LAKEVIEW VILLAGE

FUNCTIONAL SERVICING REPORT

LAKEVIEW
COMMUNITY PARTNERS LIMITED

FEBRUARY 2019

LAKEVIEW
COMMUNITY PARTNERS LIMITED

TACC CONSTRUCTION

Greenpark

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Executive Summary

The subject lands are located on the former 177-acre site of the Lakeview Generating Station, a coal fired power plant that operated from 1962 to 2005. Following the closure of the plant and eventual decommissioning of the site, Ontario Power Generation (OPG) sold the lands through a competitive bidding process to the Lakeview Community Partners consortium in 2018. The purchase and sale agreement for these lands includes a provision which will ensure the conveyance of 67.1 ha of the OPG lands to the City of Mississauga.

This report provides functional servicing design and stormwater management information in support of proposed Zoning By-Law Amendment and Draft Plan of Subdivision application for the subject lands. This report fulfils DARC 18-20Z submission requirements and addresses City of Mississauga comments related to grading, servicing, drainage, stormwater management and LID measures for the subject site. The servicing and development strategies presented in this report have been developed in conjunction with the greater consulting team and should be considered in conjunction with their work.

Servicing of the site will be provided through connections to existing infrastructure and through several proposed municipal right-of-ways (ROWs) across the subject lands. Watermain connections to existing infrastructure will be provided to the west and north of the site. Sanitary servicing will be provided through the sewers in the proposed ROWs, which will connect to existing infrastructure on Lakeshore Road East via a proposed sanitary forcemain. Minor system stormwater flows on the subject lands will be capture into the proposed storm sewer network, while major system flows will be conveyed overland by the proposed ROWs.

The proposed Lakeview Village development will incorporate a number of sustainable features that will attract international market attention and will help the City of Mississauga achieve their goal of creating "a model sustainable creative community on the waterfront, all built to world-leading standards for urban and green design".

Sustainable landscape features within the public realm

INTRODUCTION

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Introduction

1.1 SCOPE

This report provides functional servicing design and stormwater management information in support of proposed Zoning By-Law Amendment applications and Draft Plan of Subdivision for the subject lands. This report fulfils the ZBA submission requirements and addresses the City of Mississauga's preliminary comments related to grading, servicing, drainage, stormwater management and LID measures.

The proposed development will proceed under Rezoning and Plan of Subdivision processes. Subsequent site plan applications for the private blocks will be submitted once the process is further advanced and a detailed design submission for the subdivision components will be produced upon approval of the Draft Plan. The design information presented in this report considers the following guidelines:

- City of Mississauga Engineering Standard Drawings Manual
- Credit Valley Conservation Authority Stormwater Management Criteria Document (August 2012)
- Draft Ministry of the Environment and Climate Change LID SWM Guidance Manual (2017)
- Regional Municipality of Peel PW Design Specifications and Procedures
- Stormwater Management Planning and Design Manual by the Ministry of Environment and Climate Change; (March 2003)
- Ontario Building Code (2012)

The strip of waterfront lands abutting Lake Ontario are not part of this application but have been considered with respect to the related grading and servicing constraints.

The Lakeview Sustainability Strategy report provides a more detailed commentary on the sustainable opportunities and possibilities for this project. The report also looks at the financial impact of this strategy on the City of Mississauga and provides a roadmap to ensure implementation of the strategy is achieved. The sustainability study focuses on adding value and economics to the Lakeview Village project by targeting sustainable issues such as energy, water, waste management, environment, mobility, smart technologies and human well-being.

1.2 SUPPORTING STUDIES

The servicing and development strategies presented in this report have been developed in conjunction with the greater consulting team and should be considered in conjunction with their work. The following studies are included in the appendices:

- Preliminary Geotechnical Investigation – Exp Services Inc. (December 2017)
- Preliminary Geotechnical Investigation - DS Consulting Report (October 2018)
- Shoreline Hazard Assessment - Baird (December 2018)
- Water and Wastewater Servicing Analysis – Region of Peel (May 2018)
- Arborist Report – Beacon Environmental (August 2018)
- Street Hierarchy and Right-of-Way Study - TMIG (January 2019)
- Sustainability Strategy – TMIG (December 2018)
- Lakeview Waterfront Connection Project – Applewood and Serson Creeks Design Brief – TRCA, GHD (December 2015)
- CVC Living by the Lake Action Plan (December 2018)
- Lakeview Village – Development Master Plan (September 2018)
- Water Distribution Analysis Memo – TMIG (July 2018)
- Transportation Considerations Report – TMIG (October 2018)
- Wind and Thermal Comfort Assessment – RWDI (October 2018)
- Air Quality and Noise Land-Use Feasibility Assessment – RWDI (October 2018)

1.3 SITE DESCRIPTION

The subject property is approximately 71 hectares (175.45 acres) and is located in the City of Mississauga. The study area for the overall FSR includes the properties along Rangeview Road, north of the OPG lands. The site is bounded by:

- Lakeshore Road to the north,
- Lake Ontario to the south,
- the Lakeview / G.E. Booth Wastewater Treatment Plant to the east and Douglas Kennedy Park and Lakefront Promenade Park to the west.

Figure 1 illustrates the location of the site. The legal description of the site is Part of Lots 7, 8 and 9, Concession 3, south of Dundas Street Part of Water Lot in front of Lot 7, Part of water lot location hy28, hy77, and hy116 (Geographic Township of Toronto, County of Peel), City of Mississauga, Regional Municipality of Peel.

The subject lands are located on the former 177-acre site of the Lakeview Generating Station, a coal fired power plant that operated from 1962 to 2005. Following the closure of the plant and eventual decommissioning of the site, Ontario Power Generation (OPG) sold the lands through a competitive bidding process to the Lakeview Community Partners consortium in 2018. The purchase and sale agreement for these lands includes a provision which will ensure the conveyance of 67.1 ha of the OPG lands to the City of Mississauga.

Due to the former use of the site, soil investigations and remediation efforts as well as exploratory excavation and demolition of the original foundation structures have been underway since the purchase was completed. Generally, the site slopes from east to west and north to south, draining to the lake.

Aerial view of the existing Lakeview Village lands

View from Lakefront Promenade Park with the Lakeview Village site across the water

EXISTING CONDITIONS

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EXISTING CONDITIONS

2.1 LAND USE & TOPOGRAPHY

The site was formerly used OPG for coal-fired power generation, a switchyard, and other industrial uses. The plant was operational from 1962 until 2005, at which point it was decommissioned and demolished. Currently, the site is covered in low lying vegetation and some remnant roads, sports fields, parking areas, and the remaining concrete foundation / sub-surface cooling ducts. Throughout the site there are multiple monitoring wells used to monitor the environmental conditions / quality of the groundwater.

Topographical surveys of the subject lands have been completed by JD Barnes in 2017 and 2018. The site generally falls from Lakeshore Road to Lake Ontario with a maximum grade change of approximately 10m.

Figure 3 illustrates the existing site features, topography and drainage patterns.

2.2 SHORELINE

Lands adjacent to Lake Ontario are regulated by the Credit Valley Conservation Authority (CVC). Limits of the Regulated Area are shown on Figure 5. The development will require new storm sewers discharging directly to Lake Ontario. All works within the regulated area will include appropriate shoreline protection, restoration and E&SC measures required. Based on comments received, CVC and Provincial approvals will be required for the proposed shoreline alterations and will obtained through the detailed design process.

W.F. Baird and Associates completed a site-specific and detailed technical shoreline hazard assessment for Lakeview Village in December 2018, which is included in Appendix B. Terms of Reference for the shoreline hazard assessment were submitted to CVC. The Baird report determined that the Lakeview Village shoreline is an “artificial shoreline” in accordance with the CVC Lake Ontario Shoreline Hazards report (2005) and the OMNR Technical Guide (2001). Existing coastal works will be upgraded in accordance with accepted engineering practice and the protection works standard, however the overall configuration of the shoreline will be maintained.

The Baird shoreline hazard assessment is comprised of 100-year flood level plus an allowance for wave uprush, ice action, and the effects of climate change. The methodology used to determine the shoreline hazard limit is described in detail in the Baird report. The shoreline erosion hazard limit is shown on Drawing EX-1. A minimum floodproofing standard elevation of 77.0m has been established for the Lakeview Village area. The 100-year monthly mean lake level is 75.84m.

Discussions with the City related to the shoreline will be held after the first submission is filed.

2.3 SOIL CONDITIONS

The Preliminary Geotechnical Investigation by exp indicates that the soil stratigraphy of the subject property generally consists of fill underlain by native deposits of clayey silt, clayey silt till, sandy silt till, silt till and silt overlying shale bedrock. This report also establishes the long-term groundwater table at a range of about 3 to 4m below existing grade. For the purposes of this investigation it is assumed that any remediation work which may be required to deal with potential contamination will be completed prior to earthworks and servicing. DS Consulting has confirmed that the depth of bedrock ranges from 3 to 4 meters at the south and north limits of the site, with a “valley” near the midpoint of the site in which bedrock is more that 20m deep from the existing ground.

The DS consulting report in Appendix A provides a detailed discussion of geotechnical site conditions. The reports state that the site is located in the Iroquois Plain and that the soil stratigraphy in this area is generally characterized by clay till overlain by sand. Underlying bedrock comprises shale and limestone of the Georgian Bay Formation. The overburden consisted of sand with gravel, sandy silt, sandy clay with gravel, clay with sand or clay, underlain by native clay to clay with sand to clay with gravel. The overburden was underlain by slightly to highly weathered shale bedrock. Depth of bedrock ranged from 3m to 20.0m below existing grade and certain areas may require rock-breaking equipment for excavation.

Exp Services Inc. will prepare a detailed environmental remediation program if required. This program will consist primarily of conventional excavation and disposal of impacted materials at approved facilities and the completion of Risk Assessments, as per Ontario Regulation 153/04, as amended. A significant quantity of the existing concrete foundation will be removed, which provides opportunities to construct the site with engineered fill suitable for construction and for low-impact development stormwater management measures / restoration.

Please refer to Appendix A for further information.

2.4 EXISTING DRAINAGE

Serson Creek is located at the northeast corner of the subject site and continues along the eastern edge of the subject site. The low flow channel is piped under G.E. Booth Wastewater Treatment Facility. A small portion of the existing subject site drains to Serson Creek as well as some external catchment areas. The creek is proposed to be realigned and naturalized and will be further discussed in Section 5.5.

Generally, the subject site drains from the north to the south towards Lake Ontario and existing drainage is directed to Lake Ontario through a series of swales. The proposed drainage plan will be in accordance with the existing drainage pattern. The existing stormwater distribution infrastructure in the vicinity of the site includes:

- A Lakeshore Road storm sewer (900mm to 300mm) draining to Lakefront Promenade
- A Hydro Road storm sewer (450mm to 900mm) draining to Rangeview Road
- A 1050mm storm sewer on Rangeview Road east of Lakefront Promenade
- A 1200mm storm sewer on Rangeview Road west of Lakefront Promenade
- A storm sewer on Lakefront Promenade increasing in size from a 900mm at Lakeshore Road East to a 1800mm at the outfall
- An existing outfall west of the subject lands connected to the Lakefront Promenade storm sewer and discharging to Lake Ontario

Aerial View of Preliminary Site Construction in 2018

DEVELOPMENT CONCEPT

Rendering of Lakeview Village looking west

Development Concept

3.1 DRAFT PLAN

As shown on Figure 2, the proposed 71.0 ha development consists of several public right-of-ways and private site plan blocks, including:

- Mixed use blocks
- High density residential blocks
- Commercial development block
- Park blocks / Open space
- Public ROWs

The proposed development will be advanced through both Draft Plan of Subdivision approval process and the Site Plan approval process for the individual private site plan blocks. The Subdivision components will consist of the public ROW areas, open space blocks, and services. Preliminary cross sections have been prepared and are included in Appendix F. These cross sections have been developed to support the proposed surface treatment of the various right of ways. The cross sections will be further refined in consultation with the required approval agencies and utility companies, and in keeping with the developing master plan vision. The cross sections are conceptual and represent an enhanced treatment to be discussed further with the City of Mississauga. Refer to Figure 4 – Concept Plan

3.2 SITE PLANS

Details related to site plan servicing will be determined at the site plan approval stage. The locations of the site plan service connections may change through detailed subdivision design.

The purpose of this report is to demonstrate the feasibility of the proposed servicing strategy for the entirety of the subject lands. Site plan targets required to meet the design criteria related to stormwater quality and erosion control will be determined in future submissions.

3.3 DEVELOPMENT PHASING

Currently, the project is proposed to be developed in 6 phases with multiple sub-phases. Servicing infrastructure is designed to facilitate the proposed phasing and provide flexibility should the phasing be altered. The current phasing is based on the anticipated development schedule and may change through the approval process. External servicing works are required for the proposed development to proceed. These include an 884m twin 300mm forcemain extending along Hydro Road from the proposed sanitary pumping station to a proposed 3000mm manhole and a gravity connection to the existing manhole on Lakeshore Road East.

Refer to Figure 5 - Phasing Plan

3.4 G.E. BOOTH WWTF

The G.E. Booth Wastewater Treatment Facility (WWTF) is situated immediately east of the site, with Lakeshore Park / Marie Curtis Park located further east. As a transition area between proposed residential neighbourhoods and the existing G.E. Booth Wastewater Treatment Facility, an employment and innovation corridor is integrated into the urban fabric of Lakeview Village with a synergistic relationship to Lakeview Square and the surrounding retail and cultural amenities. Serson Innovation Corridor is designed to support a mix of office, institutional, and innovation uses that will complement the planned residential, cultural, and retail uses.

Sanitary flows from the subject lands will be directed to the G.E. Booth Wastewater Treatment Facility (WWTF) via the existing 600mm sanitary sewer on Lakeshore Road East.

3.5 NATURAL HERITAGE SYSTEM

Serson Creek is located along the eastern property limit of the subject lands. Serson Creek has been modified and realigned since the 1950's and as part of the OPG plant works. This feature, in its current alignment directs low flows along the former rail corridor and north / east through the wooded area, to a pipe beneath the adjacent waste water treatment plan. There is a barrier to flow at the former rail corridor and frequent flows are not currently conveyed to the lake via the existing Serson Creek corridor downstream of the rail corridor. This flow diversion impacts ecological functions within the channel and the resulting lack of frequent flow in the downstream reaches to the lake restricts fish passage to the upper reaches of the system. With respect to high / infrequent flows, the floodplain associated with the 100-year and Regional events overtops the channel banks in several locations, particularly on the east interface with the wastewater treatment plan. The CVC Living by the Lake document identified the following objectives for improvements to Serson Creek, namely:

- Capacity improvements to eliminate spills
- Pocket wetlands within the creek corridor and improvement of instream and riparian habitat by increasing diversity of structures and bed form
- Improve / provide fish passage from Lake Ontario to upper reaches of Serson Creek
- Improve wildlife connectivity
- Maintain existing terrestrial connectivity between Serson Creek / G.E. Booth Woodland / Applewood Creek

Beacon Environmental and Urbantech Consulting have developed a preliminary channel design that addresses the CVC objectives and seeks to restore the channel to a functioning NHS. These details will be provided under separate cover in the forthcoming Serson Creek Corridor Design Brief, but key design parameters have been included in this report to demonstrate that the block is sufficiently sized. Based on a fluvial assessment and hydraulic analysis, the following channel design parameters are proposed:

- Low flow channel approximately 0.5m deep and 3.0m top width, with 2:1 side slopes.
- Channel corridor bottom width of 9m
- Channel corridor depth of 1.8m (to floodplain) including 0.30m freeboard
- Channel corridor top width of approximately 16m
- 2:1 side slopes (matching existing along the wastewater treatment plan property) and 3:1 side slopes elsewhere

This channel geometry can convey the maximum design flow of 24.66m3/s associated with the 100-year event (the Regional event in this location generates a slightly lower peak flow). Since the proposed channel geometry is more efficient and has a wider bottom than the current channel, the flood elevations decrease and are contained within the channel block, thereby eliminating the spill onto the wastewater treatment plant. The low flow channel and proposed floodplain will provide opportunities for ecological enhancement. he proposed channel alignment will eliminate the flow diversion beneath the WWTP and allow for improved connectivity to the upper reaches of the creek.

The majority of the corridor will remain in its current alignment, however the reach between Lakeshore Boulevard and the former rail corridor will be realigned to position the channel along the future New Haig Boulevard, with a channel crossing through the existing Plaster Form Inc. lands for connection back to the existing channel alignment and connectivity to the existing woodland. It is recognized that the portion of the channel (and New Haig Boulevard) on the Plaster Form Inc. lands cannot be constructed until Plaster Form Inc. participates in the development. The channel construction could be phased based on participation.

Rendering of Lakeview Square and Inspiration Park's recreation pond

3.6 SUSTAINABILITY GOALS AND STRATEGIES

The Lakeview Sustainability Strategy report (December 2018), prepared by The Municipal Infrastructure Group with input from Bicol Consulting Inc., FVB Energy, Glen Schnarr & Assoc., and McMurray Environmental, outlined the sustainable development measures being considered for this community. As outlined in the report, a sustainability strategy for the Lakeview community was developed using the EcoDistricts Protocol and the applicable sustainability goals have been considered in this report.

Sustainability will be at the core of the Lakeview Village. Lakeview Village will help the City achieve their goal of creating "a model sustainable creative community on the waterfront, all built to world-leading standards for urban and green design". The following are the proposed Sustainability Goals for Lakeview Village:

- To become the City of Mississauga's first Master Planned Net Zero Energy Ready Community and strive to become a Net Zero Energy Community. This will assist in meeting the Government of Canada's goal "under the Paris Agreement, Canada has committed to reducing Greenhouse Gas (GHG) emissions by 30% below 2005 levels by 2030."
- To provide Climate Change leadership by minimizing Lakeview Village's dependence on fossil fuels.
- To support the City of Mississauga's Strategic Pillars for Change as outlined in the Strategic Plan: Our Future Mississauga (2009) and the City's Living Green Master Plan (2012) by establishing a sustainability strategy which builds upon the MOVE, CONNECT, and GREEN pillars.
- To support the City of Mississauga's Smart City Strategy by working closely with the City to implement key initiatives.
- To support the Region of Peel's goal of 75% diversion of solid waste by 2034 through an efficient waste management strategy which strives towards Net Zero Waste.
- To reduce consumption and to promote reuse of water (domestic, stormwater).

3.7 INCORPORATING SUSTAINABILITY MEASURES

The Lakeview sustainability strategy is based on the EcoDistricts Protocol to achieve a rigorous, sustainable urban development for which it is people-centered, economically vibrant, planet-loving, neighborhood- and district-scale sustainable. The sustainable development measures examined focuses on the 6 priorities outlined in the Lakeview Sustainability Strategy report (December 2018): Place, Prosperity, Health and Wellbeing, Connectivity, Living Infrastructure, and Resource Regeneration. To achieve the 6 priories the following are considered for Lakeview Village:

ENERGY CONSERVATION AND DISTRICT ENERGY

Lakeview Village will strive towards being a Net-Zero Energy community. This will reduce greenhouse gas emissions to below national levels for this scale and type of community development. The types of technology proposed are net zero ready buildings, grid-connected microgrid and community district energy.

SMART TECHNOLOGIES

Smart City Technologies within Lakeview Village are anticipated to fall into one of two categories; Community Based and Building Based. The types of technology proposed are: Co-Working Hub for Mobile Employees, Connection Kiosk in Public Spaces, Free Wi-Fi in Public Spaces, Wi-Fi Connected Smart LED Streetlights, Fibre-Optic Broadband Spine Infrastructure, Smart City sensors for Public Parking Availability Assistance, Smart City Panic Buttons for public safety, Smart City sensors for notification to City staff regarding full public garbage receptacles within public spaces, Other Smart City sensors for traffic management, environmental monitoring, gunshot detection etc., and Smart Building Management System.

WASTE MANAGEMENT

Lakeview Village will model its waste planning and programs to achieve, at a minimum, the Region of Peel's waste diversion goals, outlined in the Region's 2015-2034 Strategic Plan document, which commits to achieving a 52% diversion (from landfill) target by 2019 and a longer-term goal of 75% diversion by 2014. The technologies considered are: Comprehensive Waste Management Plan Preparation and Implementation and Vacuum Waste Collection. Vacuum waste collection uses airflow to transport waste under the streets to a waste collection station located on the outskirts of a development. Instead of daily waste collections by multiple vehicles from various locations throughout the community, one waste collection vehicle collects a container of waste from a single location (Waste Terminal), when full, and takes the container to a recycling center, waste processing facility, or directly to landfill.

INTEGRATED LOW IMPACT DEVELOPMENT FEATURES

A comprehensive stormwater management strategy has been developed for Lakeview Village which is detailed in Section 5.3. The proposed stormwater management strategy includes incorporation of several Low Impact Development (LID) measures including: bioretention, bioswales, trees in soil cells, permeable pavement, rainwater cisterns, and green roofs.

OTHER COMMUNITY TECHNOLOGIES/ FEATURES

The other community technologies considered includes: wind turbines, solar roof panels, building integrated PV glass panels within the public realm, smart LED streetlights, residential and office EV charging stations, communal EV charging stations, on-site car sharing hubs, on-site bike sharing hubs, on-site bike parking/storage, on-site shuttle to Lakeshore transit, and community gardens.

All of the technologies considered are subject to financial viability, feasibility of implementation, and approval from governing agencies.

Rendering of Lakeview Village looking west

GRADING

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Preliminary concept of Lakeview Square

Grading

4.1 GRADING

The proposed conceptual grading for the development will be designed in accordance with City of Mississauga standards. Grading is generally governed by the existing boundary conditions. Site grading has also been designed to ensure that adequate cover over proposed services is maintained. No external grading works are proposed.

A preliminary grading concept plan has been prepared for the subject lands based on the following engineering constraints:

- Storm outlet elevations
- Major system drainage paths
- Provision of minimum cover over services
- Proposed road patterns and land use
- Elevations along boundary roads, property lines and waterfront trail
- Application of the City of Mississauga standards

The grading plans are consistent with the City standards. In general, grading of all proposed roads and site plan blocks adjacent to the surrounding development and roads matches the existing grades or the ultimate anticipated grades at the property line, as appropriate. As noted in the preceding section, a considerable amount of material will be removed from the lands as part of the demolition program. The site grading design minimizes the overall site earthworks program once the concreate and any impacted soils are removed and will continue to be refined to maximize the sustainable reuse of soils within the property. Additional grading information is provided on Figures GR-1. Cross-sections are provided on Drawings GR-2 through GR-7

4.2 EARTHWORKS

Currently, demolition works are underway and some preliminary earthworks associated with transfer of concrete rubble material to the TRCA operations area (for construction of the Jim Tovey Conservation Area waterfront feature) have commenced. Earthworks will be staged based on development timing. Site Plan earthworks, particularly underground parking excavation may be conducted separately from the overall subdivision earthworks.

4.3 RIGHT-OF-WAYS

There are four main types of right-of-ways (ROW)s proposed within Lakeview Village, which include: Major Collector; Minor Collector; Special Character Street and Local Street. The widths of the ROWs vary from 26m for a Major Collector to 18m for a Local Street. The Lakeview Village Street Hierarchy and Right-of-Way Study (January 2019) provided information on the proposed streets hierarchy and ROW configurations for Lakeview Village, to confirm feasibility and provide a basis for design. A copy of the Lakeview Village Street Hierarchy and Right-of-Way Study (January 2019) is provided in Appendix E and includes details regarding the cross sections and layouts of the ROWs. The proposed ROWs have incorporated all necessary infrastructure required to service the local community, such as storm sewers; watermains; sanitary sewers; district energy pipes; vacuum waste collection pipes; and utilities corridors, as well as the realigned dedicated watermain that services the wastewater treatment plant from the water treatment plant and a sanitary forcemain to convey the sanitary flows to the existing sanitary sewer on Lakeshore Boulevard. The cross-section drawings provided in Appendix E demonstrate that the proposed ROWs can incorporate the required urban streetscape elements, such as sidewalks, street furniture, bike lanes, street trees, as well as the required stormwater management facilities and underground services.

Existing site conditions of Lakeview Village

SERVICING

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View looking south towards Lake Ontario

Sanitary Servicing

EXISTING SANITARY SERVICES

The nearest existing sanitary infrastructure to the subject property is a 250mm sewer on Rangeview Road which drains to the existing Beach Street sewage pumping station to the west. Presently, this pumping station has no additional capacity and cannot accommodate the proposed sanitary drainage. However, the existing 1650mm trunk sanitary sewer on Lakeshore Road to the north, which drains to the Lakeview Wastewater Treatment Plant just east of the subject property, does have available capacity to support the proposed development. Due to grading constraints, it is not possible to service the proposed development with gravity sewers draining to Lakeshore Road. Therefore, a new sanitary pumping station and forcemain are required.

Refer to Drawing SAN-1 and Appendix C for further details.

PROPOSED SANITARY SERVICES

In May 2018, the Region of Peel Public Works division issued a Draft Water and Wastewater Servicing Analysis for the overall Inspiration Lakeview study area, comprising of:

- The Lakeview Village lands (i.e., the former OPG lands, designated as the Ogden Village and Cultural Waterfront precincts, and the south portion of the Serson Place Innovation Corridor precinct)
- The Lakeview employment area (including the Rangeview Estates precinct and the north portion of the Serson Place Innovation Corridor precinct).

The Region's analysis utilized future population values (ranging from 29,256 – 32,853 people) based on the City of Mississauga's planning estimates and the Region of Peel's 2041 growth forecasts. The Region evaluated the capacity of the existing and planned infrastructure including the capacity of the Lakeview Water Treatment Facility (WTF) and the G.E. Booth Wastewater Treatment Facility (WWTF), located west and east of the subject lands, respectively. The G.E. Booth WWTP will be the ultimate sanitary outfall for the subject lands. The current projected population equivalent for the Lakeview Village lands only is 21,756 persons as shown on the design sheet included in Appendix C.

The Region's study informs, at a high level, the recommended servicing study for the subject lands with the understanding that input from the Master Plan consulting team may result in adjustments justified by detailed examination of the servicing design within the study area. The following table provides the Region of Peel's servicing study recommendations for sanitary drainage for the portion of the site that can be drained by gravity and the proposed Functional Servicing strategy.

Table 5.1-1: Gravity Based Sanitary Collection Network – Recommendations and Strategies

GRAVITY BASED SANITARY COLLECTION NETWORK	
Region of Peel Recommendation	Functional Servicing Strategy
Any additional flow added to the Rangeview Road sanitary sewer (250mm diameter) will trigger conveyance upgrades downstream to the Beach Street WWPS, and is not recommended.	As shown on Drawing SAN-1, no additional flow from the Lakeview Village (Ogden Village / Cultural Waterfront) lands or Innovation Corridor will be directed to the existing Rangeview Road 250mm sanitary sewer. The Rangeview Estates lands may continue to drain to the existing sewer; re-development / intensification of these lands may trigger upgrades to the sanitary sewer within Rangeview Road and further downstream.
Rangeview Road Sewer - The existing 250 mm local sanitary sewer on Rangeview Road will continue to convey flow from east to west and may require upsizing based on the final design.	
East Avenue Sewer - A new local collection sewer on East Avenue will be required to redirect flows that currently go to the Beach Street WWPS to the Beechwood WWPS.	These recommendations relate to future development within the Rangeview Estates precinct and are not required / do not influence servicing of the Master Plan area.
Lakeshore Road Sewer (West of Lakefront Promenade) - Properties fronting Lakeshore Road, west of Lakefront Promenade will drain to the existing 300 mm local collection sewer on Lakeshore Road. There is a potential need for this sewer to be upsized based on final design.	
Lakeshore Road Sewer to Beechwood WWPS - The existing 250 mm sanitary sewer on Lakeshore Road, west of East Avenue will need to be upsized to convey all flows from the Rangeview Road drainage area to the Beechwood WWPS.	
Lakeshore Road Sewer (West of Hydro Road) - The existing 300 mm local collection sewers on Lakeshore Road, between Lakefront Promenade and Hydro Road will need to be upsized to service the properties fronting on Lakeshore Road.	
Lakeshore Road Sewer (East of Hydro Road) - The existing 250 mm local collection sewers on Lakeshore Road, east of Haig Boulevard will need to be upsized to service the north Innovation Corridor lands.	This recommendation relates to future development within the north portion of the Serson Place Innovation Corridor, outside of subject lands. This upgrade is not required for servicing of the Master Plan area.
Local Collection Sewer Network - The local collection sewers within the development will range between 250 mm and 300 mm in diameter, and will be located along future road right of ways.	The size of the gravity collection sewers within the Master Plan area range from 250mm local sewers to a 600mm trunk (upstream of the WWPS) and have been sized according to the Region of Peel sanitary sewer design criteria. The sanitary sewer network will be situated within the future public road ROWs; private site plan blocks will have internal sanitary drainage systems with connections to the public collection system. While gravity sewers will be located on a portion of Lakefront Promenade, the main trunk sanitary sewer through the subject lands will run east to west between the Cultural Waterfront and Ogden Village precincts.
Trunk System - There will be one local trunk sewer collection sewer ranging between 375 mm and 450 mm used to convey flow from the local sanitary sewer network to the proposed WWPS. The preliminary servicing strategy shows this local trunk sewer along the proposed Lakefront Boulevard.	

Sanitary Servicing

Sanitary Pumping Station

As noted, the majority of the subject lands (Ogden Village, Cultural Waterfront, and the south portion of the Innovation Corridor precincts) cannot drain to the sanitary trunk sewers on Lakeshore Boulevard by gravity. Table 5.1-2 describes the Region of Peel's recommendations regarding the wastewater pumping station and forcemain and the current Functional Servicing strategy.

Table 5.1-2: Sanitary Pumping Station and Forcemain – Recommendations and Strategies

SEWAGE PUMPING STATION (SPS) AND FORCEMAIN	
REGION OF PEEL RECOMMENDATION	FUNCTIONAL SERVICING STRATEGY
The Region's preferred site for the WWPS is on the east side of the development. This site is preferred for reasons including proximity to the wastewater treatment facility and the opportunity to address odours through an integrated odour control strategy.	At the request of the Region for a connection to the sanitary trunk sewer at Hydro Road and Lakeshore, the WWPS has now been relocated to the eastern edge of the development. This changes also aligns with the anticipated phasing and potential early development of the Serson Innovation Corridor blocks. This change is reflected on Drawing SAN-1.
The proposed alignment of the forcemain would be along the future New Haig Road (connecting to the existing 1650mm sanitary trunk sewer on Lakeshore Road East), or along a modified / existing watermain easement along Serson Creek for connection to infrastructure adjacent to the G.E. Booth WWTF. Capacity analysis for the existing 1650mm sanitary trunk sewer is required.	
The size of the proposed WWPS will be confirmed at the detailed design stage; however, for the purposes of the Functional Servicing Report, the WWPS is estimated to require a firm capacity between 150 L/s and 170 L/s.	It is agreed that the proposed WWPS design / capacity will be established through the Lakeview Village FSR and detailed design studies. However, based on preliminary estimates, the anticipated sanitary flow for the Lakeview Village study area is greater than 200 L/s based on the Region of Peel's design criteria and the anticipated employment and residential populations. Consideration of the future Rangeview Estates development population in the Region's analysis may have decrease the peaking factor and hence the total flows; however, the Rangeview Estates lands will not be directed to the WWPS based on the proposed servicing strategy.
To convey the above pumped flow, a 300 mm sanitary forcemain is considered sufficient but could be subject to changes based on the final detailed design.	A 300mm sanitary forcemain (twinned for maintenance redundancy) is currently proposed along Lakefront Promenade and will be connected to the existing 1650mm sanitary trunk sewer at Lakeshore Road East.

The estimated sewage flow rates to the Lakeview Village sewage pumping station (SPS) is summarized in Table 5.1-3. It is anticipated that the peak sanitary flow rate generated by the proposed development will be 201.83 L/s. The Sanitary Sewer Design Criteria (Mar. 2017) specified a unit domestic sewage flow of 302.8 Litres per capita per day (Lpcd). However, the design basis for the SPS is based on Region's recommended / updated design flow of 290 Lpcd.

Table 5.1-3: Sanitary Sewer Flow Requirements and Total Peak Flow

SANITARY SEWER FLOW REQUIREMENTS AND TOTAL PEAK FLOW			
Parameter	Unit	Value	Reference
Equivalent Population	#	21,756	Sanitary Sewer Design Sheet (Urbantech, Feb. 7, 2019)
Project Area	ha	54.07	
Per Capita Flow	lpcd	290	Peel Design Criteria
Average Day Flow (ADF)	L/s	73.02	Population x Per Capita Flow
Peaking Factor (PF)	#	2.62	Harmon Factor
Infiltration Rate	L/ha.s	0.2	Peel Design Criteria
Infiltration (I/I)	L/s	10.81	Peel Design Criteria
Total Peak Flow	L/s	201.83	ADF x PF + I/I

Sanitary Servicing

Sanitary Pumping Station Design Considerations

The SPS will be designed in accordance with the "Design Guidelines for Sewage Works, Ministry of the Environment, (2008) and "Wastewater Pumping Station Design Standards Version 7", Region of Peel (2012). The Peel Standards (2012) note that, for peak flows above 100 L/s, the pumping station should follow the Design Style III as outlined below:

- DESIGN STYLE: III - LARGE WWPS
- TYPICAL FLOW RANGE: Greater than 100 L/s
- FACILITY DESCRIPTION: Building, emergency generator and odour control.
- GENERAL LAYOUT: Submersible pumping station with separate building for controls, MCC, standby generator with a basement or vault to house valves so confined space entry not required.
- WET WELL STORAGE CAPACITY: Split wet well design. Minimum 1 hour (preferred 2 hour) wet well storage capacity based on peak flow
- NUMBER, SIZE & WEIGHT OF PUMPS: Three or more pumps, one lead, one lag and one standby. Shall be VFD or soft starters.
- GEN SET REQ'D: Yes – sized for all connected loads

Based on the design standards, the proposed SPS will be designed with the following salient features:

- Two-celled wet well, with a basket screen or channel grinder on the sanitary inlet, and related suction piping, interconnection valving, ventilation, odour control, lighting and instruments. All electrical equipment in the wet well will be explosion proof;
- Dry pit to house the four dry pit pumps (3 duty +1 standby), and related discharge piping, valving and instruments including flowmeters;
- Brick and block building enclosure with a floating roof, and architecturally designed to be aesthetically pleasing with the surrounding buildings;
- Service Entrance Breaker, ATS and MCC line-up;
- Standby (diesel/natural gas) generator (within the building);
- Primary and secondary electrical distribution;
- Heating, lighting and ventilation;
- Pumping station control panels and instruments;
- Communication of equipment status and alarms;
- Miscellaneous plumbing, room finishes, doors and louvers;
- Site fencing/gates, landscaping, access drive and parking area.

Site Elevations: Relevant site elevations for the SPS are:

- Grade elevation of pumping station: 82.5 m
- Influent Invert Elevation: 70.6 m
- Wet well Floor Elevation: 67.6 m
- Forcemain Tie-in Invert Elevation: 81.6 m

The forcemain is approximately 864 m long from the SPS to a sanitary manhole located upstream of the existing 1,650 mm diameter trunk sewer. The Flood Water Level is assigned as the maximum level that the wetwell can rise to and that the incoming sewers can surcharge to without risking the sanitary manholes upstream of the SPS. Based on the lowest manhole elevation in the subdivision of 70.65 m, the flood water level is assigned to be the influent invert elevation of 70.6 m. The Flood Water Level may be adjusted during the detailed design stage.

WET WELL DIMENSIONS: Based on the Ministry of Environment Conservation and Parks (MECP) criteria and pump manufacturers guidelines, the wetwell should contain sufficient volume to allow for a maximum six (6) starts per hour per pump with each pump operating for a minimum of three (3) minutes whenever it starts. The pump cycle time is represented by the equation:

Volume (m3) $= \theta Q / 4$

θ = time of one pumping cycle = 10 min

Q = Pump capacity of the largest duty pump (m3/min)

The minimum wet well volume has been selected as 34 m3 at this stage. The proposed wet well will have two cells with a combined length of 8.3 m and a width of 4 m. The operating level within the wet well will be 1 m with a total wet well depth of about 15 m.

Figure 5.1-1: Channel Grinder

(photo courtesy of JWC)

Sanitary Servicing

EMERGENCY STORAGE: Emergency storage is provided at SPSs as a redundant measure to protect the station infrastructure and to reduce the risk of basement flooding in the areas upstream of the pumping station. It provides storage that enables system operators a definite period of time to fix the cause of the system outage before sewage spills overland or basement flooding occurs. One-hour of emergency storage will be allocated for the SPS at this stage, based on the Peel Standard.

At the ultimate peak flow of 201.8 L/s, emergency storage volume of 664 m3 for 1 hr is required for this facility. There will be 62 m3 of emergency storage provided in the wet well. In order to achieve the 1hr emergency storage, an emergency storage tank is required which excludes the available storage in the incoming sewer lines and the proposed wet well. The emergency storage tank will have a volume of approximately 664 m3. At the average flow of 73 L/s, the wet well and the emergency storage tank will provide 2.76 hr of storage.

A below-grade emergency storage tank will be constructed adjacent to the wet well which will have dimensions of 20 m x 18 m. The top slab of the tank will be designed such that it can be used as parking space for the facility. If the water level in the wet well rises due to pump malfunction or failure, sewage will also rise in the emergency storage tank. Once the level in the wet well has returned to normal, sewage will flow out of the emergency storage tank through its sloped benching towards the incoming channel.

SITE AND BUILDING DIMENSIONS: The proposed SPS will have a building dimensions of approximately 15 m x10 m with an emergency storage dimension of 18 m x 15 m. The required property dimensions for the SPS will be about 40m x 25 m. The SPS building may be designed to appear as a site feature with a floating roof, similar to Figure 5.1-2. A typical floor plan and a sectional view are shown on Figures 5.1-3, and 5.1-4 respectively.

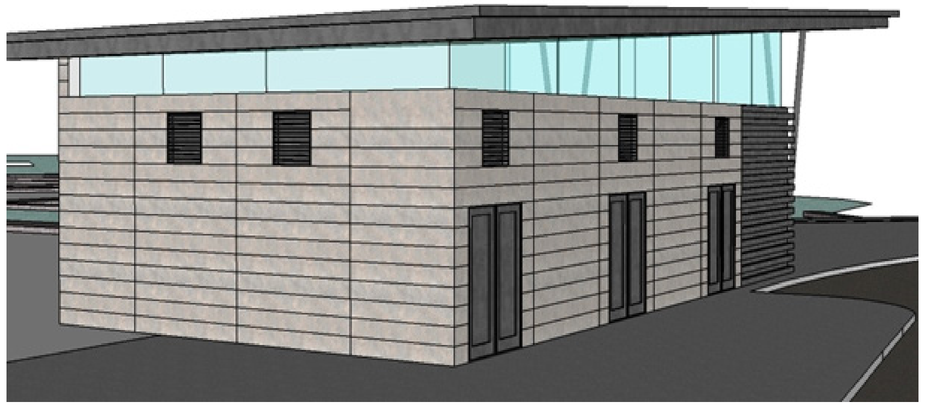


Figure 5.1-2: Typical SPS Building Rendering

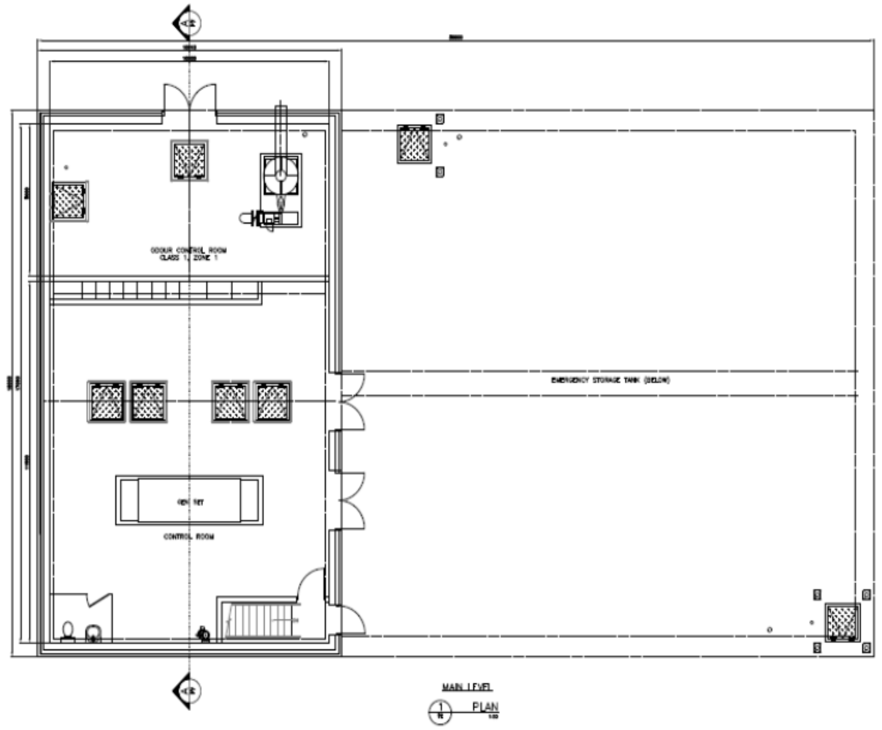


Figure 5.1-3 Typical SPS Floor Plan

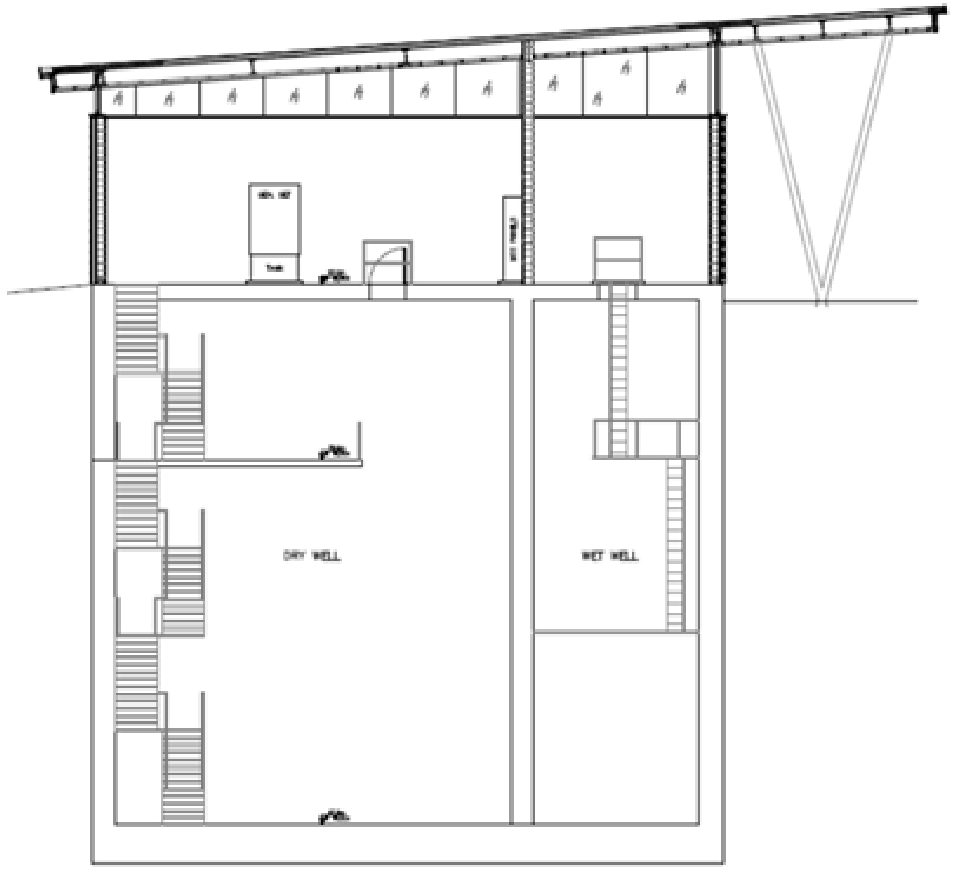


Figure 5.1-4 Typical SPS Sectional View

Sanitary Servicing

Sanitary Pumping Station Design Considerations Continued

BELOW-GRADE STRUCTURE CONSTRUCTION: Since the location of the SPS is close to the Lake and well below the lake surface water level, shoring will likely be required to mitigate dewatering operations during the construction of the SPS. Additionally, due to the typical nature of the soil close to the lake, it is anticipated that the station will need to be founded on piles. The excavation and construction methodology as well as shoring and foundation requirements will be finalized once the Geotechnical Investigation is complete to the site.

