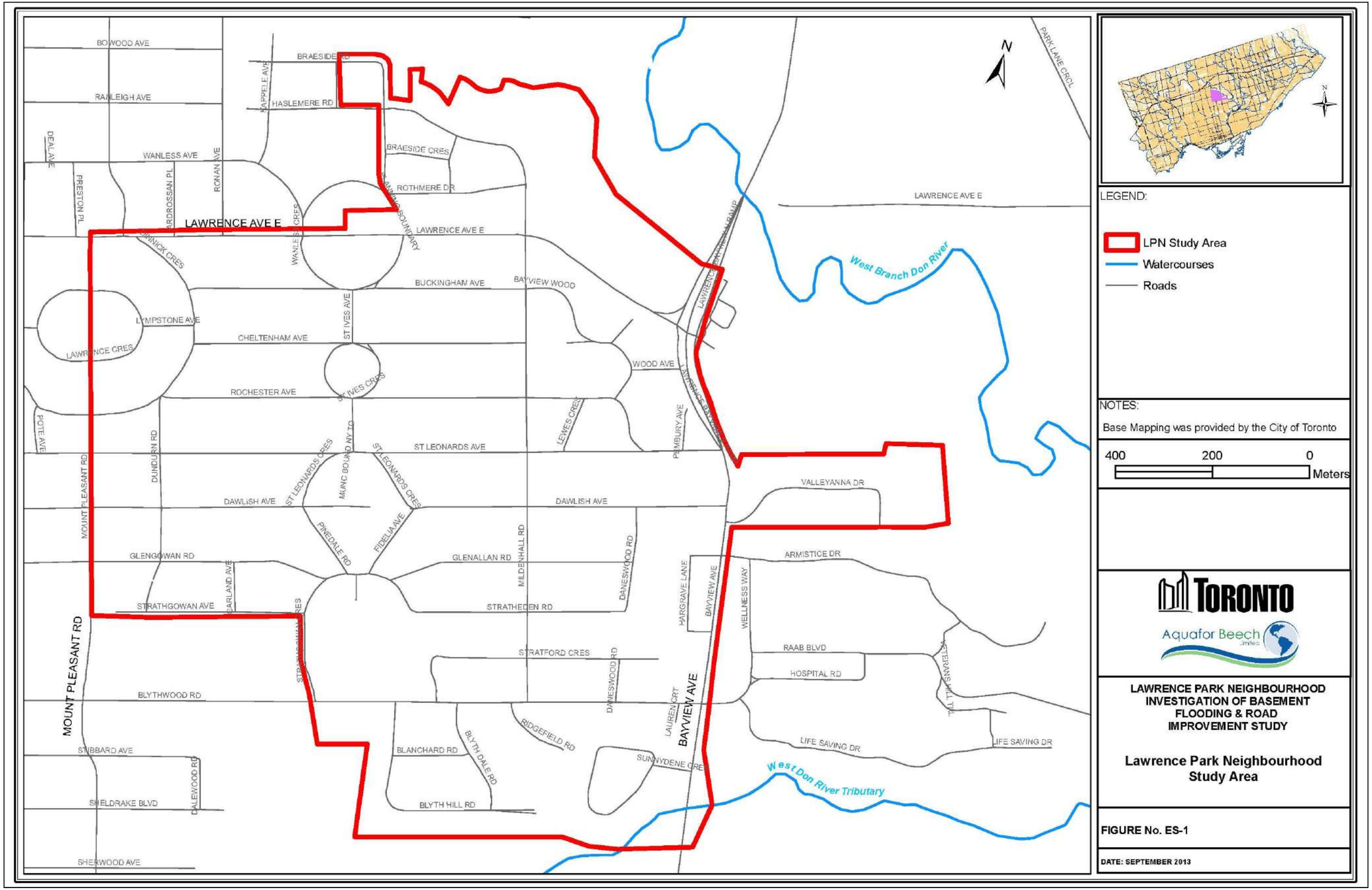
The area was originally developed in the 1920's to the 1950's and is located within two former municipalities within the City (Toronto and North York). Slightly over 30 percent of the original homes have been renovated or reconstructed.

The study area is serviced by a mix of combined, sanitary and storm sewers as well as roadside ditches. The Lawrence Park Neighbourhood Sewershed has six (6) stormwater outfalls discharging into a tributary or the West Branch of the Don River.

The homes located to the west of St. Ives Avenue (former City of Toronto) were initially serviced with combined sewers, which carry both wastewater and stormwater runoff. Throughout the 1960s until the mid 1980s, the City undertook sewer separation programs whereby stormwater runoff from public property was directed to a storm sewer. Properties located to the east of St. Ives Avenue (former City of North York) within the study area that were constructed from the 1960's onward are serviced by road ditches as well as a separate storm and sanitary sewer system.

As of 2013, approximately 10% of the area is serviced by combined sewers, 20% with partially separated sewers (storm/combined) and 70% with separated sewers (storm/sanitary). The road drainage in the separated area is also serviced by ditches. A majority of the roads in the former City of North York portion of the study area that have not received any improvements/upgrades, including the associated drainage systems, are in a state of disrepair or are substandard. Upgrades would typically include remedial measures and/or reconstruction to bring the road and drainage system to current standards. On most of the unimproved roads the existing roadside drainage systems which convey stormwater are poor to non-existent. There are, in a number of areas, no continuous paths for stormwater to flow during rainfall events.

The study area is also one of many within the City of Toronto where many residents have experienced incidents of basement flooding in recent years. The storm events that have caused flooding included May 12, 2000, August 19, 2005 and July 8, 2013.


BOWOOD AVE
RAWLEIGH AVE
DEAL AVE
PRESTON PL
WANLESS AVE
RONAN AVE
KAPPELE AVE
HASLEMERE RD
BRAESIDE RD
BRAESIDE CRES
ROTHMERE DR
MUNICIPAL BOUNDARY
LAWRENCE AVE E
LAWRENCE AVE E
WANLESS CRES
DUNWICK CRES
LYMPSTONE AVE
LAWRENCE CRES
CHELTENHAM AVE
ST IVES AVE
BUCKINGHAM AVE
BAYVIEW WOOD
ST IVES CRES
ROCHESTER AVE
WOOD AVE
LAWRENCE BAYVIEW RAMP
PLOTE AVE
DUNDURN RD
ST LEONARDS CRES
MUNC BOUND NY TO
ST LEONARDS CRES
ST LEONARDS AVE
LEWES CRES
PEMBURY AVE
DAWLISH AVE
DAWLISH AVE
PINEDALE RD
FIDELIA AVE
GLENGOWAN RD
GLENALLAN RD
MILDENHALL RD
DANESWOOD RD
VALLEYANNA DR
PARK LANE CRCL
LAWRENCE AVE E
West Branch Don River
ARMISTICE DR
HARGRAVE LANE
BAYVIEW AVE
WELLNESS WAY
CARLAND AVE
STRATHGOWAN AVE
STRATHEDEN RD
STRATFORD CRES
RAAB BLVD
HOSPITAL RD
MOUNT PLEASANT RD
BLYTHWOOD RD
LAUREN CRT
BAYVIEW AVE
TELFER GARDENS
STIBBARD AVE
DALEWOOD RD
BLANCHARD RD
BLYTH DALE RD
RIDGEFIELD RD
SUNNYDENE CRES
LIFE SAVING DR
LIFE SAVING DR
SHELDRAKE BLVD
BLYTH HILL RD
West Don River Tributary
SHERWOOD AVE
N
LEGEND:
LPN Study Area
Watercourses
Roads
NOTES:
Base Mapping was provided by the City of Toronto
400
200
0
Meters
TORONTO
Aquafor Beech Limited
LAWRENCE PARK NEIGHBOURHOOD
INVESTIGATION OF BASEMENT
FLOODING & ROAD
IMPROVEMENT STUDY
Lawrence Park Neighbourhood
Study Area
FIGURE No. ES-1
DATE: SEPTEMBER 2013

Pedestrian safety was also identified as an issue due to the lack of sidewalks located within the former City of North York (i.e. east of St. Ives.) between Lawrence Avenue and Blythwood Avenue Potential traffic issues associated with infiltration of vehicles from outside of the study area and potential issues associated with obstructions (vegetation, retaining walls) limiting sightlines at intersections were also identified.

As a result of the above issues, the City has completed an Environmental Assessment Study (EA Study) for the Lawrence Park Neighbourhood to identify the problems and opportunities, undertake field and desktop analysis to define existing conditions, identify and evaluate alternatives, select preferred solutions and develop an implementation plan for the recommended projects.

STUDY PURPOSE

The study purpose has been defined as follows:

- To address issues relating to deteriorated road conditions, traffic, pedestrian safety, poor drainage; and
- To address surface and basement flooding within the Lawrence Park Neighbourhood Study Area through the Municipal Class Environmental Assessment Process.

STUDY PROCESS

The study, which started in 2012, has been undertaken using the Master Plan approach (Approach #2), under the Municipal Class Environmental Assessment process that commenced in August 2012. Further details are described in Chapter 3.

PUBLIC AND STAKEHOLDER CONSULTATION

Public consultation during the Class EA study involved Public Information Centres (PIC), four Community Advisory Group (CAG) meetings, together with a series of meetings with local residents and the Rate Payers Association. These were held throughout the study process and exceeded the minimum requirements set out in the Class EA process. Questionnaires were also distributed at key points in the study process. Information about the study was posted on the dedicated project website (www.toronto.ca/lawrencepark). Chapter 3 of the report details the public and stakeholder consultation process for this study.

In summary,

- A Notice of Commencement was delivered in January 2013 to approximately 2,000 property owners to inform them of the study and opportunities for engagement.

- Questionnaires were distributed in January and February 2013 to all property owners in the study area to gather input on flooding and road conditions, pedestrian safety and traffic issues. There were 387 responses received.
- A total of seven public meetings were held between April 2013 and May 2016 to receive input on the problems/opportunities, the long list of alternatives, evaluation criteria and results, the preferred solutions and the supplementary detailed assessment of tree impacts.
- A Community Advisory Group (CAG) was established. The CAG Members met in advance of larger public events for initial feedback on presentation materials.
- Numerous meetings were held, and correspondence had, with individuals and various interest groups (Mildenhall Pedestrian Safety Group, Lawrence Park Ratepayers Association, Mildenhall Ratepayers Association, WalkTO, Toronto Centre for Active Transportation, Toronto French School).
- A series of meetings were held between City staff and the consulting team after the consultation process for the third PIC to address pedestrian safety concerns, specifically on Mildenhall Road from Lawrence Avenue East to Blythwood Road.
- A dedicated project website, www.toronto.ca/lawrencepark , was created to make information about the study publicly available and to provide the opportunity for members of the public who could not attend public meetings to see all documents presented, and to advise of future consultation events.

AGENCY CONSULTATION

The Notice of Study Commencement was distributed in January 2013 to all relevant government agencies to inform them of the study and requesting feedback. Notices were also sent ahead of each PIC. Response letters were received from TRCA. Copies can be found in Appendix A.

INDIGENOUS CONSULTATION

Letters were issued to the at the onset and throughout the study to notify indigenous groups of the study, they included: Alderville First Nation, Curve Lake First Nation, Hiawatha First Nation, Mississauga's of the New Credit First Nation, Mississauga of Scugog First Nation and Kawartha Nishnawbe First Nation.

PHASE 1 – PROBLEM AND OPPORTUNITY IDENTIFICATION

The primary problems identified within the study area include:

- Deteriorated road infrastructure and road drainage
- Pedestrian safety
- Traffic management
- Basement flooding
- Environmental

Deteriorated Road Infrastructure and Drainage Systems

The design and construction of the road and storm drainage systems has changed significantly since development was initiated in the Lawrence Park area over 50 years ago. Whereas past practices and associated standards were limited with respect to the types of materials to construct the road and the size of the pipe or culvert to convey stormwater from the lands to the receiving stream; present standards have been improved and the design of road and drainage systems are more integrated.

Many of the roads were built over 50 years ago and are approaching the end of their service life. The underlying road structures on several streets are deteriorated to the point that road resurfacing cannot address the road condition and, therefore, these must be reconstructed with functional road drainage systems.

Pavement widths vary across the study area from approximately 6 metres to 9 metres. Current standards set the minimum road width at 7.2 metres to accommodate emergency and service vehicle access.

In the eastern section of the study area (east of St. Ives Crescent which is the former City of North York), the original drainage system was comprised of ditches and road side culverts which conveyed flows to the West Don River. Over time, some storm sewers have been installed and other sections have been filled in, in part, by landowners or developers who have re-graded individual properties. As a result, the existing road drainage system no longer performs as originally designed. Excessive ponding on the roads occurs during rainfall or snowmelt events and the lack of a proper drainage system will contribute to surface flooding of properties.

Pedestrian Safety

The majority of the roads in the western section (i.e. former City of Toronto) of the study area have sidewalks on both sides. In contrast, the eastern section (i.e. former City of North York) of the study area generally does not contain sidewalks. However, an area along the western shoulder of Mildenhall Road between Blythwood Road and Lawrence Avenue East, which is delineated by a solid white pavement marking, is used by pedestrians.

The lack of sidewalks combined with the narrow roads in the area can lead to potential vehicle and pedestrian conflicts which may be compounded in winter by snow windrows that further reduce the useable road width. Furthermore, there is limited connectivity to existing sidewalks in the western portion of the study area and reduced accessibility and linkages to key destinations within the neighbourhood (i.e., elementary schools, parks, a daycare, and TTC bus stops).

Traffic Management

Traffic volumes in the study area were found to be within the City expected range for local and collector roads as identified in the City's road classification system.

Substandard sightlines were noted at the intersections of Blythwood Road and Strathgowan Crescent; Mount Pleasant Road and Lawrence Crescent; and Mount Pleasant Road and St. Leonards Avenue due to trees and structures.

Residents also identified concerns with speeding, particularly on Mildenhall Road (between Lawrence Avenue and Blythwood Road).

Basement Flooding

Basement flooding incidents were reported following the storm events that occurred on May 12, 2000, August 19, 2005, and July 8, 2013 and through questionnaires completed by residents and returned as part of this study.

General locations of reported basement flooding are shown on Figure ES-2 and discussed in Chapter 5. The intense rainfall during these extreme storm events resulted in stormwater volumes entering the sewers that exceeded the system design capacities

Engineering assessments using hydraulic modelling identified specific locations at risk of basement flooding during extreme events which overload the existing storm, sanitary, combined and partially-separated sewer systems. The frequency and specific causes of basement flooding vary between the different sewer systems which service the study area.

Environmental

The City of Toronto undertook a series of five (5) studies that were completed in 2003. The study, which is now referred to as the Wet Weather Flow Master Plan (WWFMP) addressed a number of issues related to drainage, protection of streams and rivers from stormwater discharge and the integrated design of road and storm systems. The WWFMP includes a Vision Statement that “recognizes rainwater as a potential resource to be utilized to improve the health of Toronto’s watercourses”. The WWFMP philosophy and principles also provided direction for treating stormwater at the source (i.e. on private and public properties) as well as looking at integrated road and storm drainage systems and end-of-pipe control and/or treatment measures.