EMERGENCY OVERFLOW: An overflow pipeline at the top of the wetwell should be installed to provide protection to the pumping station and equipment in the event of station overflows. If power fails, the emergency generator will start, providing full power to the pumping station. If the emergency generator further fails to operate, the emergency storage will provide one hour of storage at peak flow. After this storage is consumed, the sewage will overflow from an emergency overflow located near the top of the wetwell to protect the pumping station. In accordance with MECP, the overflow will be metered through a meter appropriate for a partially submerged pipe, such as a Khrone Tidalflux magnetic flow meter, and shall include a valve, such as a flap gate, to reduce the potential for odour emissions during normal operations from the overflow location. The overflow location will need to be identified during the design phase of the project.

PHASES OF DEVELOPMENT: Since the Development is anticipated to be completed in phases, the SPS should be able to accommodate the needs. Based on the minimum velocity criteria (>0.6 m/s) for the forcemain, the minimum sewage flowrate in the forcemain should be 42 L/s which translates to a population of about 2,700 of this development. The estimated sewage flowrates for each phase and corresponding pump sizes will be analyzed during the detailed design phase.

FORCEMAIN SIZE: In accordance with the MECP Guidelines and Peel Guidelines, the forcemains should be designed for flow velocities from 0.6 m/s to 3.0 m/s. Maintaining a minimum velocity is critical in a forcemain since lower velocities will result in settling of sediment within the lines. Based on the Sanitary Design Sheet (Urbantech), twin 300 mm forcemain was proposed. The forcemain will be designed as:

- 300 mm twin forcemain with peak flow of 201.8 L/s corresponding to a velocity of 1.43 m/s
- 300 mm single forcemain with average flow of 73.0 L/s corresponding to a velocity of 1.03 m/s
- 300 mm single forcemain with minimum velocity of 0.6 m/s corresponding to a flow of 42 L/s

The static head and the total dynamic head are estimated as 13 m and 17 m respectively. Based on the preliminary calculation, four (three duty + one standby) 18 kW pumps will need to be installed.

The length of the forcemain from the SPS to the discharge point is about 884 m the elevation is gradual. This shorter length of forcemain is not be as susceptible to damage from water hammer pressures. However, the station will be equipped with protection against transient phenomena.

SCREENING: Provision of screening equipment should be considered to mitigate the potential for inorganic material clogging the pumping system. Screening may be a bar screen, a travelling screen, or a channel grinder such as the Muffin Monster as shown in Figure 1. A channel grinder would require less operator attention than either the bar screen or the travelling screen which both could require operator attention. Screening will protect the pumps, reduce pump maintenance and clogging, and reduce capacity loss from clogging in the forcemain, providing an overall better system for the operating authority.

EMERGENCY GENERATOR: The Pumping Station will include an emergency generator with an Automatic Transfer Switch (ATS) that will automatically start in case of a power outage. The generator will be sized for all connected loads. The design of a new standby generator will be based on several pre-design tasks and design considerations as summarized below:

Consideration of different fuel sources, such as diesel and natural gas, exhaust stack requirements to mitigate NOX emissions, combustion air intake dampers to be spring return fail open and monitored for status, and, depending on the noise assessment, consideration of a noise barrier wall to supplement noise attenuation measures. Spatial requirements for the generator enclosure, noise attenuation and proximity to property line (including noise and air pollution assessment), and interferences of the underground utilities. The size of the standby generator will be determined during detailed design. The initial pumps selected are 20 kW each. At this stage, iwt is estimated that the generator will be at a maximum 100 kW to power all connected loads. This generator footprint will be approximately 3.0 m x 1.5 m.

ODOUR CONTROL: Due to the close proximity of the station to adjacent households and businesses, and the propensity for sewage pumping stations to develop odourous gases such as methane and hydrogen sulfide, an odour control system is recommended.
Typical media based odour control units are packed-bed systems, which have higher capital costs and larger footprints but more operational advantages and drum scrubbers. Alternative technologies such as the Phoenix H2S Removal System will be evaluated, which may have more operational advantages over traditional media units. Considerations for the odour control unit will include:

- Noise and appearance
- Effectiveness in removing contaminants of concern
- Media life span
- Operational requirements for changing out media
- Capital costs

APPROVALS/PERMITS: The following approvals will be necessary for the construction of the pumping station;

- MECP Certificate of Approval – Sewage
- MECP Certificate of Approval – Air & Noise
- Conservation Authority Permit
- Building Permit and Site Plan Approval
- ESA Approval

Permit to Take Water (if required for construction of the below-grade structure)

Cost Estimate: The preliminary capital cost estimate for the proposed SPS is approximately $12M which is in the range of -50% to +100% based on the industry standards. This cost is not included the pile foundation. Detailed cost estimates will be provided during the detailed design stage.

Watermain Servicing

Existing Watermains Servicing The Site

The Lakeview Village lands are located within Pressure Zone 1 in the Region of Peel's water distribution system, and are currently serviced via a 250/300 mm diameter watermain looped along East Avenue and Rangeview Road, which is connected to a recently installed 600 mm sub-transmission main on Lakeshore Road East. The 600mm sub-transmission main can be connected to for the proposed development.
There are also other surrounding existing watermains but as indicated by the region no connections to these watermains are permissible. These watermains includes the following:

- The existing 400 mm local distribution feedermain crossing the site south of Rangeview Road, providing direct water supply from the Lakeview Water Treatment Facility to the G.E. Booth Wastewater Treatment Facility.
- Two major distribution Zone 1 feedermains, 900 mm and 1500 mm in diameter, are located on East Avenue; and
- Zone 2 transmission main, 2400 mm in diameter that transfers supply from the Lakeview Water Treatment Facility to the Hanlan Reservoir via Lakefront Promenade.

Future Watermain Upgrades In Vicinity Of Subject Site

There are no planned water infrastructure in the vicinity of the subject to support the proposed development. However, based on the Region's latest population and employment projections, which includes the projected population of Lakeview Village, the existing trunk infrastructure in the area has sufficient capacity without future watermain upgrades.

Lakeview Water Treatment Facility Capacity And Upgrades

The Region has identified that Lakeview Water Treatment Facility has sufficient capacity for the proposed development and no upgrades are anticipated.

Proposed Water Distribution Network

The Region of Peel's study provided the following recommendations for water servicing of the subject lands:

Table 5.2-1: Water Servicing Recommendations and Strategies

WATER SERVICING	
REGION OF PEEL RECOMMENDATION	FUNCTIONAL SERVICING STRATEGY
Water will be primarily supplied to the development via the existing 600 mm sub-transmission main on Lakeshore Road.	Three water connections to the existing 600mm watermain on Lakeshore Road east are proposed at Lakefront Promenade, future Street 'G', and Hydro Road. Refer to Drawing WM-1 for details.
A secondary connection to the Lakeview Inspiration site consisting of a 400 mm watermain from the Lakeview WTP is recommended to ensure security of supply, should the 600 mm watermain on Lakeshore Road be out of service.	As shown on Drawing WM-1, a 400mm secondary feed is proposed to provide system security / redundancy to the Master Plan study area.
Water service to the buildings fronting Lakeshore Road will be provided off the existing 600 mm local distribution main on Lakeshore Road	These recommendations relate to future development within the Rangeview Estates precinct and are not required / do not directly influence servicing of the Master Plan area; however, the future connections of this development to the main will be considered in the water distribution modelling analysis.
There will be one primary 400 mm distribution watermain looped around the site via two connection points.	A 400mm loop is proposed through the subject lands, extending from Lakeshore Road East along Lakefront Promenade, along Street 'A', and up Hydro Road back to Lakeshore Road East as shown on Drawing WM-1. Placement of the watermain loop along Hydro Road is more favorable in terms of development phasing and avoids a pipe crossing / easement through Serson Creek. New Haig Road is partially situated on (currently) non-participating lands whereas Hydro Road is within the Lakeview Village lands.
The proposed local distribution main shown follows future proposed road right of ways, including Lakefront Promenade on the west, Lakefront Boulevard on the south, and New Haig Road on the east.	
There is an existing 400 mm local distribution main crossing the site south of Rangeview Road that supplies a dedicated water supply to the G.E. Booth Wastewater Treatment Facility. This watermain shall remain dedicated and shall not be used to supply water to the Inspiration Lakeview development. Based on the final land use design, the watermain may conflict with the proposed road network and may need to be relocated along a future road right of way so long as it remains a dedicated feed to the plant.	Drawing WM-1 illustrates how the existing 400mm supply to the G.E. Booth WWTF will be maintained, albeit realigned through the subject lands along a public road (Street 'B'). No service connections to this watermain will be permitted.

It is anticipated that the development will be able to connect to the recently installed 600 mm sub-transmission main on Lakeshore Road East. There are multiple existing watermains in the vicinity but the development will not be able to connect to them. As such, the proposed water distribution network is planned based on connection to the 600mm sub-transmission main on Lakeshore Road East only. Drawing WM-1 illustrates the preliminary water servicing concept.

In addition to the recommended 400mm distribution loop connected to the existing 600mm watermain on Lakeshore Road East, the new development is proposed to be serviced internally by a system of 300mm watermains to provide service connections to the future development blocks. As shown on Drawing WM-1, a 200mm watermain is proposed along the south side of the property (Streets 'K', 'D', 'F', 'J', and 'H') to provide fire protection and potable water along the shoreline. The individual site plan blocks encircled by the 200mm watermain will be serviced from the 300mm watermain on Street 'C' as opposed to the 200mm watermain. All watermain sizes have been confirmed through the hydraulic modelling completed as part of this report.

Watermain Servicing

Water Demand Analysis

The Region of Peel produced the Inspiration Lakeview Water and Wastewater Servicing Analysis (May 2018) and the Region outlined the design criteria that apply to the proposed development:

- 265 Lpcd for average day water consumption
- A maximum day peaking factor of 1.8 for residential and 1.4 for employment growth
- A peak hour factor of 3.0
- Under Maximum Day demand, pipe velocity remains below 1.5 m/s
- Under Maximum Day demand, pressure in the system should not drop below 280 kPa (40 psi)
- Pressure in the system should not drop below 140 kPa (20 psi) under a maximum day plus fire condition

InfoWater has been selected for modelling the water distribution system for the study area and the water demands associated with the subject site and external lands are summarized in Table 5.2 2. The preliminary watermain layout was imported into the InfoWater model and nodes were generated using the Fill Connectivity tool in the InfoWater.

Table 5.2-2: Water Demand Analysis

	EXTERNAL LANDS*	LAKEVIEW**
Total Residential Units	2,569	7,914
Total Residential Population	5,707	15,998
Total Employment Area (m2)	47,228	97,654
Total Employment Population	2,196	3,941
Residential Avg Day Demand	17.5 L/s	49.1 L/s
Employment Avg Day Demand	6.7 L/s	12.1 L/s
Total Avg. Day Demand	24.2 L/s	61.2 L/s
Residential Max Day Demand	31.5 L/s	88.3 L/s
Employment Max Day Demand	9.4 L/s	16.9 L/s
Total Max Day Demand	40.9 L/s	105.2 L/s
Residential Peak Hour Demand	52.5 L/s	147.2 L/s
Employment Peak Hour Demand	20.2 L/s	36.3 L/s
Total Peak Hour Demand	72.7 L/s	183.5 L/s

Notes:
* based on Inspiration Lakeview Water and Wastewater Servicing Analysis prepared by the Region, dated May 2018
** based on latest draft plan of Lakeview Village

The average daily demands were calculated for each development block (internal and external) and were assigned to nodes adjacent to the respective parcels. The average day demand set is populated with the residential demands assigned to Demand 1 and employment demands assigned to Demand 2.

Based on the standards outlined in Inspiration Lakeview Water and Wastewater Servicing Analysis (May 2018) the peaking factor for the Maximum day is 1.8 for residential and 1.4 for employment. The peaking factor for Peak hour is 3 for both residential and employment. The average day demand set was multiplied with the respective peaking factors to create separate maximum day and Peak hour demand sets.

Fire demands based on the land use have been proposed to be minimum of 300 L/s. This is common for commercial properties, and high-rise residential development. The proposed development is located within Peel Region pressure zone PZ1. Since a local area from within a larger distribution network is being modelled, suitable boundary conditions were established at the study area limits (where the proposed internal network will connect to existing sub-transmission mains). The proposed connection locations are:

- To the 600 mm watermain along Lakeshore Road East, at Lakefront Promenade;
- To the 600 mm watermain along Lakeshore Road East, at Hydro Road;

Fixed head reservoirs were established at these two locations. The HGL elevations at these reservoirs were established through pressure logging data provided by Region of Peel. The details of the boundary conditions are in Table 5.2-3.

Table 5.2-3: HGL Elevations at boundary conditions

Boundary Location	HGL Elevation*
Lakeshore Road East, at Lakefront Promenade	142 m
Lakeshore Road East, at Hydro Road	142 m

Based on the modelling results, the minimum water system requirements can be met and the results are summarized in Table 5.2-4. The Watermain Methodology and Analysis memo is included in Appendix D.

Table 5.2-4: Water Servicing Recommendations and Strategies

Water Demand Modeling Scenario		
Average Day Demand	Recommended Normal Pressures within System: 275 kPa to 690 kPa (40 psi to 100 psi)	System Pressure = 508 kPa to 645 kPa (74 psi to 94 psi)
Maximum Day Demand	Recommended Normal Pressures within System: 275 kPa to 690 kPa (40 psi to 100 psi)	System Pressure = 496 kPa to 634 kPa (72 psi to 92 psi)
	Flow velocity remains below 1.5 m/s within the distribution network	Flow velocity within the distribution network is between 0.98 m/s to 0.02 m/s.
Peak Hour Demand	Recommended Normal Pressures within System: 275 kPa to 690 kPa (40 psi to 100 psi)	System Pressure = 483 kPa to 627 kPa (70 psi to 91 psi)
Maximum Day Demand plus Fire Flow	Required Fire Flow to be provided at a residual pressure of no less than 140 kPa	
Fire Flow Requirements	Fire flow requirements for the proposed development: Qf > 300 L/s	Available Fire Flow = 334 L/s to 1484 L/s

Stormwater Drainage Background and Objectives

BACKGROUND AND OBJECTIVES

The subject site is within the Lake Ontario Shoreline East Subwatershed in the Credit Valley Conservation (CVC) watershed. The existing storm drainage infrastructure was constructed in the absence of modern stormwater management practices, and the nature of the proposed redevelopment provides an opportunity to implement an accompanying stormwater management strategy.

Current criteria are based on the Credit Valley Conservation (CVC) and the City of Mississauga Stormwater Management Criteria. However, given the site's proximity to Lake Ontario, the typical criteria have been altered and changes have been agreed upon through consultation with the City and CVC. Table 5.3-2 summarizes the stormwater management criteria for Lakeview Village along with the appropriate justification for exceptions.

STORM DRAINAGE OVERVIEW

As shown on Drawing STM-2, a majority of the subject site is composed of three drainage areas which discharge directly to Lake Ontario through Headwalls 1, 2, and 3. Three additional site plans within the Serson Creek Innovation Corridor will discharge to Serson Creek via Headwalls 4,5,and 6. Prior to any runoff discharging into the receive water body, water treatment will be provided to satisfy the stormwater management criteria set out by CVC and the City.

The runoff coefficients were based on the proposed land use and the City standard runoff coefficients. The 100-year flows from the subject lands were calculated using the increased runoff coefficients (1.25 x C10-year) as per the City requirements. The storm sewers have been conservatively sized assuming no LID/stormwater management measures are in place. However, at the detailed design stage and in consultation with CVCA and City of Mississauga it may be possible to realize benefits from the LIDs and reduce the conservative pipe sizes included in this report

Existing stormwater infrastructure around the subject lands is described in Section 2.

PROPOSED MINOR AND MAJOR SYSTEM DRAINAGE

Storm servicing conveyance for the development will conform to City of Mississauga standards. Storm sewers will be designed to convey minor system flows resulting from the 10-year storm event for ultimate discharge to Lake Ontario. The storm sewers have been conservatively sized assuming no low-impact development (LID) or stormwater management (SWM) measures are in place. However, at the Functional Servicing Report and detailed design stage (and in consultation with CVC and City of Mississauga staff) it may be possible to realize benefits from the LID / SWM measures and reduce the conservative pipe sizes presented on Drawing STM-1. The site outlets are positioned at natural low points and generally conform to the existing site drainage patterns.

The proposed storm sewers within the subject lands will be designed to intercept the minor and some of the major system flows. The proposed invert of approximately 75.5m is expected to position the pipes well above the existing lake bottom and will reduce the likelihood of any sediment entering the pipes.

The proposed minor system drainage areas and services are shown on Drawing STM-1.

The proposed ROWs within the subject lands will provide conveyance capacity for the major system flows (evaluated as the 100-year less 10-year storm flows). The capacities of the proposed ROWs were determined using the AutoCAD extension Hydraflow Express. Modelling outputs are included in Appendix F. A table comparing the capacity of the proposed ROWs with the major system flow directed to each ROW is provided in Appendix F. The ROW geometry is based on the cross-sections shown in the TMIG ROW Study included in Appendix E.

The majority of the proposed development flows southwesterly towards the discharge channel to the west to Street 'A' with the largest contributing drainage area. Street 'A' is a major collector road with a ROW width of 26m. This road is anticipated to provide sufficient conveyance capacity for the overland flow. The overland flow is the runoff from the 100-year less the 10-year storm event since the storm sewers are designed to convey the 10-year flow. The ROWs most at risk of exceeding their capacity are those nearest to the proposed outfalls. The drainage areas going to each ROW outfall are shown on Drawing STM-2. These areas have been used to determined the major system drainage to the major collector roads.

OUTFALLS

Any outfalls beneath trails / developed areas will be sized for the greater of the 100-year or Regional storm flows. Emergency spillways we be provided at all outfall locations. Storm sewer outfall inverts connecting to Lake Ontario have been set at 75.50m, which is above the 10-year monthly mean water level as determined in the 2019 Shoreline Hazard Assessment from Baird. The design of the shoreline works including outfall protection will be undertaken by others and coordinated with future submissions.

Stormwater Drainage Strategy

Table 5.3-1: Stormwater Management Criteria

STORMWATER MANAGEMENT COMPONENT	GENERAL REQUIREMENT	APPLICABILITY TO THE STUDY AREA
Quantity Control	Reducing the impact of development on stormwater flow on downstream receivers to prevent flooding or exceedance of existing flows.	Due to the subject site's proximity to Lake Ontario, quantity control is not required according to City and CVC guidelines. Discharge of stormwater flows to Serson Creek (if determined to be useful for the site servicing) may require quantity control, subject to hydraulic modelling of the channel.
Quality Control	Reducing the impact of development on water quality, with a focus on total suspended solids.	Quality control is required for the subject lands. In accordance with the Ministry of the Environment stormwater management criteria for enhanced protection, a minimum water quality target of 80% TSS removal is required.
Erosion Control	Reducing the impact of development on the stability of downstream receiving systems.	Due to the subject site's proximity to Lake Ontario, erosion control is not required for areas discharging into Lake Ontario but will be considered for areas discharging to Serson Creek. However, 3mm of runoff per storm event for the overall site will be captured as part of the water balance requirement.
Water Balance	Maintaining / mimicking where possible the natural water cycle in terms of infiltration/groundwater recharge, runoff, and evapotranspiration.	3mm filtration / retention per storm event post-development is required for the overall site. Limited space is provided within the public realm spaces for runoff retention as such 7.5mm of runoff per storm event is required for residential/ commercial development. LID measures may be used to address the water balance targets.
Thermal Mitigation	Stormwater runoff from urban areas is often warmer than pre-development runoff due to warm rooftops, pavement, and long-term retention in ponds. The warm stormwater has the potential to impact temperature-sensitive "cold-water" species.	Thermal mitigation is not required – Lake Ontario and Serson Creek are not considered to be receiving water bodies sensitive to temperature. However, the stormwater runoff from the site will generally be cool since underground conveyance / storage systems and LID measures will be employed and no end-of-pipe stormwater management facilities (i.e. ponds) are proposed.

PROPOSED STORMWATER MANAGEMENT STRATEGY

In accordance with the Ministry of the Environment, Conservation, and Parks, a minimum water quality target of 80% TSS removal is required. This requires that all runoff discharged to the lake or other receiver (e.g., Serson Creek) must be treated such that 80% of suspended solids are removed from the majority (typically 80%) of runoff events. In addition to TSS removal, the discharge of oil and other pollutants commonly encountered on roads is desirable and is typically achieved with measures such as oil/grit separators, pond forebays, polishing wetlands or other measures. CVC requires the use of a "treatment train" of water quality measures that include more than one treatment measure to ensure redundancy and better overall quality control.

The proposed stormwater management (SWM) strategy utilizes a treatment train approach to treat runoff, without the need for end-of-pipe facilities. A combination of storm sewers and overland flow routes in the right-of-ways will provide stormwater conveyance; and a suite of potential low impact development (LID) measures will provide water quality and water balance throughout the development. This approach has been created in adherence with the Mississauga Green Development Standards (October, 2012) which requires that "all site plan applications incorporate, where appropriate, technologies that maximize the natural infiltration and retention of stormwater through site development." The Standards recommend the use of a variety of low impact development (LID) features, which are included in the Lakeview Village SWM approach to achieve both water quality and water balance targets. Although LID features are typically designed to provide some form of infiltration, the soil and groundwater conditions may require the design to be modified. This will be verified at detailed design and, if required, the bottom and sides of the LID can be lined with an impermeable layer and/or a sub-drain can be provided for excess water conveyance.

Since impacts to Lake Ontario due to release of uncontrolled flood flows is not a concern, no quantity control measures are proposed. However, implementation of low impact development best management practices provides some degree of quantity control which will be assessed at the FSR and detailed stage of the development process. Benefits of quantity control can be realized through reduced size of conveyance infrastructure, resulting in lower capital and eventual maintenance / replacement costs.

The stormwater management approach requires on-site controls within each of the individual residential/ commercial development blocks, as well as within the public realm spaces, which will be discussed further in the following sections. In general, on-site controls will include water quality control of 80% TSS removal and 3mm water retention for water balance for the entire subject site. Within the individual residential/ commercial development blocks a total water retention of 7.5mm is proposed for water balance, in addition to the 80% TSS removal target.

Stormwater Drainage Strategy

The stormwater Management strategy for the subject lands is summarized in Table 5.3-2 below:

Table 5.3-2: Stormwater Management Strategy

STORMWATER MANAGEMENT COMPONENT	GENERAL REQUIREMENT	APPLICABILITY TO THE STUDY AREA	SPECIFIC REQUIREMENTS / PROPOSED STRATEGY
Conveyance	Moving / containing stormwater runoff safely to a suitable outlet	Major (road system) and minor (storm sewer system) conveyance is required for the subject lands.	Storm servicing conveyance for the development will conform to City of Mississauga standards including the following: Storm sewers will be designed to convey minor system flows resulting from the 10-year storm event for ultimate discharge to Lake Ontario. The storm sewers have been sized assuming low-impact development (LID) or stormwater management (SWM) measures are in place on site plan blocks which results in a reduced runoff coefficient value as shown in Table 5.3-8 and in the runoff reduction design sheet included in Appendix F. The site outlets are positioned at natural low points and generally conform to the existing site drainage patterns. The proposed storm sewers within the subject lands will be designed to intercept the minor and some of the major system flows. The proposed invert of approximately 75.5m is expected to position the pipes well above the existing lake bottom and will reduce the likelihood of any sediment entering the pipes. The proposed ROWs within the subject lands will provide conveyance capacity for the major system flows (evaluated as the 100-year less 10-year storm flows).
Runoff Coefficient	The runoff coefficients were based on the proposed land use and the City standard runoff coefficients.		The runoff coefficients were based on the proposed land use and the City standard runoff coefficients. The 100-year flows from the subject lands were calculated using the increased runoff coefficients (1.25 x C10-year) as per the City requirements. The storm sewers have been conservatively sized assuming no LID / stormwater management measures are in place. However, at the detailed design stage and in consultation with CVCA and City of Mississauga it may be possible to realize benefits from the LIDs and reduce the conservative pipe sizes included in this report
Quantity Control	Reducing the impact of development on stormwater flow on downstream receivers to prevent flooding or exceedance of existing flows	Due to the subject site's proximity to Lake Ontario, quantity control is not required according to City and CVC guidelines.	Since impacts to Lake Ontario due to release of uncontrolled flood flows is not a concern, no quantity control measures are proposed. However, implementation of low impact development best management practices provides some degree of quantity control which will be assessed at the FSR and detailed stage of the development process. Benefits of quantity control can be realized through reduced size of conveyance infrastructure, resulting in lower capital and eventual maintenance / replacement costs. Discharge of stormwater flows to Serson Creek (if determined to be useful for the site servicing) may require quantity control, subject to hydraulic modelling of the channel.
Quality Control	Reducing the impact of development on water quality, with a focus on total suspended solids.	Quality control is required for the subject lands.	In accordance with the Ministry of the Environment, Conservation, and Parks, a minimum water quality target of 80% TSS removal is required. This requires that all runoff discharged to the lake or other receiver (e.g., Serson Creek) must be treated such that 80% of suspended solids are removed from the majority (typically 80%) of runoff events. In addition to TSS removal, the discharge of oil and other pollutants commonly encountered on roads is desirable and is typically achieved with measures such as oil/grit separators, pond forebays, polishing wetlands or other measures. CVC requires the use of a "treatment train" of water quality measures that include more than one treatment measure to ensure redundancy and better overall quality control. rosion control and low impact development (LID) measures also fall within the category of Quality Control and are described in the following sections.
Erosion Control / Erosion Protection	Reducing the impact of development on the stability of downstream receiving systems. Erosion protection is required at all drainage outlets		Conventional erosion control (i.e. extended detention of stormwater volume to manage exceedances of erosion thresholds and flow duration) is typically not required for non-fluvial systems (i.e. the lake) but will be considered for areas discharging to Serson Creek. Outfalls at the lake will be designed with erosion protection measures to ensure that the stability of the shoreline at the storm outfalls is not impaired. This could include the use of armouring / stone and geotextiles at the outfall locations but can also include vegetation as a protective measure. The use of LIDs and other SWM measures will reduce the overall risk of erosion.
Water Balance	Maintaining / mimicking where possible the natural water cycle in terms of infiltration/ groundwater recharge, runoff, and evapotranspiration.	The City of Mississauga generally requires retention of the first 3mm of precipitation on site to address water balance.	While the City recommends retention of the first 3mm of precipitation, the target recharge volume will be confirmed through hydrogeological studies. Currently, 7.5 mm of runoff capture is proposed as per the runoff reduction calculation included in Appendix F. The use of potential LID measures may also address the water balance targets although it should be noted that opportunities for infiltration will be limited on the site plan areas due to underground parking structures and high groundwater table. However, due to the nature of the foundation and soil removal required for the subject lands, there may be unconventional flexibility to specify the new soil type/composition for the development in the open space or ROW areas. As limited space is provided within the public realm spaces for runoff retention, 7.5mm of runoff per storm event is recommended for residential/ commercial development.

Stormwater Drainage Strategy

Table 5.3-2 Continued: Stormwater Management Drainage Strategy

STORMWATER MANAGE-MENT COMPONENT	GENERAL REQUIREMENT	SPECIFIC REQUIREMENTS / PROPOSED STRATEGY
	APPLICABILITY TO THE STUDY AREA	
Low-Impact Development	The City of Mississauga and CVC encourage the use of LID measures which achieve stormwater management objectives with a distributed or passive application such as landscaping features. These measures are often required to address the CVC's requirement for a "treatment train" approach to water quality control, erosion control, and water balance.	There is an opportunity to explore LID or other sustainable best management practices to provide water quality and erosion control since a conventional end-of-pipe facility is not required. A treatment train approach including possible LID measures and Oil/ Grit Separators (or other mechanical separators) will be provided to provide quality control. Since most LID practices are limited or defined by soil characteristics, slope, and contributing area/land use, there may be a wider range of practices available to achieve the stormwater management, water balance, and overall sustainability objectives for the site. Where possible, clean / treated runoff from the site plan areas or open space blocks should be separated from the municipal system to avoid the necessity for treating the stormwater runoff a second time. Potential LID measures are described in the following section.
	LID measures will be implemented on the subject lands to achieve the quality control (erosion control, TSS removal, water balance) and overall sustainability targets.	
Thermal Mitigation	Stormwater runoff from urban areas is often warmer than pre-development runoff due to warm rooftops, pavement, and long-term retention in ponds. The warm stormwater has the potential to impact temperature-sensitive "cold-water" species.	Although thermal mitigation is not required, the stormwater runoff from the site will generally be cool since underground conveyance / storage systems and LID measures will be employed, and no end-of-pipe stormwater management facilities (i.e. ponds) are proposed.
	Thermal mitigation is not required – Lake Ontario and Serson Creek are not considered to be receiving water bodies sensitive to temperature.	
Shoreline Works and Stormwater Outfalls	The design of the shoreline works including outfall protection will be undertaken by others and coordinated with future submissions.	Any outfalls beneath trails / developed areas will be sized for the greater of the 100-year or Regional storm flows. Emergency spillways we be provided at all outfall locations. Storm sewer outfall inverts connecting to Lake Ontario have been set at 75.50m, which is above the 10-year monthly mean water level as determined in the 2019 Shoreline Hazard Assessment from Baird. The design of the shoreline works including outfall protection will be undertaken by others and coordinated with future submissions.
Sustainable Design	Sustainable design for stormwater involves utilizing rainfall / runoff as a resource integrated with other components of the development, rather than a waste product to reduce cost, energy use, and waste.	Sustainable stormwater management design for the subject lands will consider measures such as: • Use of existing structures / remnant components of the former OPG power plant for stormwater management • Use of treated stormwater for irrigation of landscaped areas and urban farm / community garden areas • Use of stormwater for cooling • Use of treated stormwater for recreational areas (splash pads, fountains, etc.) • Use of stormwater for car washes / non-potable water for condominium maintenance / cleaning. • Use of stormwater (as "grey water" for use in laundry, toilet flushing, etc.) • Use of stormwater for maintenance (water trucks, irrigation of ROW vegetation, street sweeping and dust control during construction. • Use of stormwater to feed end-of-pipe polishing features such as a recreational lake for canoeing, ice skating, etc. • Use of stormwater effluent at outlets to encourage circulation in the lake inlets / outlets • Integration of stormwater management measures such as LIDs and polishing wetlands as components of the landscaping / amenity areas • Introducing educational signage about stormwater management goals, practices, and benefits

SWM Controls for Various Land Uses

PUBLIC REALM SPACES

The stormwater management strategy considered for the public realm spaces are within the right-of-ways (ROWs) and parklands. A treatment train approaching using a combination of LID features and oil-grit separators (OGS) is proposed to provide 80% TSS removal for water quality control and 3mm water retention for water balance where possible. The types of LIDs proposed within the ROWs and parklands are based on the space available and the suitability to integrate the LID into the surrounding land use. Due to the space available for LIDs, the 3mm water retention requirement may not be able to be achieved. Therefore, it is proposed that the site plan blocks will retain 7.5mm of runoff per storm event to achieve an overall site requirement of 3mm retention

Table 5.3-4: Suitable Location of each LID

STREET TYPE	Tree Pits with Soil Cells, Bio-Retention Planters, and Bio-Swales		Bio-Retention Bump Outs	
	1-side	2-sides	1-side	2-sides
1a. Major Collector				
1b. Major Collector				
1c. Major Collector				
1d. Major Collector				
2a. Minor Collector				
2b. Minor Collector				
3a. Special Character Street				
3b. Special Character Street				
3c. Special Character Street				
4a. Local Street				
4b. Local Street				
4c. Local Street				
4d. Local Street				

Table 5.3-3: Examples of LID Features within Specific Street Types

Types of LID	Suitable Street Types	Description
 **A. Tree Pits with Soil Cells** (1.5m to 1.8m Depth and full width of blvd 2.25m to 2.9m)	Major Collector Minor Collector	Soil cell systems can be used when street trees are desirable in locations where surface areas are limited. Soil cells are rigid modular systems that are used to increase the soil volume under paved surfaces in ultra-urban areas. They provide the structural integrity required to support vehicular load on paved surfaces while offering up to 92% porous space in order to accommodate underground services and utilities. Soil cells can be used under conventional concrete or unit pavers as well as under pervious interlocking concrete pavers. In addition, given their structural integrity, soil cells be used under vehicular load bearing sidewalks, parking lay-bys or cycling infrastructure to increase soil volumes. Paved surfaces should be designed to withstand loads from sidewalk ploughs and midsize service vehicles, therefore, structural soil can be used under paved areas to allow for roots to grow into adjacent soil volumes.
 **B. Bioretention Bump outs** (1.5m to 1.8m Depth and full width of parking 2.2m)	Major Collector, Minor Collector Special Character Street	Curb extensions and bump-outs provide another design variation of the bioretention practice. They can be located at intersections, mid-block areas and at transit stops within the Edge and Roadway Zones of various street types. In addition to stormwater management functions, curb extensions / bump-outs can also enhance biodiversity, offer visual appeal and provide traffic calming benefits.
 **C. Bioretention Planters** (1.5m to 1.8m Depth and full width of blvd 2.25m to 2.9m)	Major Collector Minor Collector Special Character Street Local Road	Bioretention planters are constructed with vertical walls, are often narrow and rectangular in shape and can be installed in close proximity to utilities, driveways, trees, light standards and other street features. Bioretention planters receive roadway runoff through curb inlets and by overland flows from the surrounding sidewalk and paved surfaces. They are well-suited for ultra-urban street types and can be adapted to fit within Furnishing Zones and Medians. As a result of their context, bioretention planters require hardy, aesthetically-pleasing plant materials that tolerate harsh urban conditions and winter maintenance protocols. Bioretention planters are often located in higher pedestrian traffic areas, therefore design solutions should consider planting, curb or railing options that will impede pedestrians from inadvertently stepping into a planter bed.
 **D. Bio Swales** (1.5m to 1.8m Depth and full width of blvd 2.25m to 2.9m)	Major Collector	Bioswales are linear and have a cross-sectional surface geometry similar to a traditional ditch, however their subsurface profile is more reflective of a bioretention cell, with filter media and/or a storage gallery. Bioswales can either be planted with grasses or finished with more elaborate combinations of plant and aggregate materials as shown in the image to the left. These additional components help to slow the velocity of runoff and assist in sedimentation, filtration and evapotranspiration.

RIGHT-OF-WAYS (ROWs)

For all ROWs, oil-grit separators (OGS) are proposed as part of the treatment-train-approach for stormwater management and will be sized according to the drainage area and imperviousness. Although OGS are usually sized to provide 80% TSS removal, CVC only recognizes OGS to provide 60% TSS removal. Therefore, to achieve the required 80% TSS removal, additional water quality treatment is required (such as LID features). The types of LID considered for the ROW are limited to the space available (i.e. the width of the ROW and boulevard). The proposed ROW cross-sections are discussed in the TMIG ROW Study included in Appendix E.

Many utilities and services are proposed within the ROWs, which limits the location and the types of LIDs suitable within the ROWs. Layby parking requirements, turning lanes, and bus stops will also impact the available space for LIDs. This may impact the locations such that LIDs can only be located along one side of the road for some streets and along a certain section of road. Nonetheless, runoff from all of the proposed municipal ROWs will receive quality control through the treatment-train-approach (combinations of oil-grit separators and LID measures) and will be designed to provide a minimum of 80% TSS removal for the ROW area as per the target 'Enhanced' water quality criteria.

The types of LID measures applicable for the classification of ROWs are summarized in Table 5.3-3 and the suitable location of the LID is summarized in Table 5.3-4. The LIDs will be sized to remove a minimum of 80% of the TSS and will provide 3mm of water retention through infiltration, evaporation and/or evapotranspiration.

SWM Controls for Various Land Uses

ROW PERFORMANCE AND STRATEGY

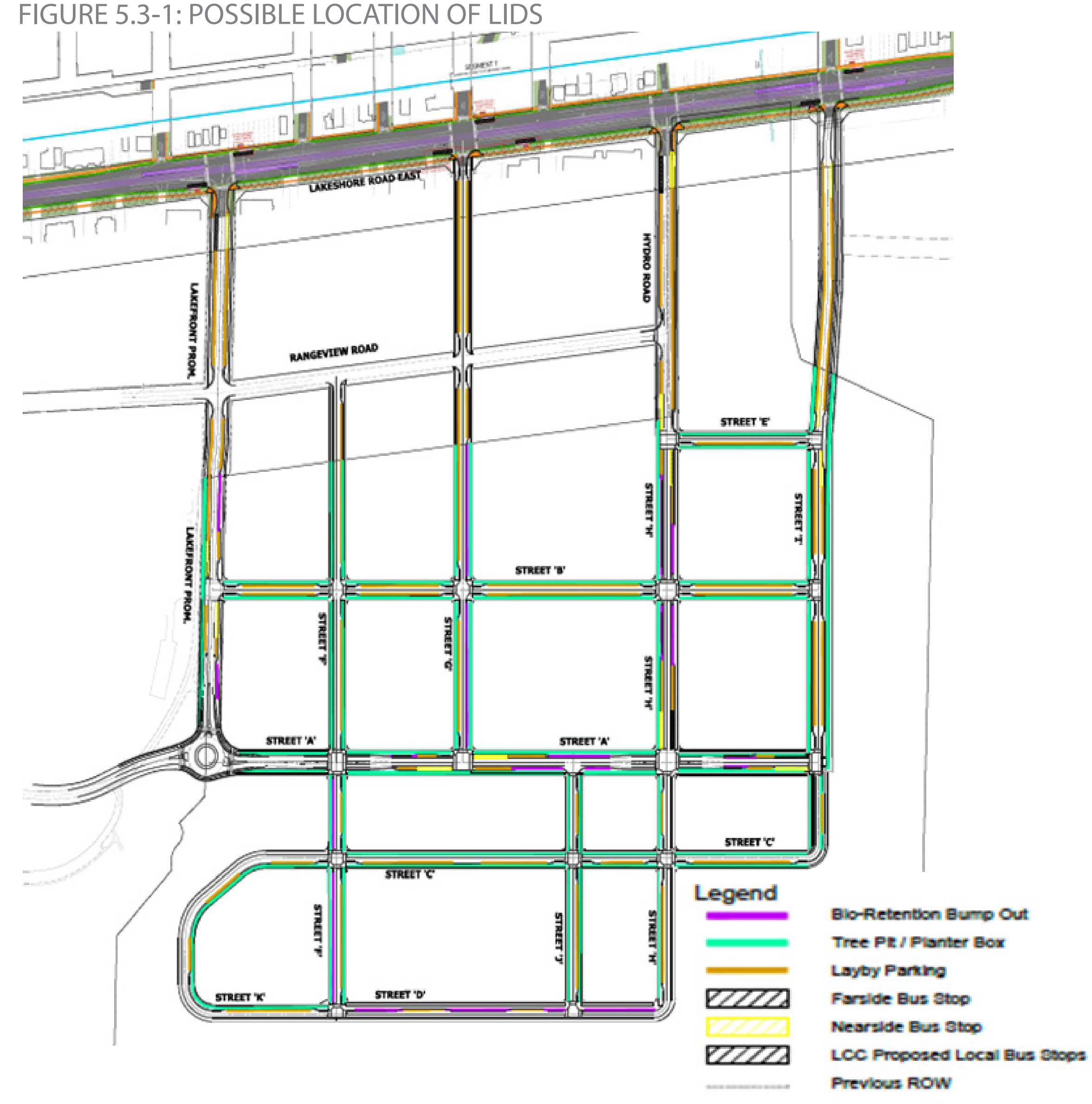
All of the proposed LIDs in Table 6 depend on the storage capacity underground and water quality is achieved through filtration within the soil/ stone media under the surface vegetation. The width is limited to the type of LID and suitability of its location within the ROW. For instance, if the proposed LID is tree pits with soil cells, then the width utilized will be limited to the width of the landscaped portion of the cross section and if the proposed LID is a bioretention bump outs, then the width will be limited to the width of the layby parking area. The length of the LID is limited by parking allocations, turning lanes, and bus laybys. A preliminary layout of the possible locations for the LIDs is illustrated on Figure 5.3-1, which includes the anticipated location for parking, turning lanes, and bus laybys. Thus, when sizing the LID, the length and width is predetermined by the space available and the depth of the facility is the only varying factor.

Based on the Sustainable Technologies Evaluation Program (STEP), the minimum depth of the filter media should be 1m to support trees, 0.6m to support flowering perennial and decorative grasses and 0.3m to support turf grass. The LID will be sized to provide filtration for minimum the full 90th percentile event, which for the City of Mississauga is the 27mm storm event. Since the majority of the TSS is from the first flush of a major storm event, the performance for the LID is expected to exceed the 80% TSS removal target. Based on the constraints, an example LID of 1m length on both sides of the road have been analyzed using the assumptions summarized in Table 5.3-5 below. Using the assumptions in Table 5.3-5, it was found that 1m of LIDs on both sides of the road can provide storage for approximately 2.9m of road. Detailed calculations are provided in Appendix G.

Table 5.3-5: Example sizing of ROW LIDs

COMPONENT	MINIMUM DIMENSION
Width	1.9m wide LIDs on both sides of road
Depth	1.8m
Filter Media Porosity	0.3

FIGURE 5.3-1: POSSIBLE LOCATION OF LIDS



As recommended in the LID Design Guide prepared by CVC and TRCA dated 2011, the lifespan of the LID can be extended through pre-treatment and pre-treatment will be provided where possible. The following pre-treatments can be implemented prior to runoff flowing into the LID:

- Goss traps at catchbasins - Goss traps capture debris, sediment and oils at source and connects directly to the catch basin outflow pipe
- Oil Grit Separators
- Gravel diaphragm (sheet flow): A small trench filled with pea gravel, which is perpendicular to the flow path between the edge of the pavement and the bioretention practice will promote settling out of sediment. It also acts as a level spreader, maintaining sheet flow into the facility. If the contributing drainage area is steep, then larger stone should be used in the diaphragm. A drop of 50-150 mm into the gravel diaphragm can be used to dissipate energy and promote settling.

Detailed sizing and locations of the LID features will be provided during detailed design. All proposed LIDs will be designed with an impermeable liner at the bottom and the sides to prevent infiltration and migration of the potential contaminates within existing soil.
The performance of the proposed LID features within the ROW is expected to provide 90% TSS removal and the oil-grit separators are expected to provide 60% TSS removal. Based on the current draft plan, the lengths and widths of the streets are summarized in Table 5.3-6 Since most of the roads will include LID treatment, the overall site is expected to provide an overall water quality control of greater than 80% TSS removal. Based on the lengths in Table 5.3-6, the weighted average treatment level is 82%.

Table 5.3-6: Length of Road Type

Road Type	Length	Proposed Treatment
Major	1,895m	LID (90% TSS removal)
Minor	1,655m	LID (90% TSS removal)
Local	2,430m	OGS (60% TSS removal) for one side of the road and LID (90% TSS removal) for the other

As shown in Table 5.3-4 Local Roads and Special Character Streets can have LIDs on one side of the ROW, so the runoff from other side of the road will be treated through OGS. The wider ROWs, such as the Major and Minor streets, have been assumed that sufficient LIDs can be installed on both sides of the ROW to provide full treatment for the entire length of road. Based on the lengths in Table 5.3-6, the weighted average treatment level is 83.9%.

SWM Controls for Various Land Uses

5.3

PARKS

The proposed draft plan of subdivision includes various park blocks that will have varying programing and imperviousness. Some will be planned to provide an urban hardscape space and others are envisioned as green spaces with gardens, trees and trails. The park blocks are subject to the same SWM criteria as the entire subject site, therefore stormwater runoff from the parks is proposed to be treated to the same water quality control (80% TSS removal) and water balance (3mm of runoff to be retained onsite) criteria. Similar to ROWs, stormwater runoff from the park blocks is proposed to be treated through a treatment train approach using LID features and/or OGS units.

The types of LIDs suitable for the parklands are summarized in Table 5.3-7.

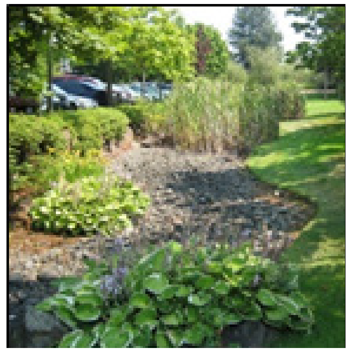
Detail sizing and locations of the LIDs will be provided during detailed design. As mentioned previously, infiltration is not ideal for the subject site and all proposed LIDs should be designed to be lined with an impermeable liner at the bottom and the sides to prevent migration of the potential contaminates within the soil.

RESIDENTIAL/COMMERCIAL DEVELOPMENT

Low Impact Development (LID) Best Management Practices (BMPs) described in the CVC Grey to Green guidelines and the CVC / TRCA LID Design manual for private development were screened for potential feasibility based on the proposed land uses, site design, and grading constraints. Drainage from each block will receive as much water quality treatment as possible from oil grit separators and LIDs within the block prior to being discharged into the right-of-way storm sewers.

- The discharge requirements for each development block is as follows:
- Water Balance - 7.5mm water retention
- Water Quality - 80% TSS removal

Table 5.3-7: Types of LID features for Parks

TYPES OF LID	DESCRIPTION
Raingarden 	Rain gardens are sunken planting beds constructed of highly permeable nutrient rich soils. They can include an engineered soil layer and overflow structure to increase their stormwater management performance. Rain gardens should always be designed to drain efficiently after a storm event to avoid creating areas of standing water where mosquitoes can breed.
Bioswales 	Bioswales are linear and have a cross-sectional surface geometry similar to a traditional ditch, however their subsurface profile is more reflective of a bioretention cell, with filter media and/or a storage gallery. Bioswales can either be planted with grasses or finished with more elaborate combinations of plant and aggregate materials as shown in the image to the left. These additional components help to slow the velocity of runoff and assist in sedimentation, filtration and evapotranspiration.
Permeable Paver 	Permeable pavements, an alternative to traditional impervious pavement, allow stormwater to drain through them and into a stone reservoir where it is temporarily detained.
Increased Topsoil Depth	Traditionally, topsoil is applied to a depth of 10 to 15cm. By increasing the topsoil to 25cm to 30cm, it can result in 5% less runoff depth.

SWM Controls for Various Land Uses

RUNOFF COEFFICIENT REDUCTION

Since storm sewers are traditionally sized based on drainage area and runoff coefficients, an ancillary benefit to retaining 7.5mm of runoff is reduced runoff coefficients as shown in Table 5.3-8, which results in potential reduced storm sewer sizes for the individual blocks. For instance, a 10-year storm based on the City's IDF curve results in a runoff of 49.83mm for a block with a runoff coefficient of 0.9. If 7.5mm is captured within the block then the runoff is reduced to 42.33mm which results in a 15% reduction. When the same percent reduction is applied to the 0.9 runoff coefficient, then the resulting new runoff coefficient for the 10-year storm event is 0.76. The resulting reductions for the runoff coefficient of 0.9 and 0.65 are summarized in Table 5.3-8. Detailed calculations are provided in Appendix F.

To provide for more conservative storm sewer sizing, an original runoff coefficient of 0.9 was used for all site plan blocks to account for any future changes in land use.

Table 5.3-8: Example of Reduced Runoff Coefficient

Storm Event	Reduced Runoff Coefficient	
	Original Runoff Coefficient = 0.9	Original Runoff Coefficient = 0.65
25mm	0.60	0.35
2-Year	0.68	0.43
5-Year	0.73	0.48
10-Year	0.76	0.51
25-Year	0.78	0.53
50-Year	0.79	0.54
100-Year	0.81	0.56

MISSISSAUGA STORMWATER CREDIT PROGRAM

Multi residential and non-residential blocks will be eligible for the City's stormwater credit program by achieving the SWM criteria set out for the subject site. These blocks will be eligible to apply for a minimum of 17.5% credit, given that the block will provide 80% TSS removal and 7.5mm water retention for the entire block.

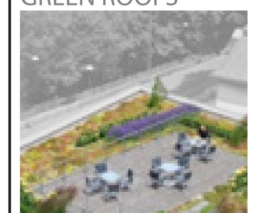
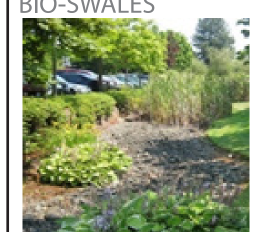
STORMWATER MANAGEMENT STRATEGY SUMMARY

The runoff from the subject site is anticipated to be treated and analyzed individually to satisfy the stormwater criteria. Therefore, the runoff from the entire subject site will satisfy the stormwater management objectives. A treatment-train approach is proposed to provide sufficient stormwater management for the public realm spaces and residential/ commercial blocks. Opportunities such as LIDS within the ROW, parklands and site plan blocks and when combined with OGSs, will provide the required water quality and water balance requirement for the spaces. Local ROWs with narrower widths may not be able to be provide the necessary 3mm water retention as sufficient space may not be available for LIDs. There are opportunities within the wider ROWs to size larger filter media areas to provide additional storage for the local roads. In addition, the individual site plans have a higher water retention depth requirement of 7.5mm to offset for the smaller ROWs where space is limited. Therefore, it is anticipated that the water balance target of 3mm can be achieved as a whole for the subject site.

SWM STRATEGY FOR SITE PLAN BLOCKS

The residential/ commercial blocks will be subject to individual site plan approvals and will be individually analyzed to provide the require SWM requirements. The proposed method for SWM treatment is through a treatment train approach of LIDs and OGS. The LIDs suitable for the site plan blocks, but not limit to, are identified in Table 5.3-9.

Table 5.3-9: Types of LIDs for Site Plans

TYPES OF LID	DESCRIPTION
GREEN ROOFS 	Green roof, also known as "living roofs" or "rooftop gardens", consist of a thin layer of vegetation and growing medium installed on top of a conventional flat or sloped roof. Green roofs areas should be allocated such that each roof will receive sunlight throughout the day. Only half of the available roof areas are typically allocated as green roofs due to the need for rooftop mechanical utilities. Green Roofs can consist of a variety of vegetative options that can provide benefits including stormwater controls, recreational spaces, heat dissipation, and air quality improvements.
PERMEABLE PAVEMENT 	Permeable Pavement is a variation on traditional pavement design that utilizes pervious paving material underlain by a uniformly graded stone reservoir. Permeable pavement areas could be allocated where vehicular traffic will be light to reduce compaction, clogging, and future maintenance costs. Pedestrian walk ways, urban amenity space and open space areas are suitable candidate sites. Permeable Pavements attenuate peak runoff flows by adsorbing and infiltrating surface runoff from the overlying and surrounding areas.
BIO-SWALES 	Bio-Swales are vegetated, open channels designed to convey, treat and attenuate runoff. Bio-swales are suitable for areas with long and uninterrupted stretches of green space. Due to this space requirement, the majority of bio-swales are located along right-of-ways or on blocks allocated as public park land. Bio-Swales also provide vegetative filtration by conveying drainage through swales constructed from an engineered vegetative media.
BIO-RETENTION 	Bio-Retention facilities collect drainage in depressions and use vegetation to filter out particulates and hydrocarbons before discharging the drainage into the storm sewer system or to another LID BMP. Bioretention areas can be integrated into a range of landscape areas including medians and cul-de-sac islands, parking lot medians and boulevards. A variety of planting and landscape treatments can be employed to integrate them into the character of the landscape.
RAINWATER HARVESTING 	Rainwater Harvesting is the process of intercepting, conveying and storing rainfall for future use. Rainwater Harvesting can be implemented by installing rainwater cisterns at underground parking structures to provide water for reuse such as car washes, irrigation, cooling, and other non-potable water uses.

Preliminary Inspiration Point district concept

6 IMPLEMENTATION

IMPLEMENTATION

6.1 EROSION & SEDIMENT CONTROL

Conventional erosion control (i.e. extended detention of stormwater volume to manage exceedances of erosion thresholds and flow duration) is typically not required for non-fluvial systems (i.e. the lake) but will be considered for areas discharging to Serson Creek. Outfalls at the lake will be designed with erosion protection measures to ensure that the stability of the shoreline at the storm outfalls is not impaired. This could include the use of armouring / stone and geotextiles at the outfall locations but can also include vegetation as a protective measure. The use of LIDs and other SWM measures will reduce the overall risk of erosion.

The erosion and sediment control plan for the site servicing program of the subject lands will be designed, approved, and implemented in conformance with the City of Mississauga, Credit Valley Conservation and MOECC recommendations. Erosion and sediment control will be implemented for all construction activities including topsoil stripping, foundation excavation and stockpiling of materials. During construction, temporary sediment ponds may be required to treat pre-development drainage from stripped areas. The sediment control plan will be designed / coordinated with the soil remediation works.

The temporary ponds will be located at the low points of the site to detain sediment laden runoff and reduce peak flows and velocities prior to release into the receiving systems. The temporary silt ponds will maintain a permanent pool as per the MOE guidelines for temporary sediment control facilities. Forebay areas will be provided to enhance sediment removal.

The following erosion and sediment control measures will be installed and maintained during construction of the subdivision:

- A temporary sediment control fence will be placed prior to grading
- A construction plan will be implemented to limit the size of disturbed areas and to minimizing nonessential clearing
- Sediment traps will be provided
- Gravel mud mats will be provided at construction vehicle access points to minimize off-site tracking of sediments
- All temporary erosion and sediment control measures will be routinely inspected and repaired during construction. Temporary controls will not be removed until the areas they serve are restored and stable.

Recognizing that erosion and sediment control is a dynamic process, a detailed set of staging plans / construction sequencing will be required for the various stages of remediation, earthworks, servicing, site plan construction, and stabilization, coupled with the proposed development phasing.

6.2 PHASING / TIMING

Details related to phasing and construction timing will be provided with future submissions. The following items have been identified as key infrastructure to be completed to allow servicing of the first phase:

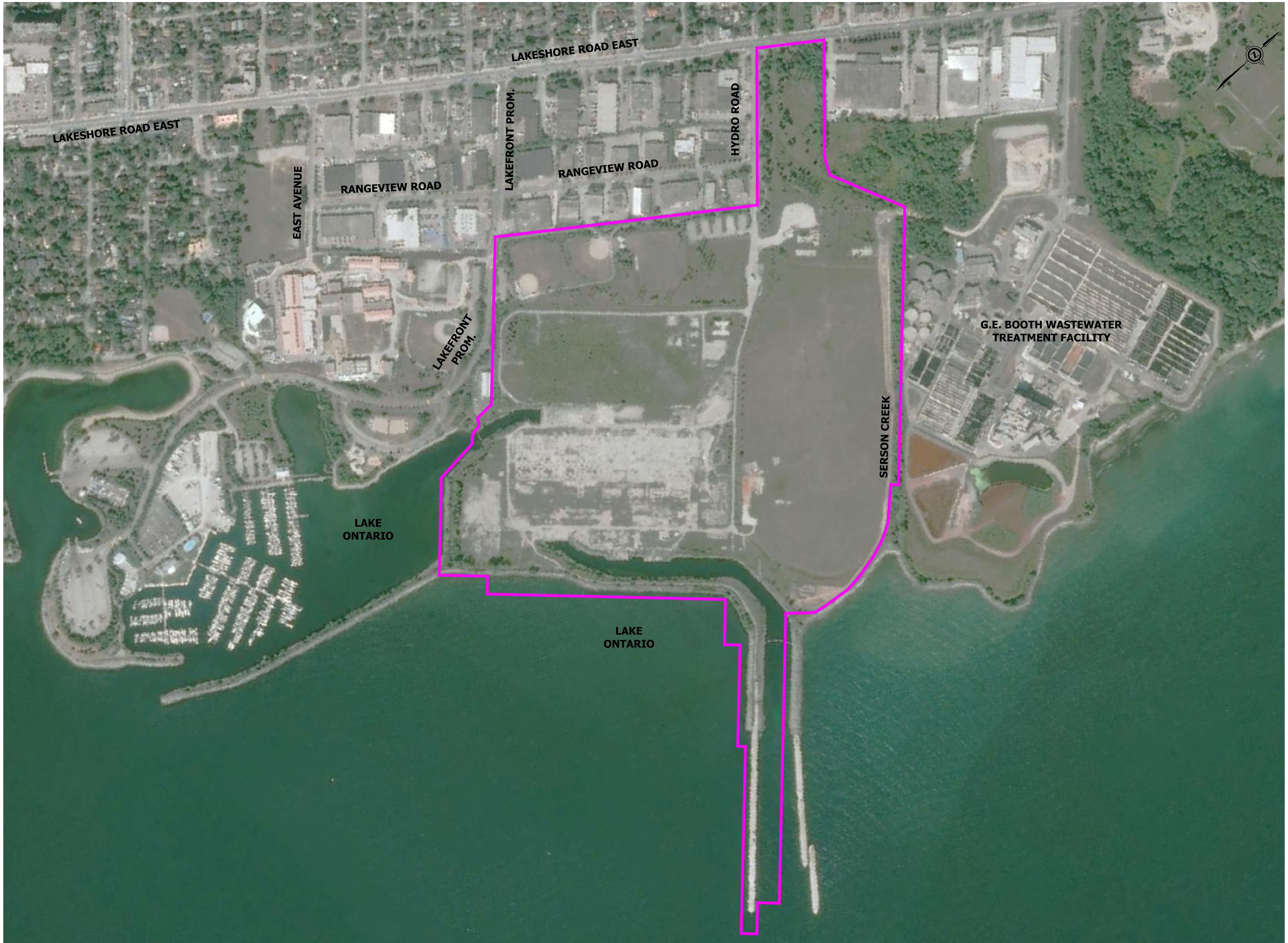
- Relocation of storage depot from future Lakefront Promenade alignment
- Sanitary Pump Station and forcemain connection to Hydro Road / Lakeshore stub.
- Hydro Road construction
- Lakefront Promenade construction
- Watermain connections to Hydro Road and Lakefront Promenade
- Realign existing 400mm watermain feed from water treatment plant to wastewater treatment plant
- Secondary watermain connection to Lakefront Promenade from water treatment plant
- Storm outfalls – to be provided as determined by extent of phasing within proposed drainage boundaries

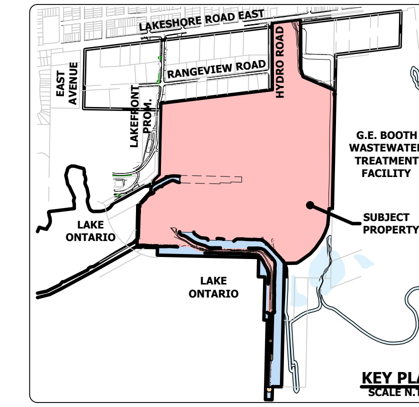
A preliminary phasing plan is shown on Figure 5

View towards Lakeview Village and Mississauga shoreline from existing pier.

FIGURES

DRAWINGS





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SITE LOCATION PLAN

PROJECT No.	DATE	SCALE	FIGURE No.
17-549	FEB 2019	1:7500	1

- Rear Lane Townhouse
- Dual Frontage Townhouse
- Standard Townhouse
- Rooftop Townhouse
- Back to Back Townhouse
- Mid Rise Townhouses
- Mid Rise Building
- Taller Elements (Residential)
- Mixed Use Mid Rise Building
- Mixed Use Taller Elements
- Cultural / Institutional
- Parking Structure / Municipal
- Employment
- Retail Only
- # Building Height
- Proposed Transit Stop

- All Units In Metric Unless Otherwise Noted and Areas are Approximate.
- Aerial Photo: Google Earth, Approx. Fall 2016

LAKEVIEW COMMUNITY PARTNERS LIMITED

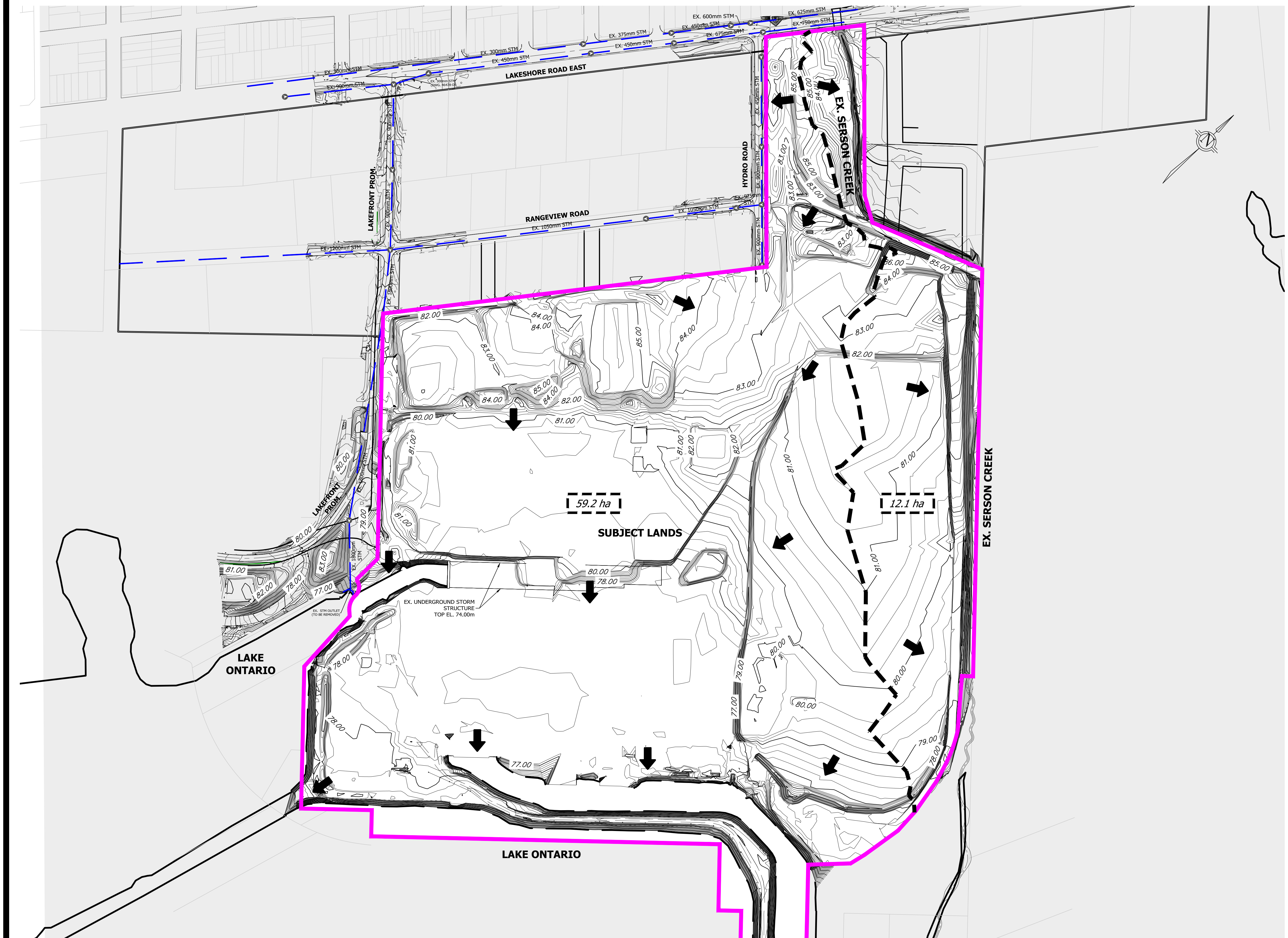
LAKEVIEW VILLAGE | MIssissauga, Ontario

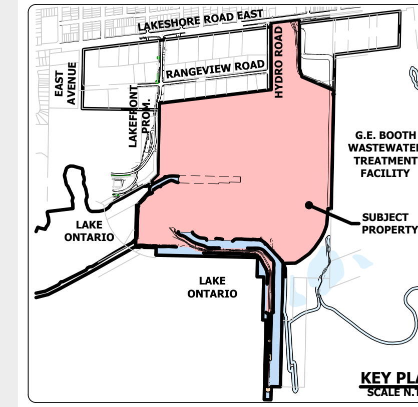
MASTERPLAN CONCEPT

DRAFT

JAN 08, 2018
PROJECT 1734
SCALE 1:4000

FIGURE 2





LEGEND

80.00	EXISTING CONTOUR AND ELEVATION
	PROPERTY BOUNDARY
	EXISTING OVERLAND FLOW ROUTE
	EXISTING DRAINAGE BOUNDARY

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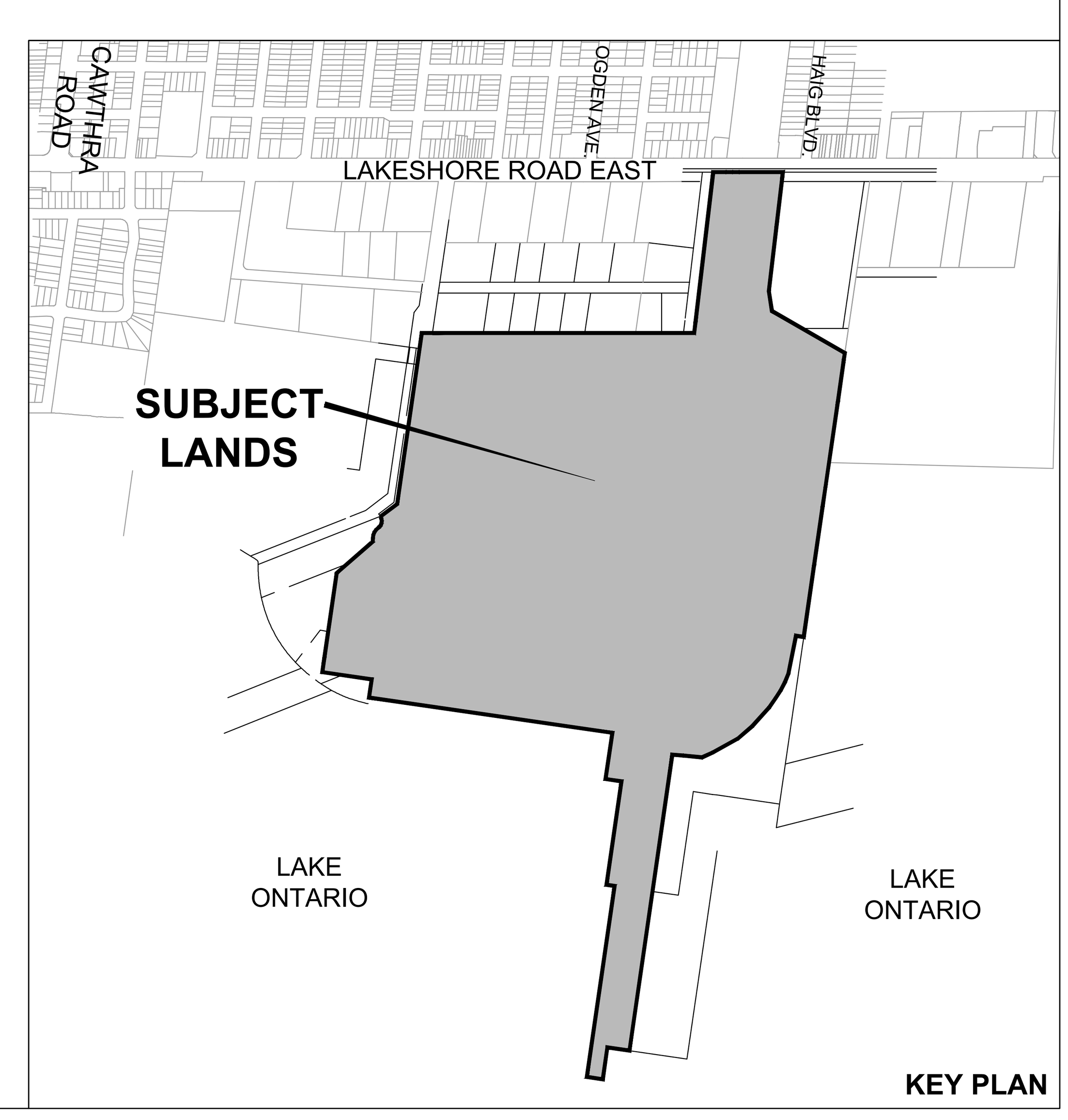
EXISTING CONDITIONS PLAN

PROJECT No.	DATE	SCALE	FIGURE No.
17-549	FEB 2019	1:5000	3

File: P:\Projects\17-549-OPG Lakeview\Reports\FSR\Figures\FIGURE 3 - EXISTING CONDITIONS PLAN.dwg - Revised by <TLEVITIN> : Wed, Feb 27 2019 - 12:18pm



LAND USE SCHEDULE

LAND USE	BLOCKS	AREA (ha)	AREA (ac)	UNITS	DENSITY (UPNHA)
RESIDENTIAL MEDIUM DENSITY	1-12	19.88	49.12	6230	313.38
MIXED USE	13-17	5.16	12.75	1774	343.80
MIXED USE CULTURAL HUB	18,19	1.14	2.82		
INSTITUTIONAL	20	3.56	8.80		
EMPLOYMENT	21	3.35	8.28		
PARK	22-30	14.49	35.81		
NATURAL HERITAGE SYSTEM (NHS)	31-33	12.75	31.51		
ROAD WIDENING	34,35	0.42	1.04		
0.3m RESERVE	36-39	0.00	0.00		
18.0m ROW (1,638m LENGTH)		2.96	7.31		
20.0m ROW (592m LENGTH)		1.19	2.94		
20.5m ROW (1,560m LENGTH)		3.21	7.93		
26.0m ROW (1,321m LENGTH)		3.15	7.78		
TOTAL	**39**	**71.26**	**176.09**	**8004**	**319.65**

DRAFT PLAN OF SUBDIVISION
LAKEVIEW COMMUNITY PARTNERS LIMITED

FILE # ____________

PART OF LOTS 7, 8 AND 9, CONCESSION 3, SOUTH OF DUNDAS STREET
PART OF WATER LOT IN FRONT OF LOT 7, CONCESSION 3, SOUTH OF DUNDAS STREET
PART OF WATER LOT LOCATION HY28 IN FRONT OF LOT 7, CONCESSION 3, SOUTH OF DUNDAS STREET
WATER LOT LOCATION HY77 IN FRONT OF LOT 7, CONCESSION 3, SOUTH OF DUNDAS STREET
PART OF WATER LOT LOCATION HY116 IN FRONT OF LOT 7 CONCESSION 3, SOUTH OF DUNDAS STREET
(GEOGRAPHIC TOWNSHIP OF TORONTO, COUNTY OF PEEL),
CITY OF MISSISSAUGA
REGIONAL MUNICIPALITY OF PEEL

OWNERS CERTIFICATE

I HEREBY AUTHORIZE GLEN SCHNARR & ASSOCIATES INC. TO PREPARE AND SUBMIT THIS DRAFT PLAN OF SUBDIVISION TO THE CITY OF MISSISSAUGA FOR APPROVAL.

SIGNED ____________ DATE: FEB. 25, 2019
FABIO MAZZOCCO, PRESIDENT
LAKEVIEW COMMUNITY PARTNERS LIMITED

SURVEYORS CERTIFICATE

I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LANDS TO BE SUBDIVIDED AS SHOWN ON THIS PLAN AND THEIR RELATIONSHIP TO ADJACENT LANDS ARE CORRECTLY AND ACCURATELY SHOWN.

SIGNED ____________ DATE: FEB. 25, 2019
RON QUERUBIN
ONTARIO LAND SURVEYOR

ADDITIONAL INFORMATION

(UNDER SECTION 51(17) OF THE PLANNING ACT) INFORMATION REQUIRED BY CLAUSES A,B,C,D,E,F,G,J & L ARE SHOWN ON THE DRAFT AND KEY PLANS.

H) MUNICIPAL AND PIPED WATER TO BE PROVIDED
I) SILTY CLAY, SANDY SILT, CLAYEY SILT, SILT, SILTY SAND, ETC.
K) SANITARY AND STORM SEWERS TO BE PROVIDED

NOTES

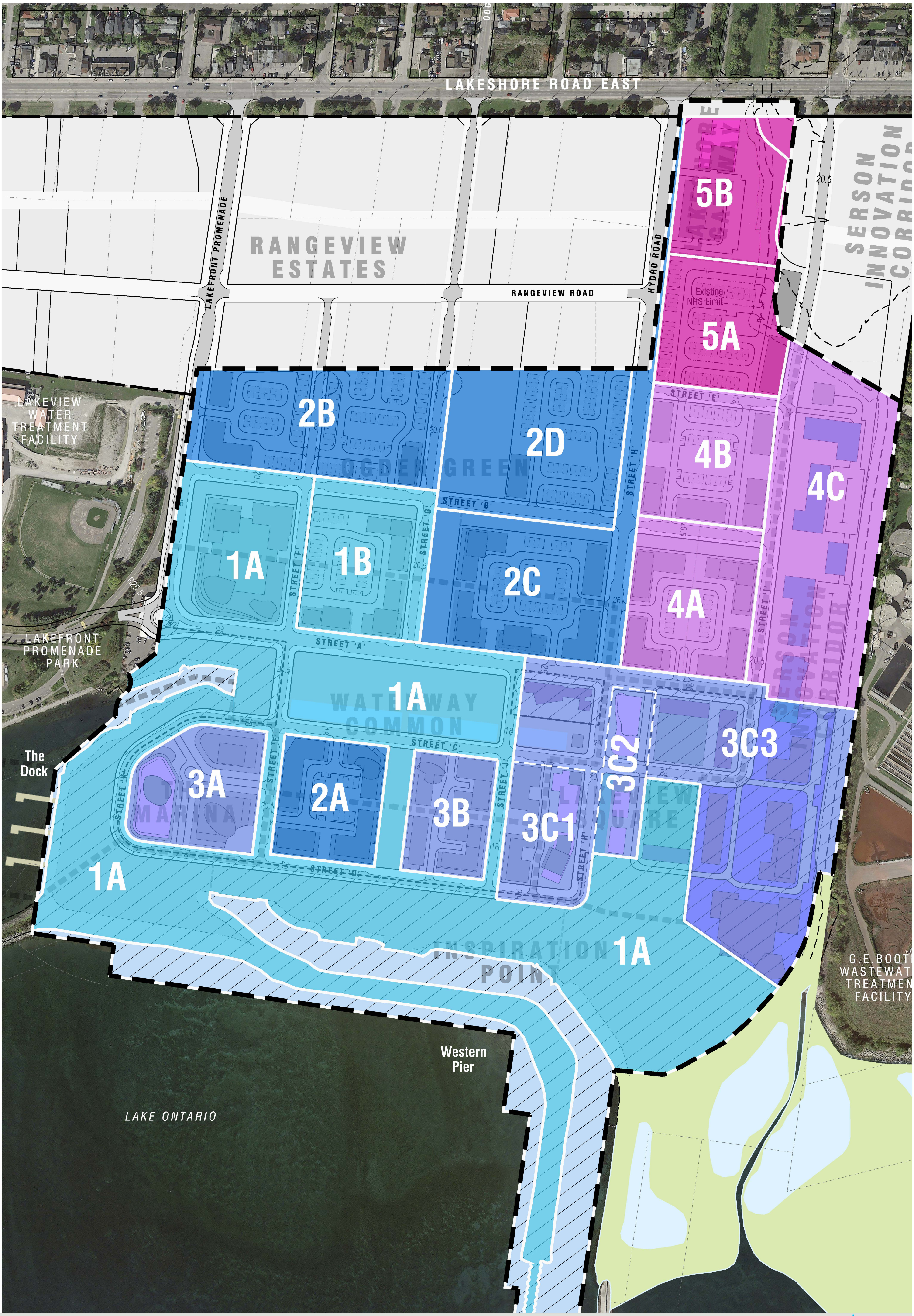
- PAVEMENT ILLUSTRATION IS DIAGRAMMATIC
- HYDRO ROAD & LAKESHORE ROAD E. DAYLIGHT TRIANGLE DIMENSIONS = 10m x 10m
- DAYLIGHT ROUNDINGS ARE 5m RADII, UNLESS OTHERWISE NOTED

Glen Broll REGISTERED PROFESSIONAL PLANNER R.P.P.

FIGURE 4

SCALE 1:2500
(24 x 36)
FEBRUARY 25, 2019

GSAI
Glen Schnarr & Associates Inc.