The study area together with the West Don River, which receives stormwater from the study area, experiences several of the issues as identified in the Don River WWFMMP. Opportunities for water quality improvement were identified in the EA; however, the focus of the study was on reduced surface and basement flooding.

The opportunities include:

- Development of an integrated road and storm drainage system to current standards which also addresses the primary problems identified and the concerns of the residents within the study area.
- Incorporation of stormwater measures in locations where road, drainage and pedestrian safety improvements are recommended and where feasible which will; (i) improve water quality and reduce flow volumes to the receiving streams including the West Don River, (ii) reduce surface and basement flooding, and (iii) are consistent with the requirements of the City of Toronto Wet Weather Flow Master Plan.

PHASE 2 – EVALUATION OF ALTERNATIVE SOLUTIONS AND SELECTION OF PREFERRED SOLUTIONS

Definition of Existing Conditions

A variety of information was collected and reviewed in order to define existing conditions. In addition to collecting and reviewing existing information a significant amount of fieldwork was undertaken in order to better define existing conditions.

Programs included field assessments to define the condition of the existing roads and soils type (in order to determine the suitability of infiltrating stormwater runoff). Flow monitoring and computer modelling was undertaken and an extensive questionnaire was circulated in order to better define the extent of flooding as well as to assess homeowner interest for implementing measures which would alleviate flooding and improve water quality conditions. Traffic counts were also undertaken in order to define existing traffic volumes and turning movements.

A summary of the findings is presented below.

<u>Flooding</u>

The City of Toronto maintains a historical record of flooding problems for homeowners who report a flooding incident to the City during or after a rainfall event. In general, the street name and house number is recorded as is the date on which the flooding occurred together with information on the nature of the flooding incident.

The City records show that a number of homeowners have experienced flooding problems in the area during large storm events. The events include May 12, 2000 and August 19, 2005. Of the properties in LPN study area, there were 10 reported basements flooded for the May 2000 event and a total of two reported flooded during the August 2005 event. There were no properties that reported surface flooding on both the May 2000 and August 2005 events. These records were used as a starting point to define the location, frequency and type of flooding problems.

As not all homeowners inform the City of flooding incidents, a detailed questionnaire was sent to each house in the study area. The questionnaire included a number of questions relating to flooding as well as other topics (See Section 5.3) and was intended to better define the cause and extent of flooding problems in the study area. In total, the City received 387 questionnaires from approximately 2,000 households. Figure ES-2 illustrates the general location of reported flooding based on the questionnaire submitted in February, 2015.

Hydraulic performance of the existing sewer systems was accomplished by computer modelling. In summary:

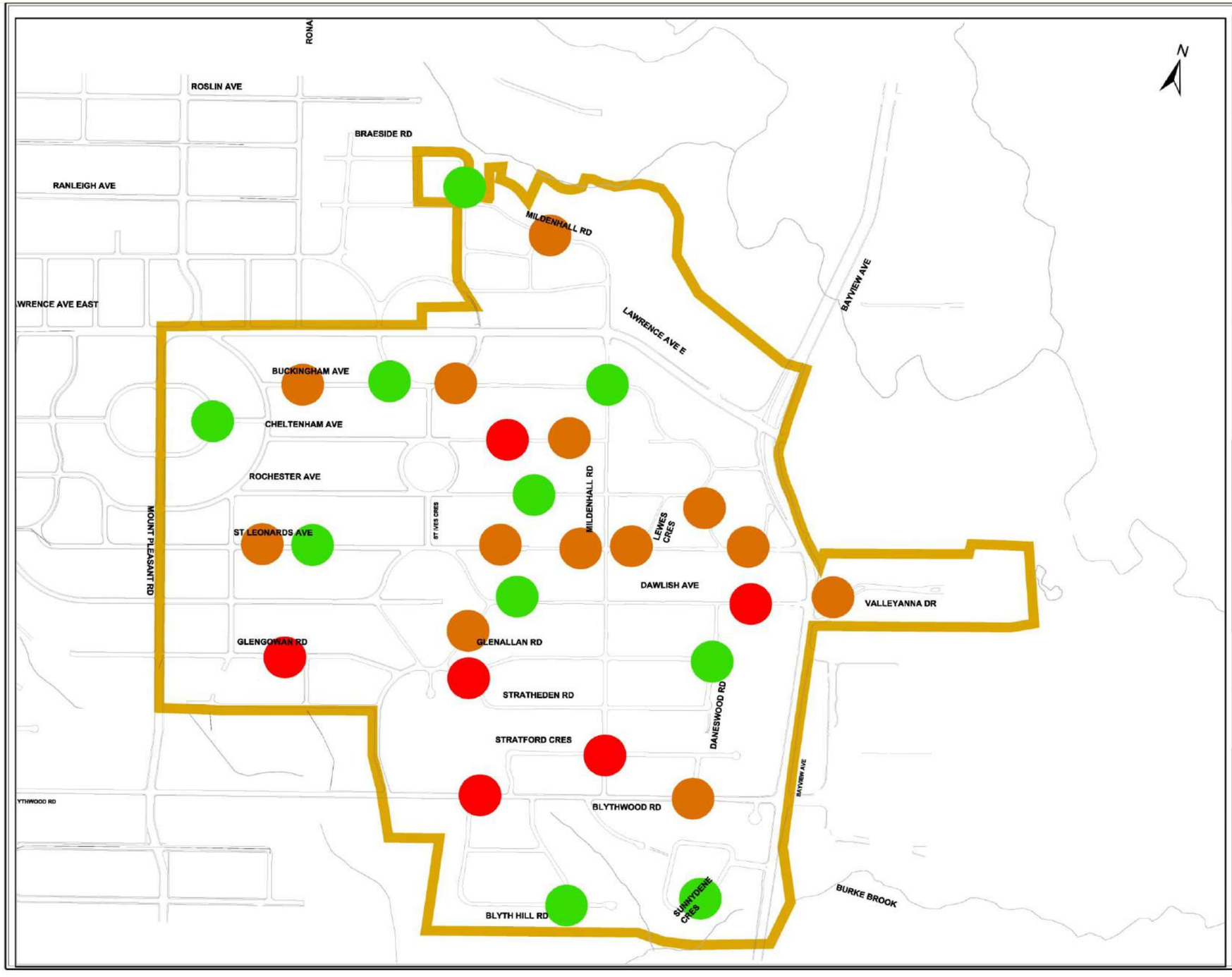
- The sanitary sewer system, during wet weather events, experiences significant infiltration/inflow (I/I). The three primary sources of I/I : downspouts connected to the sanitary sewer, private property sources and stormwater entering maintenance hole covers;
- Flooding in the combined sewershed is generally limited to a few areas which are serviced by the original combined sewer.
- During 100-year design storm conditions, the storm sewer system is surcharged in many areas; with the surcharge level higher than the basement elevation and reaching the surface.

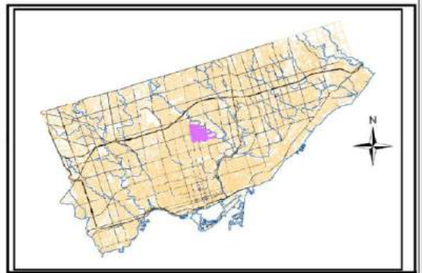
Details of the hydrologic and hydraulic model can be seen in Chapter 6 and Appendix C.

Road Structure and Soils Investigation

A total of 52 borehole samples were drilled within the study area. The boreholes were drilled to evaluate the existing condition of the roadways, provide recommendations with respect to rehabilitation alternatives and feasibility of infiltrating stormwater runoff, providing preliminary pavement design recommendations and ultimately to assist in defining the type of road and sewer reconstruction measures that may need to be undertaken.

A soils investigation was undertaken to determine the prevailing subsurface groundwater conditions and to provide geotechnical engineering recommendations for potential storm sewer improvements. Chapter 5 of the report provides details. In general the soils are quite permeable and should therefore be conducive toward infiltrating of stormwater runoff.





LEGEND:

- Study Area
- Less than 2 times
- 2 to 4 times
- more than 4 times

NOTES:

Base Mapping was provided by the City of Toronto

400 200 0 Meters

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LAWRENCE PARK NEIGHBOURHOOD INVESTIGATION OF BASEMENT FLOODING & ROAD IMPROVEMENT STUDY CLASS EA

Locations of Reported Flooding

FIGURE No. ES-2

DATE: NOVEMBER 2016

Drainage

The storm drainage assessment was accomplished through the computer model and is detailed in Chapter 6. In summary, during significant storm events, the drainage system is overloaded. During 100-year design storm conditions, the storm sewer system is surcharged in many areas; with the surcharge level higher than the basement elevation and reaching the surface in many areas. Overland flows also exceed the capacity of the roadway system (major system). The primary areas where deficiencies occur are within the former City of North York. Within this area a poor to non-existent major system exists. Roads in this area have a typical rural cross-section where surface runoff drains to road-side ditches; many of these ditches have been filled in over the years while other similar roads lack an outlet for storm runoff. An insufficient storm drainage system can contribute to flooding as water can enter the sanitary sewer system through maintenance hole covers. In addition, there are numerous reverse grade driveways where stormwater can enter private property due to the lack of difference in change in elevation between the road & top of driveway.

Traffic Management

A Traffic and Road Report was also undertaken. The objectives of the report were to investigate the traffic and road improvements that are required within the neighbourhood. For this study the study area is generally bounded by Lawrence Avenue East to the north, Bayview Avenue to the east, Blythwood Avenue to the south and Mount Pleasant Road to the west. Details of the findings are presented in Section 5.6. The primary tasks that were undertaken in this study are summarized below.

- Traffic surveys and counts were undertaken and mathematical modelling was carried out in order to define traffic patterns, traffic movements and infiltration of vehicles within the study area;
- Turning movements at intersections were studied and the Level of Service (LOS), delay and queues were examined at main intersections in order to understand traffic operations;
- Field measurements were undertaken together with an assessment of collision analysis for the last 5 years in order to understand the state of traffic safety;

A summary of the findings is presented below:

Turning Movements

Traffic counts were completed during the busiest eight hours of a weekday at 10 intersections. The information was used, in part, to study the travel patterns as well as traffic operations within the study area.

In summary, the volume of traffic on the internal roads within the study area is low compared to other similar roads in the City. The exceptions are Mildenhall Road and Blythwood Road which have higher traffic volumes that are typical for their collector road classification

The traffic volumes also help to illustrate the infiltration routes for traffic from the arterial roadway system. The volume figures do show some infiltration of traffic (vehicles driving through the study area without completely stopping) on Mildenhall Road and the Stratford Crescent and Daneswood Road intersection.

Traffic Operations and Level of Service

An intersection capacity and level of service (LOS) analysis was undertaken for 10 intersections in the area bounded by Mt. Pleasant Road, Blythwood Road Bayview Avenue and Lawrence Avenue East. The objective of the analysis was to determine if there are delays at these intersections that could result in motorists using local roads in the study area as an alternative. Section 5.6.3 of the report provides further details.

The analysis provides details at the above noted intersections with respect to Measures of Effectiveness (MOE's) including:

- The capacity of the intersection on an overall basis and for individual movements;
- The volume to capacity ratio for individual movements, each approach and the overall intersection; and
- The LOS for the movements at the intersection, particularly the movements experiencing the greatest delay (critical movements).

In summary, the analysis shows that there is only one intersection that fails (i.e. vehicles experiencing long delays based on defined LOS criteria per Appendix G) during both the morning and afternoon peak hours. That intersection is Bayview Avenue and Lawrence Avenue E (West Ramp Terminal – WRT). There are three intersections that fail either in the morning or afternoon peak hour. They are:

- Lawrence Avenue E and Mount Pleasant Road
- Bayview Avenue and Blythwood Road
- Bayview Avenue and Lawrence Avenue E (East Ramp Terminal – ERT)

The findings also suggest that, as a result of the backup of vehicles at the above noted intersections that vehicles may infiltrate through the study area in order to save time.

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Existing Road Classification

The 2008 Road Classification System of the City of Toronto provides the characteristics for local, collector and arterial roads. Lawrence Avenue East, Bayview Avenue and Mount Pleasant Road are classified as arterials. Mildenhall Road and Blythwood are

classified as collectors supporting a traffic volume range of 2,500 to 8,000 vehicles per day. The remaining roads are classified as local roads (less than 2,500 vehicles per day).

Based on traffic counts that were undertaken, local roads have daily volumes ranging between 185 and 1,477 vehicles per day. The daily volume of traffic on Mildenhall Road between Lawrence Avenue East and Blythwood Road was 3, 059 vehicles per day.

Sightlines and Stopping Distances

A sightline evaluation of the intersections within the Lawrence Park neighborhood was undertaken to identify potential locations of intersections where a lack of sightline distance may present a problem. Chapter 5 provides further information.

Figure ES-3 Sightline at Strathgowan Ave. to WB Vehicle on Blythwood Road

In summary six locations with poor sightlines were identified. An example of one intersection (Blythwood Road at Strathgowan Crescent) where heavy vegetation and a stone wall limits sightline is shown in Figure ES-3.

Pedestrian and Cyclist Safety

Figure ES-4 shows an example of the lack of sidewalks (pedestrian facilities). Figure ES-5 illustrates the locations of existing pedestrian facilities within the study area. Also shown on he Figure ES-5 are key destinations within, and adjacent to the study area. As can been seen on the figure pedestrian facilities exist only in the west part of the neighborhood (former City of Toronto) and there are limited facilities in the eastern portion (former City of North York) of the study area.