DRAFT

GENERAL NOTES:

- All Units In Metric Unless Otherwise Noted and Areas are Approximate.
- Aerial Photo: Google Earth, Approx. Fall 2016

GERRARD DESIGN

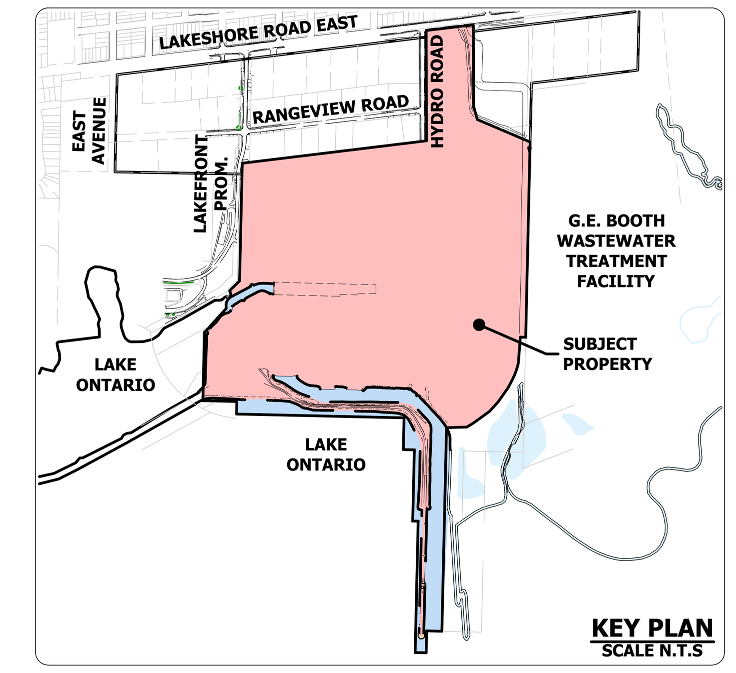
LAKEVIEW COMMUNITY PARTNERS LIMITED

LAKEVIEW VILLAGE | MIssissauga, Ontario

DEVELOPMENT PHASING CONCEPT

FEB 27, 2019
PROJECT 1734
SCALE 1:4000

FIGURE 5



LEGEND

- 83.00 — EXISTING CONTOUR AND ELEVATION
- STORM DRAINAGE AREA BOUNDARY
- PROPOSED STORM SEWER
- EXISTING STORM SEWER

STM. MH 22 — MH. NUMBER
T/G 81.38m — TOP ELEVATION
NE 79.74m, SE 79.65m — INVERTS

8.34 — AREA (ha)
0.25 — RUN-OFF COEFFICIENT

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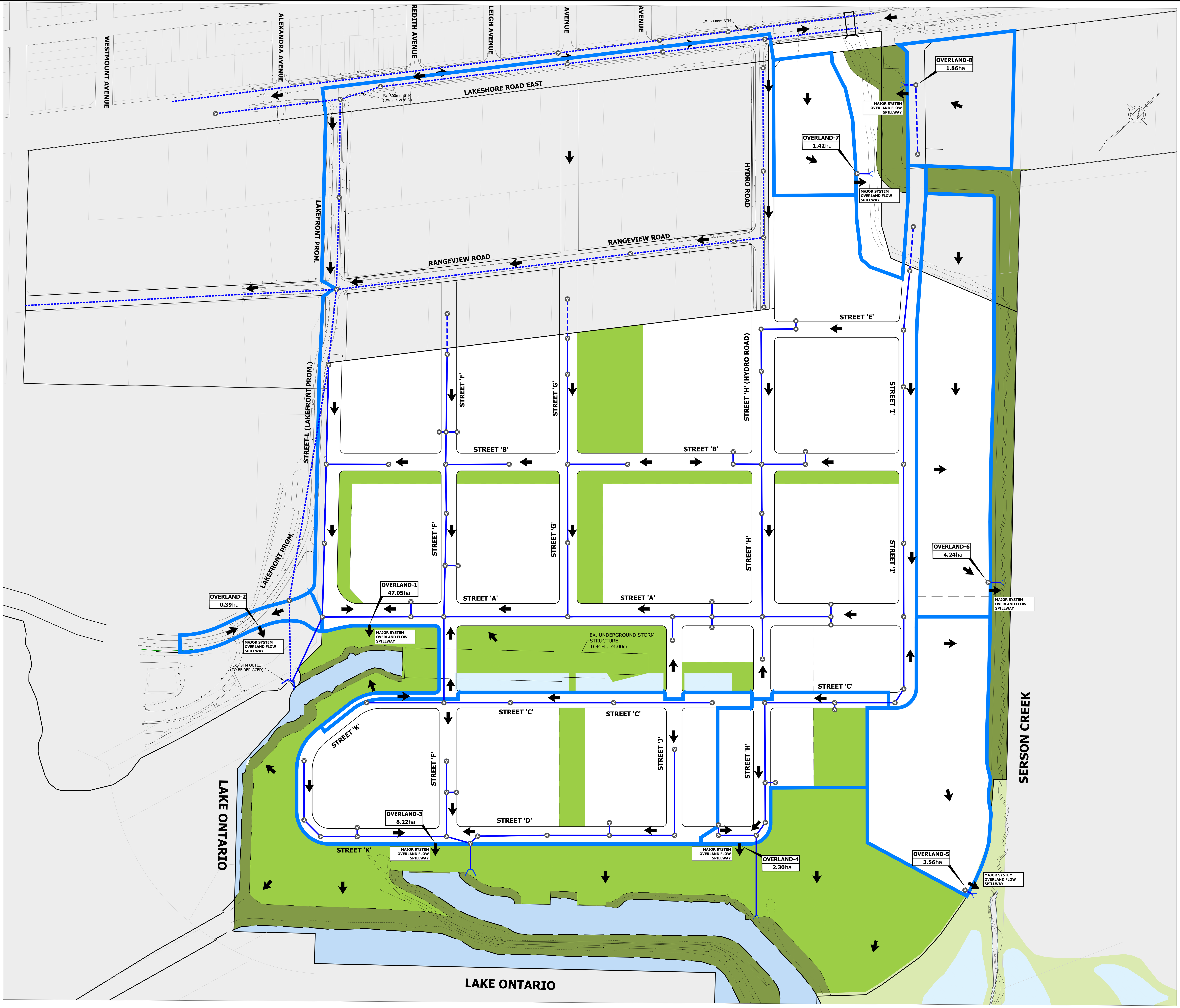
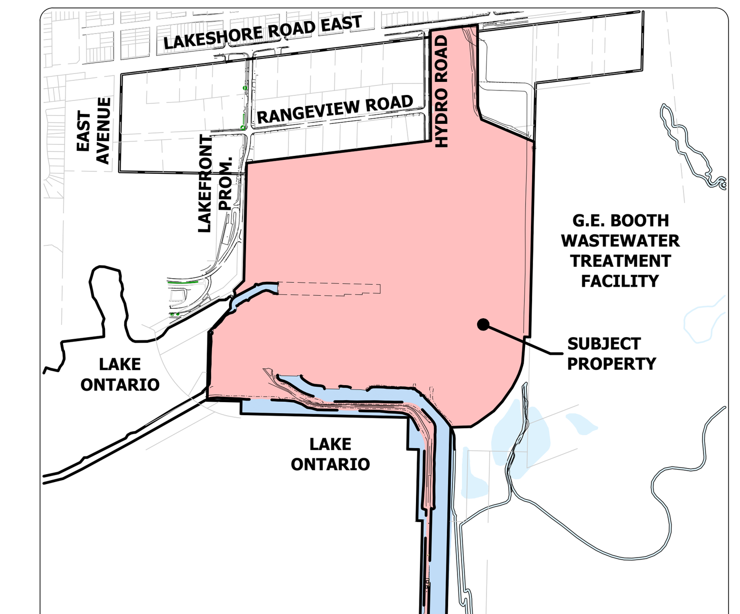
STORM SERVICING PLAN

PROJECT No.	DATE	SCALE	DWG No.
17-549	FEB 2019	1:2000	STM-1





KEY PLAN
SCALE N.T.S

LEGEND

- MAJOR SYSTEM STORM DRAINAGE AREA BOUNDARY
- PROPOSED STORM SEWER
- EXISTING STORM SEWER
- FUTURE STORM SEWER
- OVERLAND FLOW ROUTE
- OVERLAND-1 — OVERLAND FLOW SPILLWAY ID
- 47.05ha — MAJOR SYSTEM CONTRIBUTING AREA

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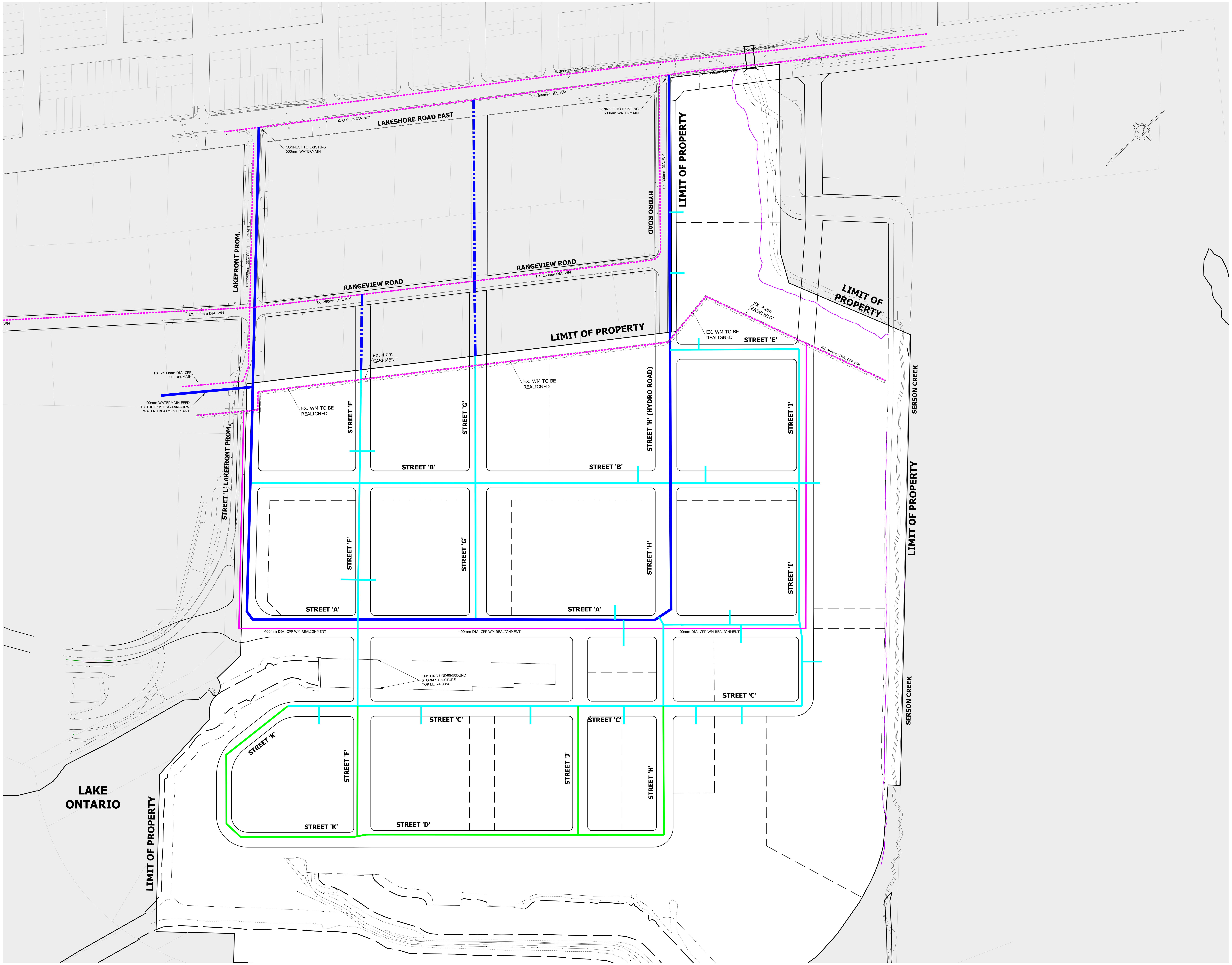
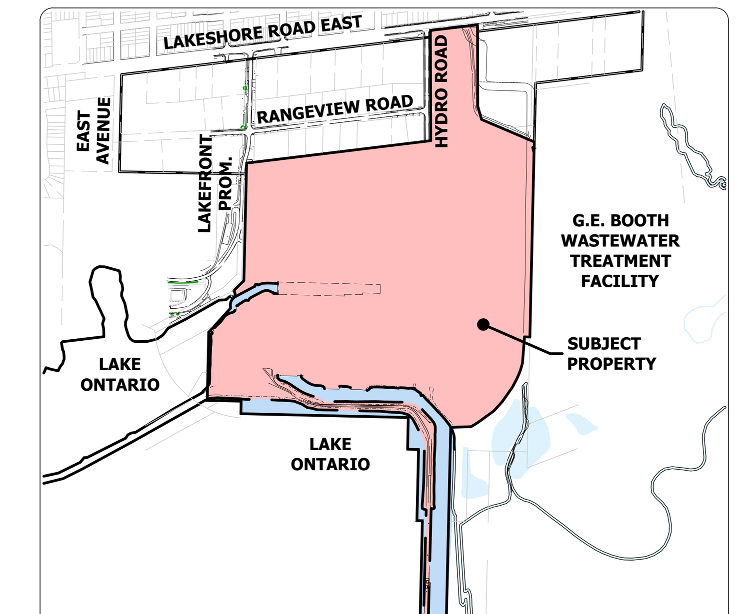
MAJOR SYSTEM STORM SERVICING PLAN

PROJECT No.	DATE	SCALE	DWG No.
17-549	FEB 2019	1:2000	STM-2





KEY PLAN
SCALE N.T.S

LEGEND

- PROPOSED 400mm WATERMAIN
- PROPOSED 300mm WATERMAIN
- PROPOSED 200mm WATERMAIN
- EXISTING WATERMAIN
- FUTURE WATERMAIN

NOTE:

- THE EXISTING 400mm WATERMAIN SHOWN WITHIN THE EXISTING EASEMENT SHALL BE REPLACED BY A DEDICATED 400mm WATERMAIN ON LAKEFRONT PROMENADE, STREET B, AND STREET I AS SHOWN ON THIS PLAN. THE EXISTING WATERMAIN IS A DEDICATED FEED FROM THE WATER TREATMENT TO WASTEWATER TREATMENT PLANT AND SHALL REMAIN IN OPERATION UNTIL THE NEW 400mm WATERMAIN IS COMMISSIONED.

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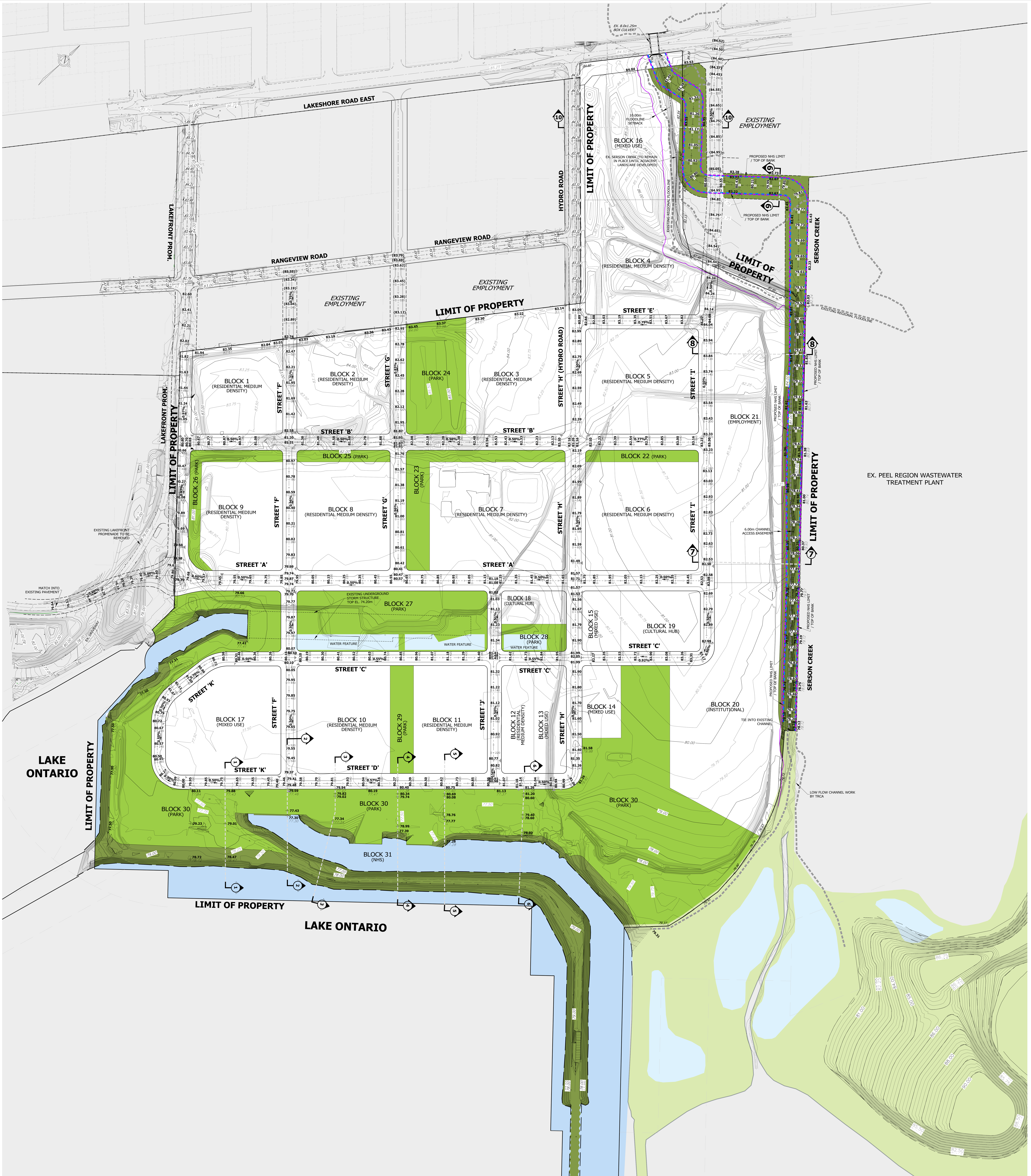
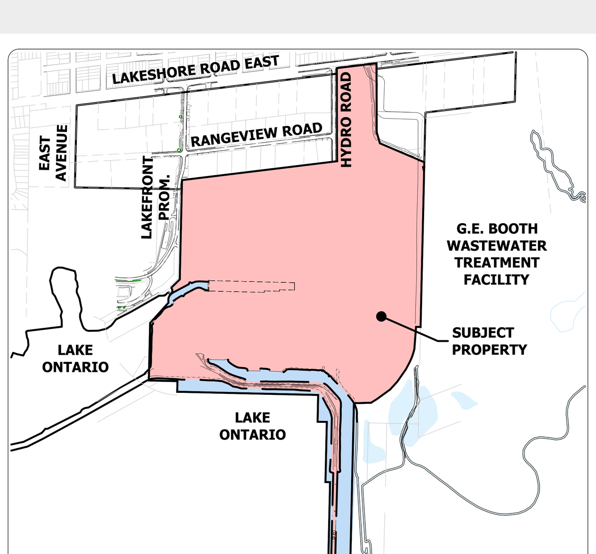
PRELIMINARY WATER SERVICING PLAN

PROJECT No.	DATE	SCALE	DWG No.
17-549	FEB 2019	1:2000	WM-1





KEY PLAN
SCALE N.T.S

LEGEND

80.00	EXISTING CONTOUR AND ELEVATION
+ 240.70	PROPOSED ELEVATION
+ (240.70)	FUTURE ELEVATION
+ 78.47	EXISTING ELEVATION
▬ ▬ ▬	EXISTING REGIONAL FLOODLINE
▬ · ▬ ·	PROPOSED FLOODLINE
- - - -	PROPOSED CHANNEL TOP OF BANK / NHS LIMIT
■	HAZARD LIMIT

NOTES:

- HYDRO ROAD IS TO BE RECONSTRUCTED TO CONFORM TO THE APPROVED RIGHT OF WAY FOR STREET H/HYDRO ROAD. EXISTING CENTRELINE GRADES SHALL BE MAINTAINED ADJACENT TO THE EXISTING INDUSTRIAL PROPERTIES.
- LAKEFRONT PROMENADE IS TO BE RECONSTRUCTED TO CONFORM TO THE APPROVED RIGHT OF WAY PROPOSED AS PART OF THIS APPLICATION. EXISTING CENTRELINE GRADES SHALL BE MAINTAINED ADJACENT TO THE EXISTING INDUSTRIAL PROPERTIES. LAKEFRONT PROMENADE IS TO BE REALIGNED SOUTH OF INTERSECTION WITH RANGEVIEW ROAD AS SHOWN ON THIS PLAN.

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PRELIMINARY GRADING PLAN

DWG No GR-1

SCALE: 1:1500 | DATE: FEB. 2019 | PROJECT No: 17-549

File: P:\Projects\17-549-OPG Lakeview\Reports\FSR\Figures\17-549-FSR-GR-1.dwg - Revised by <SRIEMER> : Thu, Aug 09 2018 - 9:43am

NOTES:

- REFER TO DRAWING GR-1 FOR SECTION LOCATIONS
- HAZARD LIMITS SHOWN ON THIS PLAN ARE TAKEN FROM THE LAKEVIEW SHORELINE HAZARD ASSESSMENT PREPARED BY BAIRD.

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CITY OF MISSISSAUGA

CROSS SECTIONS
(1-1, 2-2)

PROJECT No.	DATE	SCALE	DWG No.
17-549	FEB. 2019	H: 1:200 V: 1:50	GR-2

NOTES:

- REFER TO DRAWING GR-1 FOR SECTION LOCATIONS
- HAZARD LIMITS SHOWN ON THIS PLAN ARE TAKEN FROM THE LAKEVIEW SHORELINE HAZARD ASSESSMENT PREPARED BY BAIRD.

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CROSS SECTIONS
(3-3, 4-4)

PROJECT No.	DATE	SCALE	DWG No.
17-549	FEB. 2019	H: 1:200 V: 1:50	GR-3

SECTION 5-5
SCALE HOR. 1:200
VER. 1:50

SECTION 6-6
SCALE HOR. 1:200
VER. 1:50

NOTES:

- REFER TO DRAWING GR-1 FOR SECTION LOCATIONS
- HAZARD LIMITS SHOWN ON THIS PLAN ARE TAKEN FROM THE LAKEVIEW SHORELINE HAZARD ASSESSMENT PREPARED BY BAIRD.

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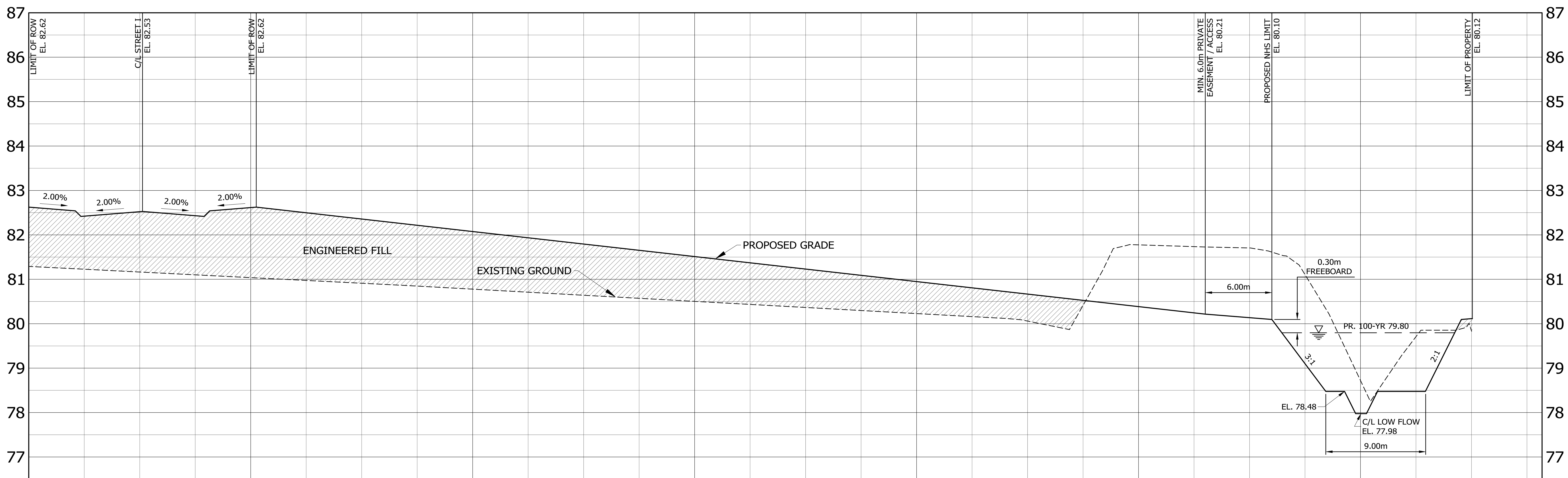
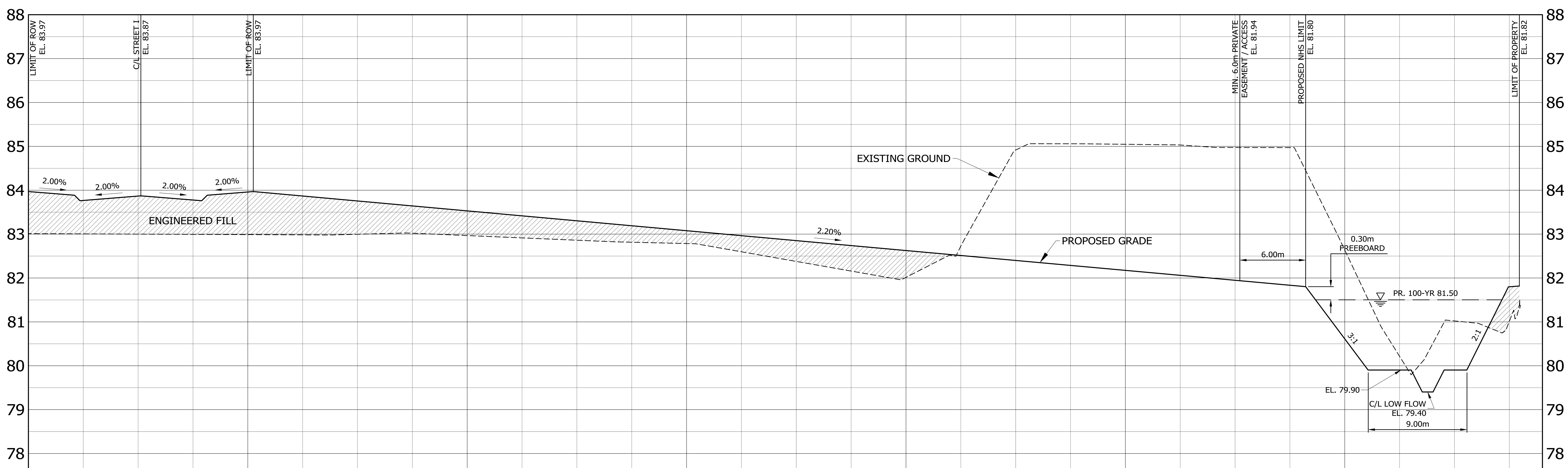
CROSS SECTIONS
(5-5, 6-6)

PROJECT No.	DATE	SCALE	DWG No.
17-549	FEB. 2019	H: 1:200 V: 1:50	GR-4



SECTION 7-7
SCALE HOR. 1:200
VER. 1:50



SECTION 8-8
SCALE HOR. 1:200
VER. 1:50

NOTES:

- REFER TO DRAWING GR-1 FOR SECTION LOCATIONS
- HAZARD LIMITS SHOWN ON THIS PLAN ARE TAKEN FROM THE LAKEVIEW SHORELINE HAZARD ASSESSMENT PREPARED BY BAIRD.

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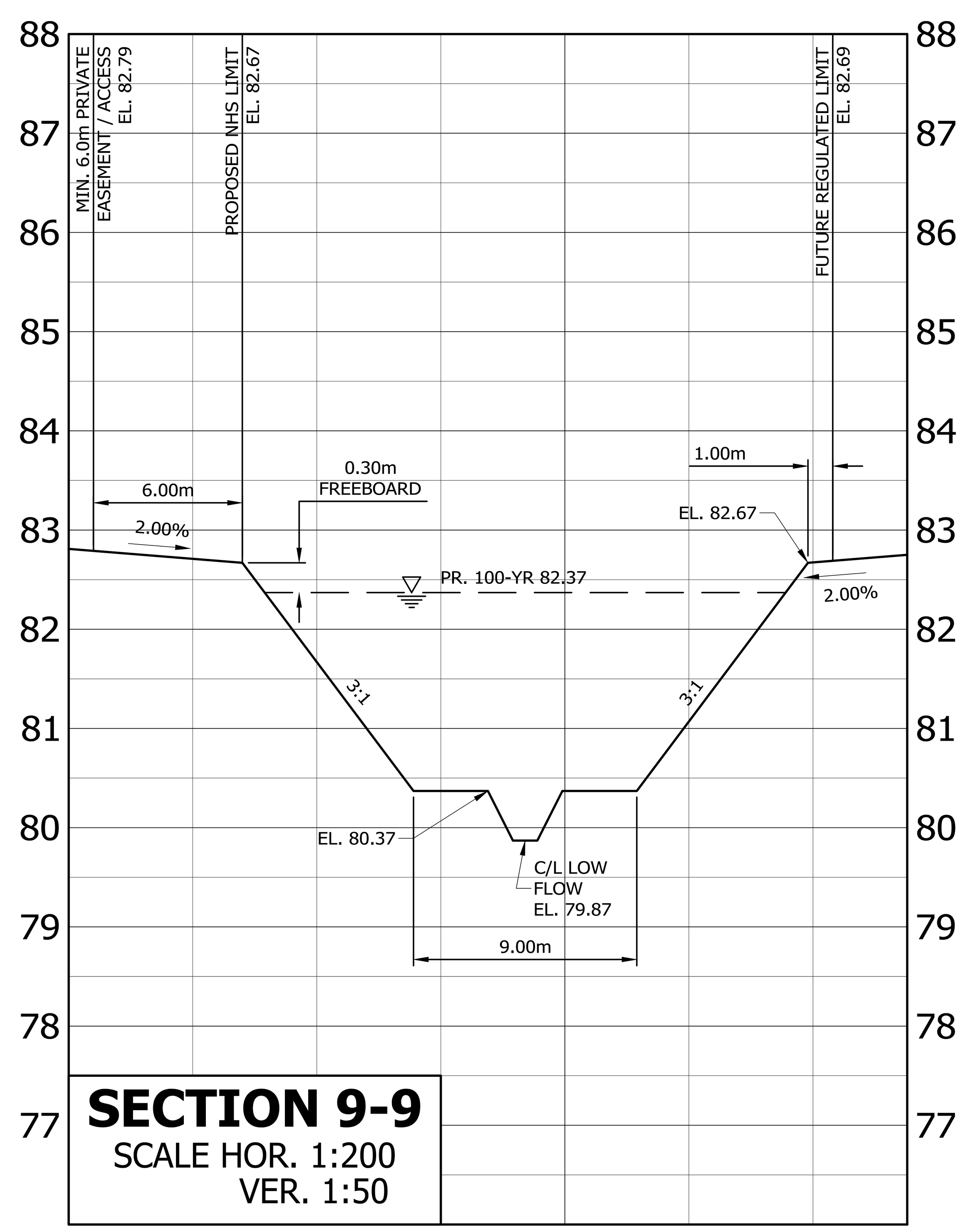
CROSS SECTIONS
(7-7, 8-8)

PROJECT No.	DATE	SCALE	DWG No.
17-549	FEB. 2019	H: 1:200 V: 1:50	GR-5



NOTES:

- REFER TO DRAWING GR-1 FOR SECTION LOCATIONS
- HAZARD LIMITS SHOWN ON THIS PLAN ARE TAKEN FROM THE LAKEVIEW SHORELINE HAZARD ASSESSMENT PREPARED BY BAIRD.

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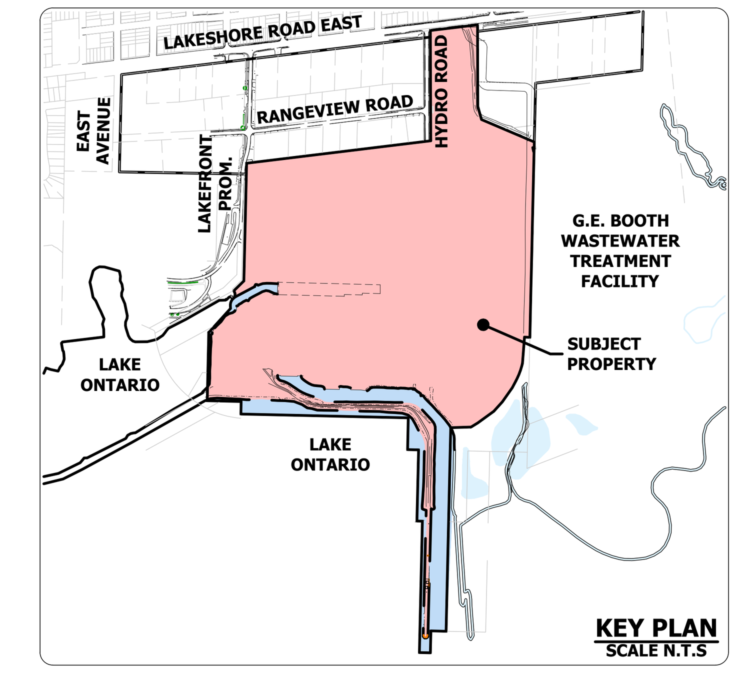
CROSS SECTIONS
(9-9, 10-10)

PROJECT No.	DATE	SCALE	DWG No.
17-549	FEB. 2019	H: 1:200 V: 1:50	GR-6



LEGEND

- SANITARY DRAINAGE AREA BOUNDARY
- PROPOSED SANITARY SEWER
- EXISTING SANITARY SEWER
- TWIN FORCEMAIN

SAN. MH 22A — MH. NUMBER
T/G 82.38m — TOP ELEVATION
NE 77.74m, SE 77.65m — INVERTS

0.10ha — DRAINAGE AREA (ha)
70 — POPULATION
7 — DENSITY (P/Ha)

NOTE:

- POPULATION DENSITIES ARE AS PER PEEL REGION STANDARDS. IN HIGH DENSITY AREAS WHERE POPULATION IS EXPECTED TO EXCEED 475 PERSONS/HECTARE, THE POPULATION EQUIVALENT HAS BEEN CALCULATED USING 2.7 PEOPLE/UNIT

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CITY OF MISSISSAUGA

SANITARY SERVICING PLAN

PROJECT No.	DATE	SCALE	DWG No.
17-549	FEB 2019	1:2000	SAN-1

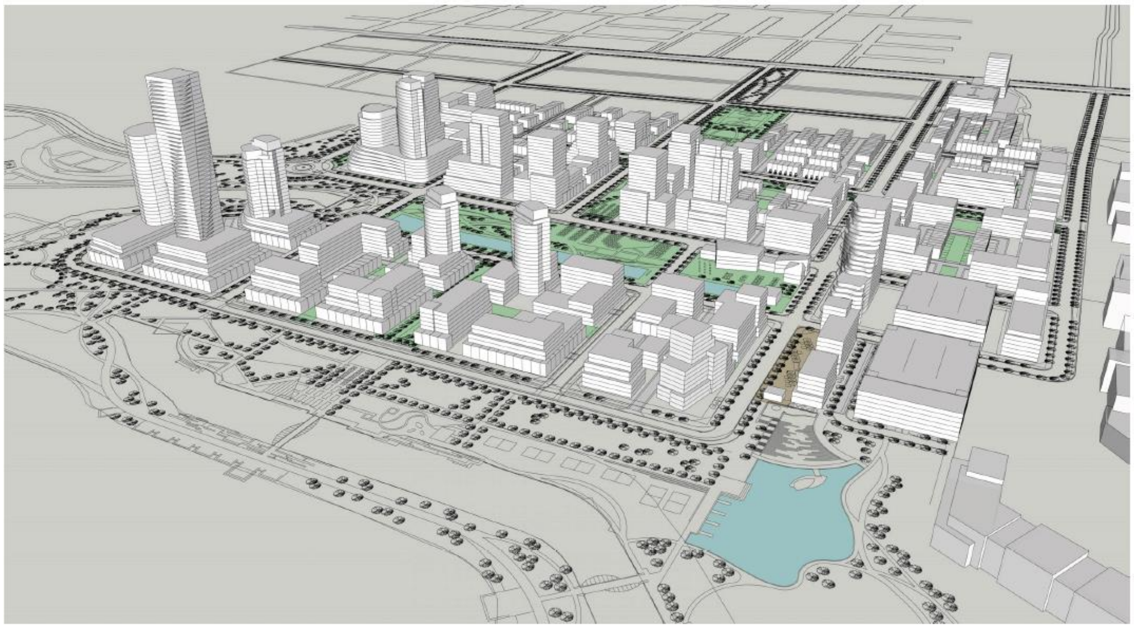
Appendix A – Geotechnical Investigations

Preliminary Geotechnical Investigation – 800 Hydro Road (DS Consultants, Oct. 2018)

LAKEVIEW
COMMUNITY PARTNERS LIMITED

REPORT ON

Preliminary Geotechnical Investigation
Proposed Residential & Commercial Development
800 Hydro Road
Mississauga, Ontario



PREPARED FOR:

Lakeview Community Partners Limited

PREPARED BY:

DS Consultants Ltd.

DS Project No : 18-519-10
Date : October 15, 2018

DS CONSULTANTS LTD.
6221 Highway 7, Unit 16
Vaughan, Ontario, L4H 0K8
Telephone: (905) 264-9393
www.dsconsultants.ca

Table of Contents

APPENDIX B: LOGS AND LOCATION PLAN OF EXP BOREHOLES

APPENDIX C: GEOPHYSICAL SURVEY REPORT BY GEOPHYSICS GPR INTERNATIONAL INC.

1. INTRODUCTION

DS Consultants Ltd. (DSCL) was retained by the ARGO Development Corporation on behalf of Lakeview Community Partners Limited to carry out preliminary geotechnical and hydrogeological investigations for the proposed Lakeview Village on the lands of the former Lakeview Power Generation Station located at 800 Hydro Road in Mississauga, Ontario.

It is understood that the proposed 71.6-hectare Lakeview Village will include 5,000 to 7,000 new homes in a variety of housing options, including townhouses, mid-rise and high-rise buildings. There will be more than 600,000 square feet of employment and institutional use and another 200,000 square feet of cultural space. Lakeview Village will include a Serson Square, a year-round central gathering space with retail offices and homes that can be used as an arts and cultural hub.

The proposed high-rise structures will entail up to 3-levels of basement. The finished basement floor elevations are not available to us at the time of writing this report.

exp Services Inc (exp.) conducted a preliminary geotechnical investigation at the subject site in December 2017 and drilled nine (9) boreholes as a part of their field work. The logs and location plan of exp. boreholes (BH1 to BH9) are attached in **Appendix B** of this report.

The purpose of this geotechnical investigation was to determine the subsurface conditions at the borehole locations and make preliminary engineering recommendations for the following:

1. Foundations
2. Floor slabs and permanent drainage
3. Earth pressures
4. Excavations and backfill
5. Earthquake considerations
6. Pavements
7. Underground utilities

This report deals with geotechnical issues only. Preliminary hydrogeological findings by DSCL will be presented in a separate report. Environmental testing was not part of our scope of work.

This report is provided on the basis of the assumption that the design will be in accordance with the applicable codes and standards. If there are any changes in the design features relevant to the geotechnical analyses, or if any questions arise concerning the geotechnical aspects of the codes and standards, this office should be contacted to review the design. It may then be necessary to carry out additional borings and reporting before the recommendations of this office can be relied upon.

The site investigation and recommendations follow generally accepted practice for geotechnical consultants in Ontario, Canada. The format and contents are guided by client specific needs and economics and conform to generalized standards for services. Laboratory testing for most part follows ASTM or CSA Standards or modifications of these standards that have become standard practice.

The foundation recommendations made in this report are based on the subsoil conditions found during the field investigation. The comments made in this report on potential construction problems and possible construction options intended only for guidance of the designer.

This report has been prepared for Lakeview Community Partners Limited and its architects and designers. Third party use of this report without DS Consultants Ltd. consent is prohibited.

2. FIELD WORK & LAB TESTING

Forty-five (45) boreholes (BH18-1 to BH18-49, except BH18-22 to BH18-24 and BH18-26, see Drawing 1 for location plan) were drilled at the site to depths varying from 1.7 m to 48.3m below the existing grade.

Four boreholes (BH18-22 to BH18-24 and BH18-26) were not be drilled due to the on-going construction work related to removal of buried concrete slabs associated with the former power house.

Boreholes were drilled with solid stem and hollow stem continuous flight auger equipment by a drilling sub-contractor under the direction and supervision of DS Consultants Limited personnel. Mud rotary was used in the drilling of some deep boreholes. Samples were retrieved at regular intervals with a 50 mm O.D. split-barrel sampler driven with a hammer weighing 624 N and dropping 760 mm in accordance with the Standard Penetration Test (SPT) method. The samples were logged in the field and returned to the DS Consultants Limited laboratory for detailed examination by the project engineer and for laboratory testing.

Shale bedrock was cored at five (5) borehole locations (BH18-19, BH18-29, BH18-32, BH18-37 and BH18-45), with HQ double tube wireline equipment providing 63.5mm diameter rock core samples. The coring was carried out under the full-time supervision of a representative from DSCL who identified and described the rock samples, noting and recording the percentages of total and solid rock core recovery, RQD values, fracture index and the percentage and thicknesses of hard layers.

As well as visual examination in the laboratory, majority of the soil samples were tested for moisture contents. Selected fourteen (14) soil samples were subjected to grain size analyses and gradation curves are presented on Drawings 58 & 59. Atterberg's Limits tests were conducted on selected five (5) soil samples and results are presented on the respective borehole logs.

Water level observations were made during drilling and in the open boreholes at the completion of the drilling operations. Monitoring wells were installed in overburden and bedrock at seven (7) borehole locations for the longer-term groundwater level monitoring.

Methane gas measurements were taken in boreholes during drilling and upon completion of drilling, using a portable multi-gas detector RKI Eagle 2 instrument.

The ground surface elevations at the borehole locations was undertaken by DSCL personnel, using the differential GPS unit, leased from Sokkia Inc.

Geophysical survey was carried out at the subject site by the sub-contractor, Geophysics GPR International Inc. and their report is attached in **Appendix C** of this report.

3. SITE AND SUBSURFACE CONDITIONS

The subject site is located at 800 Hydro Road in Mississauga, approximately three kilometers east of Port Credit, on Mississauga's waterfront. The subject property primarily consists of former OPG Lakeview Coal plant that was decommissioned between 2006 & 2008 and the City own lands that is currently being used as playing fields and parking lot. The topography of the site has gentle slope towards south towards Lake Ontario, with elevations decreasing from 84m to 77m. At the time of our field work, the existing concrete slabs associated with the former OPG power house were being removed by the contractor.

The borehole location plan is shown on Drawing 1. Notes on samples description are provided on Drawing 1A. The subsurface conditions in the boreholes are presented in the individual borehole log on Drawings 2 to 46. Generalized sub-surface profiles are provided on Drawing 47 to 57.

Based on the borehole information, there is a significant variation in the bedrock depths at site along the north-south and east-west directions. There is a bedrock valley within the site, with the bedrock surface depths varying from 1.5m to at or below 48.3m. To delineate the bedrock valley and for the ease of describing the geotechnical conditions, the site is sub-divided into three areas (Area A, Area B & Area C, see Drawing 1 for areas & respective borehole locations). The subsurface conditions in the boreholes, area wise, are summarized in the following paragraphs.

3.1 Soil Conditions in Area 'A'

Seventeen boreholes (BH18-14, BH18-19, BH18-21, BH18-25, BH27 to BH18-38 and BH18-49) were drilled within Area 'A'. All boreholes were drilled to shale bedrock.

<u>Topsoil, Pavement Structure & Fill Materials</u>: A surficial topsoil layer, ranging in thickness from 125 to 350mm, was encountered at BH18-21, BH18-33 to BH18-38 & BH18-49. Two boreholes (BH18-28 & BH18-30) drilled on the paved areas encountered 70mm of asphalt at the surface, overlying granular base/subbase. Fill materials were found in all boreholes, extending to depths varying from 0.8 to 4.2m below the existing grade. Fill material was heterogeneous and consisted of sand & gravel, crusher run limestone, silty sand, sandy silt and clayey silt to silty clay, with inclusions of organics/topsoil, wood, concrete, asphalt and shale fragments. The SPT 'N' values recorded in fill materials ranged from 5 to over 50 blows per 300mm of spoon penetration, indicating loose to very dense state of relative density.

Clayey Silt to Silty Clay Till: Below the fill materials, clayey silt to silty clay till deposits were encountered in BH18-14, BH18-19, BH18-29, and BH18-34 to BH18-38 (except BH18-35), overlying shale bedrock or silty clay. Clayey silt till was present in a stiff to hard consistency, with measured SPT 'N' values ranging from 8 to over 50 blows per 300mm of spoon penetration. Occasional cobble/boulders and sand seams were encountered within this deposit.

Grain size analysis of one soil sample (BH18-33/SS3) was conducted. The results are shown on Drawing 59, with the following fractions:

Clay: 29%
Silt: 46%
Sand: 23%
Gravel: 2%

Atterberg limits testing of one soil sample (BH18-33/SS3) was conducted. The results are shown on the borehole log and are summarized as follows:

Liquid limit (W_L): 34%
Plastic limit (W_P): 21%
Plasticity index (PI): 13

Silty Clay: A silty clay deposit was encountered in BH18-25, BH18-27, BH18-30 and BH18-36, below the fill material, or cohesionless soils or clayey silt till, and overlying shale bedrock. Silty clay was present in a firm to hard, generally hard consistency, with measured SPT 'N' values ranging from 6 to more than 50 blows for 300 mm penetration.

Grain size analysis of one soil sample (BH18-36/SS4) was conducted. The results are shown on Drawing 59 with the following fractions:

Clay: 32%
Silt: 57%
Sand: 11%

Atterberg limits testing of same soil sample (BH18-36/SS7) was conducted. The results are shown on the borehole log and are summarized as follows:

Liquid limit (W_L): 37%
Plastic limit (W_P): 23%
Plasticity index (PI): 14

Cohesionless Soils (Sand & Gravel, Sand): Cohesionless soils consisting of sand and gravel and sand were encountered in boreholes BH18-25, to BH18-28, BH18-32 below the fill material. These cohesionless soils were water bearing and present in a very loose to very dense state, as indicated by the measured SPT 'N' values of nil to over 50 blows per 300mm of spoon penetration.

Sandy Silt Till: A sandy silt till deposit was encountered in BH18-49 below the fill material, extending to a depth of 4.5m, overlying shale bedrock. Sandy silt till was present in a compact to dense state, as indicated by the measured SPT 'N' values of 29 to 31 blows per 300mm of spoon penetration. Occasional cobble/boulders and sand seams were encountered within this deposit.