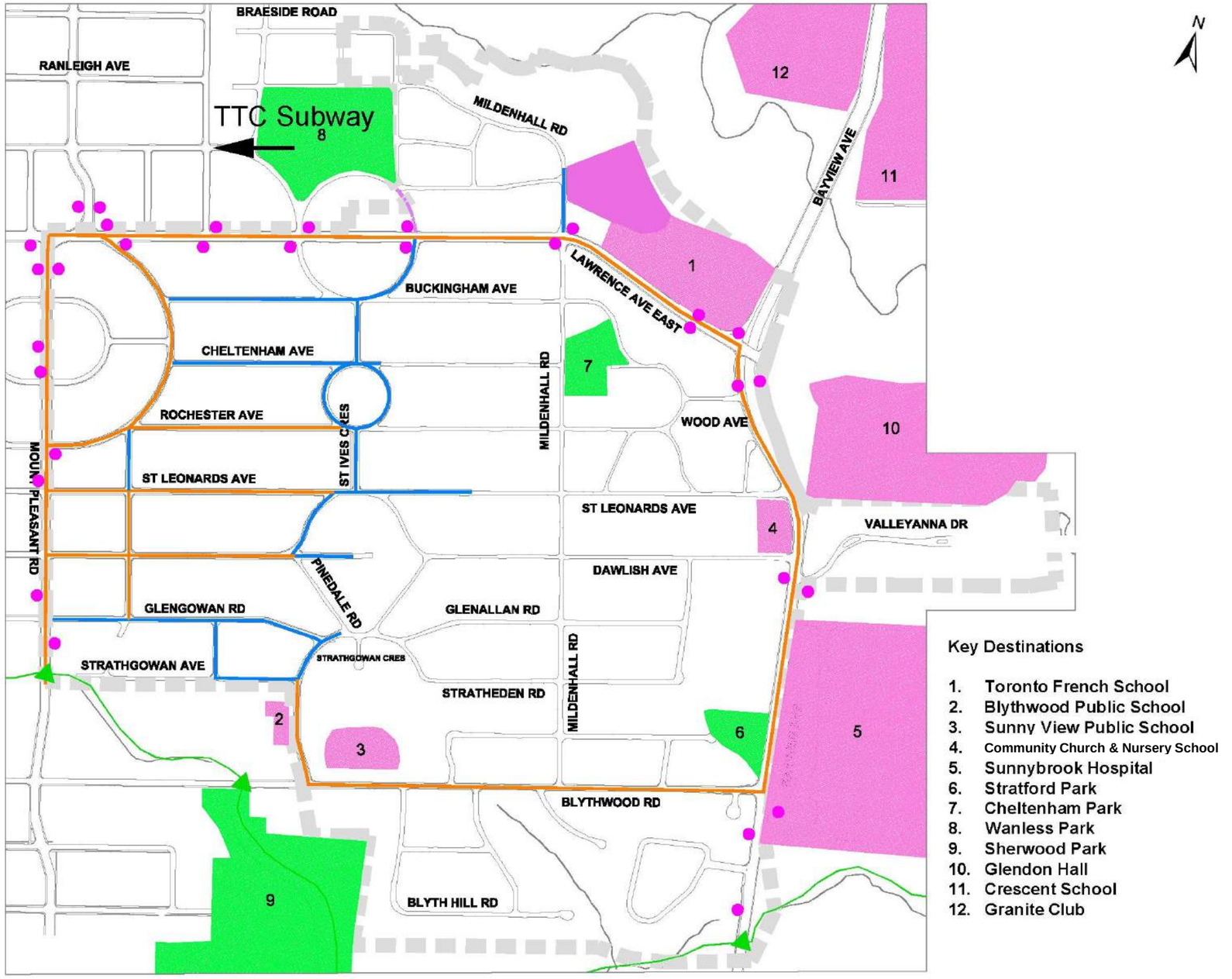
Figure ES-4 Rochester Road Blocked as a Result of Street Parking on both Sides, Narrow Road, and Large Construction Vehicle

Currently, there is no cycling facility within the neighbourhood. New cycling facilities in Toronto are identified in the Cycling Network Plan and the Lawrence Park Neighbourhood is not identified in the bike network, therefore, new cycling facilities such as bike lanes are not expected.

Road Widths

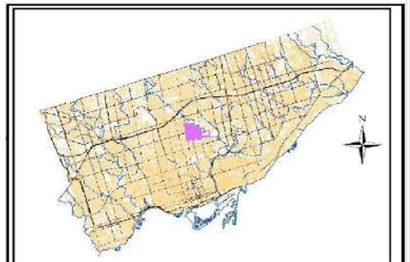
The existing road widths were measured for each street as shown on Figure ES-6. The widths were then compared to City standards relating to minimum requirements.

The recognized transportation infrastructure policy for a local road within the City of Toronto consists of a 20 m right-of-way, an 8.5 m paved road surface, concrete curbs and a 1.7m to 2.0 m sidewalk on one or both sides of the road.



Key Destinations

1. Toronto French School
2. Blythwood Public School
3. Sunny View Public School
4. Community Church & Nursery School
5. Sunnybrook Hospital
6. Stratford Park
7. Cheltenham Park
8. Wanless Park
9. Sherwood Park
10. Glendon Hall
11. Crescent School
12. Granite Club



LEGEND:

- Study Area
- Existing Pathway
- Existing Pathway
- Existing Pathway
- Institutions
- Parks
- Access Points to Trail
- Bus Stop
- Trails

NOTES:

Base Mapping was provided by the City of Toronto

400 200 0 Meters

Property boundaries based on City parcel data provided 2012-08-15

TORONTO

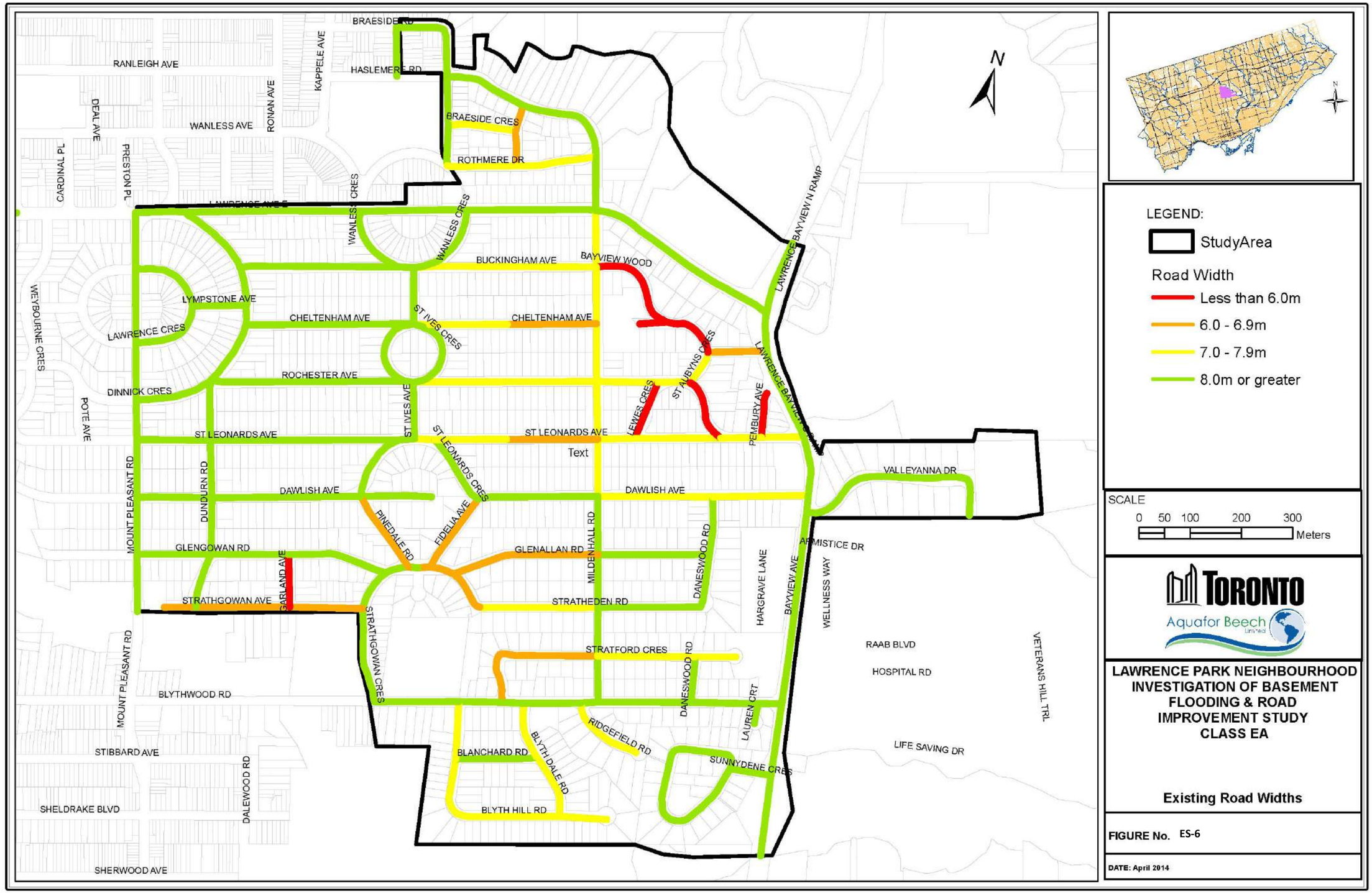
Aquafor Beech Limited

LAWRENCE PARK NEIGHBOURHOOD INVESTIGATION OF BASEMENT FLOODING & ROAD IMPROVEMENT STUDY CLASS EA

Existing Sidewalk Linkages

FIGURE No. ES-5

DATE: NOVEMBER 2016


BRAESIDE RD
RANLEIGH AVE
HASLEMERE RD
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RONAN AVE
DEAL AVE
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ROTHMERE DR
CARDINAL PL
PRESTON PL
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BUCKINGHAM AVE
BAYVIEW WOOD
LAWRENCE BAYVIEW N RAMP
WEYBOURNE CRES
LYMPSTONE AVE
CHELTENHAM AVE
ST IVES CRES
LAWRENCE CRES
ROCHESTER AVE
DINNICK CRES
POTE AVE
ST AUBYNS CRES
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MOUNT PLEASANT RD
DUNDURN RD
DAWLISH AVE
PINEDALE RD
FIDELIA AVE
GLENGOWAN RD
GLENALLAN RD
MILDENHALL RD
DANESWOOD RD
ARMISTICE DR
HARGRAVE LANE
BAYVIEW AVE
WELLNESS WAY
GARLAND AVE
STRATHGOWAN AVE
STRATHEDEN RD
STRATHGOWAN CRES
STRATFORD CRES
RAAB BLVD
HOSPITAL RD
VETERANS HILL TRL
BLYTHWOOD RD
LAUREN CRT
RIDGEFIELD RD
BLANCHARD RD
BLYTH DALE RD
SUNNYDENE CRES
LIFE SAVING DR
STIBBARD AVE
DALEWOOD RD
SHELDRAKE BLVD
BLYTH HILL RD
SHERWOOD AVE
N
LEGEND:
StudyArea
Road Width
Less than 6.0m
6.0 - 6.9m
7.0 - 7.9m
8.0m or greater
SCALE
0 50 100 200 300
Meters
TORONTO
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LAWRENCE PARK NEIGHBOURHOOD INVESTIGATION OF BASEMENT FLOODING & ROAD IMPROVEMENT STUDY CLASS EA
Existing Road Widths
FIGURE No. ES-6
DATE: April 2014

EVALUATION OF ALTERNATIVES AND SELECTION OF PREFERRED SOLUTIONS

The alternative solutions that were initially developed to address the study purpose and associated issues were broadly categorized as follows:

- Basement flooding alternatives;
- Road, drainage and pedestrian safety alternatives; and
- Traffic management and sightlines

Basement Flooding Alternatives

As noted in Chapter 7 of the report, remedial measures were considered for sanitary, combined and storm sewer systems to alleviate basement flooding. The Lawrence Park Neighbourhood includes areas with combined and separated sewer systems.

In April 2006, City Council approved a Basement Flooding Work Plan (now referred to as the Basement Flooding Protection Program or BFPP) to undertake comprehensive engineering studies and identify infrastructure improvements in chronic basement flooding areas that experienced significant flooding during extreme storms in May 2000 and August 2005. In 2013, the BFPP was expanded City-wide. As part of the work plan, enhanced level of service criteria were adopted by Council that are to be applied for the sanitary, combined and storm sewer systems in basement flooding study areas. For the sanitary system, the level of protection being targeted is the storm event equivalent to the May 12, 2000 storm gauged at the City's Oriole Yard located at Sheppard Avenue and Leslie Street. For the combined and storm systems, the 100-year design storm protection is being targeted. These criteria are detailed in Chapter 7.

In developing alternatives, an initial screening was done to eliminate or identify any constraints in potential remedial measures that are detailed in Chapter 7. The remedial measures fall into one of six categories: "Do nothing", source control measures, local control measures, remedial measures for the sanitary system, remedial measures for the combined system, and remedial measure for the storm system. Based on the initial screening, alternative remedial measures for the sanitary and combined systems were developed.

Sizing of each of the alternatives was accomplished by hydrologic and hydraulic computer simulation. As part of the field program, flow monitoring was conducted on the sanitary and combined systems. Flow monitoring was not undertaken for the storm system. Findings included the identification of significant infiltration/inflow (I/I) into the sanitary system from connected downspouts, private property sources and maintenance hole covers and surcharge conditions in the combined system during extreme storm events.

The determination of the preferred works for the sanitary and combined system included the evaluation of three alternatives for the sanitary system and three for the combined

system. Chapter 7 details each alternative that was modelled and assessed, covers the evaluation process for each alternative and summarizes the evaluation criteria and methodology in choosing the preferred alternatives. The evaluation was based on impacts that included socio-cultural, technical effectiveness, natural environment and economic,

Based on the evaluation of the alternatives, the Preferred Solutions for basement flooding protection included:

- Sanitary Alternative #3 – Conveyance through larger pipes and in-line storage; and
- Combined Alternative #1 – Conveyance through installation of new storm sewers

The Preferred Solutions for the basement flooding improvements are shown in Figures ES-7 and ES-8 respectively. The estimated cost, together with the applicable Municipal Class EA Schedule for each project is shown in Table ES-1.

Road, Drainage and Pedestrian Safety Alternatives

As is noted in Chapter 8 of the report, there are various streets where common issues relating to poor road conditions, narrow road widths, poor drainage and no sidewalks were identified. These areas were identified and grouped into 18 different locations (for the purpose of the EA process).

As previously mentioned, a total of 52 borehole samples were drilled within the study area. The boreholes were drilled to evaluate the condition of the roadways, provide recommendations with respect to rehabilitation alternatives and feasibility of infiltrating stormwater runoff, providing preliminary pavement design recommendations and ultimately to assist in defining the type of road and sewer reconstruction measures that may need to be undertaken. The above information was then undertaken to provide typical roadway maintenance and rehabilitation measures for each of the streets within the study area. The representative rehabilitation measure for each of the streets within the study area is illustrated in Figure ES-9A.

Each location includes the street(s) being reconstructed, a curb and gutter drainage system with storm sewers that is typical of urban drainage system and, where technically and operationally feasible and supported by underground conditions, the installation of a perforated pipe system to promote infiltration of stormwater into the surrounding ground and thereby reducing pollutant loading and flow volumes to the West Don River. Sizing of the proposed storm sewers is based on the City's level of service criteria.

Figure ES-9B illustrates the location of each of the 18 locations. Each of the 18 locations was evaluated in order to come up with an integrated solution that would address these issues on both a project specific and overall system wide manner. The process that was used to undertake the evaluation together with the findings is provided below. It should

be noted that streets not highlighted in Figure ES-9B may require the installation or upgrading of existing storm sewers that would be tied into the each of the 18 locations. Costing and the sequence of implementation are addressed in Chapter 10.

In the event where the City standards cannot be adopted due to constraints to road expansion (mature trees, infrastructure constraints, etc.), then there are a number of factors that could be considered in determining the minimum road width for this study.