Shale Bedrock:

In Area 'A', shale bedrock of Georgian Bay Formation was found at all borehole locations, at depths ranging from 1.5 to 6.3m below the existing grade, corresponding to elevations ranging from 71.2 to 80.1m. The approximate depth and elevation of the shale bedrock surface at the borehole locations are listed on Table 3.1 below.

Table 3.1: Approximate Depth and Elevation of Shale Bedrock Surface in Area 'A'

Borehole No.	Depth of Shale Bedrock Surface below Existing Ground (m)	Approximate Elevation of Shale Bedrock Surface (m)	Notes
BH18-14	2.3	78.1	Augered
BH18-19	4.5	76.2	CORED
BH18-21	1.5	78.2	Augered
BH18-25	4.2	73.3	Augered
BH18-27 (30a)	3.8	73.5	Augered
BH18-28	3.3	79.5	Auger refusal
BH18-29A	6.3	71.2	cored
BH18-30	1.5	75.7	Augered
BH18-31	3.8	73.5	Augered
BH18-32	4.3	72.9	CORED
BH18-33	3.8	75.7	Augered
BH18-34	3.1	77.0	Augered
BH18-35	4.2	73.7	Augered
BH18-36	4.6	75.7	Augered
BH18-37	3.1	78.2	CORED
BH18-38	4.6	75.7	Augered
BH18-49	4.5	76.3	Augered
BH3*	**3.2**	**74.1**	**CORED**
BH5*	**3.5**	**76.8**	**Augered**
BH6*	**1.3**	**75.8**	**Augered**
BH9*	**4.4**	**74.6**	**CORED**

*exp. boreholes

Detailed description of shale bedrock is provided in Section 3.4.

3.2 Soil Conditions in Area 'B'

Twenty-two (22) boreholes (BH18-1 to BH18-13, BH18-15 to BH18-18, BH18-20, BH18-39, BH18-40, BH18-46 & BH18-48) were drilled within Area 'B', to depths ranging from 11.1 to 48.3m.

<u>Topsoil, Pavement Structure & Fill Materials</u>: A surficial topsoil layer, ranging in thickness from 100 to 350mm, was encountered at BH18-1, BH18-3 to BH18-6, BH18-10 to BH18-12, BH18-16, BH18-39, BH18-40 and BH18-48). Three boreholes (BH18-2, BH18-17 and BH18-20) drilled on the paved areas encountered 70 to 100mm of asphalt at the surface, overlying granular base/subbase. Fill materials were found in all boreholes, extending to depths varying from 0.8 to 3.1m below the existing grade. Fill material was heterogeneous and consisted of clayey silt, silty clay, silty sand, sandy silt, silt and sand and gravel, with inclusions of organics/topsoil in varying proportions and trace asphalt & shale fragments. The SPT 'N' values recorded in fill materials ranged from 4 to 50 blows per 300mm of spoon penetration, indicating loose to very dense state of relative density.

<u>Clayey Silt to Silty Clay Till:</u> Clayey silt to silty clay till deposits of varying thicknesses were encountered in boreholes at varying depths. Clayey silt to silty clay till was present in a stiff to hard consistency, with measured SPT 'N' values ranging from 14 to over 50 blows per 300mm of spoon penetration. Occasional cobble/boulders and sand seams were encountered within this deposit.

Grain size analysis of four soil samples from clayey silt to silty clay till (BH18-1/SS5, BH18-2/SS6, BH18-7/SS12 & BH18-15/SS3) were conducted. The results are shown on Drawings 58 & 59, with the following fractions:

Clay:	16 to 37%
Silt:	33 to 48%
Sand:	15 to 49%
Gravel:	1 to 9%

Atterberg limits testing of two soil samples (BH18-2/SS6 & BH18-3/SS15) were conducted. The results are shown on the borehole logs and are summarized as follows:

Liquid limit (W_L):	19 to 20%
Plastic limit (W_P):	11 to 12%
Plasticity index (PI):	8

<u>Clayey Silt to Silty Clay:</u> Clayey silt to silty clay deposit of varying thicknesses were encountered in boreholes at varying depths of the boreholes. Clayey silt o silty clay was present in a firm to hard, generally in very stiff consistency, with measured SPT 'N' values ranging from 6 to more than 50 blows for 300 mm penetration.

Grain size analysis of one soil sample (BH18-6/SS12) was conducted. The results are shown on Drawings 58 with the following fractions:

Clay: 68%
Silt: 26%
Sand: 6%

Atterberg limits testing of same soil sample (BH18-6/SS12) was conducted. The results are shown on the borehole log and are summarized as follows:

Liquid limit (W_L): 48%
Plastic limit (W_P): 23%
Plasticity index (PI): 25

Sandy Silt to Silty Sand Till: Sandy silt to silty sand till deposits of varying thicknesses were encountered in boreholes at varying depths. Sandy silt to silty sand till was generally water bearing and present in a very dense state, with measured SPT 'N' values of over 50 blows per 300mm of spoon penetration. Occasional to frequent cobble/boulders should be expected within this deposit.

Cohesionless Soils (Sand & Gravel, Sand, Silty Sand, Sandy Silt, Silt): Cohesionless soils consisting of sand & gravel, sand, silty sand, sandy silt, silt were encountered in majority of boreholes, embedded within the glacial till, at varying depths. These cohesionless soils were water bearing and present in a compact to very dense state, as indicated by the measured SPT 'N' values of 22 to over 50 blows per 300mm of spoon penetration.

Grain size analyses of seven (7) soil sample (BH18-2/SS3, BH18-3/SS10, BH18-8/SS7, BH18-8/SS8, BH18-8/SS12, BH18-9/SS5 and BH18-40/SS7) were conducted. The results are shown on Drawings 58 and 59, with the following fractions: 2

Clay: 2 to 10%
Silt: 3 to 62%
Sand: 23 to 95%
Gravel: up to 4%

Shale Bedrock:

In Area 'B', shale bedrock Georgian Bay Formation was found at five (5) borehole locations (BH18-6, BH18-9, BH18-15, BH18-18 & BH18-20), at depths ranging from 9.1 to 48.1 below the existing grade, corresponding to elevations ranging from 34.7 to 71.3m. There is a bedrock valley in this area which was further confirmed by the geophysics testing. The approximate depth and elevation of the shale bedrock surface at the borehole locations are listed on Table 3.2 below.

Table 3.2: Approximate Depth and Elevation of Shale Bedrock Surface in Area 'B'

Borehole No.	Depth of Shale Bedrock Surface below Existing Ground (m)	Approximate Elevation of Shale Bedrock Surface (m)	Notes
BH18-6	48.1	34.7	Augered
BH18-7	>30.7		Not encountered at 30.7m
BH18-9	15.2	65.0	Augered
BH18-15	9.1	71.3	Augered
BH18-18	13.7	67.4	Augered
BH18-20	10.7	69.6	Augered
BH2*	**12.0**	**68.3**	**Augered**

*exp. boreholes

Detailed description of shale bedrock is provided in Section 3.4.

3.3 Soil Conditions in Area 'C'

Six boreholes (BH18-41 to BH18-45 and BH18-47) were drilled within Area 'C'. All boreholes were drilled to shale bedrock.

Topsoil & Fill Materials: A surficial topsoil layer, ranging in thickness from 150 to 400mm, was encountered at borehole locations. Fill materials were found in all boreholes, extending to depths varying from 0.8 to 3.4m below the existing grade. Fill material was heterogeneous and consisted of clayey silt, silty clay, sandy silt, and sand & gravel with trace inclusions of organics/topsoil, brick, concrete, asphalt and shale fragments. The SPT 'N' values recorded in fill materials ranged from 4 to 17 blows per 300mm of spoon penetration, indicating loose to compact/firm to stiff state of compactness.

Clayey Silt to Silty Clay Till: Below the fill materials or silt/sandy silt, clayey silt to silty clay till deposits were encountered in boreholes, overlying shale bedrock or silt/sandy silt. Clayey silt till was present in a stiff to hard consistency, with measured SPT 'N' values ranging from 13 to over 50 blows per 300mm of spoon penetration.

Cohesionless Soils (Silt, Sandy Silt to Silty Sand): Cohesionless soils consisting of silt and sandy silt to silty sand were encountered in all boreholes, except in BH18-43 and BH18-44 below the fill material or clayey silt till. These cohesionless soils were generally water bearing and present in a very loose to dense state, as indicated by the measured SPT 'N' values of 5 to 32 blows per 300mm of spoon penetration.

Shale Bedrock: In Area 'C', shale bedrock of Georgian Bay Formation was found at all borehole locations, at depths ranging from 3.1 to 7.6m below the existing grade, corresponding to elevations ranging from 75.7 to 80.4m. The approximate depth and elevation of the shale bedrock surface at the borehole locations are listed on Table 3.3 below.

Table 3.3: Approximate Depth and Elevation of Shale Bedrock Surface in Area 'C'

Borehole No.	Depth of Shale Bedrock Surface below Existing Ground (m)	Approximate Elevation of Shale Bedrock Surface (m)	Notes
BH18-41	7.6	75.7	Augered
BH18-42	6.1	79.6	Augered
BH18-43	3.1	80.4	Augered
BH18-44	3.8	80.1	Augered
BH18-45	3.8	79.2	CORED
BH18-47	6.1	76.3	Augered
BH7*	3.6	79.8	CORED

*exp. boreholes

Detailed description of shale bedrock is provided in Section 3.4.

3.4 Shale Bedrock (Georgian Bay Formation)

Shale bedrock belonging to Georgian Bay Formation was encountered at this site. Because of the method of drilling and sampling, the surface elevations of the bedrock can be different than indicated on the borehole logs (Drawings 2 to 46). Commonly the till overlying the shale contains slabs of limestone which would give a false indication of the bedrock level. Similarly, the depth of weathering cannot be determined accurately due to the presence of limestone layers.

Shale bedrock was cored at five (5) borehole locations (BH18-19, BH18-29, BH18-32, BH18-37 and BH18-45) to confirm the depth and quality of bedrock.

Photographs of the bedrock cores are also presented in **Appendix A** of the report. The descriptive terms used on the record of rock cores and throughout this report are explained on the "Explanation of Terms Used in the Bedrock Core Log" sheet in Appendix A. **Appendix A** also presents more details and general comments about the shale bedrock in Toronto area.

Total Core Recovery (TCR):

The total core recovery indicates the total length of rock core recovered, expressed as a percentage of the actual length of the core run. The total core recovery for the cored runs ranged from 67 to 100%. Generally, less core recovery was experienced only near the surface of the rock, where the formation is highly to moderately weathered and was almost full as depth increased.

Solid Core Recovery (SCR):

The solid core recovery is the total length of solid, full diameter rock core that was recovered, expressed as a percentage of the length of the core run. Solid core recovery ranged from 28 to 98%, and also appears to generally improve with depth. The SCR index was generally influenced by the orientations of the fractures. SCR was low when fractures oblique to the borehole axis were intercepted.

Rock Quality Designation (RQD):

The rock quality designation index is obtained by measuring the total length of recovered rock core pieces which are longer than 100mm and expressing their sum total length as a percentage of the length of the core run. RQD is a function of the frequency of joints, bedding plane partings and fractures in the rock cores. While the use of double tube core barrels provided reasonably good protection of the core during drilling and core retrieval, the fissile nature of the shale greatly influences the RQD values of the rock cores. Consequently, it is believed that the RQD values recorded underestimate the rock quality classification of the laminated fissile shale. On the basis of the recorded RQD values which range from nil to 97%, the rock quality is estimated to be "very poor" to "excellent", and the average value of more than 50% suggests a rock of generally "fair" quality.

Hard Layers:

Based on the visual examination of the rock cores, an attempt was made to identify and record the thickness and percentages of the relatively harder siltstone and limestone layers. The percentage of the "hard layers" per core run ranges between nil and 32%. The thickness of these layers varied but was generally varied from 50 to 380mm, but thicker layers have been observed to be as much as 750 to 900 mm at other sites. The layers are actually lenses and they can vary significantly in thickness over short distance. Encountering such thick layers should be anticipated. It is also common to encounter closely spaced groupings of thin strong limestone/siltstone layers which individually may only be 25 to 50mm thick but collectively can be 1m in thickness.

Fracture Index:

When logging the rock cores, the fracture Index (i.e. the number of fractures for each 0.3m length of core) was also recorded. The recorded values range between nil and greater than 25. Occasional fragmented and broken zones were encountered within the solid core. Bedrock was fragmented up to a depth of about 4.9m m in BH18-37, as indicated by nil solid core recovery in this zone. It was observed that the planes of weaknesses along which the cores tended to break, included planes of fissility and bedding, the contact surfaces between shale and siltstone or limestone bands and some oblique and subvertical joints.

Weathering:

In general, moderately weathered zone in the bedrock was limited to about 1.5 m from the bedrock surface. Below this, the degree of weathering ranged from slightly weathered to fresh. The siltstone and limestone layers were generally fresh with only slight surficial weathering on joint surfaces in the zone close to bedrock surface.

Methane Gas:

Methane gas under pressure was encountered in BH18-13 below a depth of about 11m, which is possibly just above the bedrock surface. The borehole was terminated at this depth and properly sealed. Although, during the rock coring there were no physical indications of the presence of gas in the coreholes, the Georgian Bay Formation is known to contain pockets of combustible gas. Therefore, appropriate care and monitoring are essential in all confined excavation work, particularly caissons and tunnels.

3.5 Groundwater Conditions

During drilling, short-term (un-stabilized) groundwater levels were found at depths ranging from 1.5 to 18.3m below the existing grade. Long-term (stabilized) groundwater levels in the monitoring wells were found at depths ranging from 2.0 to 8.0m below the existing grade, corresponding to Elevations of 74.9 to 80.2m. The results of the water level readings taken on Sept. 26, 2018 in the monitoring wells are summarized on Table 3.5.

Table 3.5: Groundwater Levels Observed in DS Monitoring Wells

Borehole	Surface Elevation (m)	Date of Observation	Water Level Depth (mbgs)	Water Level Elev. (m)	Notes
BH18-8	81.6	Sept. 26, 2018	2.8	78.8	Screened in overburden
BH18-12	83.2	Sept. 26, 2018	8.0	75.2	Screened in overburden
BH18-16	82.9	Sept. 26, 2018	2.7	80.2	Screened in overburden
BH18-19	80.7	Sept. 26, 2018	4.7	76.0	Screened in bedrock
BH18-29A*	77.5	Sept. 26, 2018	-	-	Screened in bedrock (Well not accessible)
BH18-32	77.2	Sept. 26, 2018	2.3	74.9	Screened in bedrock
BH18-37	81.3	Sept. 26, 2018	2.0	79.3	Screened in bedrock

It should be noted that the groundwater levels can vary and are subject to seasonal fluctuations in response to major weather events.

4. FOUNDATIONS

It is understood that the 71.6-hectare Lakeview Village will include 5,000 to 7,000 new homes in a variety of housing options, including townhouses, mid-rise and high-rise buildings. The proposed structures will entail up to 3-levels of basement. The finished basement floor elevations are not available to us at the time of writing this report. It is assumed that P1, P2 and P3 basement levels will approximately be at 3m, 6m and 9m depths respectively below the existing grade. Footings will be 1m to 2m below the lowest basement slab.

Based on the encountered bedrock depths, the subject site is sub-divided into three areas (Area A, Area B and Area C), as summarized in Sections 3.1 to 3.3. The foundation recommendations for these three areas are provided below:

4.1 Proposed Buildings in Area 'A'

Boreholes drilled within Area 'A' (BH18-14, BH18-19, BH18-21, BH18-25, BH27 to BH18-38 and BH18-49) reported shale bedrock at depths ranging from 1.5 to 6.3m below the existing grade, corresponding to elevations ranging from 71.2 to 80.1m. Due to the shallow bedrock depths, this area is considered more suitable for high-rise development with one or more basement levels.

Depending upon the finished lowest basement floor elevation, the proposed buildings can be supported by conventional spread and strip footings / mat foundations or short drilled piers founded on shale bedrock, at minimum 0.3 m below the shale bedrock surface, for a bearing pressure values of 2.5 MPa at the Serviceability Limit States (SLS), and for a factored geotechnical resistance of 3.75 MPa at the Ultimate Limit States (ULS).

The footings/piers founded on sound shale, at minimum 1.5 m below the shale surface can be designed for a bearing pressure of 5.0 MPa at SLS, and a factored geotechnical resistance of 7.5 MPa at ULS.

The depths and elevations of shale bedrock at the borehole locations in Area 'A' are provided in Table 3.1 of this report.

4.2 Proposed Buildings in Area 'B'

Twenty-two (22) boreholes (BH18-1 to BH18-13, BH18-15 to BH18-18, BH18-20, BH18-39, BH18-40, BH18-46 & BH18-48) were drilled within Area 'B', to depths ranging from 11.1 to 48.3m.

There is a bedrock valley within Area 'B', with bedrock depths ranging from 9.1 to 48.1m below the existing grade, corresponding to elevations ranging from 34.7 to 71.3m. Therefore, this area is more suitable for low-rise to mid-rise development to be supported by shallow foundations (footings/raft) founded on undisturbed native soil.

Depending upon the location of the building and number of basement levels, it may be possible to support the proposed development in this area on footings or deep foundations such as caissons founded on bedrock.

Additional boreholes will be required to further delineate and confirm the bedrock depths if foundations are to be supported on bedrock.

Footings and/or raft founded on undisturbed native soils can be designed for a bearing capacity values of 300 to 500 kPa at SLS (serviceability limit states) and for a factored geotechnical resistance of 450 to 750 kPa at ULS (ultimate limit states). The bearing values and the corresponding founding elevations at the borehole locations are summarized on Table 4.2.

Table 4.2: Bearing Values and Founding Levels of Spread Footings

BH No.	Material	Bearing Capacity at SLS (kPa)	Factored Geotechnical Resistance at ULS (kPa)	Minimum Depth below Existing Ground (m)	Founding Level At or Below Elevation (m)	Notes/WL Elevation (m)
BH18-1	Silty clay Till/ Sandy Silt Till	500	750	3.4	79.4	during drilling WL at 76.7m
BH18-2	Clayey Silt Till	500	750	2.6	81.2	
BH18-3	Clayey Silt Till/ sandy silt to silty sand	500	750	1.0	80.4	during drilling WL at 76.8m
BH18-4	Sandy silt to silty sand	400	600	2.1	79.0	during drilling WL at 75.1m
BH18-5	Clayey Silt Till	500	750	2.6	81.4	
BH18-6	Clayey Silt Till	500	750	1.8	81.0	
BH18-7	Clayey Silt Till	500	750	1.5	80.6	
BH18-8	Clayey Silt/sandy silt	400	600	1.1	80.5	WL at 78.8m on Sept. 26/18
BH18-9	Clayey Silt/sandy silt	300 500	450 750	2.3 6.1	77.9 74.1	during drilling WL at 77.1m
BH18-10	Clayey Silt Till/clayey silt/sandy silt till	500	750	1.8	80.5	during drilling WL at 76.5m
BH18-11	Clayey Silt Till Silty Clay	500 300	750 450	3.4 13.0	81.7 72.1	
BH18-12	Clayey Silt Till Clayey Silt	500 300	750 450	3.0 8.0	80.2 75.2	WL at 75.2m on Sept. 26/18
BH18-13	Clayey Silt Till/Clayey Silt/Sandy silt to silty sand till	300 500	450 750	1.8 4.6	78.4 75.6	during drilling WL at 75.6m; methane gas encountered at 11m
BH18-15	Silt/silty sand/silty clay	500	750	3.1	77.3	
BH18-16	Clayey silt till	500	750	2.6	80.3	WL at 80.2m on Sept. 26/18
BH18-17	Clayey Silt Till/Clayey Silt	500	750	1.8	78.5	
BH18-18	Clayey silt till Silty clay/silt	300	450	2.1	79.0	
BH18-20	Clayey silt till/silty clay/silt to clayey silt	500	750	1.0	79.3	during drilling WL at 77.2m
BH18-39	Sandy silt till/silty clay till	500	750	3.4	78.4	
BH18-40	Sandy Silt to silty sand/silty clay till	500	750	2.5	79.3	during drilling WL at 79.5m
BH18-46	Silty clay till	500	750	1.1	80.3	
BH18-48	Clayey silt till/sandy silt till	500	750	1.8	79.3	during drilling WL at 78.0m

4.3 Proposed Buildings in Area 'C'

Boreholes drilled in Area 'C' (BH18-41 to BH18-45 and BH18-47) reported shale bedrock depths ranging from 3.1 to 7.6m below the existing grade, corresponding to elevations ranging from 75.7 to 80.4m. Due to the shallow bedrock depths, this area is also suitable for high-rise development with one or more basement levels.

Depending upon the finished lowest basement floor elevation, the proposed buildings can be supported by conventional spread and strip footings / mat foundations or short drilled piers founded on shale bedrock, at minimum 0.3 m below the shale bedrock surface, for a bearing pressure values of 2.5 MPa at the Serviceability Limit States (SLS), and for a factored geotechnical resistance of 3.75 MPa at the Ultimate Limit States (ULS).

The footings/piers founded on sound shale, at minimum 1.5 m below the shale surface can be designed for a bearing pressure of 5.0 MPa at SLS, and a factored geotechnical resistance of 7.5 MPa at ULS.

The depths and elevations of shale bedrock at the borehole locations are provided in Table 3.3 of this report.

Footings and/or raft founded on undisturbed native soils can be designed for a bearing capacity values of 300 to 500 kPa at SLS (serviceability limit states) and for a factored geotechnical resistance of 450 to 750 kPa at ULS (ultimate limit states). The bearing values and the corresponding founding elevations at the borehole locations are summarized on Table 4.3.

Table 4.3: Bearing Values and Founding Levels of Spread Footings

BH No.	Material	Bearing Capacity at SLS (kPa)	Factored Geotechnical Resistance at ULS (kPa)	Minimum Depth below Existing Ground (m)	Founding Level At or Below Elevation (m)	Notes/WL Elevation (m)
BH18-41	Silty clay Till/ silt	500	750	2.6	80.7	during drilling WL at 78.7m
BH18-42	Clayey Silt Till	500	750	4.6	81.1	
BH18-43	Clayey Silt Till	500	750	1.1	82.4	
BH18-44	Clayey Silt Till	300	450	1.5	82.4	
BH18-45	Silty Clay Till	400	600	2.6	80.7	
BH18-47	Clayey Silt Till / Silt/sandy silt to silty sand	300	450	1.0	81.4	during drilling WL at 77.8m

4.4 Other Comments on Foundations

Foundations designed to the specified bearing capacity at the serviceability limit states (SLS) are expected to settle less than 25 mm total and 19 mm differential.

Where it is necessary to place footings at different levels in soil, the upper footing must be founded below an imaginary 10 horizontal to 7 vertical line drawn up from the base of the lower footing. Where it is necessary to place footings at different levels on bedrock, the upper footing must be founded below an imaginary 1 horizontal to 1 vertical line (1H:1V in bedrock) drawn up from the base of the lower footing. The lower footing must be installed first to help minimize the risk of undermining the upper footing.

All foundation bases must be inspected by this office prior to pouring concrete.

The shale bedrock weathers rapidly between wetting and drying cycles. In view of this, it is suggested that a lean concrete mat slab be placed immediately after the excavation is complete to keep the shale intact, unless the footings are cast immediately after excavating.

The inspected and approved footing base should be covered with 50 mm thick mud slab immediately in order to avoid disturbance of the founding soil due to construction activity and weathering /drying.

It should be noted that the recommended bearing capacities have been calculated by DS Consultants Limited from the borehole information for the preliminary design stage only. Additional boreholes may be required when the final building plans are available. The investigation and comments are necessarily on-going as new information of the underground conditions becomes available. For example, more specific information is available with respect to conditions between boreholes when foundation construction is underway. The interpretation between boreholes and the recommendations of this report must therefore be checked through field inspections provided by DS Consultants Limited to validate the information for use during the construction stage.

5. FROST PROTECTION

All foundations exposed to seasonal freezing conditions must have at least 1.2m of soil cover for frost protection.

There is no official rule governing the required founding depth for footings below unheated basement floors. Certainly, it will not be greater than the 1.2 m required in Southern Ontario for exterior footings. Un-monitored experience indicates that a shallower depth ranging from 0.82 to 0.9 m for interior column footings and 0.4 m for wall footings has been successful where 2 or more basement levels apply. The 0.82 m depth is believed to be close to the minimum structural requirement for interior column footings. Adjacent to air shafts and entrance and exit doors, a footing depth of 1.2 m below floor level is required or, alternatively, insulation protection must be provided.

It is also emphasized that underfloor drainage and/or an adequate free draining gravel base is required to minimize the risk of floor dampness. Floor dampness could lead to temporary icing and the risk of accidents.

6. FLOOR SLAB AND PERMANENT DRAINAGE

The floor slab can be supported on grade provided all existing fill material and disturbed soils are removed and the base thoroughly proof rolled. The fill required to raise the grade can consist of inorganic soil, placed in shallow lifts and compacted to 98 percent of Standard Proctor Maximum Dry Density (SPMDD). A moisture barrier consisting of at least 200 mm of 19 mm clear crushed stone should be installed under the floor slab.

In the area where shale bedrock is encountered at floor slab level, the floor slab can be cast as slab-on-grade, provided a 200 mm layer of clear crushed stone (19 mm maximum size) is placed between the underside of the floor slab and the exposed bedrock surface.

A perimeter and underfloor drainage system will be required for buildings with basements. Typical drainage and backfill recommendations are illustrated on Drawings 60 to 62 for the open cut and shored excavation system.

7. ELEVATOR AND SUMP PITS

If elevator/sump pits are to be installed in cohesionless soils (sandy silt, sand, silt) below the water table, drainage systems at the base level of the pits are not recommended, due to the concern of loss of fines. In this case, the pits can be designed as water-tight structures, and water pressure on the pit walls and the pit base slab should be considered.

8. EARTH, ROCK AND WATER PRESSURES

The design of basement walls can incorporate the conventional design in the overburden using the earth pressure coefficient K_1=0.40. In the rock, the earth pressure coefficient K can be reduced to K_2=0.20.

The lateral earth/rock pressure acting at any depth on basement walls can be calculated as follows:

In soil: $p = K_1 (\gamma_1 h_1 + q) + p_w$

In rock: $p = K_2 (\gamma_1 H_1 + q + \gamma_2 h_2) + p_w$

where p = lateral earth and water pressure in kPa acting at depth h_1 or h_2

K_1, K_2 = earth pressure coefficients, K_1=0.40 for overburden soil; K_2=0.20 for rock

γ_1 = unit weight of overburden soil, assuming 20.5 kN/m^3 above the water table and 11 kN/m^3 below the water table

γ_2 = unit weight of rock below water, assuming 15 kN/m^3

h_1 = Depth in overburden soil, below ground surface

H_1 = thickness of soil above rock

h_2 = Depth in rock, below rock surface

q = value of surcharge in kPa

p_w = hydrostatic water pressure

When the foundation wall is poured against the caisson wall, the foundation wall as well as the caisson wall should be designed for hydrostatic pressure, even though a drainage board is provided between the basement wall and the caisson wall.

9. EXCAVATIONS AND GROUNDWATER CONTROL

Excavations can be carried out with heavy hydraulic backhoe. Long-term (stabilized) groundwater levels in the monitoring wells were found at depths ranging from 2.0 to 8.0m below the existing grade, corresponding to Elevations of 74.9 to 80.2m. Positive dewatering will be required prior to any excavation in water bearing cohesionless soils below the groundwater table, otherwise it will result in an unstable base and flowing sides. A contractor specializing in dewatering should be retained to design the dewatering systems for excavations below the groundwater table.

Further comments on groundwater control during construction and permanent drainage are provided in our preliminary hydrogeology report.

It should be noted that the glacial till soils may contain boulders. Large obstructions in the fill material are anticipated. Provisions must be made in the excavation contract for the removal of boulders in the till and large obstructions in the fill material.

Excavation of the shale can be carried out using heaviest available single tooth ripper equipment. The limestone beds are present and may overly the shale bedrock surface at some locations. It may be necessary at some locations to utilize jackhammer type equipment to “open” the limestone layers for the ripper.

All excavations must be carried out in accordance with the most recent Occupational Health and Safety Act (OHSA). In accordance with OHSA, the fill material can be classified as Type 3 soil above the groundwater table. The very stiff to hard clayey soils can be classified as Type 2 Soil above the groundwater table and as Type 3 below the groundwater table. The cohesionless soils of sand and silty sand can be classified as Type 3 Soil above the groundwater table and Type 4 soil below the groundwater table.

The native soils free from topsoil and organics can be used as general construction backfill, provided its moisture content is within 2 percent of the optimum moisture content. Loose lifts of soil, which are to be compacted, should not exceed 200 mm. Depending on the time of construction and weather, some excavated material may be too wet to compact and will require aeration prior to its use.

Imported granular fill, which can be compacted with hand held equipment, should be used in confined areas. The excavated soils are not considered to be free draining. Where free draining backfill is required, imported granular fill such as OPSS Granular B should be used.

It should be noted that the excavated soils are subject to moisture content increase during wet weather which would make these materials too wet for adequate compaction. Stockpiles should be compacted at the surface or be covered with tarpaulins to minimize moisture uptake.

10. EARTHQUAKE CONSIDERATIONS

Based on the existing borehole information and according to Table 4.1.8.4.A of OBC 2012, the subject site for the proposed development can be classified as “Class C” for seismic site response.

In Area ‘A’ and Area ‘B’, for the proposed buildings with one or more levels of basement, founded on sound shale bedrock, it may be possible to classify the site as “Class B” for seismic site response. This should be further confirmed during the detail design stage.

11. ROADS

The proposed development will be serviced by a network of roads.

11.1 Pavement Thickness

The investigation has shown that the predominant subgrade soil, after stripping the topsoil and any other organic and otherwise unsuitable subsoil, will generally consist of clayey silt till, clayey silt, clayey silt till shale complex and shale bedrock.

Based on the above and assuming that traffic usage will be residential/commercial collector road, the following minimum pavement thickness is recommended for roads to be constructed within the development:

50 mm HL3 Asphaltic Concrete

60 mm HL8 Asphaltic Concrete

150 mm Granular ‘A’

400 mm Granular ‘B’

These values may need to be adjusted according to the City of Mississauga Standards. The site subgrade and weather conditions (i.e. if wet) at the time of construction may necessitate the placement of thicker granular sub-base layer in order to facilitate the construction. Furthermore, heavy construction equipment may have to be kept off the newly constructed roads before the placement of asphalt and/or immediately thereafter, to avoid damaging the weak subgrade by heavy truck traffic.

11.2 Stripping, Sub-excavation and Grading

The site should be stripped of all topsoil and any organic, weathered or otherwise unsuitable soils to the full depth of the roads, both in cut and fill areas. Following stripping, the site should be graded to the subgrade level and approved. The subgrade should then be proof-rolled, in the presence of the Geotechnical Engineer, by at least several passes of a heavy compactor having a rated capacity of at least 8 tonnes. Any soft spots thus exposed should be removed and replaced by select fill material, similar to the existing subgrade soil and approved by the Geotechnical Engineer. The subgrade should then be re-compacted from the surface to at least 98% of its Standard Proctor Maximum Dry Density (SPMDD). The final subgrade should be cambered or otherwise shaped properly to facilitate rapid drainage and to prevent the formation of local depressions in which water could accumulate.

Owing to the clayey (i.e. impervious) nature of some subsoils at the site, proper cambering and allowing the water to escape towards the sides (where it can be removed by means of subdrains) is considered to be beneficial for this project. Otherwise, any water collected in the granular sub-base materials could be trapped thus causing problems due to softened subgrade, differential frost heave, etc. For the same reason damaging the subgrade during and after placement of the granular materials by heavy construction traffic should be avoided. If the moisture content of the local material cannot be maintained at ±2% of the optimum moisture content, imported granular material may need to be used.

Any fill required for re-grading the site or backfill should be select, clean material, free of topsoil, organic or other foreign and unsuitable matter. The fill should be placed in thin layers and compacted to at least 95% of its SPMDD. The degree of compaction should be increased to 98% within the top 1.0 m of the subgrade, or as per City Standards. The compaction of the new fill should be checked by frequent field density tests.

11.3 Construction

Once the subgrade has been inspected and approved, the granular base and sub-base course materials should be placed in layers not exceeding 200 mm (uncompacted thickness) and should be compacted to at least 100% of their respective SPMDD. The grading of the material should conform to current OPS Specifications.

The placing, spreading and rolling of the asphalt should be in accordance with OPS Specifications or, as required by the local authorities.

Frequent field density tests should be carried out on both the asphalt and granular base and sub-base materials to ensure that the required degree of compaction is achieved.

11.4 Drainage

The City of Mississauga may require the installation of full-length subdrains on all roads. The subdrains should be properly filtered to prevent the loss of (and clogging by) soil fines.

All paved surfaces should be sloped to provide satisfactory drainage towards catch-basins. As discussed in Section 11.2, by means of good planning any water trapped in the granular sub-base materials should be drained rapidly towards subdrains or other interceptors.

12. UNDERGROUND UTILITIES

It is understood that underground services (watermains, storm and sanitary sewer) will be installed at the site to service the proposed development. Based on the preliminary servicing plans prepared by Urbantech, invert levels of the proposed utilities will be about 2 to 6m below the existing grade, with sanitary sewer at the deepest point at about 6m below the existing grade.

Trenches will be dug through fill materials followed by native soils of cohesive and cohesionless nature. Long-term (stabilized) groundwater levels in the monitoring wells were found at depths ranging from 2.0 to 8.0m below the existing grade, corresponding to Elevations of 74.9 to 80.2m. Positive dewatering will be required prior to any excavation in water bearing cohesionless soils below the groundwater table, otherwise it will result in an unstable base and flowing sides. Water table must be lowered to at least 1m below the lowest excavation level.

Detailed comments on excavation and groundwater control are provided in Section 9.

The undisturbed native soils encountered in the boreholes will provide adequate support for the service pipes and allow the use of Class B type bedding. The recommended minimum thickness of granular bedding below the invert of the pipes is 150 mm. The thickness of the bedding may, however, have to be increased depending on the pipe diameter or in accordance with local standards or if wet or weak subgrade conditions are encountered, especially when the soil at the trench base level consists of wet, dilatant silt.

The bedding material should conform to City of Mississauga bedding stone gradation requirements. Where the bedding falls below the anticipated water table, the bedding stone must be surrounded with a geotextile filter cloth.

For deep trenches, i.e. more than 2.0 m below the shale surface, a minimum 50 mm thick polystyrene etc. layer will be required at both sides of the pipe to avoid rock squeezing. The polystyrene layer should extend vertically to at least 0.3 m above the pipe. The rock trench should be wide enough so that at each side, the horizontal distance between the pipe side and the cut rock surface is at least 0.3 m.

The select inorganic fill materials or native soils free from topsoil / organics can be used as general construction backfill, provided their moisture contents at the time of construction are within 2% of their optimum moisture content.

In any case the degree of compaction of the trench backfill should be at least 95% of the material's Standard Proctor Maximum Dry Density (SPMDD). This value should be increased to at least 98% within 2 m of the road surface. The granular pavement sub-base and base materials should be compacted to at least 100% of their respective SPMDD.

13. GENERAL COMMENTS AND LIMITATIONS OF REPORT

This geotechnical report is preliminary, prepared based on the conceptual design plans. Additional boreholes will be required, once the detailed development plans are available to confirm the findings and recommendations provided in this report.

This report is intended solely for the client named. The material in it reflects our best judgment in light of the information available to DS Consultants Limited at the time of preparation. Unless otherwise agreed in writing by DS Consultants Limited, it shall not be used to express or imply warranty as to the fitness of the property for a particular purpose. No portion of this report may be used as a separate entity, it is written to be read in its entirety.

The conclusions and recommendations given in this report are based on information determined at the borehole locations. The information contained herein in no way reflects on the environment aspects of the project, unless otherwise stated. Subsurface and groundwater conditions between and beyond the boreholes may differ from those encountered at the borehole locations, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the site investigation. The benchmark and elevations used in this report are primarily to establish relative elevation differences between the borehole locations and should not be used for other purposes, such as grading, excavating, planning, development, etc.

DS Consultants Limited should be retained for a general review of the final design and specifications to verify that this report has been properly interpreted and implemented. If not accorded the privilege of making this review, DS Consultants Limited will assume no responsibility for interpretation of the recommendations in the report.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. DS Consultants Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

We accept no responsibility for any decisions made or actions taken as a result of this report unless we are specifically advised of and participate in such action, in which case our responsibility will be as agreed to at that time.

We trust that the information contained in this report is satisfactory. Should you have any questions, please do not hesitate to contact this office.

Yours Very Truly,
DS CONSULTANTS LTD.

Alka Sangar, M.Eng., P.Eng.

Shabbir Bandukwala, M.Eng., P.Eng.