These include:

- Requirements for emergency vehicle access
- Requirements for service vehicle access
- Consideration for cyclist and pedestrian / vehicle conflict
- Consideration for two-way traffic flow
- Requirement for winter road maintenance (reduction in road width as a result of snow banks)
- Impact to utilities and underground infrastructure
- On-street parking
- Types of cross section (urban versus rural)
- Impact to roadside features

Based on an assessment of the above a minimum road width of 7.2 m was selected for local roads.

Table ES-2 includes the recommended road and drainage works. The recommended projects and sequencing of implementation is addressed in Figure ES-20.

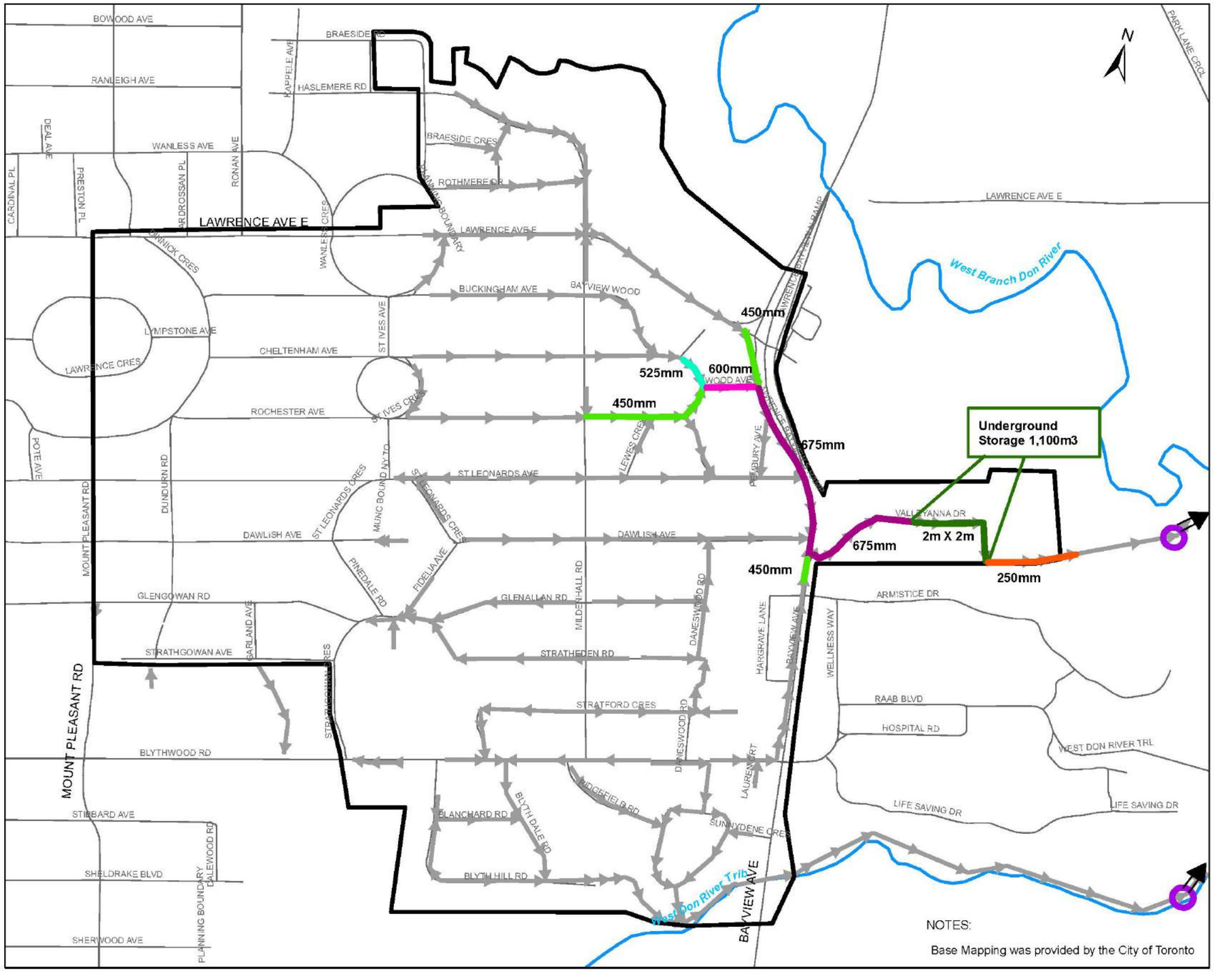
From a pedestrian safety point of view, it is the City's policy to promote safety and walkability through the installation of sidewalks on both sides of arterial and collector roads and on at least one side of local streets. The Essential Links program considers the road class, the presence of pedestrian generators such as nearby schools, parks, bus stops, right-of-way and road width, impact on trees and vegetation as well as other factors such as above-ground utility locations in making recommendations for constructing sidewalks.

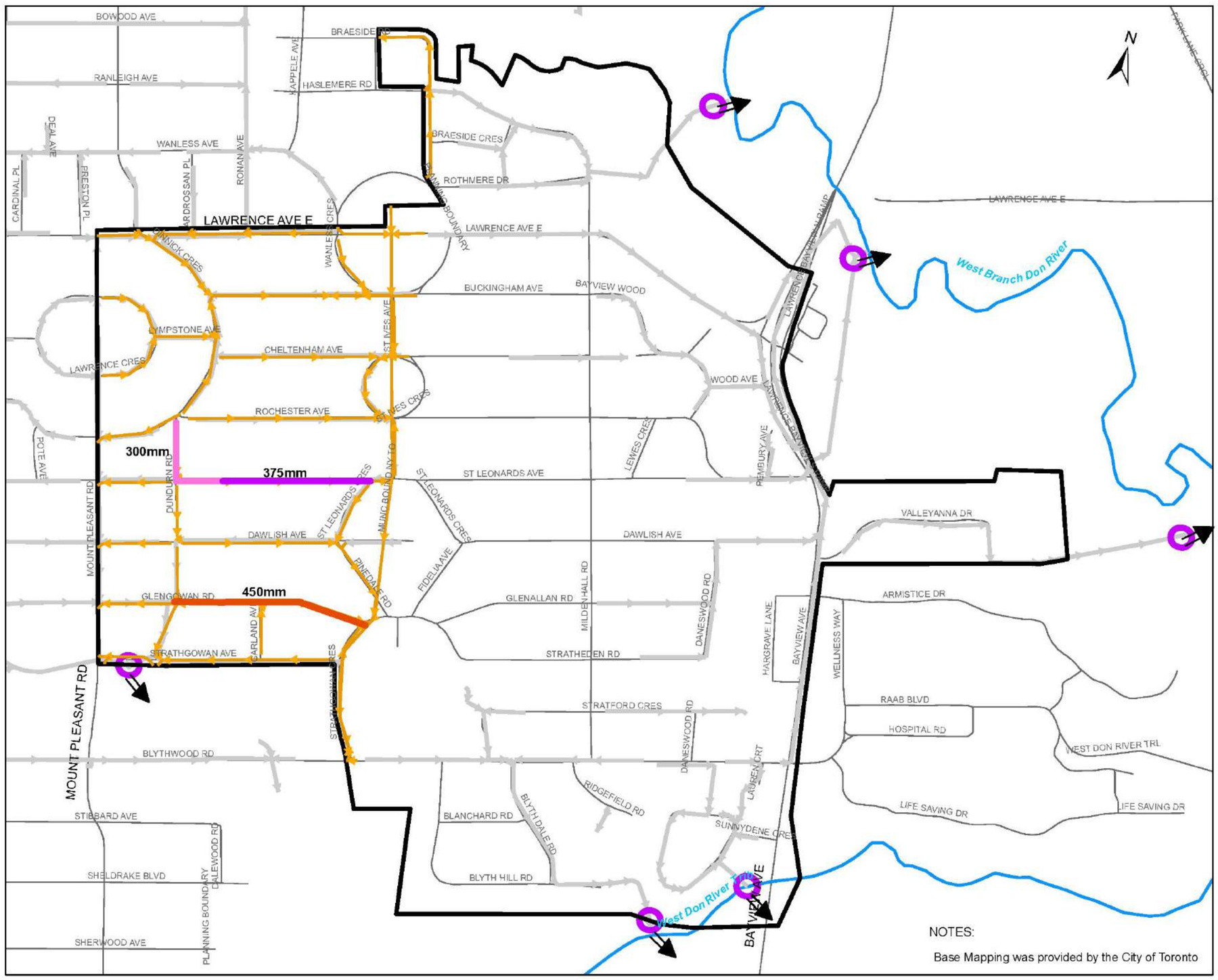
There is a general lack of continuation of the pedestrian facilities to the east side of the neighbourhood east of St. Ives Crescent and a connectivity of the facilities in the north-south direction. In order to determine the potential locations for new sidewalks, several factors should be considered including:

- Vicinity to key pedestrian destinations;
- Potential accessibility for persons with disabilities and older adults;
- Connectivity to existing facilities;
- Available road width and potential impact on natural and linear infrastructure;
- Recommendations as outlined in the City's road classification system; and
- Preservation of vegetation and other roadside features

As was noted above, sidewalks should be provided wherever possible to facilitate and encourage pedestrian movement within the neighbourhood. As part of this EA study, the study team examined potential locations of the sidewalks that best improve pedestrian connectivity within the neighbourhood and to the key destinations, while considering the potential impacts of sidewalks on street trees.

The above factors were taken into consideration in the development of recommended linkages for the Lawrence Park Neighborhood and in the evaluation of the road, drainage and pedestrian safety alternatives. The linkages are shown in Figure ES-13.


BOWOOD AVE
RANLEIGH AVE
DEAL AVE
WANLESS AVE
CARDINAL PL
PRESTON PL
MCDROSSAN PL
RONAN AVE
KAPPELE AVE
HASLEMERE RD
BRAESIDE RD
BRAESIDE CRES
ROTHMERE DR
LAWRENCE AVE E
WANLESS CRES
CRAMMOND BOUNDARY
CRANWICK CRES
BUCKINGHAM AVE
BAYVIEW WOOD
LAMPSTONE AVE
LAWRENCE CRES
CHELTENHAM AVE
ST IVES AVE
ST IVES CRES
ROCHESTER AVE
POTE AVE
DUNDURN RD
MOUNT PLEASANT RD
ST LEONARDS AVE
ST LEONARDS CRES
MUNC BOUNDARY TO
DAWLISH AVE
PINEDALE RD
FIDELIA AVE
GLENGOWAN RD
BARLAND AVE
STRATHGOWAN AVE
STRATHGOWAN CRES
GLENALLAN RD
MILDENHALL RD
DANESWOOD RD
STRATHEDEN RD
STRATFORD CRES
BLYTHWOOD RD
STIBBARD AVE
SHELDRAKE BLVD
PLANNING BOUNDARY
DALEWOOD RD
SHERWOOD AVE
BLANCHARD RD
BLYTH DALE RD
BLYTH HILL RD
MIDCHFIELD RD
SUNNYDENE CRES
LAURENCE RT
BAYVIEW AVE
WELLNESS WAY
HARGRAVE LANE
ARMISTICE DR
RAAB BLVD
HOSPITAL RD
WEST DON RIVER TRL
LIFE SAVING DR
LIFE SAVING DR
VALLEYANNA DR
PARK LANE CRCL
LAWRENCE AVE E
LAWRENCE EAST RAMP
PEMBURY AVE
WOOD AVE
West Branch Don River
West Don River Trib
450mm
525mm
600mm
450mm
675mm
675mm
2m X 2m
450mm
250mm
Underground Storage 1,100m3
N
LEGEND:
Outlet
LPN Study Area
Watercourses
Roads
Proposed Sanitary Sewer Sizes
250mm
450mm
525mm
600mm
675mm
2m x 2m
Existing Sanitary Sewer
400
200
0
Meters
TORONTO
Aquafor Beech Limited
LAWRENCE PARK NEIGHBOURHOOD INVESTIGATION OF BASEMENT FLOODING & ROAD IMPROVEMENT STUDY CLASS EA
Sanitary Alternative #3
Preferred Basement Flooding Solution
FIGURE No. ES-7
DATE: April 2014
NOTES:
Base Mapping was provided by the City of Toronto



LEGEND:

- LPN Study Area
- Outlet
- Watercourses
- Roads
- Existing Storm Sewer
- Existing Combined Sewer

Proposed Storm Sewer

- 300mm
- 375mm
- 450mm

400 200 0 Meters

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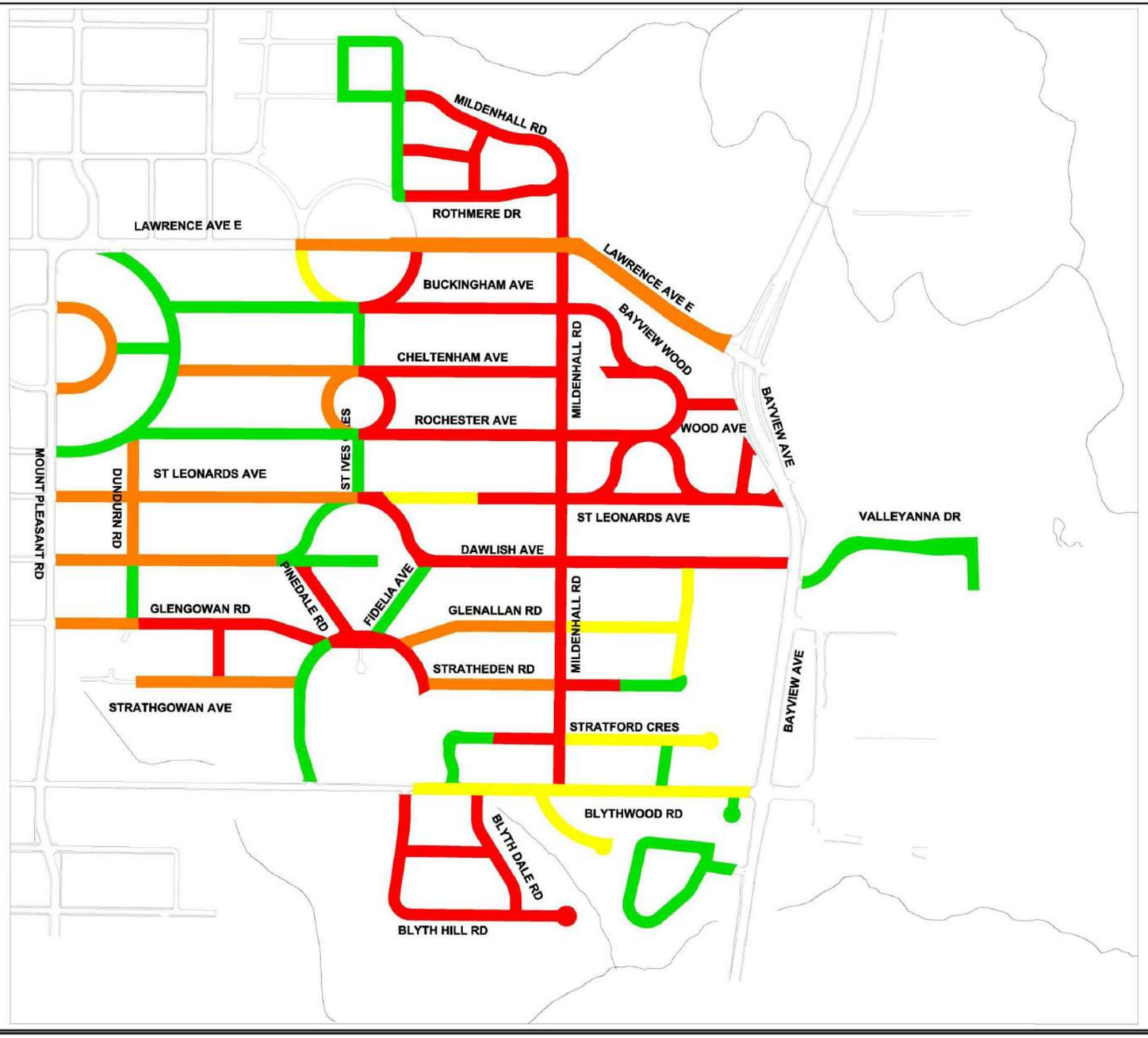
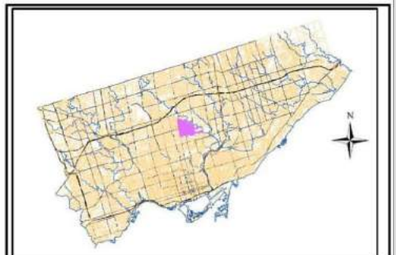
LAWRENCE PARK NEIGHBOURHOOD INVESTIGATION OF BASEMENT FLOODING & ROAD IMPROVEMENT STUDY CLASS EA

Combined Alternative #1 Preferred Basement Flooding Solution

FIGURE No. ES-8

DATE: April 2014





LEGEND:

- Full Depth Reconstruction
- Full Depth Asphalt Removal
- Partial Depth Asphalt Removal
- Routine Preventive Maintenance

NOTES:

Base Mapping was provided by the City of Toronto

400 200 0 Meters

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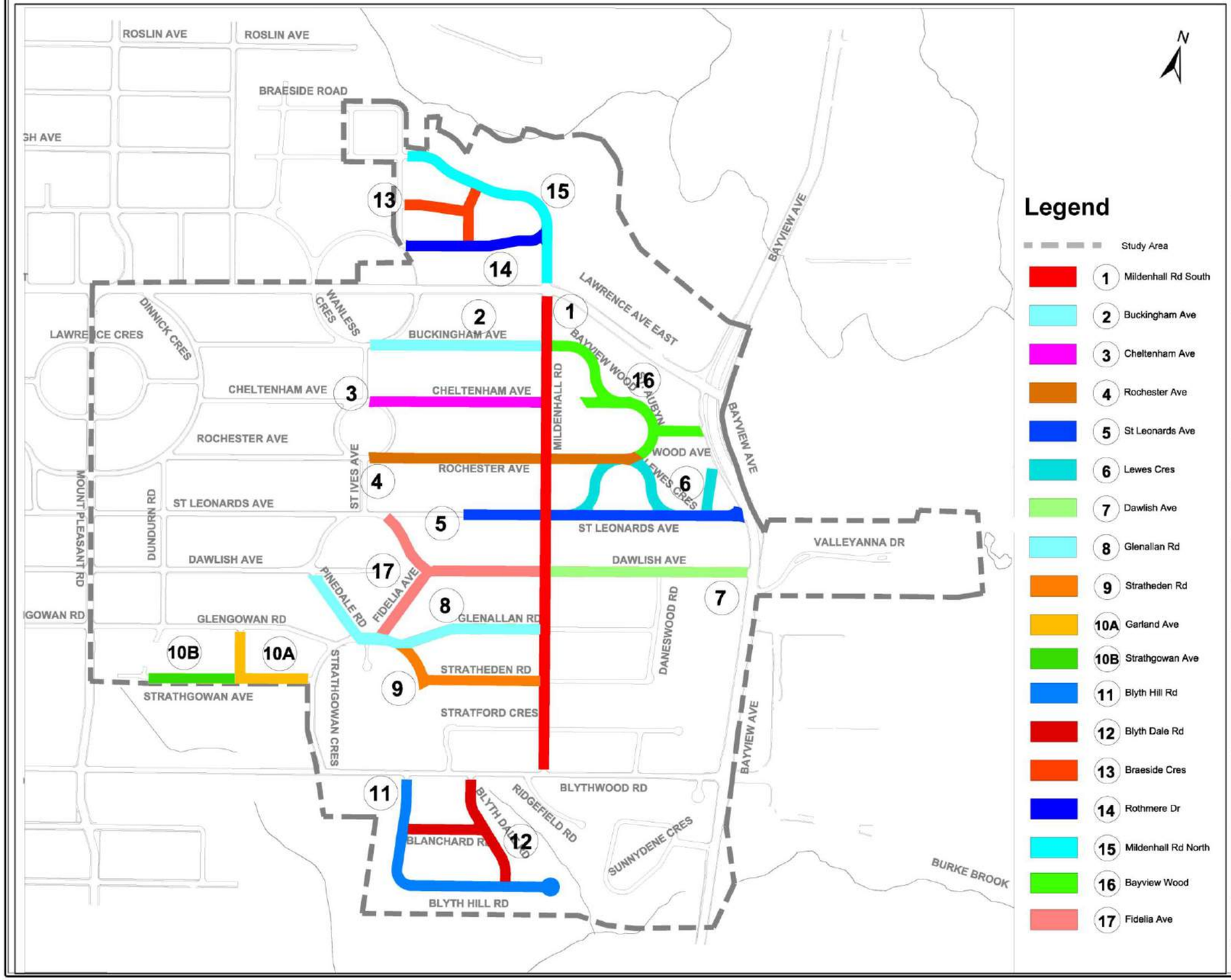
LAWRENCE PARK NEIGHBOURHOOD INVESTIGATION OF BASEMENT FLOODING & ROAD IMPROVEMENT STUDY CLASS EA

Rehabilitation Measures

FIGURE No. ES-9A

DATE: NOVEMBER 2016



LEGEND:

NOTES:

Base Mapping was provided by the City of Toronto

400 200 0 Meters

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LAWRENCE PARK NEIGHBOURHOOD INVESTIGATION OF BASEMENT FLOODING & ROAD IMPROVEMENT STUDY CLASS EA

Proposed Road Reconstruction Locations

FIGURE No. ES-9B

DATE: NOVEMBER 2016

The first step in the evaluation process involved the determination of alternatives for the above noted locations.

A total of 8 alternatives were initially considered at the third PIC for each of the locations that addressed issues related to local roads. Five alternatives were considered for the collector road (Mildenhall Road – from Lawrence Avenue East to Blythwood Road). Note that Alternative #1 is the "Do Nothing" alternative that is not shown on Figures ES-10 and ES-11.

For the local roads, the alternatives considered the following variables:

- Road width of 7.2 m or 8.5 m;
- Urban or rural cross section; and
- With no sidewalk or one sidewalk

Figure ES-10 illustrates each of the alternatives that were considered.

For Mildenhall Road south of Lawrence Avenue East to Blythwood Road a total of five alternatives were considered. These alternatives included:

- Urban cross section only;
- 8.5 m or 9.5 m roadway widths;
- One or two sidewalks; and
- 7.2 m road width with two sidewalks

Figure ES-11 illustrates each of the alternatives that were considered.

Evaluation criteria were then developed in order to evaluate the alternative solutions and to select a preferred alternative. Details of the approach are provided in Chapter 8.

The Preferred Solution for Roads, Drainage and Sidewalks after the third PIC is presented below:

- Reconstruction of a number of local roads with pavement widths of 7.2 metres, and urban road drainage (curb and gutter) with storm sewers.
- Reconstruction of the collector road (Mildenhall) with pavement width of 8.5 m and urban road drainage (curb and gutter) with storm sewer.
- Where technically and operationally feasible and supported by underground conditions, the urban road drainage system will also include the installation of a perforated pipe system to promote infiltration of stormwater into the surrounding ground and thereby reducing pollutant loading and flow volumes to the West Don River; and;

- New sidewalks on five of the streets to be reconstructed (Pinedale Road, Glenallan Road/Strathgowan Crescent, St. Leonards Avenue, Dawlish Avenue, and Mildenhall Road).

A series of meetings was held between City staff and the consulting team after the consultation process for the third PIC. Based on public input and subsequent discussions between the City and the consulting team, it was agreed to select a different preferred alternative for Location #1 – Mildenhall Road – From Lawrence Avenue East to Blythwood Road.

The original alternative, which included an 8.5 m roadway and one (1) sidewalk, was replaced due to concerns from the public about safety and traffic speed together with the request for a narrower road. A new Preferred Solution included a 7.2 m roadway with two (2) sidewalks. This narrower option addressed residents' concerns regarding traffic speed. Two (2) sidewalks were selected to improve pedestrian safety as Mildenhall road is the busiest road within the study area.

After the fourth and final PIC, the above Preferred Solution was reviewed by City staff. It was determined that a 7.2 m road width one (1) sidewalk would be selected in order to reduce (by seven (7)) the number of tree removals.
Staff presented a report to the Public Works & Infrastructure Committee (PWIC) of Toronto City Council, at its meeting on May 9, 2017. The report outlined the study recommendations and a request to proceed with a 30-day public review. All persons on the mailing list were notified of the report's availability and opportunity to arrange to speak or submit comments to PWIC. A number of persons submitted emails and/or appeared before the Committee to share their comments.

The Preferred Solution for Roads, Drainage and Sidewalks is presented in Figure ES-12.

Sightlines

Sightline issues were identified and sight-line obstruction letters were mailed out to the affected residences. Staff from the City of Toronto and the consulting team conducted a follow-up investigation at each of the sites that were identified as having potential sightline issues. In summary, three of the sites were not found to pose a problem with respect to sightlines and no further action is recommended. For two of the sites discussions were held with the homeowners to remove the vegetation that is causing the sightline issue. At the Blythwood Road / Strathgowan Avenue location a recommendation to relocate the stone wall and remove the vegetation thereby limiting the sightline issue, was made.

Alternative 2:

- 8.5 metre road width
- Rural cross section
- 1 sidewalk

Alternative 3:

- 8.5 metre road width
- Urban cross section
- 1 sidewalk

Alternative 4:

- 7.2 metre road width
- Rural cross section
- 1 sidewalk

Alternative 5:

- 7.2 metre road width
- Urban cross section
- 1 sidewalk

Alternative 6:

- 8.5 metre road width
- Rural cross section
- No sidewalk

Alternative 7:

- 8.5 metre road width
- Urban cross section
- No sidewalk

Alternative 8:

- 7.2 metre road width
- Rural cross section
- No sidewalk

Alternative 9:

- 7.2 metre road width
- Urban cross section
- No sidewalk

Figure ES-10: Alternative Roadway Cross Sections – Local Roads

Note: Alternative 1: Do Nothing not shown in figure.

Alternative 2:

- 9.5 metre road width
- Urban cross section
- 2 sidewalks

Alternative 3:

- 9.5 metre road width
- Urban cross section
- 1 sidewalk

Alternative 4:

- 8.5 metre road width
- Urban cross section
- 2 sidewalks

Alternative 5:

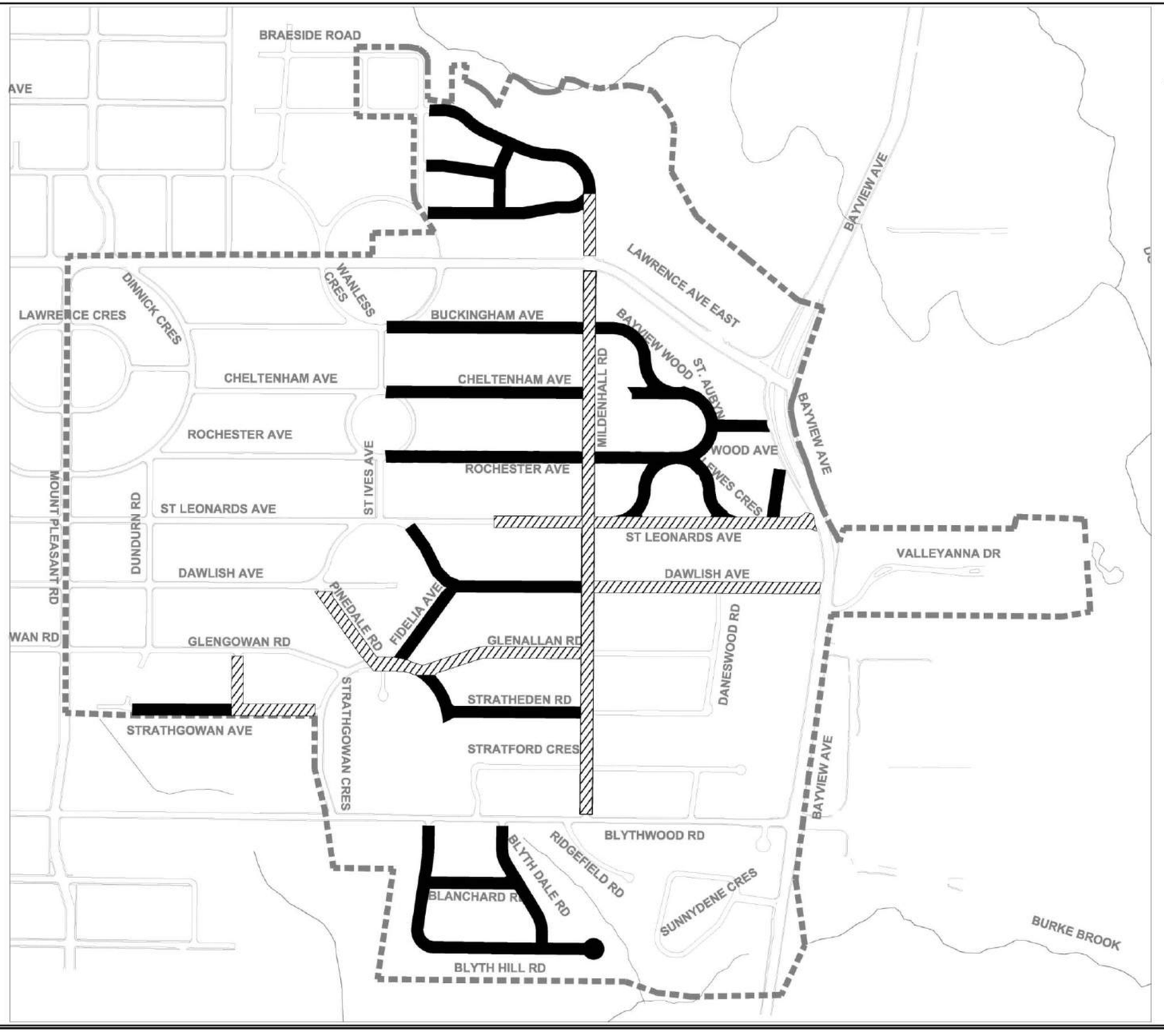
- 8.5 metre road width
- Urban cross section
- 1 sidewalk

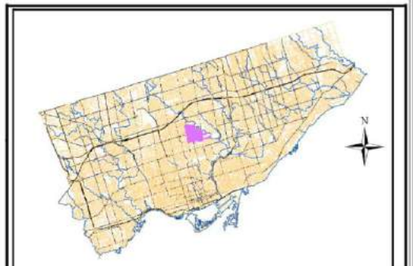
Alternative 6:

- 7.2 metre road width
- Urban cross section
- 2 sidewalks

Figure ES-11: Alternative Roadway Cross Sections – Mildenhall Rd. south of Lawrence Ave. E.