Drawings

J:\-GIS\18-519-10 800 Hydro Road, Mississuaga\1-QGIS\Geotechnical\Figure 1- BH Location Plan.qgs

100 0 100 200 m

Image Source: Imagery @2018 Google

Legend:

Boreholes

- Monitoring Well
- Borehole
- Area 'A' Bedrock depth 1.5 to 4.6m
- Area 'B' Bedrock depth 9.1 to 48.1m
- Area 'C' Bedrock depth 3.1 to 76m

DS CONSULTANTS LTD. 6221 Highway 7, Unit 16 Vaughan, Ontario, L4H 0K8 Telephone: (905) 264-9393 www.dsconsultants.ca	Project: GEOTECHNICAL INVESTIGATION		
	Title: **BOREHOLE LOCATION PLAN**		
Client: LAKEVIEW COMMUNITY PARTNERS LIMITED	Approved By: N.W	Drawn By: S.Y	Date: October 2018
	Scale: As Shown	Project No.: 18-519-10	Figure No.: 1

Appendix B – Storm Servicing Design Calculations

Storm Sewer Design Sheet (Urbantech)

LAKEVIEW
COMMUNITY PARTNERS LIMITED

urbantech

STORM SEWER DESIGN SHEET
10 Year Storm
Lakeview Lands (OPG)
City of Mississauga

PROJECT DETAILS	
Project No:	17-549
Date:	13-Feb-19
Designed by:	TL
Checked by:	JO

DESIGN CRITERIA				
Min. Diameter =	300	mm	Rainfall Intensity =	A / (Tc+B)^c
Mannings 'n'=	0.013			
Starting Tc =	10	min	A =	1010
			B =	4.6
Factor of Safety =	20	%	c =	0.78
				NOMINAL PIPE SIZE USED

STREET	FROM MH	TO MH	AREA (ha)	RUNOFF COEFFICIENT "R"	'AR'	ACCUM. 'AR'	RAINFALL INTENSITY (mm/hr)	FLOW (m3/s)	CONSTANT FLOW (m3/s)	ACCUM. CONSTANT FLOW (m3/s)	TOTAL FLOW (m3/s)	LENGTH (m)	SLOPE (%)	PIPE DIAMETER (mm)	FULL FLOW CAPACITY (m3/s)	FULL FLOW VELOCITY (m/s)	INITIAL Tc (min)	TIME OF CONCENTRATION (min)	ACC. TIME OF CONCENTRATION (min)	PERCENT FULL (%)
BLOCK 4	101	102	1.73	0.75	1.30	1.30	124.8	0.450			0.450	10.0	0.50	675	0.594	1.66	10.00	0.10	10.10	76%
Street E	102	103	0.27	0.90	0.24	1.54	124.1	0.531			0.531	40.0	0.50	750	0.787	1.78	10.10	0.37	10.47	67%
Street H	103	104	0.45	0.90	0.41	1.95	121.7	0.658			0.658	49.0	0.50	825	1.015	1.90	10.47	0.43	10.90	65%
Street H	104	105				1.95	119.1	0.643			0.643	108.0	0.50	825	1.015	1.90	10.90	0.95	11.85	63%
BLOCK 5	106	107	1.95	0.75	1.46	1.46	124.8	0.507			0.507	15.0	0.50	750	0.787	1.78	10.00	0.14	10.14	64%
Street B	107	105	0.32	0.90	0.29	1.75	123.8	0.602			0.602	51.0	0.50	750	0.787	1.78	10.14	0.48	10.62	76%
BLOCK 3	108	109	2.00	0.75	1.50	1.50	124.8	0.520			0.520	14.0	0.50	750	0.787	1.78	10.00	0.13	10.13	66%
Street B	109	105	0.21	0.90	0.19	1.69	123.9	0.581			0.581	33.0	0.50	750	0.787	1.78	10.13	0.31	10.44	74%
Street H	105	110	0.43	0.90	0.39	5.77	113.7	1.823			1.823	57.0	0.40	1200	2.466	2.18	11.85	0.44	12.29	74%
Street H	110	111				5.77	111.4	1.786			1.786	120.0	0.40	1200	2.466	2.18	12.29	0.92	13.21	72%
BLOCK 6	112	113	2.22	0.75	1.67	1.67	124.8	0.577			0.577	15.0	0.50	750	0.787	1.78	10.00	0.14	10.14	73%
BLOCK 15/19	114	113	1.17	0.75	0.88	0.88	124.8	0.304			0.304	9.0	0.50	600	0.434	1.54	10.00	0.10	10.10	70%
Street A	113	111	0.40	0.90	0.36	2.90	123.8	0.999			0.999	80.0	0.25	1050	1.365	1.58	10.14	0.85	10.99	73%
Street H	115	111	0.18	0.90	0.16	0.16	124.8	0.056			0.056	49.0	1.00	300	0.097	1.37	10.00	0.60	10.60	58%
Street A	111	116	0.56	0.90	0.50	9.34	106.9	2.773			2.773	58.0	0.25	1200x1800 (BOX)	4.204	1.95	13.21	0.50	13.70	66%
BLOCK 7/23	117	116	3.13	0.75	2.35	2.35	124.8	0.814			0.814	17.0	0.50	825	1.015	1.90	10.00	0.15	10.15	80%
BLOCK 18/28	118	116	0.64	0.75	0.48	0.48	124.8	0.166			0.166	13.0	0.50	450	0.202	1.27	10.00	0.17	10.17	83%
Street A	116	119				12.17	104.6	3.536			3.536	46.0	0.25	1200x1800 (BOX)	4.204	1.95	13.70	0.39	14.10	84%
Street J	120	119	0.15	0.90	0.14	0.14	124.8	0.047			0.047	27.0	0.50	300	0.068	0.97	10.00	0.47	10.47	68%
Street A	119	121	1.88	0.30	0.56	12.87	102.9	3.677			3.677	122.0	0.25	1200x1800 (BOX)	4.204	1.95	14.10	1.04	15.14	87%

urbantech

STORM SEWER DESIGN SHEET

10 Year Storm

Lakeview Lands (OPG)

City of Mississauga

PROJECT DETAILS

Project No: 17-549
Date: 13-Feb-19
Designed by: TL
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Min. Diameter =	300	mm	Rainfall Intensity =	$\frac{A}{(Tc+B)^c}$
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Starting Tc =	10	min	A =	1010
			B =	4.6
Factor of Safety =	20	%	c =	0.78

NOMINAL PIPE SIZE USED

STREET	FROM MH	TO MH	AREA (ha)	RUNOFF COEFFICIENT "R"	'AR'	ACCUM. 'AR'	RAINFALL INTENSITY (mm/hr)	FLOW (m3/s)	CONSTANT FLOW (m3/s)	ACCUM. CONSTANT FLOW (m3/s)	TOTAL FLOW (m3/s)	LENGTH (m)	SLOPE (%)	PIPE DIAMETER (mm)	FULL FLOW CAPACITY (m3/s)	FULL FLOW VELOCITY (m/s)	INITIAL Tc (min)	TIME OF CONCENTRATION (min)	ACC. TIME OF CONCENTRATION (min)	PERCENT FULL (%)
Street G	122	123	0.75	0.75	0.56	0.56	124.8	0.195			0.195	46.0	0.50	525	0.304	1.40	10.00	0.55	10.55	64%
Street G	123	124				0.56	121.3	0.189			0.189	42.0	0.50	525	0.304	1.40	10.55	0.50	11.04	62%
Street G	124	125	1.09	0.30	0.33	0.89	118.2	0.292			0.292	104.0	0.50	600	0.434	1.54	11.04	1.13	12.17	67%
Street B	126	125	0.23	0.90	0.21	0.21	124.8	0.072			0.072	70.0	1.00	300	0.097	1.37	10.00	0.85	10.85	74%
Street G	125	127	0.34	0.90	0.31	1.40	112.0	0.436			0.436	91.0	0.50	675	0.594	1.66	12.17	0.91	13.09	73%
Street G	127	121				1.40	107.4	0.419			0.419	86.0	0.50	675	0.594	1.66	13.09	0.86	13.95	70%
Street A	121	128	0.35	0.90	0.32	14.58	98.6	3.995			3.995	144.0	0.25	1200x2400 (BOX)	6.013	2.09	15.14	1.15	16.29	66%
Street F	129	130	1.07	0.75	0.80	0.80	124.8	0.278			0.278	47.0	1.25	525	0.481	2.22	10.00	0.35	10.35	58%
Street F	130	131	0.23	0.90	0.21	1.01	122.5	0.343			0.343	90.0	1.25	525	0.481	2.22	10.35	0.68	11.03	71%
BLOCK 2	132	131	1.56	0.75	1.17	1.17	124.8	0.406			0.406	13.0	0.50	675	0.594	1.66	10.00	0.13	10.13	68%
BLOCK 1	133	131	1.33	0.75	1.00	1.00	124.8	0.346			0.346	8.0	0.50	600	0.434	1.54	10.00	0.09	10.09	80%
Street F	131	134				3.18	118.3	1.044			1.044	38.0	0.50	900	1.280	2.01	11.03	0.31	11.34	82%
Street B	135	134	0.27	0.90	0.24	0.24	124.8	0.084			0.084	74.0	0.50	375	0.124	1.12	10.00	1.10	11.10	68%
Street F	134	136	0.30	0.90	0.27	3.69	116.5	1.194			1.194	57.0	1.00	900	1.810	2.85	11.34	0.33	11.68	66%
Street F	136	137				3.69	114.6	1.175			1.175	60.0	1.00	900	1.810	2.85	11.68	0.35	12.03	65%
BLOCK 8	138	137	1.83	0.75	1.37	1.37	124.8	0.476			0.476	15.0	0.50	675	0.594	1.66	10.00	0.15	10.15	80%
Street F	137	128				5.06	112.7	1.585			1.585	60.0	0.50	1050	1.931	2.23	12.03	0.45	12.48	82%
Street C	139	140	0.65	0.90	0.59	0.59	124.8	0.203			0.203	114.0	0.50	525	0.304	1.40	10.00	1.35	11.35	67%
Street C	140	141				0.59	116.4	0.189			0.189	120.0	0.50	525	0.304	1.40	11.35	1.42	12.78	62%
Street C	141	142				0.59	108.9	0.177			0.177	77.0	0.50	525	0.304	1.40	12.78	0.91	13.69	58%
Street K	143	142	0.26	0.90	0.23	0.23	124.8	0.081			0.081	90.0	0.50	375	0.124	1.12	10.00	1.34	11.34	65%

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STORM SEWER DESIGN SHEET

10 Year Storm

Lakeview Lands (OPG)

City of Mississauga

PROJECT DETAILS

Project No: 17-549
Date: 13-Feb-19
Designed by: TL
Checked by: JO

DESIGN CRITERIA

Min. Diameter =	300	mm	Rainfall Intensity =	$\frac{A}{(Tc+B)^{c}}$
Mannings 'n'=	0.013			
Starting Tc =	10	min	A =	1010
			B =	4.6
Factor of Safety =	20	%	c =	0.78

NOMINAL PIPE SIZE USED

STREET	FROM MH	TO MH	AREA (ha)	RUNOFF COEFFICIENT "R"	'AR'	ACCUM. 'AR'	RAINFALL INTENSITY (mm/hr)	FLOW (m3/s)	CONSTANT FLOW (m3/s)	ACCUM. CONSTANT FLOW (m3/s)	TOTAL FLOW (m3/s)	LENGTH (m)	SLOPE (%)	PIPE DIAMETER (mm)	FULL FLOW CAPACITY (m3/s)	FULL FLOW VELOCITY (m/s)	INITIAL Tc (min)	TIME OF CONCENTRATION (min)	ACC. TIME OF CONCENTRATION (min)	PERCENT FULL (%)
Street F	142	128	0.18	0.90	0.16	0.98	104.7	0.285			0.285	100.0	0.25	675	0.420	1.17	13.69	1.42	15.11	68%
Street A	128	144				20.63	94.4	5.407			5.407	38.0	0.25	1200x3000 (BOX)	7.871	2.19	16.29	0.29	16.58	69%
BLOCK 9	145	144	1.83	0.75	1.37	1.37	124.8	0.476			0.476	17.0	0.50	675	0.594	1.66	10.00	0.17	10.17	80%
Street A	144	146	0.37	0.90	0.33	22.33	93.3	5.791			5.791	103.0	0.25	1200x3000 (BOX)	7.871	2.19	16.58	0.79	17.37	74%
Lakefront Prom.	147	148	0.29	0.90	0.26	0.26	124.8	0.090	5.160	5.160	5.250	115.0	0.25	1800	5.747	2.26	10.00	0.85	10.85	91%
Street B	149	148	0.27	0.90	0.24	0.24	124.8	0.084			0.084	73.0	0.50	375	0.124	1.12	10.00	1.08	11.08	68%
Lakefront Prom.	148	150	0.43	0.90	0.39	0.89	118.0	0.292		5.160	5.452	92.0	0.20	1200x3000 (BOX)	7.040	1.96	11.08	0.78	11.87	77%
Lakefront Prom.	150	146				0.89	113.6	0.281		5.160	5.441	86.0	0.20	1200x3000 (BOX)	7.040	1.96	11.87	0.73	12.60	77%
	146	HW 1	0.39	0.90	0.35	23.58	90.7	5.942		5.160	11.102	83.0	0.20	1500x3600 (BOX)	12.157	2.25	17.37	0.61	17.98	91%
Street J	201	202	0.26	0.90	0.23	0.23	124.8	0.081			0.081	100.0	0.50	375	0.124	1.12	10.00	1.48	11.48	65%
Street D		202	0.81	0.30	0.24	0.24														
Street D	202	203	0.52	0.90	0.47	0.95	115.7	0.304			0.304	76.0	0.30	675	0.460	1.29	11.48	0.98	12.47	66%
BLOCK 11	204	203	1.30	0.75	0.98	0.98	124.8	0.338			0.338	15.0	0.50	600	0.434	1.54	10.00	0.16	10.16	78%
Street D	203	205	0.41	0.30	0.12	2.04	110.5	0.627			0.627	72.4	0.30	825	0.786	1.47	12.47	0.82	13.29	80%
Street D	205	206				2.04	106.5	0.604			0.604	80.7	0.30	825	0.786	1.47	13.29	0.91	14.20	77%
	206	207				2.04	102.4	0.581			0.581	11.7	0.30	825	0.786	1.47	14.20	0.13	14.34	74%
Street F	208	209	0.30	0.90	0.27	0.27	124.8	0.094			0.094	36.2	0.50	375	0.124	1.12	10.00	0.54	10.54	75%
BLOCK 10	210	209	1.64	0.75	1.23	1.23	124.8	0.426			0.426	11.5	0.50	675	0.594	1.66	10.00	0.12	10.12	72%
Street F	209	211				1.50	121.3	0.505			0.505	51.5	0.30	750	0.610	1.38	10.54	0.62	11.16	83%
Street K	212	213	0.50	0.90	0.45	0.45	124.8	0.156			0.156	69.0	0.50	450	0.202	1.27	10.00	0.91	10.91	77%
Street K	213	214	1.45	0.30	0.44	0.89	119.0	0.293			0.293	27.0	0.50	600	0.434	1.54	10.91	0.29	11.20	67%

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P:\Projects\17-549-OPG Lakeview\Reports\FSR\Design Sheets\17-549 STM (10 yr):STM (10yr)

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STORM SEWER DESIGN SHEET

10 Year Storm

Lakeview Lands (OPG)

City of Mississauga

PROJECT DETAILS

Project No: 17-549
Date: 13-Feb-19
Designed by: TL
Checked by: JO

DESIGN CRITERIA

Min. Diameter =	300	mm	Rainfall Intensity =	A / (Tc+B)^c
Mannings 'n'=	0.013			
Starting Tc =	10	min	A =	1010
			B =	4.6
Factor of Safety =	20	%	c =	0.78

NOMINAL PIPE SIZE USED

STREET	FROM MH	TO MH	AREA (ha)	RUNOFF COEFFICIENT "R"	'AR'	ACCUM. 'AR'	RAINFALL INTENSITY (mm/hr)	FLOW (m3/s)	CONSTANT FLOW (m3/s)	ACCUM. CONSTANT FLOW (m3/s)	TOTAL FLOW (m3/s)	LENGTH (m)	SLOPE (%)	PIPE DIAMETER (mm)	FULL FLOW CAPACITY (m3/s)	FULL FLOW VELOCITY (m/s)	INITIAL Tc (min)	TIME OF CONCENTRATION (min)	ACC. TIME OF CONCENTRATION (min)	PERCENT FULL (%)
Street K	214	215				0.89	117.3	0.288			0.288	43.0	0.50	600	0.434	1.54	11.20	0.47	11.67	66%
BLOCK 17	216	215	1.87	0.75	1.40	1.40	124.8	0.486			0.486	10.0	0.50	675	0.594	1.66	10.00	0.10	10.10	82%
Street K	215	211				2.29	114.7	0.729			0.729	103.9	0.25	900	0.905	1.42	11.67	1.22	12.88	81%
	211	207				3.79	108.4	1.141			1.141	28.8	0.25	1200	1.949	1.72	12.88	0.28	13.16	59%
	207	HW 2				5.83	101.9	1.650			1.650	34.0	0.25	1350	2.669	1.86	14.34	0.30	14.64	62%
Street I	301	302	0.64	0.90	0.58	0.58	124.8	0.200			0.200	51.0	0.50	525	0.304	1.40	10.00	0.61	10.61	66%
Street I	302	303				0.58	120.9	0.193			0.193	69.0	0.50	525	0.304	1.40	10.61	0.82	11.42	64%
Street I	303	304				0.58	116.0	0.186			0.186	66.0	0.50	525	0.304	1.40	11.42	0.78	12.21	61%
Street I	304	305				0.58	111.8	0.179			0.179	90.0	0.50	525	0.304	1.40	12.21	1.07	13.27	59%
Street I	305	306	0.36	0.90	0.32	0.90	106.6	0.266			0.266	92.0	0.50	600	0.434	1.54	13.27	1.00	14.27	61%
Street I	306	307				0.90	102.1	0.255			0.255	85.0	0.50	600	0.434	1.54	14.27	0.92	15.20	59%
Street C	307	308	0.19	0.90	0.17	1.07	98.4	0.293			0.293	84.0	0.50	600	0.434	1.54	15.20	0.91	16.11	67%
Street C	308	309				1.07	95.0	0.283			0.283	19.0	0.50	600	0.434	1.54	16.11	0.21	16.31	65%
Street C	309	310	0.27	0.90	0.24	1.31	94.3	0.344			0.344	70.0	0.50	600	0.434	1.54	16.31	0.76	17.07	79%
BLOCK 30	311	310	0.58	0.75	0.44	0.44	124.8	0.151			0.151	8.0	0.50	450	0.202	1.27	10.00	0.11	10.11	75%
Street C	310	312				1.75	91.7	0.445			0.445	81.0	0.50	675	0.594	1.66	17.07	0.81	17.89	75%
Street H	312	313	0.49	0.90	0.44	2.19	89.1	0.542			0.542	93.0	0.50	750	0.787	1.78	17.89	0.87	18.76	69%
BLOCK 14	314	313	0.46	0.75	0.35	0.35	124.8	0.120			0.120	12.0	0.50	450	0.202	1.27	10.00	0.16	10.16	59%
Street H	313	315	3.86	0.30	1.16	3.69	86.5	0.887			0.887	46.0	0.50	900	1.280	2.01	18.76	0.38	19.14	69%
Street H	315	316				3.69	85.4	0.876			0.876	18.0	0.50	900	1.280	2.01	19.14	0.15	19.29	68%
BLOCK 12/13	317	318	1.15	0.75	0.86	0.86	124.8	0.299			0.299	12.0	0.50	600	0.434	1.54	10.00	0.13	10.13	69%
Street H	318	316				0.86	123.9	0.297			0.297	44.0	0.50	600	0.434	1.54	10.13	0.48	10.61	68%
	316	HW 3				4.56	85.0	1.075			1.075	93.1	0.50	975	1.585	2.12	19.29	0.73	20.02	68%

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STORM SEWER DESIGN SHEET
10 Year Storm
Lakeview Lands (OPG)
City of Mississauga

PROJECT DETAILS

Project No: 17-549
Date: 13-Feb-19
Designed by: TL
Checked by: JO

DESIGN CRITERIA

Min. Diameter = 300 mm
Mannings 'n'= 0.013
Starting Tc = 10 min
Factor of Safety = 20 %

Rainfall Intensity = $\frac{A}{(Tc+B)^c}$

A = 1010
B = 4.6
c = 0.78

NOMINAL PIPE SIZE USED

STREET	FROM MH	TO MH	AREA (ha)	RUNOFF COEFFICIENT "R"	'AR'	ACCUM. 'AR'	RAINFALL INTENSITY (mm/hr)	FLOW (m3/s)	CONSTANT FLOW (m3/s)	ACCUM. CONSTANT FLOW (m3/s)	TOTAL FLOW (m3/s)	LENGTH (m)	SLOPE (%)	PIPE DIAMETER (mm)	FULL FLOW CAPACITY (m3/s)	FULL FLOW VELOCITY (m/s)	INITIAL Tc (min)	TIME OF CONCENTRATION (min)	ACC. TIME OF CONCENTRATION (min)	PERCENT FULL (%)
BLOCK 20	401	HW 4	3.56	0.75	2.67	2.67	124.8	0.925			0.925	10.0	0.30	975	1.227	1.64	10.00	0.10	10.10	75%
BLOCK 21/40	501	HW 5	4.24	0.75	3.18	3.18	124.8	1.102			1.102	15.0	0.30	1050	1.496	1.73	10.00	0.14	10.14	74%
BLOCK 16	601	HW 6	1.42	0.75	1.07	1.07	124.8	0.369			0.369	15.0	0.30	675	0.460	1.29	10.00	0.19	10.19	80%
	701	702	1.86	0.75	1.40	1.40	124.8	0.484			0.484	81.0	0.30	750	0.610	1.38	10.00	0.98	10.98	79%
	702	HW 7				1.40	118.6	0.460			0.460	14.0	0.30	750	0.610	1.38	10.98	0.17	11.15	75%

Appendix C – Sanitary Servicing Design Calculations

Sanitary Sewer Design Sheet (Urbantech)

LAKEVIEW
COMMUNITY PARTNERS LIMITED

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SANITARY SEWER DESIGN SHEET

(FSR)

Lakeview Community Partners Ltd.

CITY OF MISSISSAUGA, REGION OF PEEL

PROJECT DETAILS

Project No: 17-549
Date: 7-Feb-19
Designed by: T.L.
Checked by: S.R.

DESIGN CRITERIA

Min. Flow = 13 l/s
Min Diameter = 250 mm
Mannings 'n'= 0.013
Min. Velocity = 0.75 m/s
Max. Velocity = 3.50 m/s
Factor of Safety = 20 %

Avg. Domestic Flow = 290.0 l/c/d
Infiltration = 0.200 l/s/ha
Max. Peaking Factor = 4.00
Min. Peaking Factor= 2.00
Domestic Sewage flow for < 1000 ppl = 0.013m^3/s
(Region of Peel Std. 2-5-2)

NOMINAL PIPE SIZE USED

			RESIDENTIAL							COMMERCIAL/INDUSTRIAL/INSTITUTIONAL						FLOW CALCULATIONS								PIPE DATA					
STREET	FROM MH	TO MH	AREA (ha)	ACC. AREA (ha)	UNITS (#)	DENSITY (P/ha)	DENSITY (P/unit)	POP	ACCUM. RES. POP.	AREA (ha)	ACC. AREA (ha)	EQUIV. POP. (p/ha)	FLOW RATE (l/s/ha)	EQUIV. POP.	ACCUM. EQUIV. POP.	INFILTRATION (l/s)	TOTAL ACCUM. POP.	PEAKING FACTOR	RES. FLOW (l/s)	MIN. RES. FLOW (l/s)	COMM. FLOW (l/s)	ACCUM. COMM. FLOW (l/s)	TOTAL FLOW (l/s)	SLOPE (%)	PIPE DIAMETER (mm)	FULL FLOW CAPACITY (l/s)	FULL FLOW VELOCITY (m/s)	ACTUAL VELOCITY (m/s)	PERCENT FULL (%)
Hydro Road	101A	102A	1.87	1.87		475		889	889							0.4	889	3.83	11.4	13.0			13.4	0.50	250	42.0	0.86	0.75	32%
BLOCK 4	105A	106A	1.72	1.72		475		817	817							0.3	817	3.85	10.6	13.0			13.3	0.50	250	42.0	0.86	0.75	32%
Street E	106A	104A	0.46	2.18					817							0.4	817	3.85	10.6	13.0			13.4	0.50	250	42.0	0.86	0.75	32%
Hydro Road	104A	107A	0.44	2.62					817							0.5	817	3.85	10.6	13.0			13.5	0.50	250	42.0	0.86	0.75	32%
Hydro Road	107A	108A		2.62					817							0.5	817	3.85	10.6	13.0			13.5	0.50	250	42.0	0.86	0.75	32%
BLOCK 5	109A	110A	1.95	1.95		755		1473	1473							0.4	1473	3.69	18.2	18.2			18.6	0.50	250	42.0	0.86	0.80	44%
Street B	110A	108A	0.62	2.57					1473							0.5	1473	3.69	18.2	18.2			18.7	0.50	250	42.0	0.86	0.82	45%
BLOCK 24		111A	1.11	1.11												0.2							0.2		250				
BLOCK 3	111A	112A	2.00	3.11		475		950	950							0.6	950	3.81	12.2	13.0			13.6	0.50	250	42.0	0.86	0.75	32%
Street B	112A	108A	0.40	3.51					950							0.7	950	3.81	12.2	13.0			13.7	0.50	250	42.0	0.86	0.75	33%
Street H	108A	113A	0.43	9.13					3240							1.8	3240	3.41	37.1	37.1			39.0	0.80	250	53.2	1.08	1.16	73%
Street H	113A	114A		9.13					3240							1.8	3240	3.41	37.1	37.1			39.0	0.80	250	53.2	1.08	1.16	73%
BLOCK 2	115A	116A	1.60	1.60		475		760	760							0.3	760	3.87	9.9	13.0			13.3	0.50	250	42.0	0.86	0.75	32%
BLOCK 1	117A	116A	1.33	1.33		710		945	945							0.3	945	3.82	12.1	13.0			13.3	0.50	250	42.0	0.86	0.75	32%
Street F	116A	118A	0.22	3.15					1705							0.6	1705	3.64	20.8	20.8			21.5	0.50	250	42.0	0.86	0.85	51%
Street F		118A	0.76	0.76												0.2							0.2						
Street F	118A	119A	0.28	4.19					1705							0.8	1705	3.64	20.8	20.8			21.7	0.50	250	42.0	0.86	0.85	52%
BLOCK 25		120A	0.18	0.18												0.0							0.0						
BLOCK 8	120A	119A	1.66	1.84		975		1619	1619							0.4	1619	3.66	19.9	19.9			20.2	0.50	250	42.0	0.86	0.82	48%
BLOCK 26		121A	0.40	0.40												0.1							0.1						
BLOCK 9	121A	119A	1.45	1.85		1635		2371	2371							0.4	2371	3.53	28.1	28.1			28.4	0.50	250	42.0	0.86	0.90	68%
Street F	119A	122A		7.88					5695							1.6	5695	3.19	61.0	61.0			62.6	0.50	375	124.0	1.12	1.11	50%
		122A	0.90	0.90												0.2							0.2						
		122A	0.32	0.32												0.1							0.1						
		122A	0.80	0.80												0.2							0.2						
BLOCK 27		122A	1.88	1.88												0.4							0.4						
Street A	122A	123A	0.36	12.14					5695							2.4	5695	3.19	61.0	61.0			63.4	0.35	375	103.7	0.94	0.97	61%
Street A	123A	124A		12.14					5695							2.4	5695	3.19	61.0	61.0			63.4	0.35	375	103.7	0.94	0.97	61%
BLOCK 23		124A	0.56	0.56												0.1							0.1						
		124A	0.91	0.91												0.2							0.2						
Street A	124A	125A	0.56	14.17					5695							2.8	5695	3.19	61.0	61.0			63.9	0.35	375	103.7	0.94	0.97	62%
Street A	125A	126A	0.14	14.31					5695							2.9	5695	3.19	61.0	61.0			63.9	0.35	375	103.7	0.94	0.97	62%
BLOCK 7	127A	126A	2.41	2.41		745		1796	1796							0.5	1796	3.62	21.8	21.8			22.3	0.50	250	42.0	0.86	0.85	53%
BLOCK 18	128A	126A	0.35	0.35		475		167	167							0.1	167	4.00	2.2	13.0			13.1	0.50	250	42.0	0.86	0.75	31%
Street A	126A	114A		17.07					7658							3.4	7658	3.07	78.9	78.9			82.3	0.35	375	103.7	0.94	1.02	79%
		114A	0.17	0.17												0.0							0.0						
Street A	114A	129A	0.41	26.78					10898							5.4	10898	2.92	106.7	106.7			112.1	0.35	450	168.7	1.06	1.11	66%
BLOCK 15	130A	129A	0.38	0.38		475		181	181							0.1	181	4.00	2.4	13.0			13.1	0.50	250	42.0	0.86	0.75	31%

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STREET	FROM MH	TO MH	RESIDENTIAL AREA (ha)	ACC. AREA (ha)	UNITS (#)	DENSITY (P/ha)	DENSITY (P/unit)	POP	ACCUM. RES. POP.	COMMERCIAL/INDUSTRIAL/INSTITUTIONAL AREA (ha)	ACC. AREA (ha)	EQUIV. POP. (p/ha)	FLOW RATE (l/s/ha)	EQUIV. POP.	ACCUM. EQUIV. POP.	FLOW CALCULATIONS INFILTRATION (l/s)	TOTAL ACCUM. POP.	PEAKING FACTOR	RES. FLOW (l/s)	MIN. RES. FLOW (l/s)	COMM. FLOW (l/s)	ACCUM. COMM. FLOW (l/s)	TOTAL FLOW (l/s)	PIPE DATA SLOPE (%)	PIPE DIAMETER (mm)	FULL FLOW CAPACITY (l/s)	FULL FLOW VELOCITY (m/s)	ACTUAL VELOCITY (m/s)	PERCENT FULL (%)
Street A	129A	131A		27.16					11079							5.4	11079	2.91	108.2	108.2			113.7	0.35	450	168.7	1.06	1.11	67%
BLOCK 22		132A	0.22	0.22												0.0							0.0						
BLOCK 6	132A	131A	2.01	2.23		885		1779	1779							0.4	1779	3.62	21.6	21.6			22.1	0.50	250	42.0	0.86	0.85	53%
BLOCK 19	133A	131A	0.79	0.79		475		376	376							0.2	376	4.00	5.0	13.0			13.2	0.50	250	42.0	0.86	0.75	31%
Street A	131A	134A		30.18					13234							6.0	13234	2.83	125.8	125.8			131.9	0.35	450	168.7	1.06	1.16	78%
BLOCK 30	135A	136A	1.45	1.45												0.3							0.3	0.50	250	42.0	0.86	0.22	1%
Street K	136A	137A	0.43	1.88												0.4							0.4	0.50	250	42.0	0.86	0.22	1%
BLOCK 17	138A	137A	1.87	1.87		1860		3479	3479							0.4	3479	3.39	39.6	39.6			39.9	0.50	300	68.4	0.97	0.98	58%
Street K / Street D	137A	139A	0.90	4.65					3479							0.9	3479	3.39	39.6	39.6			40.5	0.35	300	57.2	0.81	0.87	71%
BLOCK 10	140A	139A	1.64	1.64		925		1517	1517							0.3	1517	3.68	18.7	18.7			19.0	0.50	250	42.0	0.86	0.82	45%
BLOCK 29		139A	0.41	0.41												0.1							0.1						
Street D	139A	141A	5.25	11.95					4996							2.4	4996	3.25	54.4	54.4			56.8	0.35	375	103.7	0.94	0.95	55%
BLOCK 11	142A	141A	1.30	1.30		975		1268	1268							0.3	1268	3.73	15.9	15.9			16.1	0.50	250	42.0	0.86	0.77	38%
Street D	141A	143A		13.25					6264							2.7	6264	3.15	66.3	66.3			68.9	0.35	375	103.7	0.94	0.99	66%
BLOCK 13	144A	145A	0.57	0.57		1000		570	570							0.1	570	3.94	7.5	13.0			13.1	0.50	250	42.0	0.86	0.75	31%
Street D	145A	146A	0.48	1.05					570							0.2	570	3.94	7.5	13.0			13.2	0.50	250	42.0	0.86	0.75	31%
BLOCK 12	147A	146A	0.57	0.57		1000		570	570							0.1	570	3.94	7.5	13.0			13.1	0.50	250	42.0	0.86	0.75	31%
Street D	146A	143A		1.62					1140							0.3	1140	3.76	14.4	14.4			14.7	0.50	250	42.0	0.86	0.77	35%
Street J	143A	148A	0.26	15.13					7404							3.0	7404	3.08	76.6	76.6			79.6	0.35	375	103.7	0.94	1.02	77%
Street J	148A	149A		15.13					7404							3.0	7404	3.08	76.6	76.6			79.6	0.35	375	103.7	0.94	1.02	77%
Street C	149A	150A	0.50	15.63					7404							3.1	7404	3.08	76.6	76.6			79.7	0.35	375	103.7	0.94	1.02	77%
BLOCK 28	151A	150A	0.29	0.29		475		138	138							0.1	138	4.00	1.9	13.0			13.1	0.50	250	42.0	0.86	0.75	31%
Street C	150A	152A		15.92					7542							3.2	7542	3.08	77.8	77.8			81.0	0.35	375	103.7	0.94	1.02	78%
BLOCK 14	153A	152A	0.46	0.46		475		219	219							0.1	219	4.00	2.9	13.0			13.1	0.50	250	42.0	0.86	0.75	31%
Street C	152A	154A		16.38					7761							3.3	7761	3.06	79.8	79.8			83.1	0.35	375	103.7	0.94	1.03	80%
BLOCK 30	155A	154A	0.58	0.58		475		276	276							0.1	276	4.00	3.7	13.0			13.1	0.50	250	42.0	0.86	0.75	31%
Street C	154A	156A		16.96					8037							3.4	8037	3.05	82.2	82.2			85.6	0.35	375	103.7	0.94	1.03	83%
Street C	156A	157A	0.17	17.13					8037							3.4	8037	3.05	82.2	82.2			85.7	0.35	375	103.7	0.94	1.03	83%
Street C	157A	158A		17.13					8037							3.4	8037	3.05	82.2	82.2			85.7	0.35	375	103.7	0.94	1.03	83%
BLOCK 20	159A	158A	3.56	3.56		70		250	250							0.7	250	4.00	3.4	13.0			13.7	0.50	250	42.0	0.86	0.75	33%
Street C	158A	134A		20.69					8287							4.1	8287	3.04	84.4	84.4			88.6	0.35	450	168.7	1.06	1.05	53%
BLOCK 21	160A	161A	3.35	3.35		70		235	235							0.7	235	4.00	3.2	13.0			13.7	0.50	250	42.0	0.86	0.75	33%
Street I	161A	134A		3.35					235							0.7	235	4.00	3.2	13.0			13.7	0.50	250	42.0	0.86	0.75	33%
Street A	134A	162A	0.33	54.55					21756							10.9	21756	2.62	191.0	191.0			201.9	0.35	525	254.4	1.18	1.28	79%
	162A	PS		54.55					21756							10.9	21756	2.62	191.0	191.0			201.9	0.35	525	254.4	1.18	1.28	79%

Urbantech Consulting, A Division of Leighton-Zec Ltd.
3760 14th Avenue, Suite 301 Markham, Ontario L3R 3T7
TEL: 905.946.9461 FAX: 905.946.9595
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Appendix D – Watermain Analysis

Lakeview Community Water Modelling Methodology and Analysis Memo (TMIG, Feb. 2019)

LAKEVIEW
COMMUNITY PARTNERS LIMITED

THE MUNICIPAL INFRASTRUCTURE GROUP LTD.
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F 905.738.0065
www.tmig.ca

MEMORANDUM

DATE	February 26, 2019
TO	**Jeff Ormonde (Urbantech)**
CC	
SUBJECT	Lakeview Community Water Modelling Methodology and Analysis
FROM	Cassandra Leal, P.Eng
PROJECT NUMBER	17201

1 Introduction

The Municipal Infrastructure Group Ltd. (TMIG) has been retained to conduct an analysis to review the water servicing capacity of the proposed watermain network (Urbantech, February 2019) relative to the contemplated development densities.

This memorandum will outline the modelling methodology adopted for the Lakeview Community. The water model was used to confirm that the proposed pipe network can supply the design water demands at appropriate pressures expected under various scenarios.

This memorandum has been updated with the new watermain layout, provided from Urbantech February 2019, and the updated population, provided from Urbantech February 2019.

2 Design Criteria

The Region of Peel produced the Inspiration Lakeview Water and Wastewater Servicing Analysis (May 2018). Within this document, the Region outlined the design criteria that apply to the proposed development:

- 265 Lpcd for average day water consumption
- A maximum day peaking factor of 1.8 for residential and 1.4 for employment growth
- A peak hour factor of 3.0

Also, there are limits to the velocity and pressures:

- Under Maximum Day demand, pipe velocity remains below 1.5 m/s
- Under Maximum Day demand, pressure in the system should not drop below 280 kPa (40 psi)
- Pressure in the system should not drop below 140 kPa (20 psi) under a maximum day plus fire condition

Standards outlined in the Region's *Inspiration Lakeview Water and Wastewater Servicing Analysis (May 2018)* report and Inspiration Lakeview Conceptual Municipal Servicing Strategy (TMIG, July 2014) were used in substitution.

3 Population Breakdown

The population originally used to calculate the water demands and sanitary flows were found from the Inspiration Lakeview Village Masterplan Concept (July 12, 2018.

Standards outlined in the Region's *Inspiration Lakeview Water and Wastewater Servicing Analysis (May 2018)* report were used to complete calculations.

Following the information provided from Urbantech (February 2019), the populations in the water model were modified to match the populations used in the sanitary sewer design sheet and drainage map (Urbantech, February 2019). All populations are considered “residential” in this update. The information provided by Urbantech does not include any External Lands. The sanitary drainage map used to obtain the population is found in **Appendix A.**

Detailed Design Demand and Flow Calculations can be found in **Appendix B**.

The existing lands between Lakeshore and the Lakeview Community Lands (called “External”) was calculated using the population breakdown from the Masterplan for this area. This information is also included in **Appendix B**.

The external lands demands are modelled as two junction demands within the physical external lands and J-198 and J-34. As the information received had residential and employment populations, the demands were calculated using the appropriate rates and factors.

A summary of the water demands is provided in **Table 1**:

TABLE 1 WATER DEMANDS – SUMMARY

	External	Lakeview Community
Total Residential Population	5,707	23,022
Residential Avg Day Demand	17.50 L/s	57.6 L/s
Employment Avg Day Demand	6.73 L/s	-
Residential Max Day Demand	31.51 L/s	103.7 L/s
Employment Max Day Demand	9.43 L/s	-
Residential Peak Hour Demand	52.51 L/s	172.8 L/s
Employment Peak Hour Demand	20.20 L/s	-

4 Water Model Development

InfoWater has been selected for modelling the water distribution system for the study area. The key input factors for the model are described below:

4.1 Pipe Network

The preliminary watermain layout was provided by Urbantech and is included in **Appendix C**.

4.2 Water Demands

The average daily demands were calculated for each development block (internal), as shown in **Appendix B**. These demands were assigned to nodes adjacent to the respective parcels. The average day demand set is populated with the residential demands assigned to Demand 1.

Based on the standards outlined in Inspiration Lakeview Water and Wastewater Servicing Analysis (May 2018) the peaking factor for the Maximum day is 1.8 for residential and 1.4 for employment. For the purposes of this review, the more conservative value for 1.8 was applied to all Lakeview Community population (residential and employment). The peaking factor for Peak hour is 3 for both residential and employment.

The average day demand set was multiplied with the respective peaking factors to create separate maximum day and Peak hour demand sets.

Design fire demands have been proposed to be minimum of 300 L/s. This is common for commercial properties, and high-rise residential development.

Using the Inspiration Lakeview Master Plan population breakdown, the external lands were included in the model. For simplicity, the external demands were added as two demands in the model, an east and a west demand (junction J-34 and J-198, respectively). The population breakdown included residential and employment. For this review, the appropriate rates and factors were used.

A table listing the nodes at which the development blocks were allocated is provided in **Appendix B**.

4.3 Boundary Conditions

The proposed development is located within Peel Region pressure zone PZ1. Since we are modelling a local area from within a larger distribution network, suitable boundary conditions were established at the study area limits (where the proposed internal network will connect to existing sub-transmission mains). The proposed connection locations are:

- To the 600 mm watermain along Lakeshore Road East, at Lakefront Promenade;
- To the 600 mm watermain along Lakeshore Road East, at Hydro Road;

Fixed head reservoirs were established at these two locations. The HGL elevations at these reservoirs were established through pressure logging data provided by Region of Peel. The details of the boundary conditions are in **Table 2**.

TABLE 2 HGL ELEVATIONS AT BOUNDARY CONDITIONS

Boundary Location	HGL Elevation	Source
Lakeshore Road East, at Lakefront Promenade	142 m	Region of Peel email dated September 11th
Lakeshore Road East, at Hydro Road	142 m	Region of Peel email dated September 11th

5 Modelling Results

The proposed watermain network and demands were simulated to determine the resulting pressures under various demand conditions.

Pressure maps indicating modelled pressure at every node for the Scenarios are provided in Fig 1 to Fig 4. The InfoWater Junction output for all scenarios and Pipe output for Maximum day scenario is provided in **Appendix D**.

The summary of modelling results is provided in **Table 3**.

TABLE 3 MODELLING RESULTS SUMMARY

Water Demand Modeling Scenario	Minimum Water System Requirements	Modeling Results
Average Day Demand	Recommended Normal Pressures within System 275 kPa to 690 kPa (40 psi to 100 psi)	System Pressure = 510 kPa to 648 kPa (74 psi to 94 psi)
Maximum Day Demand	Recommended Normal Pressures within System 275 kPa to 690 kPa (40 psi to 100 psi)	System Pressure = 510 kPa to 648 kPa (74 psi to 94 psi)
	Flow velocity remains below 1.5 m/s within the distribution network	Flow velocity within the distribution network is between 0.01 m/s to 0.97 m/s.
Peak Hour Demand	Recommended Normal Pressures within System 275 kPa to 690 kPa (40 psi to 100 psi)	System Pressure = 496 kPa to 634 kPa (72 psi to 92 psi)
Maximum Day Demand plus Fire Flow	Required Fire Flow to be provided at a residual pressure of no less than 140 kPa	
	Fire flow requirements for the proposed development Q_f > 300 L/s	Available Fire Flow = 561 L/s to 1,589 L/s

To simulate an emergency or maintenance condition where one or both water supply points to Lakeshore Road are not available, the two boundary conditions and watermain along Lakeshore Road East were turned off and the boundary condition to the west (supply from Lakefront Promenade and south of Rangeview Road) was turned on.

The HGL at this boundary condition was established through pressure logging data provided by the Region of Peel. The details of the boundary condition is in **Table 4**.

TABLE 4 HGL ELEVATION AT WEST BOUNDARY CONDITION

Boundary Location	HGL Elevation	Source
Water Treatment Plant, south of Rangeview Road	148 m	Region of Peel email dated September 11th

Under this condition, the pressures were between 530 – 668 kPa (77 to 97 psi). This is still within the acceptable pressure range. Figure 5 is the pressure map for this scenario. This scenario illustrates that the watermain network and sizing is acceptable for the population and demands for Lakeview Community. Under normal conditions, all three of these supply points would be available.

6 Conclusions and Recommendations

The modelled results all lie within acceptable range, but the pressures could exceed 600 kPa (90 psi) along Street A. The available fire flows at the nodes within the Study Area will be between 561 and 1,589 L/s. The actual block-by-block fire flow requirements should be verified relative to these values.

The watermain network and sizing appears to be adequate for the population and demands used in this model.