Note: Alternative 1: Do Nothing not shown in figure.





LEGEND:

- Study Area
- Road Width - 7.2m, 1 Sidewalk Urban cross section
- Road Width - 7.2m, No Sidewalk Urban cross section

NOTES:

Base Mapping was provided by the City of Toronto

400 200 0 Meters

TORONTO

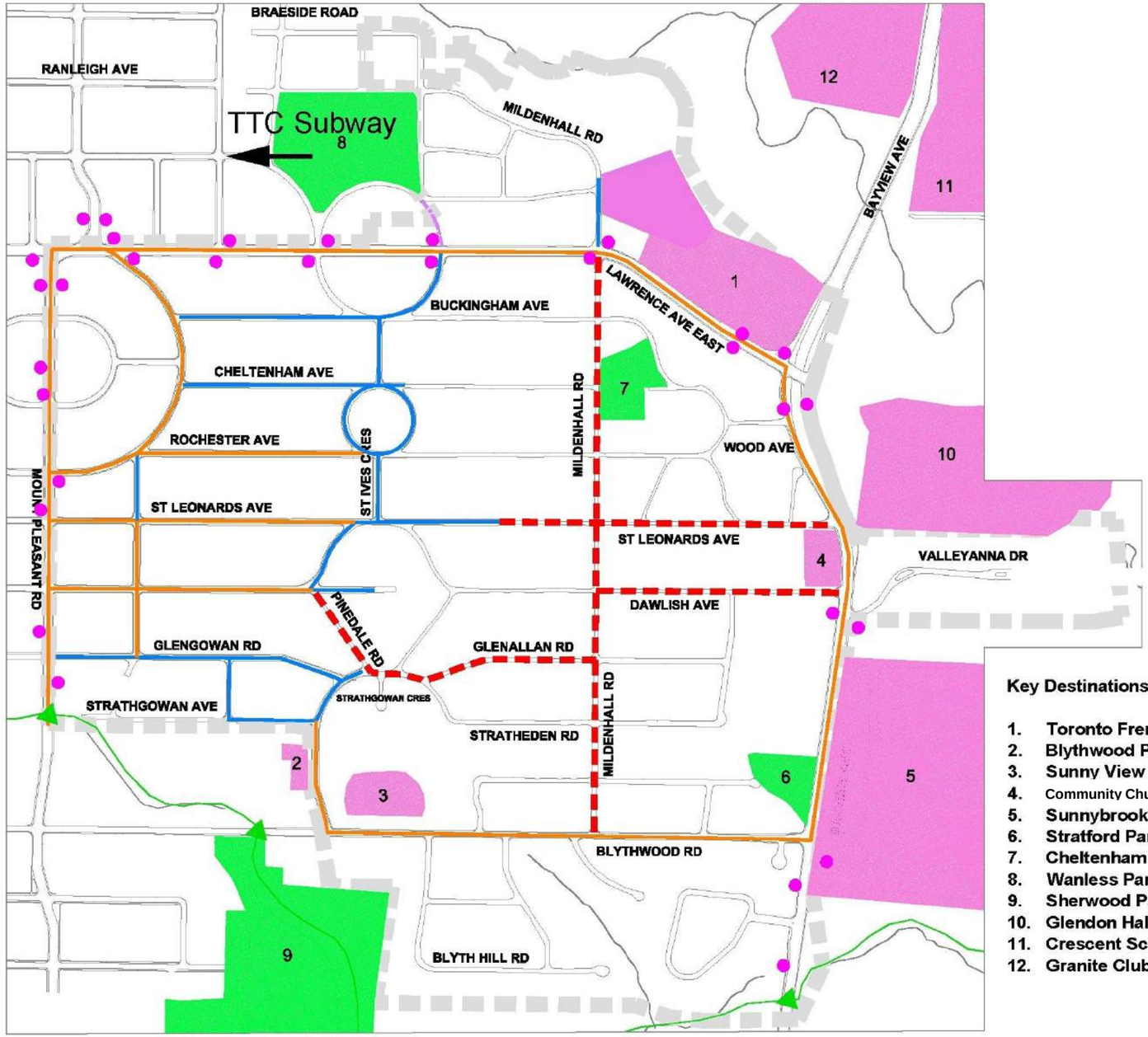
Aquafor Beech Limited

LAWRENCE PARK NEIGHBOURHOOD INVESTIGATION OF BASEMENT FLOODING & ROAD IMPROVEMENT STUDY CLASS EA

Recommended Road, Drainage and Sidewalk Alternatives

FIGURE No. ES-12

DATE: NOVEMBER 2016



Key Destinations

1. Toronto French School
2. Blythwood Public School
3. Sunny View Public School
4. Community Church & Nursery School
5. Sunnybrook Hospital
6. Stratford Park
7. Cheltenham Park
8. Wanless Park
9. Sherwood Park
10. Glendon Hall
11. Crescent School
12. Granite Club

LEGEND:

- Study Area
- Existing Pathway
- Existing Pathway
- Existing Pathway
- Institutions
- Parks
- Access Points to Trail
- Bus Stop
- Trails
- Proposed High Priority Sidewalks

NOTES:

Base Mapping was provided by the City of Toronto

400 200 0 Meters

Property boundaries based on City parcel data provided 2012-08-15

TORONTO

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LAWRENCE PARK NEIGHBOURHOOD INVESTIGATION OF BASEMENT FLOODING & ROAD IMPROVEMENT STUDY CLASS EA

Proposed Sidewalk Linkages

FIGURE No. ES-13

DATE: NOVEMBER 2016

DESCRIPTION OF THE PREFERRED SOLUTION

Chapter 10 of the report provides a description of the Preferred Solution. Information is presented with respect to:

- Costing information;
- Mitigation of potential impact considerations;
- Considerations at the detail design stage such as required agency and MOECC approvals; and
- Implementation considerations.

Provided below is a summary of the above considerations for the Preferred Solutions for the:

- Sewer system;
- Roads, drainage and pedestrian safety; and
- Traffic management.

Sewer System Projects

Sewer works are recommended for two primary reasons. The first reason is to provide the required capacity in the combined or sanitary sewer systems so that the risk of basement flooding is reduced and the level of service criteria as defined by the City is met. The second reason is to improve local drainage issues (such as surface flooding) that exist due to a deteriorated and sub-standard storm drainage conveyance system. These works will be carried out in coordination with the road and pedestrian safety works and are described under roads, drainage and sidewalks projects.

The Preferred Solution for the Basement Flooding improvements includes one project for the fully separated system and two projects for the partially separated system as shown on Figures ES-7 and ES-8 respectively. The estimated cost together with the applicable Municipal Class Environmental Assessment Schedule for each project is shown in Table ES-1.

Table ES-1 – Summary of Preferred Solution
– Basement Flooding Protection Projects

Project	Reference Figure Number	Estimated Capital Cost	Municipal Class Environmental Assessment Schedule
Combined Sewer Area			
Dundurn Road, and St. Leonard's Avenue	Figure ES-8	$4,000,000	Schedule 'A+'
Glengowan Road			
Separated Sewer Area			
Bayview Avenue, Rochester Avenue, St. Aubyn's Crescent, Valleyanna Drive, Wood Avenue.	Figure ES-7	$15,000,000	Schedule 'B'

The mitigation measures, detail design and implementation considerations for the combined sewer area do not require additional considerations related to easements and the outlet. For the separated sewer area, at the time of this report, no easement existed that allowed construction on private property at the outlet. Formal negotiations with the affected landowner at 28 Valleyanna Drive will be undertaken during the detailed design phase to acquire an easement allowing construction of the new sanitary sewer at the outlet. A copy of the easement letters to property owners affected by the Preferred Solution is included in Appendix A.

Roads, Drainage and Pedestrian Safety Projects

Chapter 8 discussed the development and assessment of alternative remedial measures related to roads, drainage and pedestrian safety. In summary, various streets were identified where common issues related to poor road conditions; narrow road widths, poor drainage and no sidewalks were identified.

Chapter 10 discusses the development of storm sewer works to address drainage issues that includes surface flooding. A hydrologic and hydraulic model developed for the existing drainage system was used as a basis to develop the Preferred Solution for construction of the storm sewer system as part of the replacement of the existing streets with an urban cross-section and provides conveyance of flows that currently have no connecting flow paths to an outlet.

Figure ES-12 illustrates the Preferred Solution for each of the 18 locations. The estimated cost is shown in Table ES-2 that includes road reconstruction and storm drainage works.

Based on further assessment, it was found that it was more cost effective to include the proposed storm sewer works on Glengowan Road (see Table ES-1) as part of the storm drainage improvement works. A cost estimate for the proposed storm sewer works is provided below.

Table ES-2 –Summary of Preferred Solution - Road Reconstruction Works and Associated Storm Drainage Improvements

Location (Road Reconstruction or Sewer Outfall Number)	Estimated Capital Cost
1 - Mildenhall Road South	$ 3,100,000
2 - Buckingham Avenue	$1,400,000
3 - Cheltenham Avenue	$1,500,000
4 - Rochester Avenue	$2,400,000
5 - St Leonards Avenue	$3,900,000
6 - Lewes Crescent, Plembury Avenue	$1,800,000
7 - Dawlish Avenue	$2,900,000
8 - Glenallan Road	$2,600,000
9 - Stratheden Road	$1,800,000
10A - Garland Avenue,	$4,000,000
10B - Strathgowan Avenue	$1,200,000
11 - Blyth Hill Road	$4,400,000
12 - Blyth Dale Road	$2,200,000
13 - Braeside Crescent	$1,100,000
14 - Rothmere Drive	$1,400,000
15 - Mildenhall Road North	$2,300,000
16 - Bayview Wood	$3,200,000
17 - Fidelia Avenue	$1,600,000
Storm Sewer Outfall #1	$900,000
Storm Sewer Outfall #2	$1,900,000
Storm Sewer Outfall #4	$1,000,000
Glengowan Road	$1,600.000
Total Estimated Cost	$48,500,000

Further information with respect to the mitigation measures, detail design and implementation considerations for the road reconstruction and storm sewer installation is provided in Chapter 10. A copy of the easement letters to property owners affected by the Preferred Solution is included in Appendix A.

Tree Impacts

Residents living within the Lawrence Park area expressed, throughout the course of the study, considerable concern about loss of existing street trees due to proposed construction practices.

The City undertook considerable measures at the Environmental Assessment stage to initially define the location, type, age as well as general health of each street tree located within the study area. Subsequent work was then undertaken by City and Consulting staff to further refine and update this work as well as to better define whether each tree would be impacted.

In summary there are approximately 2,700 street trees within the study area. For the streets where road reconstruction is proposed, 1,201 trees were identified. Based on the work undertaken it was assessed that 99 trees would be removed, 247 trees would be preserved and 848 trees would not be impacted.

Graphics were also prepared for each of the 18 locations to illustrate potential impacts to street trees. Figure ES-14 illustrates the trees that are located along Wood Avenue. Also shown are the trees to be removed, protected if possible as well as trees that will not be impacted. Figure ES-15 represents a photo shopped image which corresponds to a section of the roadway shown in Figure ES-14. The top image represents existing conditions while the bottom image illustrates the proposed roadway, catch basins together with the proposed pavement width and roadway (or construction) width. In this image any tree which is slated to be removed has also been taken off the photo in an effort to illustrate the visual difference between existing and proposed conditions as a result of any tree removal. The photo shop image also shows a comparison between the existing and proposed pavement width. As can be seen from the selected illustrations (see also Figures ES-16 to ES-19), the pavement width may increase or decrease for proposed conditions depending upon the street that is being considered.

At the fourth PIC the City outlined several measures which could be implemented to both limit the loss of trees as a result of construction as well as plant new tress prior to construction. A summary of the methods is outlined below.

Planting New Street Trees

The City will undertake a program to plant new street trees prior to construction. The program will involve identifying potential locations and species type. Consultation with property owners will be undertaken. This program will assist in allowing the new trees to become well established well ahead of the proposed construction. During construction trees that are removed will also be replaced with a new tree.

Localized Road Narrowing and Shifting of the Road

Efforts will be made at the detail design stage to narrowing the roadway at locations where additional efforts are required to protect existing street trees. This may occur in areas where one or more significant trees exist and where additional efforts should therefore be undertaken. In these situations, localized narrowing of the road to a minimum of 6.6 m would be carried out. Due to the narrowing of the road, parking would not be allowed within the narrowed section of the roadway.

Efforts will also be made to localize shifting of the road at select locations within the study area. Shifting of the road (the width would still remain at 7.2 m) would be utilized in locations where a significant number of trees are located along one side of the road while the other side has less vegetation.

Detail Design Stage

Detailed tree removal and retention plans will be prepared as will plans for construction access, staging and material storage. Alternative construction techniques to protect existing trees will also be considered and will be incorporated into contract specifications, as applicable.

Tree protection specifications will be included in design drawings.