FIGURE 7-1 AVERAGE DAY DEMAND SCENARIO PRESSURE

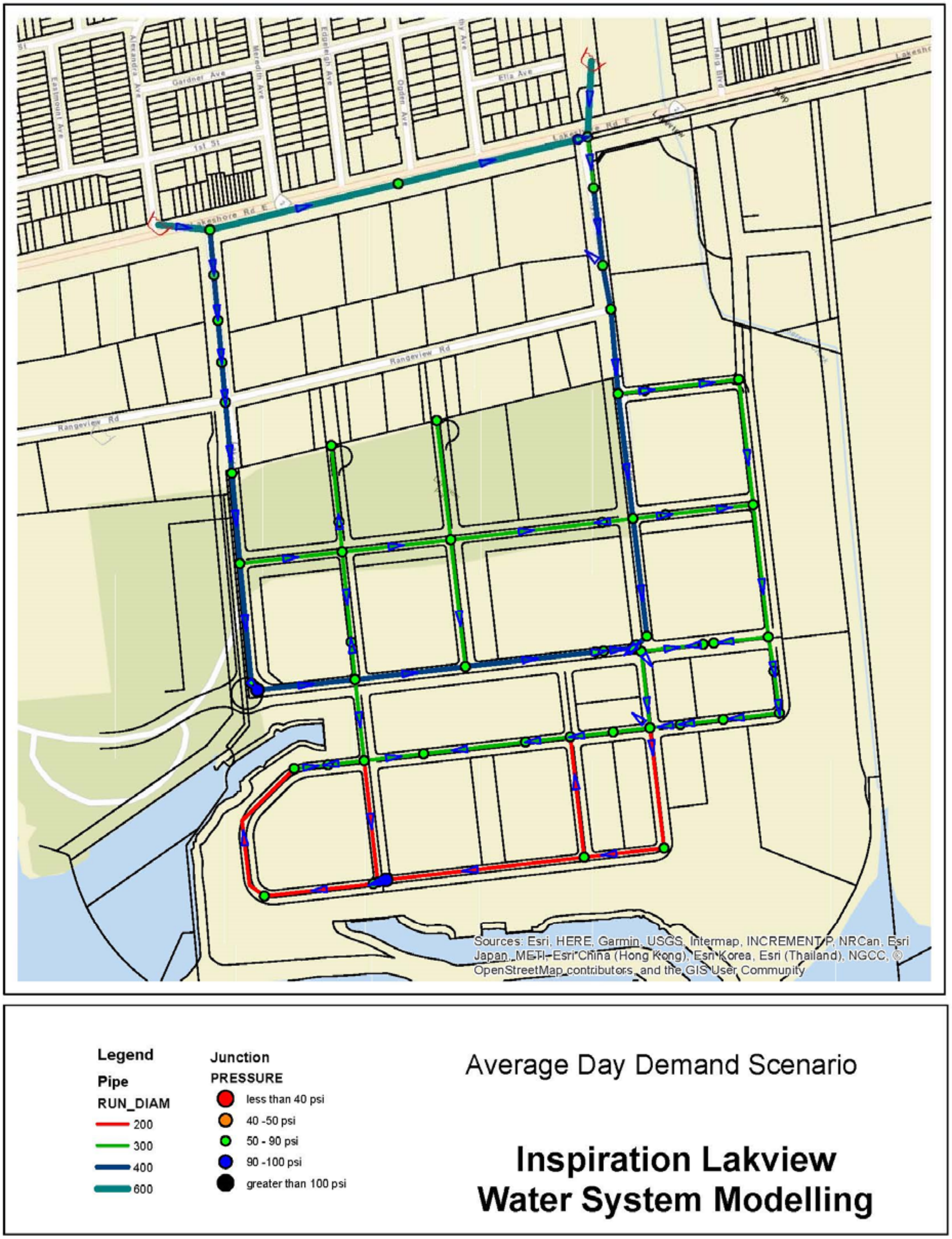


FIGURE 7-2 MAXIMUM DAY DEMAND SCENARIO PRESSURE

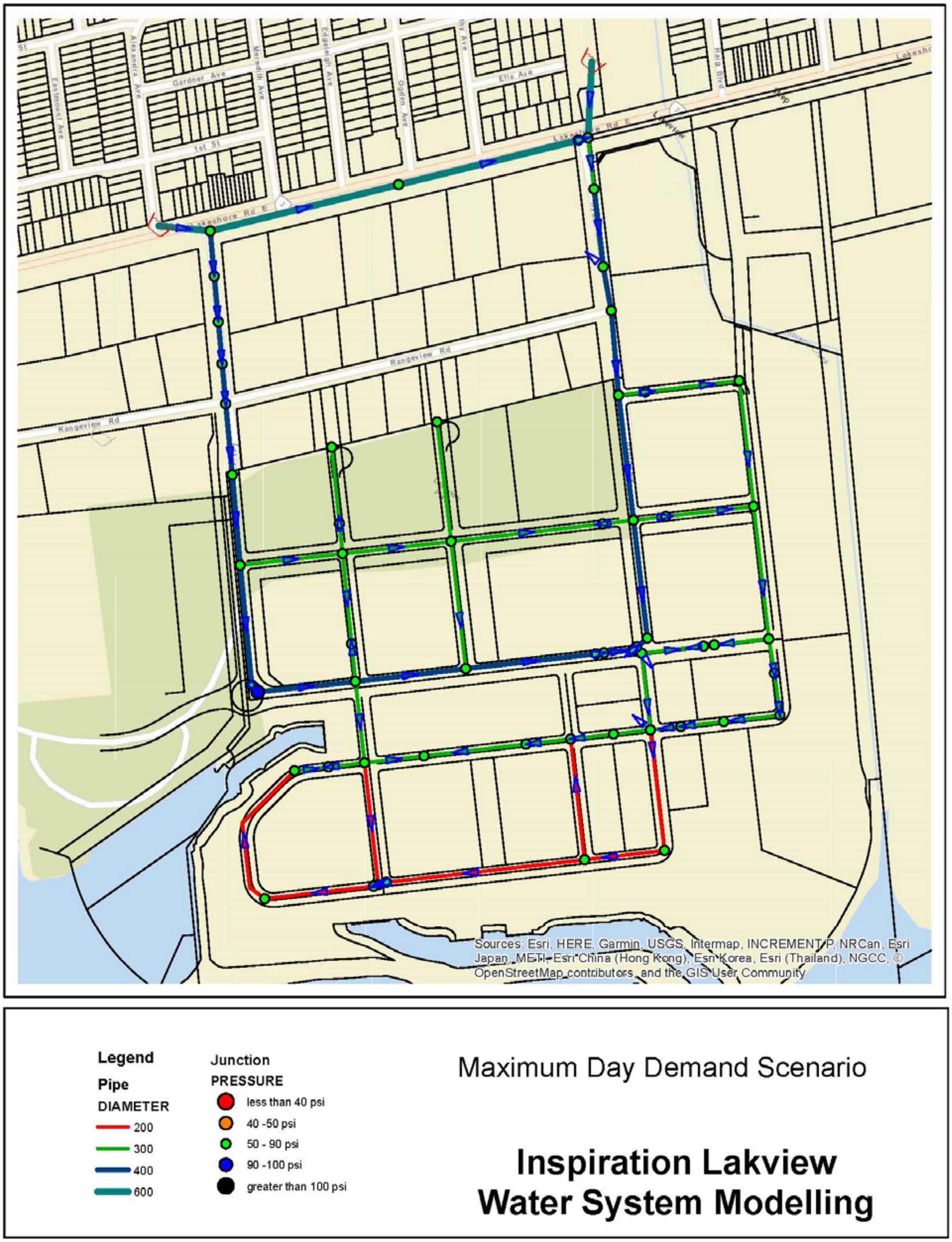


FIGURE 7-3 PEAK HOUR DEMAND SCENARIO PRESSURE

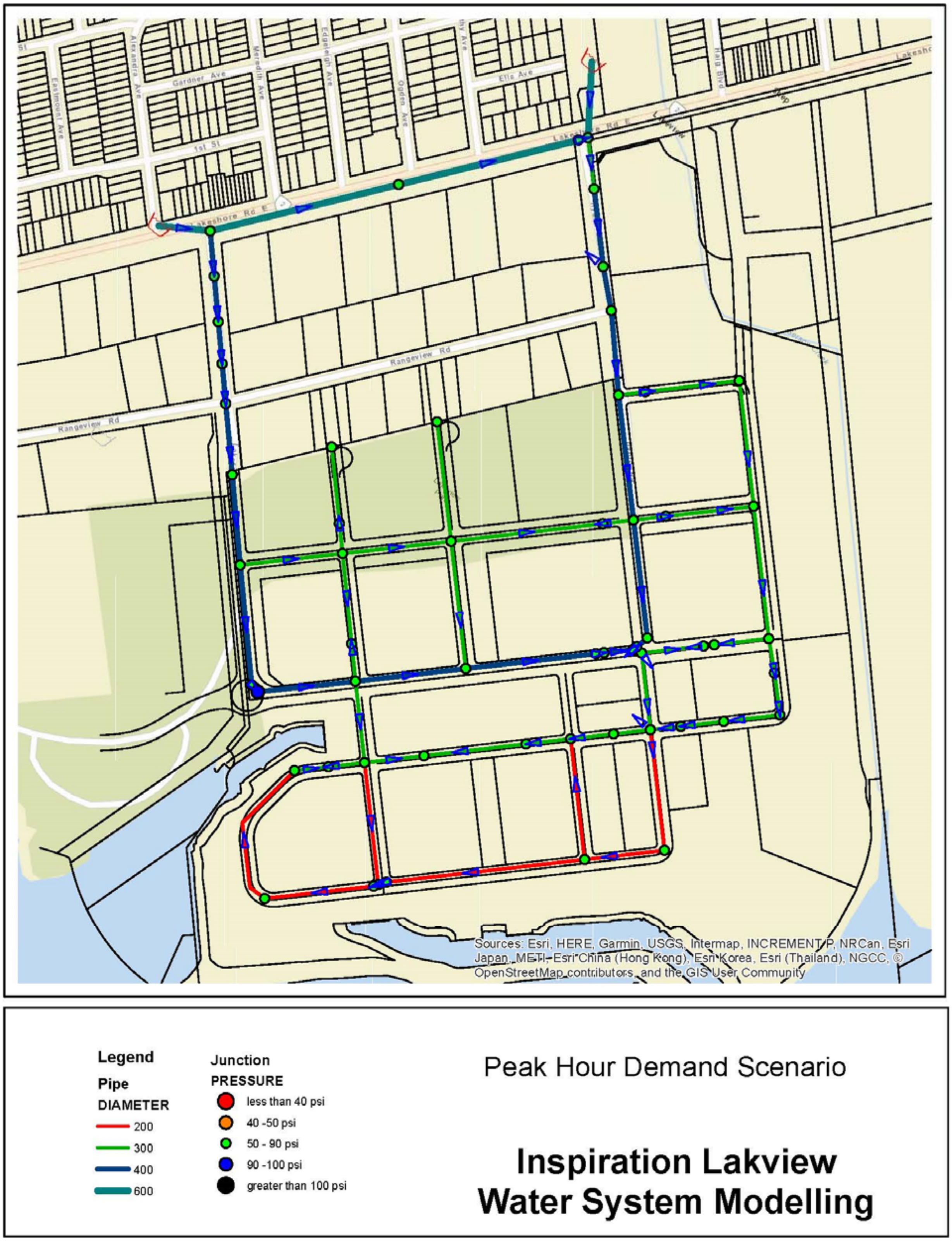


FIGURE 7-4 MAXIMUM DAY PLUS FIRE FLOW SCENARIO AVAILABLE FIREFLOW

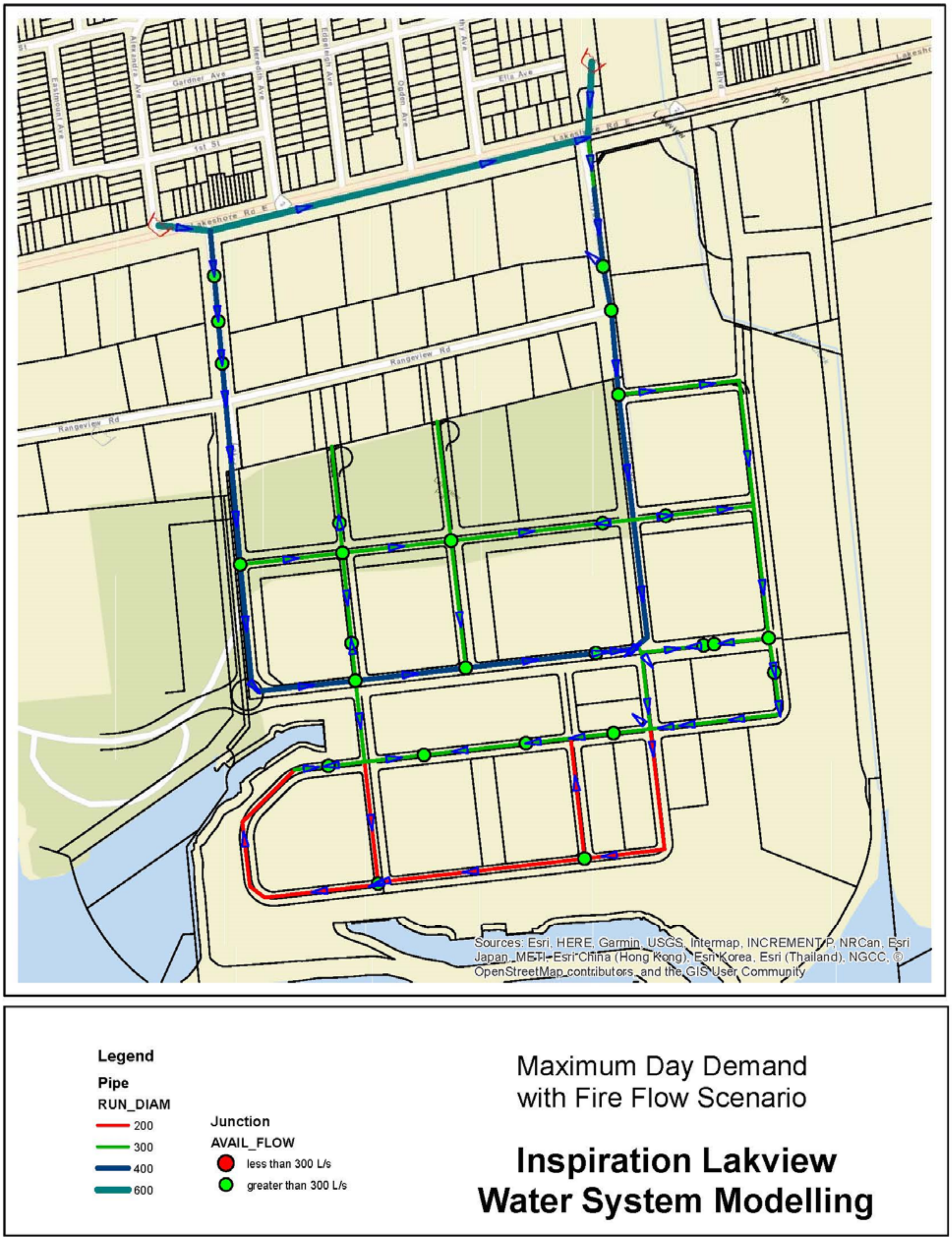
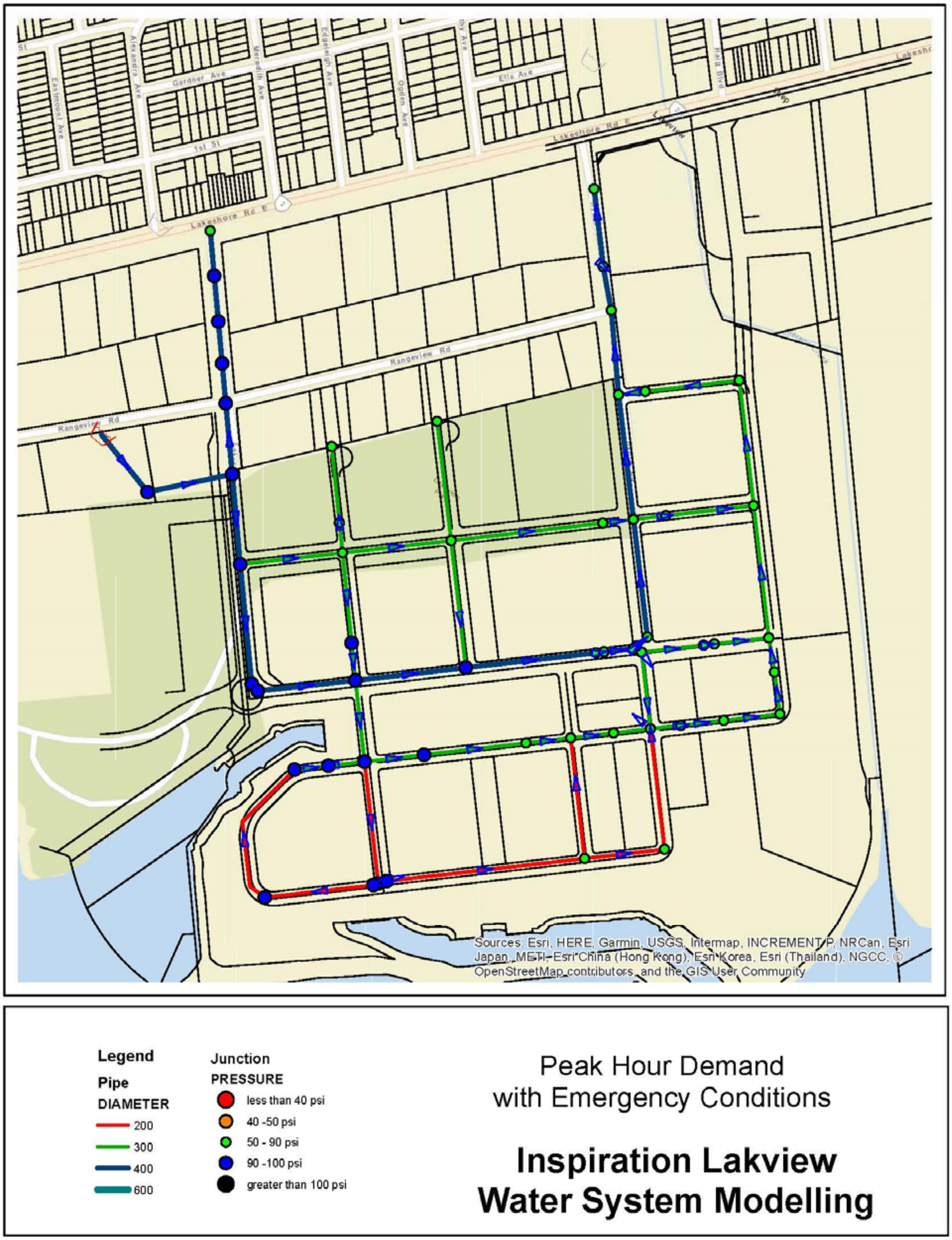


FIGURE 7-5 PEAK HOUR DEMAND UNDER EMERGENCY CONDITIONS



APPENDIX A


LEGEND
SANITARY DRAINAGE AREA BOUNDARY
PROPOSED SANITARY SEWER
EXISTING SANITARY SEWER
TWIN FORCEMAIN
MH. NUMBER
TOP ELEVATION
INVERTS
DRAINAGE AREA (ha)
POPULATION
DENSITY (P/Ha)
NOTE:
POPULATION DENSITIES ARE AS PER PEEL REGION STANDARDS. IN HIGH DENSITY AREAS WHERE POPULATION IS EXPECTED TO EXCEED 475 PERSONS/HECTARE, THE POPULATION EQUIVALENT HAS BEEN CALCULATED USING 2.7 PEOPLE/UNIT
urbantech
TMIG
LAKEVIEW COMMUNITY PARTNERS LTD.
CITY OF MISSISSAUGA
SANITARY SERVICING PLAN
17-549
FEB 2019
1:2000
SAN-1
G.E. BOOTH WASTEWATER TREATMENT FACILITY
SERSON CREEK
LAKE ONTARIO
HYDRO ROAD
LAKESHORE ROAD EAST
RANGEVIEW ROAD
LAKEFRONT PROM.
STREET 'H' (HYDRO ROAD)
STREET L (LAKEFRONT PROM.)

APPENDIX B

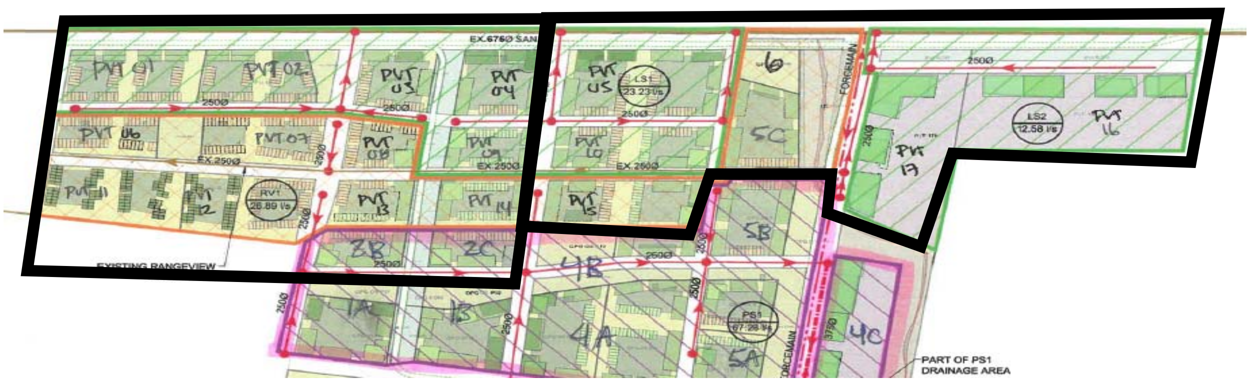
PN 17201
Date 21-Feb-19
By CBL

Design Criteria (from previous excel)	ADD	265	Lpcd
	MDD Factor	1.8	
	PHD Factor	3	

Phase / Block	Junction in Model	Population	Combined	ADD	MDD	PHD
6	J196	889	889	2.73	4.91	8.18
1A	J62	2371				
1B	J62	1824	4195	5.59	10.07	16.78
2A	J100	1517	1517	4.65	8.38	13.96
2B	J44	945	945	2.90	5.22	8.70
2C	J44	760				
3A	J104	3479	3479	10.67	19.21	32.01
3B	J96	1268	1268	3.89	7.00	11.67
3C1	J70	167				
3C1	J70	167	334	0.51	0.92	1.54
3C1	J92	570				
3C1	J92	570	1140	1.75	3.15	5.24
3C2	J80	181	181	0.56	1.00	1.67
3C2	J88	219	219	0.67	1.21	2.02
3C3	J24	250	250	0.77	1.38	2.30
3C3	J80	376				
3C3	J84	276	276	0.85	1.52	2.54
4A	J64	1796	1796	5.51	9.92	16.53
4B	J58	950	950	2.91	5.24	8.74
4C	J20	235	235	0.72	1.30	2.16
5A	J74	1779	1779	5.46	9.82	16.37
5**B**	J54	1473	1473	4.52	8.13	13.55
5C	J30	960	960	2.94	5.30	8.83
		23022		57.59456	103.6702	172.7837

PN	17201
Date	26-Feb-19
By	CL

	RESIDENTIAL	EMPLOYMENT	JUNCTION
Pvt 01	386	0	West
Pvt 02	386	0	West
Pvt 03	261	0	West
Pvt 04	366	65	West
Pvt 05	555	46	East
Pvt 06	210	0	West
Pvt 07	285	0	West
Pvt 08	350	0	West
Pvt 09	346	0	West
Pvt 10	566	0	West
Pvt 11	428	0	East
Pvt 12	452	0	West
Pvt 13	206	0	West
Pvt 14	366	0	West
Pvt 15	543	0	East
Pvt 16	0	1,100	East
Pvt 17	0	985	East
	5,707	2,196	



ADD	265	Lpcd
MDD Factor - Res	1.8	
MDD Factor - Empl	1.4	
PHD	3	

		POPULATION		DMD 1	DMD 2	DMD 1	DMD 2	DMD 1	DMD 2
JUNCTION		**RES**	**EMP**	**ADD RES**	**ADD EMP**	**MDD RES**	**MDD EMP**	**PHD RES**	**PHD EMP**
west	J198	4,042	65	12.40	0.20	22.32	0.28	37.20	0.59
east	J34	1,665	2,131	5.11	6.54	9.19	9.15	15.32	19.61

APPENDIX C


LEGEND
PROPOSED 400mm WATERMAIN
PROPOSED 300mm WATERMAIN
PROPOSED 200mm WATERMAIN
EXISTING WATERMAIN
FUTURE WATERMAIN
NOTE:
THE EXISTING 400mm WATERMAIN SHOWN WITHIN THE EXISTING EASEMENT SHALL BE REPLACED BY A DEDICATED 400mm WATERMAIN ON LAKEFRONT PROMENADE, STREET B, AND STREET I AS SHOWN ON THIS PLAN. THE EXISTING WATERMAIN IS A DEDICATED FEED FROM THE WATER TREATMENT TO WASTEWATER TREATMENT PLANT AND SHALL REMAIN IN OPERATION UNTIL THE NEW 400mm WATERMAIN IS COMMISSIONED.
urbantech
TMIG
LAKEVIEW COMMUNITY PARTNERS LTD.
CITY OF MISSISSAUGA
PRELIMINARY WATER SERVICING PLAN
PROJECT No. 17-549
DATE FEB 2019
SCALE 1:2000
DWG No. WM-1
SERSON CREEK
LAKE ONTARIO
HYDRO ROAD
STREET 'H' (HYDRO ROAD)
LAKESHORE ROAD EAST
RANGEVIEW ROAD
LAKEFRONT PROM.
STREET 'L' LAKEFRONT PROM.
STREET 'I'
STREET 'C'
STREET 'H'
STREET 'B'
STREET 'A'
STREET 'J'
STREET 'G'
STREET 'D'
STREET 'F'
STREET 'K'

APPENDIX D

17201 - Inspiration Lakeview Water Modelling - Feb 2019 InfoWater Output - Avg Day Demand Run				
ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)
J10	0	85	142	81.02
J100	4.65	80.1	141.83	87.75
J104	10.67	79.92	141.83	88
J110	0	79.47	141.85	88.67
J112	0	81.34	141.84	86.01
J114	0	81.23	141.84	86.17
J116	0	79.95	141.83	87.96
J118	0	79.36	141.83	88.81
J120	0	78.33	141.83	90.28
J122	0	79.33	141.83	88.84
J124	0	79.44	141.83	88.69
J126	0	80.21	141.83	87.6
J128	0	81.35	141.83	85.98
J130	0	82.01	141.84	85.05
J132	0	82.11	141.84	84.9
J134	0	81.8	141.85	85.36
J136	0	79.85	141.85	88.14
J138	0	82.78	141.84	83.95
J14	0	81.75	141.89	85.49
J142	0	80.35	141.87	87.46
J144	0	83.05	141.85	83.58
J146	0	81.26	141.85	86.14
J150	0	78.92	141.86	89.47
J152	0	75.92	141.86	93.73
J154	0	82.07	141.85	84.98
J156	0	81.32	141.84	86.03
J158	0	81.44	141.84	85.87
J160	0	85.04	142	80.97
J170	0	85.04	142	80.97
J18	0	85.04	142	80.97
J190	0	82.36	141.97	84.75
J192	0	81.89	141.95	85.38
J194	0	81.79	141.93	85.49
J196	2.73	84.23	141.91	82
J198	12.6	81.77	141.91	85.5
J20	0.72	82.84	141.85	83.88
J24	0.77	82.29	141.84	84.65
J30	2.94	83.73	141.88	82.67
J34	11.65	83.36	141.87	83.18
J38	0	82.86	141.86	83.87
J40	0	83.61	141.85	82.8
J42	0	82.93	141.86	83.77
J44	2.9	81.47	141.85	85.84
J46	0	82.71	141.85	84.07
J48	0	89.79	141.83	73.98
J50	0	80.75	141.83	86.83
J54	4.52	82.17	141.85	84.83
J58	2.91	82.05	141.85	85
J62	5.59	79.65	141.85	88.42
J64	5.51	81.1	141.84	86.35
J70	0.51	81.15	141.84	86.28
J74	5.46	81.63	141.84	85.59
J80	0.56	81.7	141.84	85.49
J84	0.85	82.46	141.84	84.4
J88	0.67	82	141.84	85.06
J92	1.75	81.61	141.83	85.61
J96	3.89	80.91	141.83	86.6

17201 - Inspiration Lakeview Water Modelling - Feb 2019 InfoWater Output - Max Day Demand Run				
ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)
J10	0	85	141.99	81.01
J100	8.37	80.1	141.51	87.29
J104	19.21	79.92	141.49	87.53
J110	0	79.47	141.56	88.26
J112	0	81.34	141.54	85.59
J114	0	81.23	141.55	85.75
J116	0	79.95	141.51	87.51
J118	0	79.36	141.51	88.35
J120	0	78.33	141.51	89.82
J122	0	79.33	141.51	88.39
J124	0	79.44	141.5	88.23
J126	0	80.21	141.5	87.13
J128	0	81.35	141.52	85.54
J130	0	82.01	141.53	84.61
J132	0	82.11	141.54	84.48
J134	0	81.8	141.56	84.95
J136	0	79.85	141.55	87.72
J138	0	82.78	141.53	83.52
J14	0	81.75	141.69	85.21
J142	0	80.35	141.62	87.11
J144	0	83.05	141.56	83.17
J146	0	81.26	141.57	85.74
J150	0	78.92	141.59	89.08
J152	0	75.92	141.59	93.34
J154	0	82.07	141.56	84.58
J156	0	81.32	141.55	85.61
J158	0	81.44	141.55	85.45
J160	0	85.04	141.99	80.96
J170	0	85.04	141.99	80.96
J18	0	85.04	141.99	80.96
J190	0	82.36	141.93	84.68
J192	0	81.89	141.86	85.25
J194	0	81.79	141.8	85.31
J196	4.91	84.23	141.74	81.76
J198	22.6	81.77	141.74	85.26
J20	1.3	82.84	141.56	83.46
J24	1.39	82.29	141.53	84.22
J30	5.29	83.73	141.67	82.37
J34	18.34	83.36	141.63	82.83
J38	0	82.86	141.59	83.49
J40	0	83.61	141.57	82.4
J42	0	82.93	141.59	83.39
J44	5.22	81.47	141.57	85.44
J46	0	82.71	141.57	83.66
J48	0	89.79	141.51	73.53
J50	0	80.75	141.52	86.38
J54	8.14	82.17	141.56	84.42
J58	5.24	82.05	141.56	84.59
J62	10.06	79.65	141.56	88
J64	9.92	81.1	141.55	85.93
J70	0.92	81.15	141.55	85.86
J74	9.83	81.63	141.54	85.16
J80	1.01	81.7	141.54	85.06
J84	1.53	82.46	141.53	83.97
J88	1.21	82	141.53	84.62
J92	3.15	81.61	141.52	85.17
J96	7	80.91	141.51	86.14

17201 - Inspiration Lakeview Water Modelling - Oct,2018 - Max Daily Demand with Fireflow Simulation Run Note:- At any given node the Available Flow (at 140 kPa/20 psi) must be greater than Total demand.							
ID	Static Demand (L/s)	Static Pressure (psi)	Static Head (m)	Fire-Flow Demand (L/s)	Residual Pressure (psi)	Available Flow at Hydrant (L/s)	Available Flow Pressure (psi)
J100	8.37	87.29	141.51	300	75.6	977.73	2.9
J104	19.21	87.53	141.49	300	74.05	908.71	2.9
J110	0	88.26	141.56	300	82.13	1,504.64	2.9
J118	0	88.35	141.51	300	60.3	561.8	2.9
J132	0	84.48	141.54	300	76.03	1,162.24	2.9
J134	0	84.95	141.56	300	77.35	1,241.39	2.9
J136	0	87.72	141.55	300	81.31	1,446.54	2.9
J142	0	87.11	141.62	300	81.79	1,613.41	2.9
J146	0	85.74	141.57	300	78.74	1,320.13	2.9
J190	0	84.68	141.93	300	83.19	3,311.78	2.91
J192	0	85.25	141.86	300	82.78	2,487.15	2.9
J194	0	85.31	141.8	300	82.13	2,144.28	2.9
J24	1.39	84.22	141.53	300	74.69	1,068.34	2.9
J30	5.29	82.37	141.67	300	77.50	1,631.99	2.9
J34	18.34	82.83	141.63	300	77.61	1,589.77	2.9
J42	0	83.39	141.59	300	77.70	1,509.39	2.9
J44	5.22	85.44	141.57	300	75.23	1,021.69	2.9
J50	0	86.38	141.52	300	60.76	583.97	2.9
J54	8.14	84.42	141.56	300	76.83	1,254.35	2.9
J58	5.24	84.59	141.56	300	75.67	1,115.93	2.9
J62	10.06	88	141.56	300	80.45	1,291.60	2.9
J64	9.92	85.93	141.55	300	79.30	1,410.90	2.9
J74	9.83	85.16	141.54	300	76.28	1,143.17	2.9
J80	1.01	85.06	141.54	300	76.12	1,126.13	2.9
J92	3.15	85.17	141.52	300	75.28	1,062.93	2.9
J96	7	86.14	141.51	300	74.46	965.99	2.9

17201 - Inspiration Lakeview Water Modelling - Feb 2019 InfoWater Output - Max Day Demand Run - Pipe Report									
ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)	Headloss (m)	HL/1000 (m/k-m)
24	J44	J146	38.3	300	120	-5.22	0.07	0	0.03
25	J112	J114	10.44	300	120	-20.26	0.29	0	0.39
26	J110	J116	104.44	300	120	22.48	0.32	0.05	0.47
27	J116	J118	156.86	200	120	0.31	0.01	0	0
28	J120	J118	11.01	200	120	1.66	0.05	0	0.03
29	J118	J122	6.21	200	120	1.97	0.06	0	0.04
30	J122	J124	140.15	200	120	1.97	0.06	0.01	0.04
31	J126	J124	201.47	200	120	-1.97	0.06	0.01	0.04
32	J120	J50	255.55	200	120	-1.66	0.05	0.01	0.03
33	J128	J130	155.02	200	120	-2.3	0.07	0.01	0.05
34	J130	J112	98.38	300	120	-12.05	0.17	0.01	0.15
35	J112	J74	79.94	300	120	8.21	0.12	0.01	0.07
36	J14	J198	91.16	400	120	-53.58	0.43	0.05	0.58
37	J136	J134	164.41	300	120	-4.95	0.07	0	0.03
38	J138	J24	53.89	300	120	-5.93	0.08	0	0.04
40	J142	J146	131.72	300	120	21.31	0.3	0.06	0.43
41	J134	J144	153.57	300	120	0	0	0	0
42	J126	J104	43.75	300	120	1.97	0.03	0	0.01
6	J40	J38	121.37	300	120	-10.26	0.15	0.01	0.11
8	J48	J50	154.97	200	120	-0.65	0.02	0	0
P101	RES9002	J18	66.07	600	120	79.4	0.28	0.01	0.17
P105	J18	J170	248.54	600	120	3.23	0.01	0	0
P107	J160	J10	12.91	600	120	3.23	0.01	0	0
P121	J170	J160	237.2	600	120	3.23	0.01	0	0
P13	J146	J134	140.07	300	120	7.17	0.1	0.01	0.06
P143	J190	J18	57.69	400	120	-76.18	0.61	0.06	1.11
P145	J192	J190	59.14	400	120	-76.18	0.61	0.07	1.11
P147	J194	J192	53.88	400	120	-76.18	0.61	0.06	1.11
P15	J146	J62	116.54	300	120	8.93	0.13	0.01	0.08
P155	J196	J30	99.85	400	120	63.53	0.51	0.08	0.79
P157	J198	J194	51.31	400	120	-76.18	0.61	0.06	1.11
P17	J62	J110	48.21	300	120	-1.14	0.02	0	0
P19	J20	J54	113.06	300	120	-0.97	0.01	0	0
P21	J14	J142	115.75	400	120	53.58	0.43	0.07	0.58
P25	J150	J152	11.75	400	120	32.26	0.26	0	0.23
P27	J152	J110	125.55	400	120	32.26	0.26	0.03	0.23
P29	J110	J136	142.22	400	120	8.64	0.07	0	0.02
P31	J136	J64	168.25	400	120	13.59	0.11	0.01	0.05
P33	J64	J70	10.17	400	120	3.67	0.03	0	0
P35	J70	J156	37.62	400	120	2.76	0.02	0	0
P37	J156	J114	6.34	400	120	2.76	0.02	0	0
P39	J114	J158	17.29	400	120	-17.51	0.14	0	0.07
P41	J158	J154	151.96	400	120	-17.51	0.14	0.01	0.07
P43	J154	J42	160.98	400	120	-29.63	0.24	0.03	0.19
P45	J42	J34	108.19	400	120	-39.9	0.32	0.04	0.33
P47	J34	J30	57.66	400	120	-58.24	0.46	0.04	0.67
P51	J134	J58	195.85	300	120	2.22	0.03	0	0.01
P53	J58	J154	39.4	250	120	-3.02	0.06	0	0.03
P55	J104	J116	46.43	300	120	-17.24	0.24	0.01	0.29
P57	J116	J100	76.87	300	120	4.93	0.07	0	0.03
P59	J100	J96	131.67	300	120	-3.44	0.05	0	0.01
P61	J96	J48	57.62	300	120	-10.44	0.15	0.01	0.11
P63	J48	J92	55.25	300	120	-9.79	0.14	0.01	0.1
P65	J92	J130	47.43	300	120	-12.94	0.18	0.01	0.17
P69	J88	J84	55.07	300	120	-4.4	0.06	0	0.02
P71	J84	J138	72.56	300	120	-5.93	0.08	0	0.04
P73	J24	J132	44.59	300	120	-7.32	0.1	0	0.06
P75	J132	J20	170.58	300	120	-9.94	0.14	0.02	0.1
P77	J20	J40	161.6	300	120	-10.26	0.15	0.02	0.11
P79	J50	J128	103.31	200	120	-2.3	0.07	0.01	0.05
P81	J38	J42	34.46	300	120	-10.26	0.15	0	0.11
P83	J54	J154	41.9	300	120	-9.11	0.13	0	0.09
P85	J74	J80	13.6	300	120	-1.61	0.02	0	0
P87	J80	J132	70.35	300	120	-2.62	0.04	0	0.01
P89	J10	J196	66.2	300	120	68.44	0.97	0.24	3.69
P93	J88	J130	39.36	300	120	3.19	0.05	0	0.01
P95	J142	J150	154.33	400	120	32.26	0.26	0.03	0.23
P97	J46	J44	98.27	300	120	0	0	0	0
P99	RES9006	J10	97.04	600	120	65.21	0.23	0.01	0.12

17201 - Inspiration Lakeview Water Modelling - Feb 2019 InfoWater Output - Peak Hour Demand Run				
ID	**Demand (L/s)**	**Elevation (m)**	**Head (m)**	**Pressure (psi)**
J10	0	85	141.97	80.99
J100	13.95	80.1	140.69	86.14
J104	32.01	79.92	140.67	86.35
J110	0	79.47	140.83	87.22
J112	0	81.34	140.79	84.51
J114	0	81.23	140.8	84.68
J116	0	79.95	140.7	86.36
J118	0	79.36	140.7	87.2
J120	0	78.33	140.7	88.67
J122	0	79.33	140.7	87.24
J124	0	79.44	140.68	87.06
J126	0	80.21	140.67	85.95
J128	0	81.35	140.73	84.41
J130	0	82.01	140.75	83.5
J132	0	82.11	140.77	83.39
J134	0	81.8	140.83	83.92
J136	0	79.85	140.82	86.68
J138	0	82.78	140.76	82.42
J14	0	81.75	141.18	84.48
J142	0	80.35	141	86.23
J144	0	83.05	140.83	82.14
J146	0	81.26	140.85	84.72
J150	0	78.92	140.91	88.12
J152	0	75.92	140.9	92.37
J154	0	82.07	140.83	83.54
J156	0	81.32	140.8	84.55
J158	0	81.44	140.8	84.39
J160	0	85.04	141.97	80.93
J170	0	85.04	141.97	80.93
J18	0	85.04	141.97	80.93
J190	0	82.36	141.8	84.5
J192	0	81.89	141.63	84.92
J194	0	81.79	141.47	84.84
J196	8.19	84.23	141.31	81.15
J198	37.79	81.77	141.32	84.66
J20	2.16	82.84	140.82	82.41
J24	2.31	82.29	140.77	83.13
J30	8.82	83.73	141.1	81.56
J34	34.93	83.36	140.99	81.93
J38	0	82.86	140.89	82.51
J40	0	83.61	140.86	81.39
J42	0	82.93	140.9	82.41
J44	8.7	81.47	140.85	84.42
J46	0	82.71	140.85	82.64
J48	0	89.79	140.72	72.39
J50	0	80.75	140.72	85.24
J54	13.56	82.17	140.82	83.37
J58	8.73	82.05	140.83	83.55
J62	16.77	79.65	140.83	86.97
J64	16.53	81.1	140.8	84.87
J70	1.53	81.15	140.8	84.79
J74	16.38	81.63	140.77	84.07
J80	1.68	81.7	140.77	83.97
J84	2.55	82.46	140.75	82.87
J88	2.01	82	140.75	83.52
J92	5.25	81.61	140.73	84.04
J96	11.67	80.91	140.7	84.99

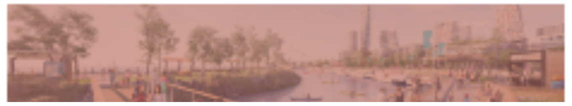
17201 - Inspiration Lakeview Water Modelling - Feb 2019 InfoWater Output - Peak Hour Demand Run Emergency Conditions				
ID	**Demand (L/s)**	**Elevation (m)**	**Head (m)**	**Pressure (psi)**
J100	13.95	80.1	143.99	90.83
J104	32.01	79.92	144.01	91.1
J110	0	79.47	144.39	92.28
J112	0	81.34	143.98	89.05
J114	0	81.23	143.99	89.22
J116	0	79.95	144.05	91.11
J118	0	79.36	144.01	91.91
J120	0	78.33	144.01	93.38
J122	0	79.33	144.01	91.95
J124	0	79.44	144.01	91.79
J126	0	80.21	144.01	90.7
J128	0	81.35	143.97	89.02
J130	0	82.01	143.97	88.08
J132	0	82.11	143.95	87.9
J134	0	81.8	144.25	88.78
J136	0	79.85	144.24	91.54
J138	0	82.78	143.95	86.95
J14	0	81.75	146.01	91.35
J142	0	80.35	145.19	92.18
J144	0	83.05	144.25	87
J146	0	81.26	144.49	89.89
J150	0	78.92	144.77	93.6
J152	0	75.92	144.73	97.82
J154	0	82.07	143.95	87.98
J156	0	81.32	143.99	89.09
J158	0	81.44	143.98	88.91
J16	0	80.46	147.09	94.72
J18	0	85.04	145.98	86.64
J190	0	82.36	145.98	90.45
J192	0	81.89	145.98	91.11
J194	0	81.79	145.98	91.26
J196	8.19	84.23	143.83	84.73
J198	37.79	81.77	145.98	91.29
J20	2.16	82.84	143.93	86.84
J24	2.31	82.29	143.95	87.65
J30	8.82	83.73	143.83	85.45
J34	34.93	83.36	143.84	85.97
J38	0	82.86	143.9	86.78
J40	0	83.61	143.91	85.73
J42	0	82.93	143.89	86.66
J44	8.7	81.47	144.49	89.59
J46	0	82.71	144.49	87.81
J48	0	89.79	143.97	77.01
J50	0	80.75	143.97	89.88
J54	13.56	82.17	143.94	87.81
J58	8.73	82.05	144.02	88.09
J62	16.77	79.65	144.4	92.04
J64	16.53	81.1	144.03	89.46
J70	1.53	81.15	144.02	89.38
J74	16.38	81.63	143.95	88.58
J80	1.68	81.7	143.95	88.49
J84	2.55	82.46	143.95	87.42
J88	2.01	82	143.96	88.08
J92	5.25	81.61	143.97	88.65
J96	11.67	80.91	143.97	89.64

Appendix E – Right-of-Way Cross Sections

Right-of-Way Study (TMIG, 2019)

LAKEVIEW
COMMUNITY PARTNERS LIMITED



LAKEVIEW VILLAGE

STREET HIERARCHY AND RIGHT-OF-WAY STUDY

LAKEVIEW COMMUNITY PARTNERS LIMITED

JANUARY 2019

LAKEVIEW
COMMUNITY PARTNERS LIMITED

TACC CONSTRUCTION

Greenpark

CCI

BRANTHAVEN HOMES

ARGO DEVELOPMENT CORP

Purpose and Context

This document builds upon the **Lakeview Village Development Master Plan** (DMP) to provide additional information on the proposed streets hierarchy and right-of-way configurations for Lakeview Village, to confirm feasibility and provide a basis for design.