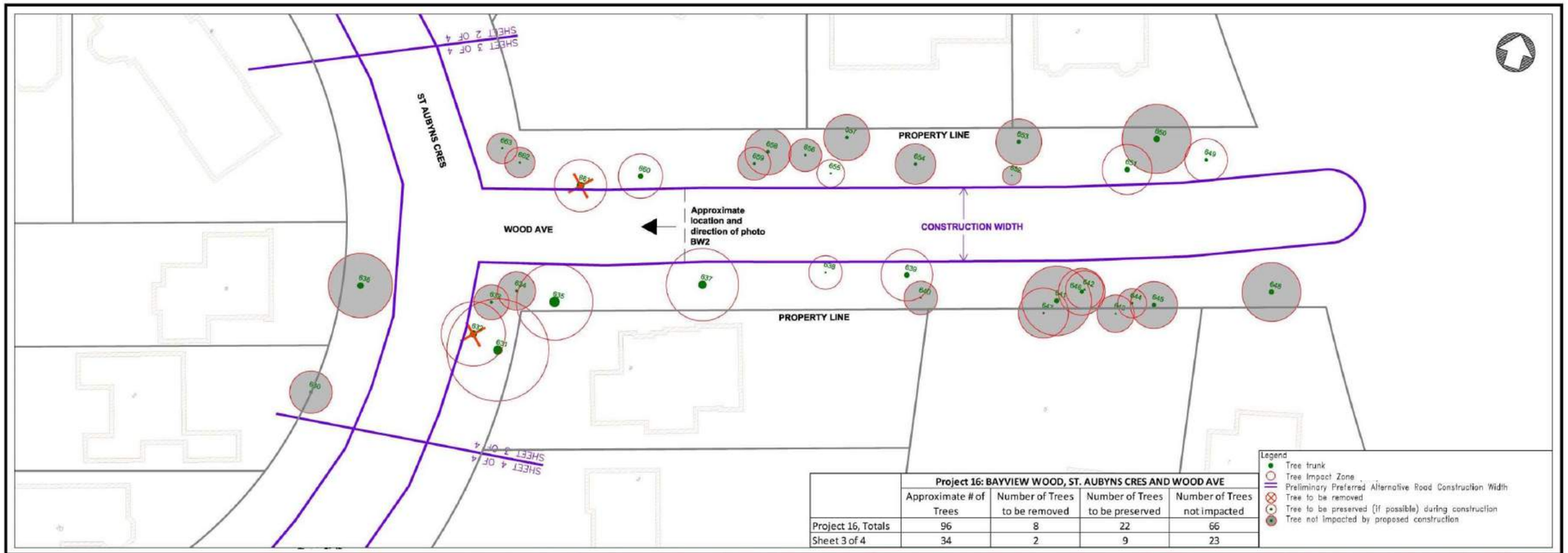
Construction Stage

Several techniques to limit tree loss will be applied at the construction stage. This will include on-site supervision by a certified arborist together with the development of a communication plan for residents. Alternative excavation techniques including the use of pneumatic and hydraulic excavation techniques and hand digging to protect tree roots together with consideration of root pruning techniques and specialized backfill considerations can be implemented.

Post Construction Stage

Post construction measures include monitoring approaches to ensure the long-term health of the trees. Measures such as proper irrigation, aeration, fertilization and mulching will be employed. Wound treatment, as necessary, will also be undertaken.

In addition to the works proposed above, rehabilitation of roads (see section 5.4) in areas where coordinated road and storm sewer works are not recommended is needed. These works are generally located in the former City of Toronto (west of St. Ives Avenue) and are required as part of improving the general condition of the road system. In total, approximately 2.2 km of roads would be rehabilitated at an estimated cost of $6 million.



	Project 16: BAYVIEW WOOD, ST. AUBYNS CRES AND WOOD AVE			
	Approximate # of Trees	Number of Trees to be removed	Number of Trees to be preserved	Number of Trees not impacted
Project 16, Totals	96	8	22	66
Sheet 3 of 4	34	2	9	23

Legend
- Tree trunk
- Tree Impact Zone
- Preliminary Preferred Alternative Road Construction Width
- Tree to be removed
- Tree to be preserved (if possible) during construction
- Tree not impacted by proposed construction

Trees to be removed

Tree No	Tree Species		Condition	Diameter (cm)
632	QUERCUS RUBRA	Red Oak	ModHigh	74
661	QUERCUS RUBRA	Red Oak	ModHigh	78

Trees to be preserved (if possible)

Tree No	Tree Species		Condition	Diameter (cm)
649	ACER SACCHARUM SSP SACCHARUM	Sugar Maple	Moderate	33
651	ACER SACCHARUM SSP SACCHARUM	Sugar Maple	High	54
655	SORBUS AUCUPARIA	Mountain Ash	ModHigh	16
660	TILIA CORDATA	Littleleaf Linden	High	53
631	QUERCUS RUBRA	Red Oak	ModHigh	95
635	QUERCUS RUBRA	Red Oak	High	109
637	ACER SACCHARUM SSP SACCHARUM	Sugar Maple	ModHigh	85
638	THUJA OCCIDENTALIS	Eastern White Cedar	ModHigh	12
639	ACER SACCHARUM SSP SACCHARUM	Sugar Maple	ModHigh	55

Trees not Impacted

Tree No	Tree Species		Condition	Diameter (cm)
630	ACER PLATANOIDES	Norway Maple	ModHigh	31
636	ACER PLATANOIDES	Norway Maple	ModHigh	65
633	ACER PLATANOIDES	Norway Maple	ModHigh	29
634	ACER PLATANOIDES	Norway Maple	ModHigh	24
640	PICEA ABIES	Norway Spruce	ModHigh	12
641	ACER SACCHARUM SSP SACCHARUM	Sugar Maple	Moderate	51
642	ACER SACCHARUM SSP SACCHARUM	Sugar Maple	ModHigh	21
643	ACER SACCHARUM SSP SACCHARUM	Sugar Maple	ModHigh	14
644	ACER SACCHARUM SSP SACCHARUM	Sugar Maple	ModHigh	22
645	ACER SACCHARUM SSP SACCHARUM	Sugar Maple	Moderate	42
647	ACER SACCHARUM SSP SACCHARUM	Sugar Maple	ModHigh	16
648	ACER PLATANOIDES	Norway Maple	High	53
650	ACER SACCHARUM SSP SACCHARUM	Sugar Maple	ModHigh	65
652	AMELANCHIER LAEVIS	Smooth Serviceberry	ModHigh	9
653	ACER RUBRUM	Red Maple	Low	39
654	ACER PLATANOIDES	Norway Maple	Moderate	30
656	ACER PLATANOIDES	Norway Maple	ModHigh	23
657	BETULA PAPYRIFERA	Paper Birch	Moderate	31
658	BETULA PAPYRIFERA	Paper Birch	ModHigh	34
659	BETULA PAPYRIFERA	Paper Birch	ModHigh	27
662	PICEA OMORIKA	Serbian Spruce	ModHigh	15
663	PICEA OMORIKA	Serbian Spruce	ModHigh	18
646	ACER SACCHARUM SSP SACCHARUM	Sugar Maple	Moderate	38

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Consultants: Aquator Beech Limited

No.	DATE	REVISIONS	INITIAL	SIGNED

TORONTO Engineering & Construction Services

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Manager, Design & Construction Linear Underground Infrastructure Basement Flooding Protection Program

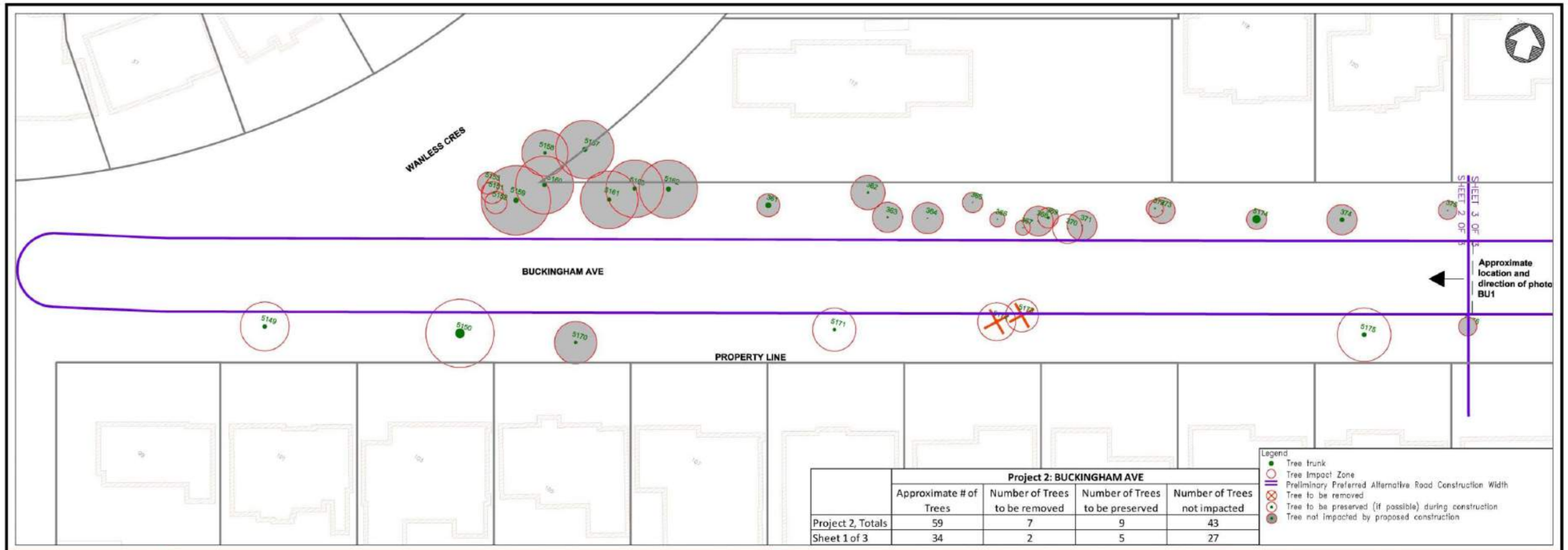
16 BAYVIEW WOOD, ST. AUBYNS CRES AND WOOD AVE

City of Toronto

Plan and Profile (Not for Construction)

DESIGN:	CR	DRAFT NO.	CR	CHECK:	PT	CONTRACT No.
SCALE:	HOR 1:200 VER 1:100			DRAWING NUMBER:	FIGURE ES-14	SHEET No. 3 OF 4
DATE:	11/05/2015					

FIGURE ES-15: Illustration of Existing and Proposed Dimensions for Woods Ave.



	Project 2: BUCKINGHAM AVE			
	Approximate # of Trees	Number of Trees to be removed	Number of Trees to be preserved	Number of Trees not impacted
Project 2, Totals	59	7	9	43
Sheet 1 of 3	34	2	5	27

Trees to be removed

Tree No	Tree Species		Condition	Diameter (cm)
5172	ACER PLATANOIDES	Norway Maple	ModHigh	43
5173	ACER PLATANOIDES	Norway Maple	ModHigh	25

Trees to be preserved (if possible)

Tree No	Tree Species		Condition	Diameter (cm)
370	MORUS ALBA	White Mulberry	Low	8
5149	PICEA PUNGENS GLAUCA	Colorado Spruce	ModHigh	44
5150	ACER PLATANOIDES	Norway Maple	ModHigh	100
5171	GLEDITSIA TRIACANTHOS VAR INERMIS	Smooth Honeylocust	ModHigh	31
5175	TILIA CORDATA	Littleleaf Linden	ModHigh	46

Trees not Impacted

Tree No	Tree Species		Condition	Diameter (cm)
5151	PICEA OMORIKA	Serbian Spruce	ModHigh	5
5152	PICEA OMORIKA	Serbian Spruce	ModHigh	6
5153	PICEA OMORIKA	Serbian Spruce	ModHigh	7
5157	FRAXINUS PENNSYLVANICA	Green Ash	Moderate	50
5158	FRAXINUS PENNSYLVANICA	Green Ash	Low	33
5159	FRAXINUS PENNSYLVANICA	Green Ash	Low	54
5160	FRAXINUS PENNSYLVANICA	Green Ash	ModHigh	44
5161	FRAXINUS PENNSYLVANICA	Green Ash	ModHigh	42
5162	BETULA PAPYRIFERA	WN/A	Moderate	49
5163	FRAXINUS PENNSYLVANICA	Green Ash	Moderate	42
5170	TILIA CORDATA	Littleleaf Linden	ModHigh	31
5174	QUERCUS ALBA	White Oak	ModHigh	84
5176	FAGUS SYLVATICA ATROPUNICEA	Copper Beech	ModHigh	5
361	GLEDITSIA TRIACANTHOS VAR INERMIS	Smooth Honeylocust	High	57
362	ABIES CONCOLOR	White Fir	ModHigh	22
363	CELTIS OCCIDENTALIS	Hackberry	ModHigh	16
364	MORUS ALBA	White Mulberry	Low	8
365	MORUS ALBA	White Mulberry	Low	6
366	MORUS ALBA	White Mulberry	Low	8
367	MORUS ALBA	White Mulberry	Low	9
368	ACER PLATANOIDES	Norway Maple	Low	12
369	FRAXINUS PENNSYLVANICA	Green Ash	Moderate	26
371	ACER PLATANOIDES	Norway Maple	Low	10
372	ACER NEGUNDO	Manitoba Maple	Moderate	14
373	ACER PLATANOIDES	Norway Maple	Low	10
374	GLEDITSIA TRIACANTHOS VAR INERMIS	Smooth Honeylocust	ModHigh	44
375	PYRUS CALLERYANA GLENS FORM	Chanticlear Pear	Moderate	6

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Manager, Design & Construction
Linear Underground Infrastructure
Basement Flooding Protection Program

(2) BUCKINGHAM AVE

City of Toronto

Plan and Profile (Not for Construction)

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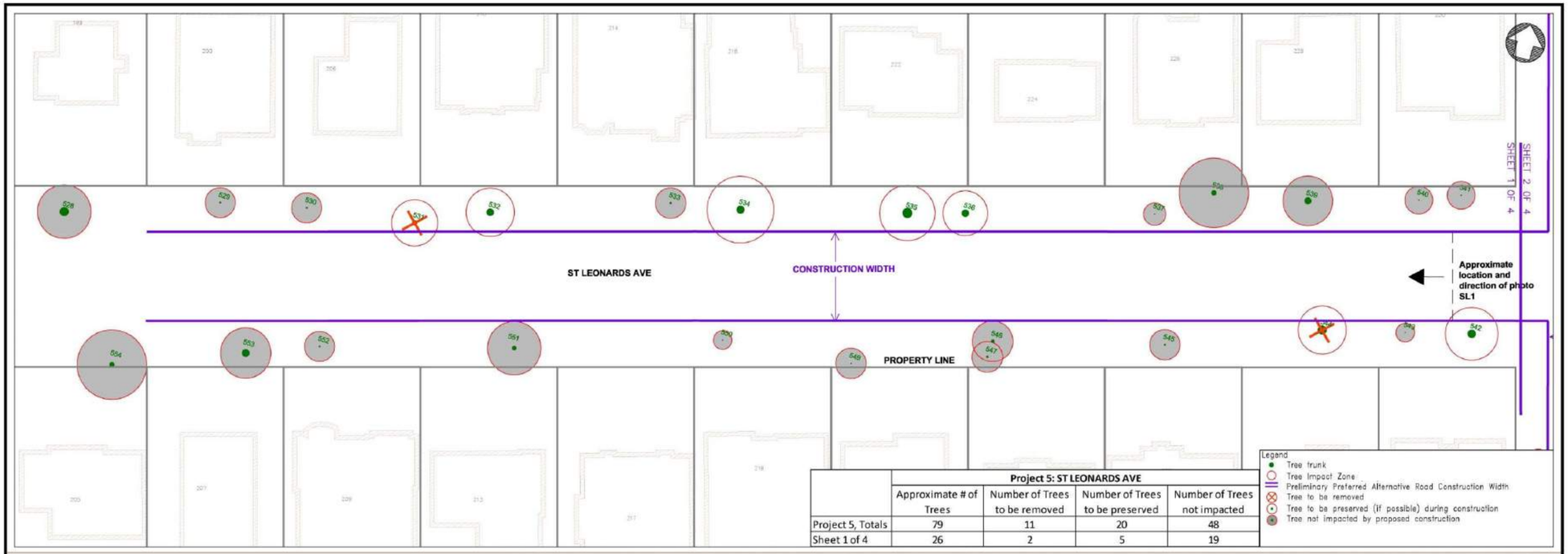
SCALE:	HOR 1:200 VER 1:100			DRAWING NUMBER:	FIGURE ES-16	SHEET No. 1 OF 3
DATE:	11/05/2015					

FIGURE ES-17: Existing and Proposed Dimensions for Buckingham Ave.



	Project 5: ST LEONARDS AVE			
	Approximate # of Trees	Number of Trees to be removed	Number of Trees to be preserved	Number of Trees not impacted
Project 5, Totals	79	11	20	48
Sheet 1 of 4	26	2	5	19

Trees to be removed

Tree No	Tree Species		Condition	Diameter (cm)
544	ACER SACCHARINUM	Silver Maple	ModHigh	94
531	SALIX SP	Willow sp.	Moderate	52

Trees to be preserved (if possible)

Tree No	Tree Species		Condition	Diameter (cm)
542	ACER PLATANOIDES	Norway Maple	ModHigh	86
532	ACER PLATANOIDES	Norway Maple	Moderate	77
534	ACER PLATANOIDES	Norway Maple	High	82
535	ACER SACCHARINUM	Silver Maple	ModHigh	105
536	ACER SACCHARINUM	Silver Maple	High	76

Trees not impacted

Tree No	Tree Species		Conditions	Diameter (cm)
545	SYRINGA RETICULATA IVORY SILK	Japanese Tree Lilac	ModHigh	17
546	ACER PALMATUM	Japanese Maple	ModHigh	32
547	PICEA PUNGENS GLAUCA	Colorado Spruce	ModHigh	22
549	GLEDITSIA TRIACANTHOS VAR INERMIS	Smooth Honeylocust	ModHigh	9
550	GINKGO BILOBA	Ginkgo	ModHigh	6
551	PICEA PUNGENS GLAUCA	Colorado Spruce	ModHigh	43
552	GINKGO BILOBA	Ginkgo	ModHigh	14
553	ACER PLATANOIDES	Norway Maple	ModHigh	80
554	ABIES CONCOLOR	White Fir	High	52
543	ACER SACCHARINUM	Silver Maple	ModHigh	6
537	AMELANCHIER LAEVIS	Smooth Serviceberry	ModHigh	8
538	GLEDITSIA TRIACANTHOS VAR INERMIS	Smooth Honeylocust	High	52
539	TILIA CORDATA	Littleleaf Linden	High	71
540	LIRIODENDRON TULIPIFERA	Tulip Tree	ModHigh	8
541	LIRIODENDRON TULIPIFERA	Tulip Tree	ModHigh	8
533	SYRINGA RETICULATA IVORY SILK	Japanese Tree Lilac	ModHigh	19
528	ACER SACCHARINUM	Silver Maple	Moderate	94
529	SYRINGA RETICULATA IVORY SILK	Japanese Tree Lilac	ModHigh	14
530	ACER SACCHARINUM	Silver Maple	ModHigh	14

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Consultants: Aquafor Beech Limited

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(5) ST LEONARDS AVE

City of Toronto

Plan and Profile (Not for Construction)

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DATE:	11/09/2015					

FIGURE ES-19: Existing and Proposed Dimensions for St. Leonard's Ave.

Traffic

Chapter 9 described the assessment of alternative remedial measures for traffic within the Lawrence Park neighborhood (for the area bounded by Lawrence Park Avenue E., Bayview Avenue, Blythwood Avenue and Mount Pleasant Road). The proposed recommendations are relatively minor and will generally be dealt with as part of ongoing operations and maintenance or future rehabilitation projects

In summary, the proposed works include:

- Improving sightlines at three intersections: This includes removal of excess vegetation at St. Leonard's Avenue/Mount Pleasant Road and Lawrence Crescent/Mount Pleasant Road (south intersection) and relocation of a stone wall along the north-east corner of the Strathgowan Avenue/Blythwood Road intersection. The existing stone wall could be relocated as part of a future intersection or road reconstruction project; and
- Improving pedestrian safety: Recommendations to improve pedestrian safety by installing sidewalks along five roads (Mildenhall Road south of Lawrence Avenue E., Dawlish Avenue between Mildenhall Road and Bayview Avenue, St. Leonard's Avenue, Glenallen Road and Pinedale Road). The sidewalks would be installed as part of the road reconstruction process.

Summary of EA Undertakings

The EA schedule for all of the proposed undertakings associated with the Preferred Solution is summarized in Tables ES-3 and ES-4.

The Basement Flooding Protection projects summarized in Table ES-3 have been grouped into two (2) projects for the combined area west of St, Ives Crescent and one (1) project for the separated area east of St. Ives Crescent. It should also be noted that the preferred solution for Basement Flooding for Glengowan Road (Project BF-02) is now addressed under the Road Drainage and Pedestrian Safety Projects along with the corresponding cost estimate.

For the Roads, Drainage and Pedestrian Safety Projects, the eighteen locations have been grouped into four (4) projects according to the storm sewer system drainage areas and are listed in Table ES-4 and illustrated in Figure ES-20. The projects include:

- roads to be reconstructed with a 7.2 m pavement width;
- curb and gutter drainage system with new or replacement storm sewers and, where technically and operationally feasible and supported by underground conditions, the installation of a perforated pipe system; and
- a 1.5 m sidewalk on one side of five streets to be reconstructed.

Implementation

In general, timing of the proposed works will be dependent on the overall priority as compared to other City of Toronto projects and will follow the City Council adopted prioritization approach for the implementation of recommended basement flooding protection projects, under the Basement Flooding Protection Program.

The City prepared a staff report that was approved by City Council in May, 2017. This document provided a preliminary construction sequencing plan on the projects described above as noted in Tables ES-3 and ES-4. The sequencing plan groups the projects according to the sewer system drainage areas. The size and sequencing of each construction contract is based on providing basement flooding protection infrastructure as a first priority, limiting disruption to the neighborhood and ensuring that newly built infrastructure is not damaged by subsequent construction of the proposed works. The overall sequencing of work and actual construction schedule will be dependent on funding, prioritization and coordination of works with other City Divisions and utility companies, and securing the necessary property easements, permits and approvals.

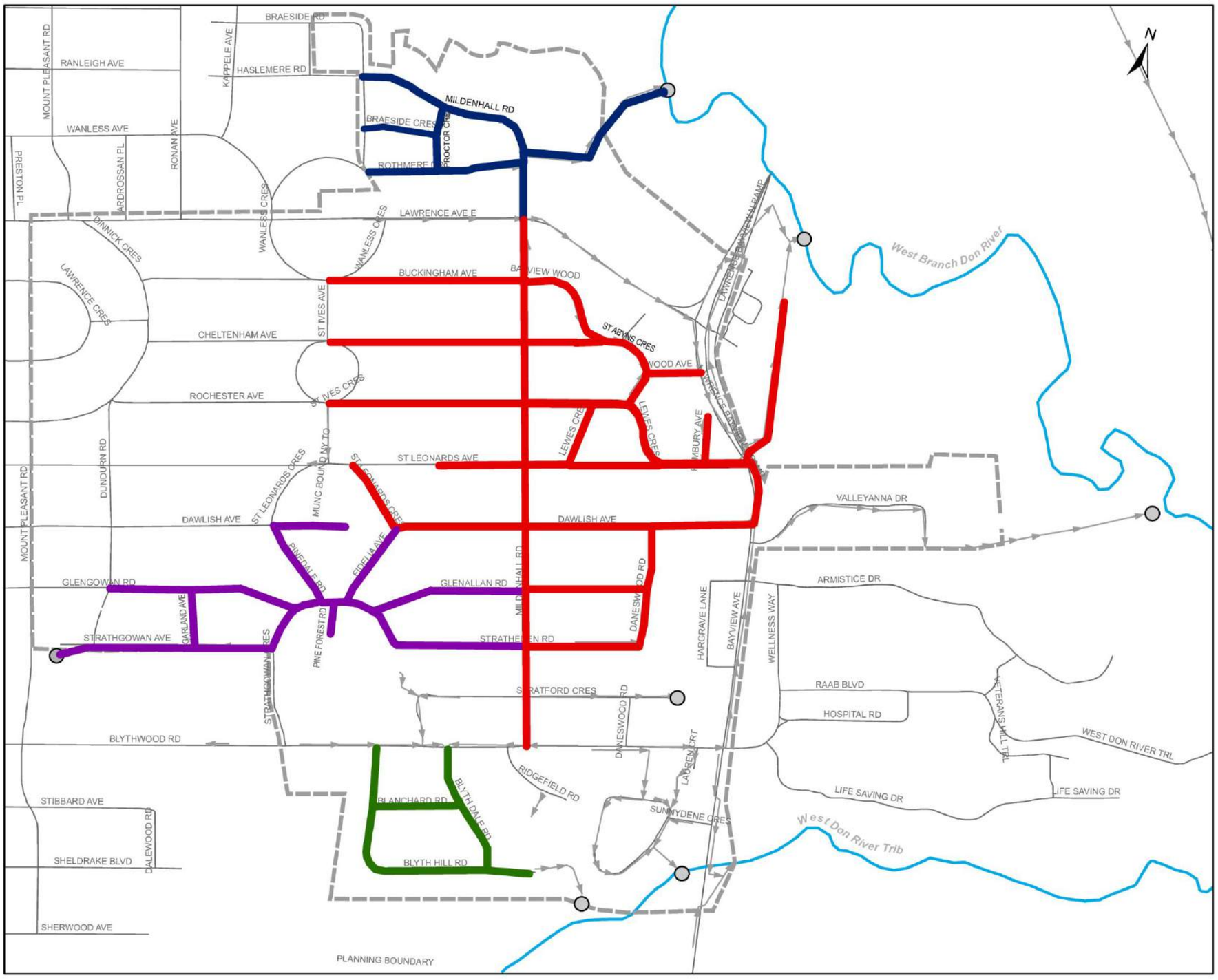
Table ES-3 – Summary of Preferred Solution – Basement Flooding Protection Projects

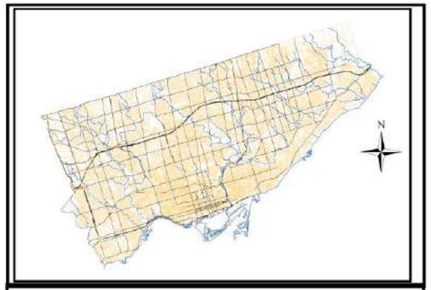
Project No.	Streets	Recommended Works	Estimated Capital Cost	Class EA Schedule
BF-01	• Dundurn Road (Rochester Avenue to St. Leonard's Avenue) • St. Leonard's Avenue (Dundurn Road to St. Ives Avenue)	Addition of storm sewer	$2,400,000	Schedule 'A+'
BF-02	• Glengowan Road (Dundurn Road to Strathgowan Crescent)	Addressed under Road, Drainage and Pedestrian Safety Projects		
BF-03	• Valleyanna Drive;	Replacement and addition of sanitary sewer and installation of a 1,100 m^3 underground tank.	$15,000,000	Schedule 'B'
	• 28 Valleyanna Drive; and • 2075 Bayview Avenue	Replacement of Sanitary Sewer		
	• Bayview Avenue (Lawrence Avenue to Armistice Drive); • Rochester Avenue (Mildenhall Road to St. Aubyns Crescent); • St. Aubyn's Crescent (Rochester Avenue to Bayview Wood); and • Wood Avenue.	Replacement of sanitary sewer (to be integrated with RDS-02*)		

Table ES-4 – Summary of Preferred Solution – Road Reconstruction Works and Associated Storm Drainage Works

Project No.	Streets	Recommended Works	Estimated Capital Cost	Class EA Schedule
RDS-01	• Braeside Crescent • Mildenhall Road (north of Rothmere Drive); • Proctor Crescent; • Rothmere Drive	Road reconstruction and replacement of storm sewer	$5,500.000	Schedule 'B'
	• 101 Mildenhall Road (Mildenhall Road through to and including the outfall at the West Don River Tributary)	Replacement of storm sewer and reconstruction of outfall		
RDS-02	• Bayview Wood; • Buckingham Avenue (St. Ives Avenue to Mildenhall Road); Cheltenham Avenue (St. Ives Avenue to and including Cheltenham Park); • Lewes Crescent; • Plembury Avenue; • Rochester Avenue (St. Ives Avenue to Mildenhall Road); • St. Aubyns Crescent; • St. Leonard's Crescent; • St. Leonard's Avenue (east of St. Ives Avenue).	Road reconstruction and addition or replacement of storm sewer	$24,000,000	Schedule 'A+'
	• Dawlish Avenue (St. Leonard's Crescent to Bayview Avenue –); • Glenallan Road (east of Mildenhall Road); • Mildenhall Road (Rothmere Drive to Blythwood Road).	Road reconstruction with sidewalk and addition or replacement of storm sewer		
	• Wood Avenue.	Road Reconstruction		

Project No.	Streets	Recommended Works	Estimated Capital Cost	Class EA Schedule
	• Bayview Avenue (Dawlish Avenue to St. Leonard's Avenue); • Daneswood Road; • St. Ives Crescent (Cheltenham Avenue to Rochester Avenue); • Stratheden Road (east of Mildenhall Road); • 2275 Bayview Avenue (York University).	Addition or replacement of storm sewer		
RDS-03	• Blanchard Road; • Blyth Dale Road; and • Blyth Hill Road.	Road reconstruction and/or addition/replacement of storm sewer	$6,600,000	Schedule 'A+'
RDS-04	• Fidelia Avenue; • Garland Avenue; • Stratheden Road (west of Mildenhall Road); • Strathgowan Avenue.	Road reconstruction and addition or replacement of storm sewers	$10,000,000	Schedule 'B'
	• Glenallan Road (west of Mildenhall Road); • Pinedale Road; • Strathgowan Crescent (from Strathgowan Avenue to Stratheden Road).	Road reconstruction with sidewalk and addition or replacement of storm sewer		
	• Dawlish Avenue (from St. Leonard's Crescent east to the end of the cul-de-sac); • Glengowan Road (Dundurn Road to Strathgowan Crescent); • Pine Forest Road.	Addition or replacement of storm sewers		
	• City of Toronto Blythwood/Sherwood Ravine	Addition of storm sewer and outfall		





LEGEND:

- LPN Study Area
- Watercourses
- Existing_Storm_Sewers
- Storm Outfall
- RDS-01
- RDS-02
- RDS-03
- RDS-04

NOTES:

Base Mapping was provided by the City of Toronto

0 50 100 200 300 Meters

TORONTO

Aquafor Beech Limited

LAWRENCE PARK NEIGHBOURHOOD INVESTIGATION OF BASEMENT FLOODING & ROAD IMPROVEMENT STUDY CLASS EA

Road Reconstruction Works and Associated Storm Drainage Works

FIGURE No. ES-20

DATE: January, 2017