The street network for Lakeview Village is planned to achieve multiple objectives:

- Pedestrian, cyclist, transit and vehicular movement, with multiple linkage opportunities to reinforce active transportation;
- Streetscaping to complement the community's urban design vision and promote a healthy street tree canopy, integrated with functional water management and planting strategies;
- On-street and lay-by parking;
- Traditional underground storm, sanitary, and water networks to service the community;
- Utilities and street lighting that meets the principles of a connected community;
- Underground vacuum waste network with community-wide receptacles;
- Underground district heating and cooling network.

The key purpose of this document is to describe the constraints and opportunities related to each feature, assess the proposed approaches relative to prevailing criteria, and establish a streets hierarchy and rights-of-way strategy that mitigates potential conflicts and meets the objectives of the community and stakeholders. Balancing these objectives is critical to achieving a street network that is responsive to the design and technical requirements for delivering the Lakeview Village vision of a unique, innovative and exciting waterfront community.

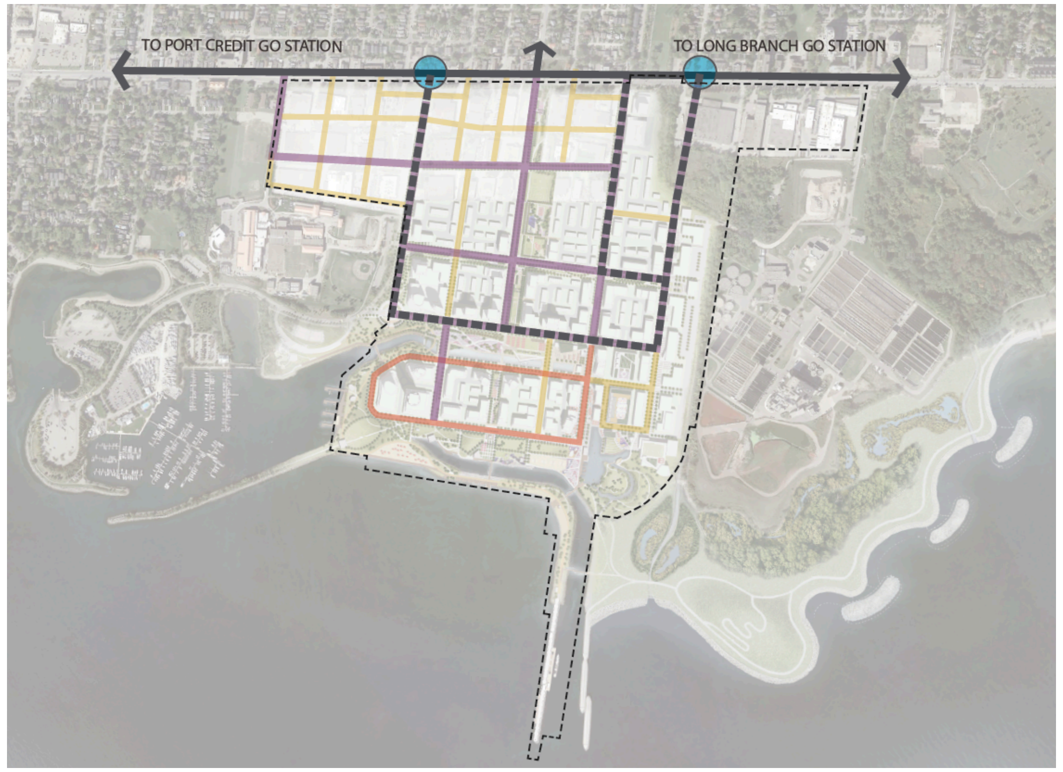
Principles of Movement

A FINE GRAIN STREET PATTERN

The proposed street network is designed to allow people using various modes of travel (i.e. **pedestrians, cyclists, transit riders, vehicles**) to access Lakeview Village and move through the site safely.

Both as a means of structuring the community and providing the building blocks for distinctive districts and neighbourhoods, establishing a fine grain street pattern will appropriately respond to a multitude of users and functions. Ensuring all districts and neighbourhoods are well-interwoven by the street network is fundamental to ensuring pedestrians, cyclists, transit riders, and drivers have appropriate means to make direct, efficient, safe, and memorable connections throughout and to the water's edge.

Achieving street patterns that limit block lengths, reduce vehicular speeds, and adds to the character of Lakeview Village will promote walkability and is an important means of achieving a significant active transportation network that reduces reliance on vehicular travel within the community.



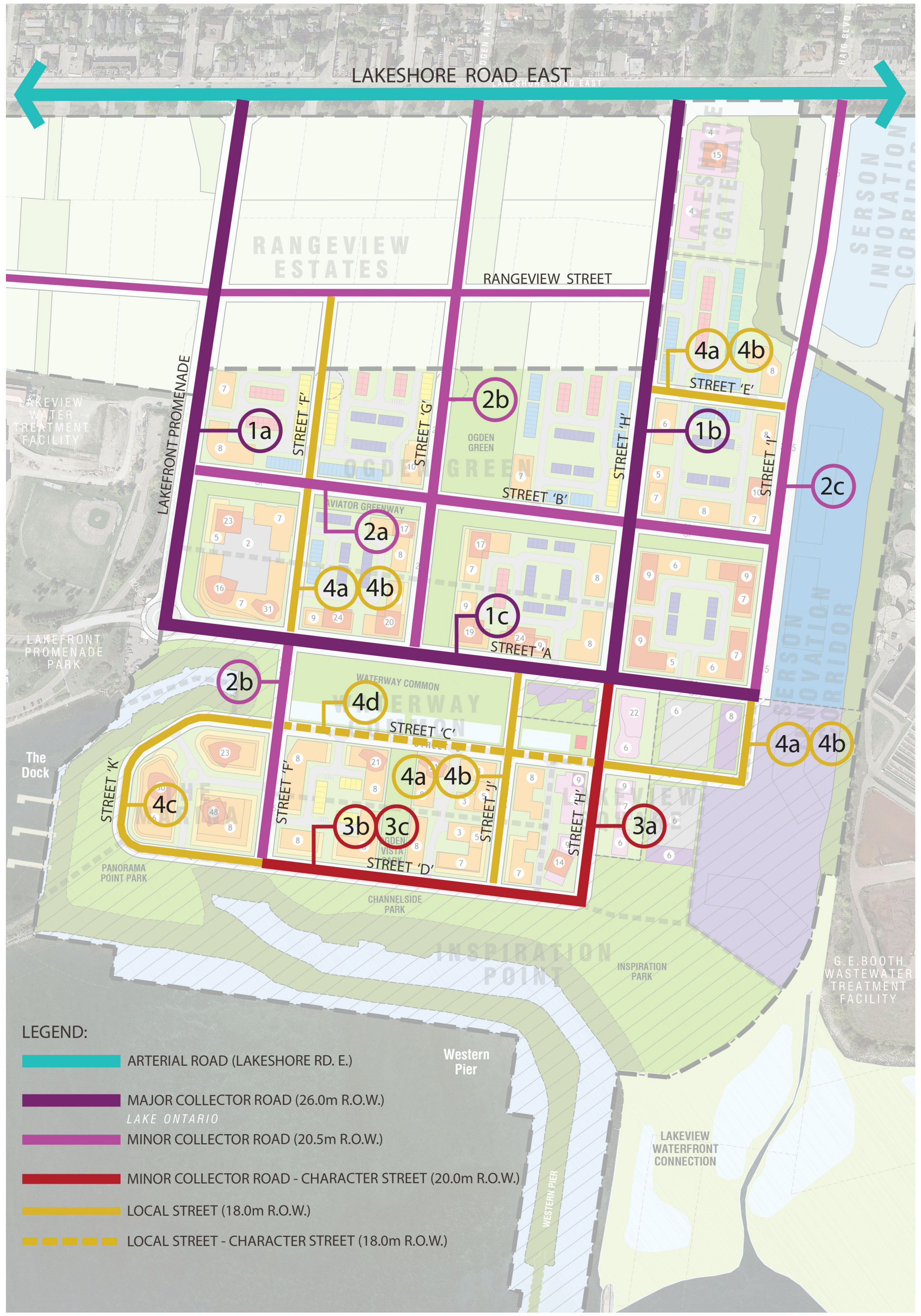
BRINGING TRANSIT TO THE SITE

Ensuring efficient and convenient transit options are provided to and from Lakeview Village is a fundamental component of the transportation and sustainability strategy. Lakeview Village is ideally situated in proximity to the Long Branch and Port Credit GO stations, future Hurontario Street LRT, and TTC transit hub, bringing residents, employees, and visitors within easy reach of local and regional destinations.

At this stage, it is anticipated that the transit link into Lakeview Village and the Employment and Innovation Corridor will bring local bus service along collector streets with direct connections to the two GO stations and a link to the future Lakeshore Road East transit facility. Bringing transit to the site will be important for ensuring the long term sustainability of the project. The plan is designed to be flexible, so that transit can be incorporated as the project is phased and as regional transit plans are implemented.

Beyond traditional bus transit methods, new technologies and initiatives are presenting alternative options that focus on first and last mile issues and have recently emerged as real considerations for new community development. These include micro transit options, shared private services (such as uberPool or Lyft), and even autonomous vehicle services. Regardless of the ultimate method, the focus will remain on bringing a transit model that will see a significant increase in the modal split to transit and away from private car use.

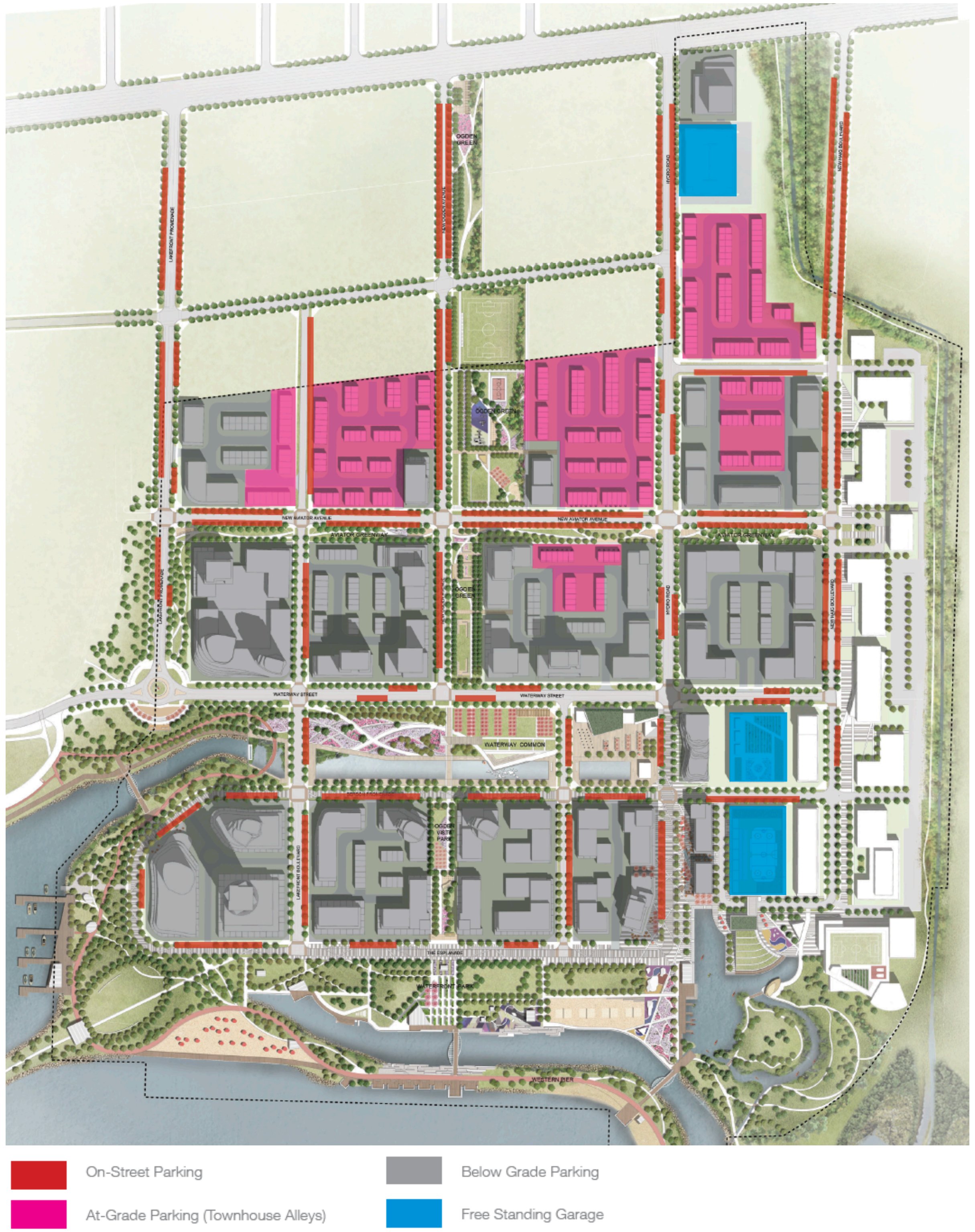
Streets Hierarchy



The principles for establishing safe, efficient and convenient movement of pedestrians, cyclists, transit riders and motorists has been reflected in the development of the proposed street hierarchy strategy consistent with the Lakeview Village community vision. Four (4) primary street categories have been defined, with further variations that consider local conditions and objectives.

1. **MAJOR COLLECTOR STREETS**: Major collector roads provide important connections between Lakeview Village districts and community functions, such as parks, recreation centres, and other facilities. They largely define the community structure, serve as the primary inter-district circulation routes, and accommodate transit. The proposed major collector road right-of-way width is **26.0 metres**. Streetscape character varies according to adjacent land uses, which range from high-rise residential, mid-rise residential, rear lane townhomes, mixed-use buildings, Serson Innovation Campus, Lakefront Promenade Park and Waterway Common Park.
2. **MINOR COLLECTOR STREETS**: Minor collector roads also provide important connections between Lakeview Village districts. They further break down the community structure into smaller blocks and serve as key circulation routes. The proposed minor collector road right-of-way width is **20.5 metres**. Streetscape character varies according to adjacent land uses, which typically range from mid-rise residential and townhomes, Aviator Greenway Park and Ogden Green Park.
3. **MINOR COLLECTOR SPECIAL CHARACTER STREETS**: Minor collector special character streets serve as vital functions within the Lakeview Village community. They define the community structure and provide circulation adjacent to important public spaces within the community. The minor collector special character street's right-of-way width is **20.0 metres**. As character streets, they will be distinguished by streetscape treatments (unique planting, furniture and paving elements) that support the adjacent land uses and built form types found along their edges.
4. **LOCAL STREETS**: Local streets serve as the finer grain street network within Lakeview Village and are intended to provide a comfortable pedestrian experience with relatively low levels of local vehicular traffic. The local street's right-of-way width is **18.0 metres**.

Parking



LAY-BY + ON-STREET PARKING

Proposed dimensions of a parking space within the ROW provided are **L 6.7m x W 2.5m** (including gutter). Parking is to be located along park frontages and on all residential streets while maintaining accommodation of SWM features and transit bays.

PUBLIC PARKING STRATEGY

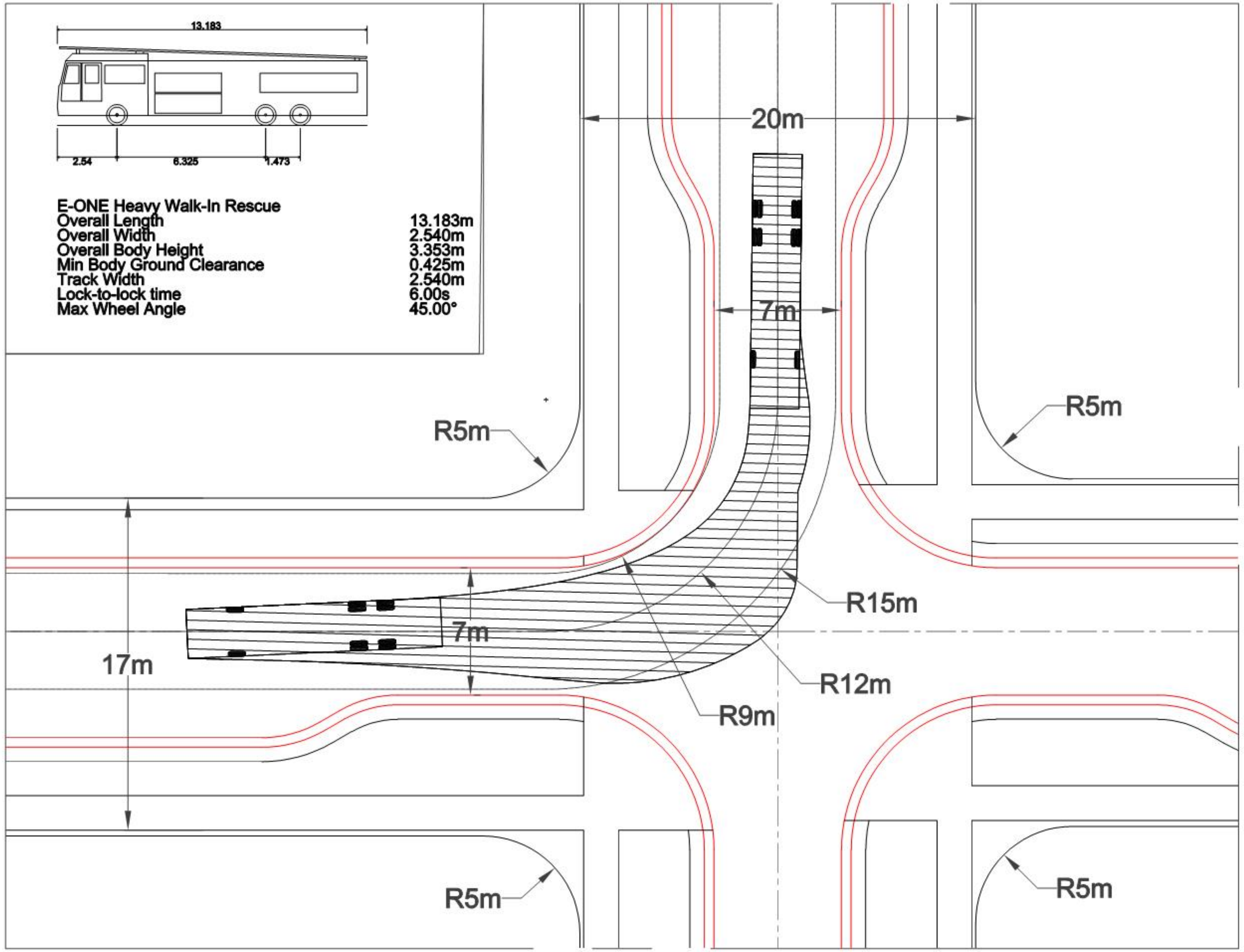
The City should consider monitoring the need for public parking in the Lakeview Waterfront area and may prepare a public parking strategy that considers:

- The amount of on-street parking required to support planned commercial, entertainment and institutional uses;
- The amount of office parking that could be made available through shared parking arrangements to the public in the evenings and on weekends;
- Appropriate locations and sizes for off-street public parking facilities;
- The potential role for a municipal parking authority; and
- Appropriate cash-in-lieu of parking amounts for development in Lakeview Waterfront, in accordance with Policy 8.4.4 of the Mississauga Official Plan, including any special conditions wherein reductions in cash-in-lieu requirements would be considered.

UNDERGROUND PARKING

- Access anticipated to be within the blocks (i.e. not onto the ROW)
- A 1-metre setback will be applied for underground structures from the property line
- Minimizing driveway access points to the public street as well as driveway crossings of the sidewalk, and include shared driveway access with adjacent sites;
- Incorporate innovative stormwater management features;
- Priority parking for accessibility (vehicular and scooters), car share and electric or hybrid vehicles, and including electrical charging stations, and integration of secure bicycle parking;
- Where parking facilities or accesses are located at the rear of buildings, provide rear entrances and pedestrian walk-throughs in order to facilitate pedestrian access to the street and clear way finding.

Vehicular Movement



SUMMARY OF TRAFFIC INVESTIGATIONS

- One lane of traffic provided in each direction to support the anticipated needs of the community
- Turning lanes recommended at select locations:
  - Eastbound and westbound left turn lanes at Street 'A' and Street 'F'
  - Eastbound and westbound left turn lanes at Street 'A' and Street 'H'
  - Facilitate right turn lanes at nearside transit stops
- With the exception of one, 5.0-metre rounding, daylighting provided at all intersections in compliance with TAC guidelines
- 5.0 x 10.0 metre daylight triangle required at the northwest corner of Street 'F' and Street 'K'/Street 'D'
- The road network was designed with a minimum 7.0 metre pavement width and 12.0 metre centerline radius to facilitate service vehicle movement. Vehicle swept path analyses confirm that a fire truck design vehicle will be able to easily access the development and negotiate the proposed internal roads as designed.

Pedestrians and Cyclists

The transportation network proposed for Lakeview Village is designed to encourage a shift away from single occupant vehicle travel, and to embrace multi-modal transportation options with an emphasis on active transportation and transit. This will reduce vehicle trip generation, reduce traffic delays, alleviate congestion, and reduce energy consumption and emissions, while promoting healthy, active lifestyle choices.

The Lakeview Village street and open space system will provide a comprehensive network of pedestrian and cycling routes with local and regional connections. These include the following proposed facilities -

- Sidewalks on both sides of the street for all road categories;
- On-street bike lanes on major collector roads;
- Multi-use trails within park systems adjacent to minor collector roads.
- Multi-use path adjacent to Serson Innovation Corridor (New Haig Boulevard) linking Lakeshore Road to Street ‘A’ bicycle facilities

Pedestrian connections will be seen to promote and identify existing and planned trails in Lakeview Village, including municipal connections to the existing Waterfront Trail.

The proposed cycling facilities approach achieves a core principle of the community which is connectivity, particularly north-south bicycle connections, linking the entire Lakeview community and beyond to the waterfront and other key character districts and neighbourhoods identified within Lakeview Village. This high level of connectivity provides an opportunity to directly link residences to retail and employment uses.

Transit

LONG-TERM TRANSIT STRATEGY

The long-term local transit plan for Lakeview Village utilizes the planned major collector road network in the north-south and east-west directions. These roads will form part of a circuitous route accessing Lakeshore Road East between Lakefront Promenade and New Haig Boulevard (north-south), with an internal east-west connection via Waterway Street. In the interim, transit routing will be located on Hydro Road until the New Haig Boulevard connection to Lakeshore Road East is fully realized.

All residential, commercial, and institutional development will be located less than 225 metres from the internal transit system which will define the planned transit service route. Proposed bus stops will be implemented at a spacing of approximately 300 metres along the transit route, to make travel by transit as attractive as possible to new residents and employees.

To ensure new residents, employees, and visitors generated and attracted to the community can rely upon, and become familiar with, attractive and competitive transit service at the onset of development, it is recommended that the City of Mississauga Transit Authority investigate the opportunity to modify or add bus routes into and through Lakeview Village at first occupancies. Alternatively, LCPL proposes private shuttle service between the initial phases of Lakeview Village to connect to Lakeshore Road (and potentially other destinations such as Port Credit and Long Branch GO Stations, Square One, etc.) until transit demand satisfies the City's threshold to provide public transit routes through the site.

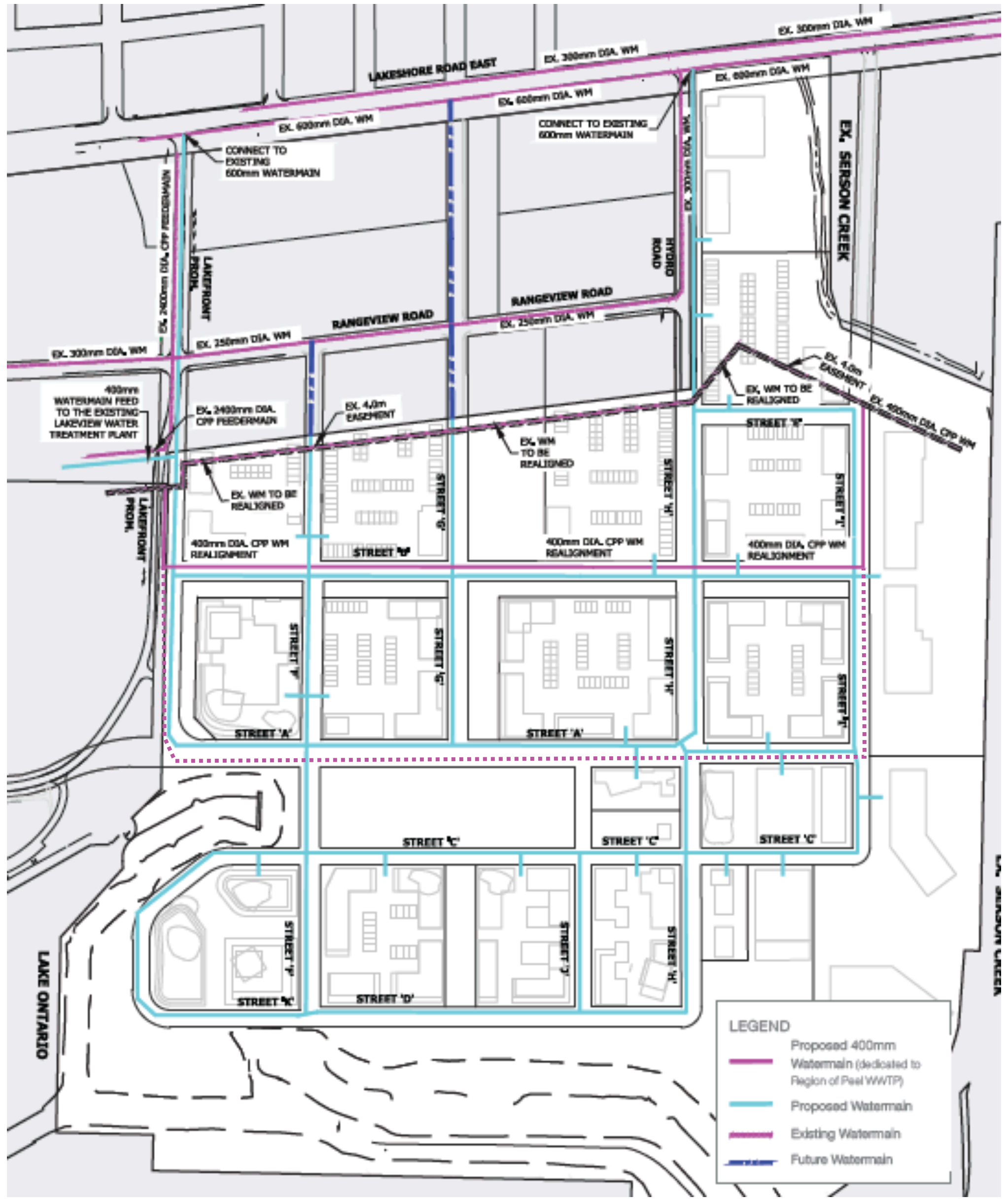
The actual route of initial transit service will be governed by the overall system services in operation at the time, phasing and occupation percentage of the development, and practical integration of the new route into the broader Lakeview Village construction program.

Streetscape Elements

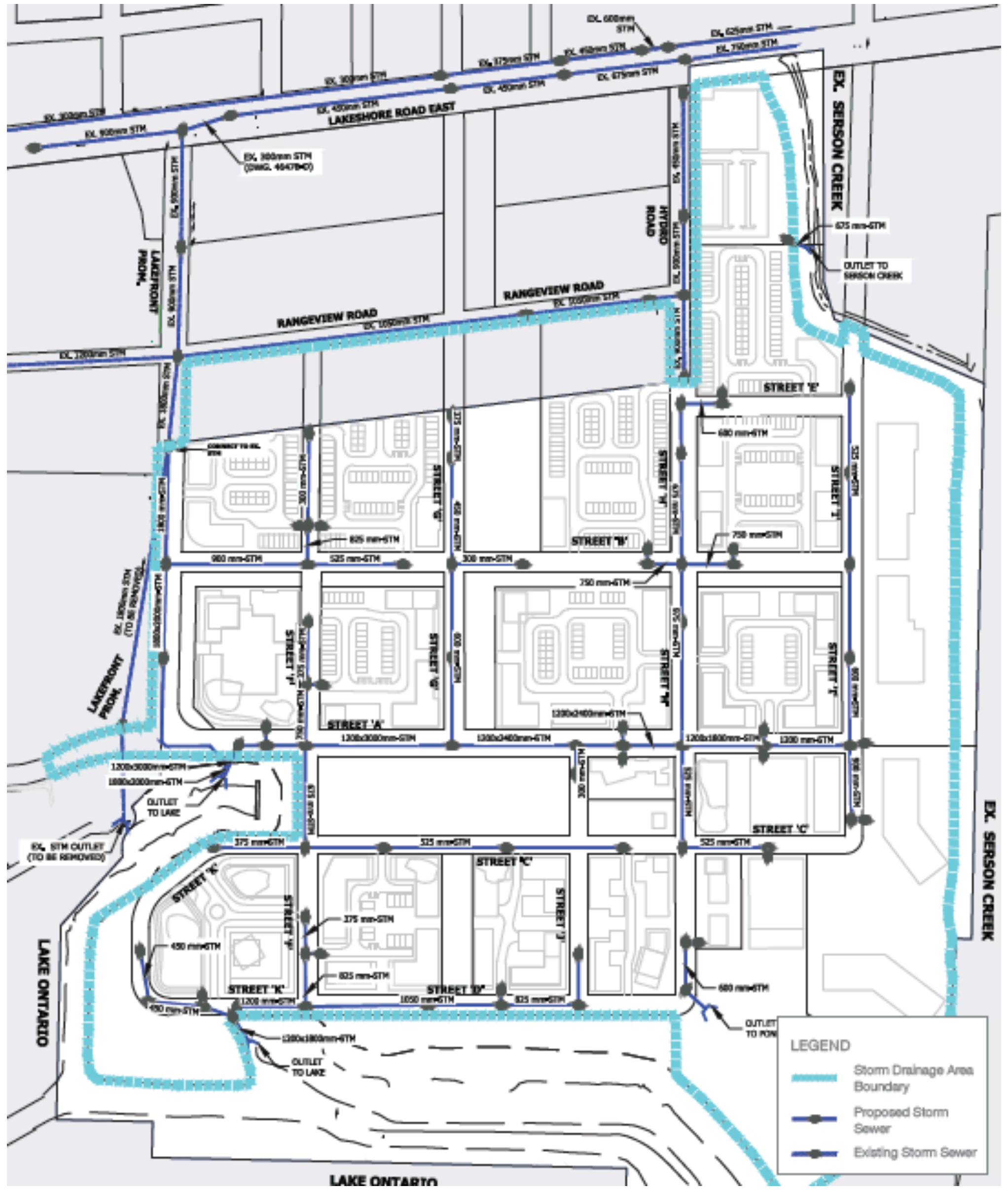
Harmoniously designed streetscapes that appropriately integrate infrastructure requirements will contribute to the identity of Lakeview Village and each of its districts and neighbourhoods. A unique and inviting public realm experience for residents and visitors that appropriately responds to adjacent land uses can achieved through a carefully considered combination of streetscape features. Elements such as outdoor furniture, lighting and enhanced paving materials can reinforce the pedestrian priority and reinforce the unique character of the community and districts. The proposed streetscape treatment will be appropriate to the street designation and ensure the safety, comfort and accessibility of pedestrians, cyclists and motorists. Some of the streetscape elements to be considered include:

- Street trees – grass boulevards, tree grates, raised planters, soil cells;
- Street furniture – benches, bollards, bike racks (including bike sharing kiosks), wayfinding and information signage;
- Vacuum waste receptacles;
- Street lights – street and pedestrian scale, pathway, light bollards, banners;
- WIFI hubs; and,
- Public art.

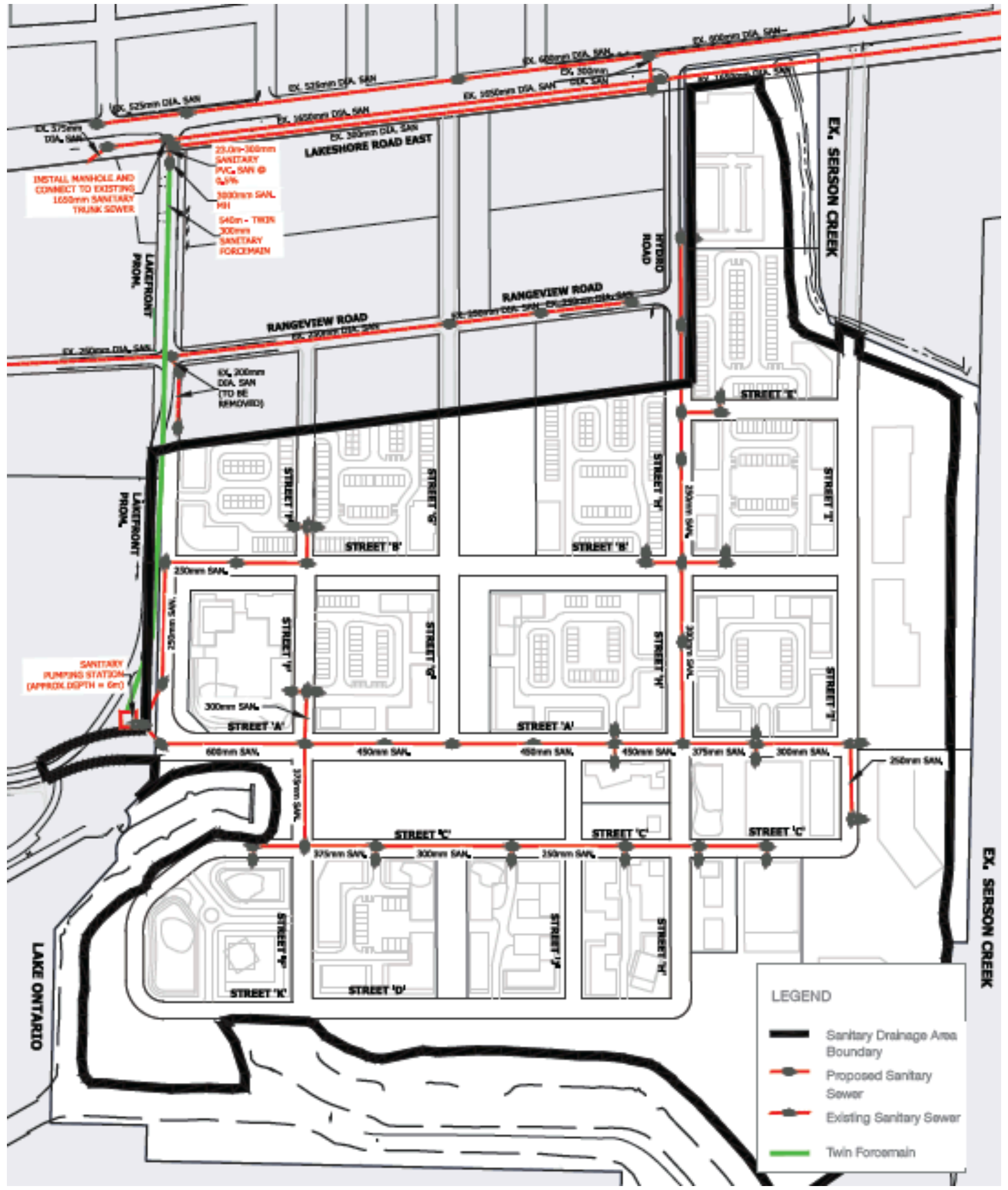
Municipal Services



WATER: a new looped watermain will connect the new community to existing trunk infrastructure. Pipe sizes are expected to range from 200mm to 400mm to typically be located within the paved roadway portion of the ROW.



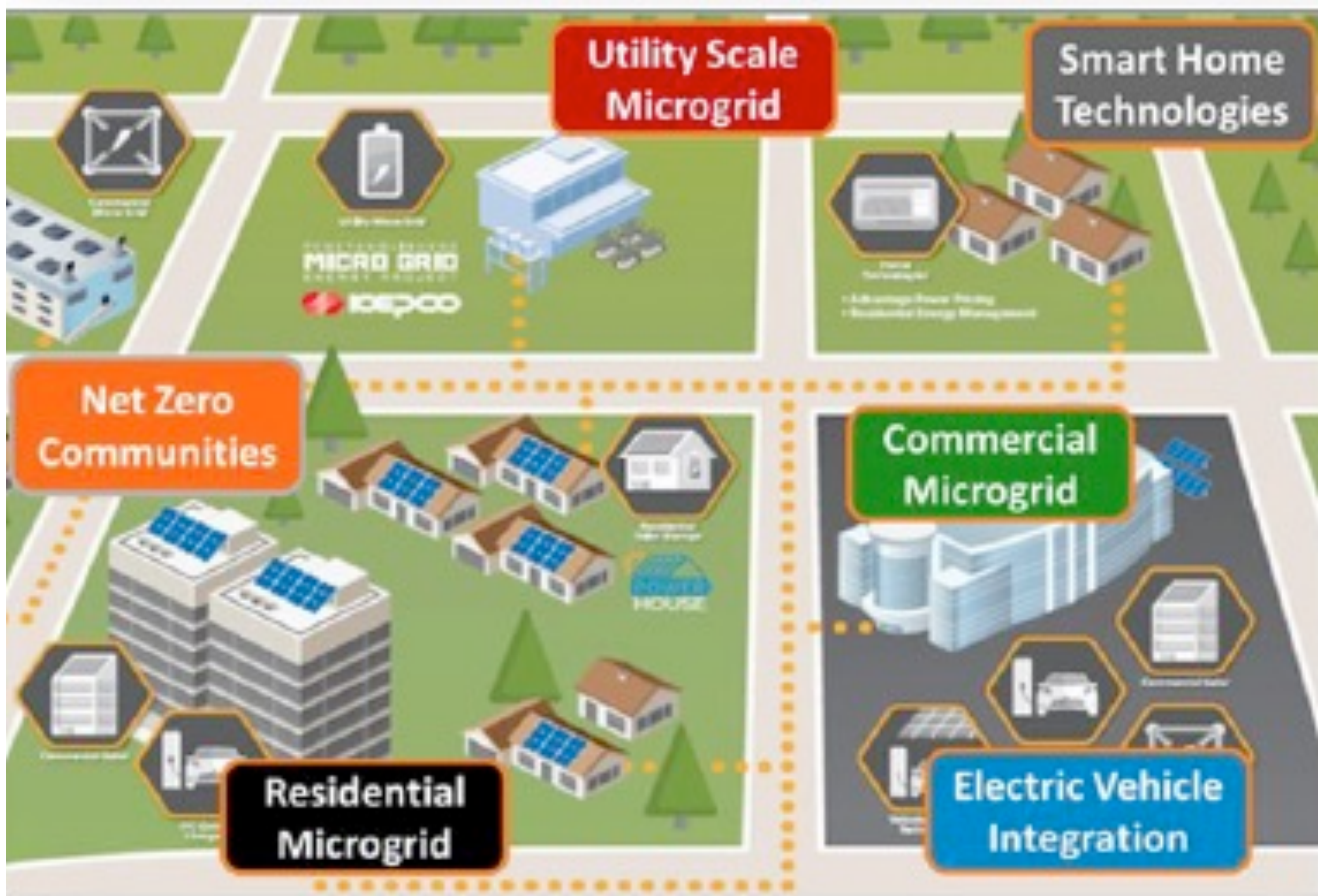
STORM: Runoff throughout the community will be conveyed by a network of storm sewers, along with road surfaces and a range of stormwater management features on route to the outlets. Storm sewers are expected to range from 300mm to 1.2x3.0m (box culvert) to typically be located within the paved roadway portion of the ROW.



SANITARY: Sanitary network will be installed throughout the neighbourhood, in combination with a new pumping station and forcemain to convey flows to the Regional network. Sanitary sewers are expected to range from 250mm to 600mm, to typically be located within the paved roadway portion of the ROW.

LAKEVIEW COMMUNITY PARTNERS LIMITED

Utilities



The utility corridor will permeate the community and will require space within each right-of-way.

The Lakeview Village street cross sections have assigned a utility corridor width ranging from 2.0 to 2.3m throughout the neighbourhood.

The utility corridor will accommodate a conventional utility network, the enhanced connectivity elements under consideration for Lakeview Village, as well as the potential introduction of a 'microgrid' network to service the neighbourhood.

Stormwater Management

The stormwater management strategy for Lakeview includes features within the street corridors that will provide water quality treatment for runoff generated by those streets.

Each street category has been reviewed to establish the suite of stormwater management measures that are appropriate given the corridor width, the adjacent land use, the urban design vision, and the other services within that corridor that could introduce potential conflicts or servicing constraints.

The suite of stormwater management features have also considered other precedents within the City of Mississauga and encouraged by Credit Valley Conservation. Details of the specific features selected will consider the operational and maintenance requirements of the City.

STORMWATER MANAGEMENT TYPE

	A + C + D		B	
STREET TYPE	1-side	2-sides	1-side	2-sides
1a. Major Collector	✓		✓	
1b. Major Collector	✓			✓
1c. Major Collector		✓		✓
1d. Major Collector				✓
2a. Minor Collector		✓		
2b. Minor Collector		✓	✓	
3a. Special Character Street	✓			
3b. Special Character Street			✓	
3c. Special Character Street			✓	
4a. Local Street		✓		
4b. Local Street		✓		
4c. Local Street	✓			
4d. Local Street		✓		

A. TREE PITS WITH SOIL CELLS

Dimensions: 1.5m to 1.8m depth and full width of boulevard, 2.25m to 2.9m

Suitability: Major and Minor Collectors

B. BIORETENTION BUMP-OUTS

Dimensions: 1.5m to 1.8m depth and full width of lay-by parking, 2.2m

Suitability: Major and Minor Collectors, Special Character Streets

C. BIORETENTION PLANTERS

Dimensions: 1.5m to 1.8m depth and full width of boulevard, 2.25m to 2.9m

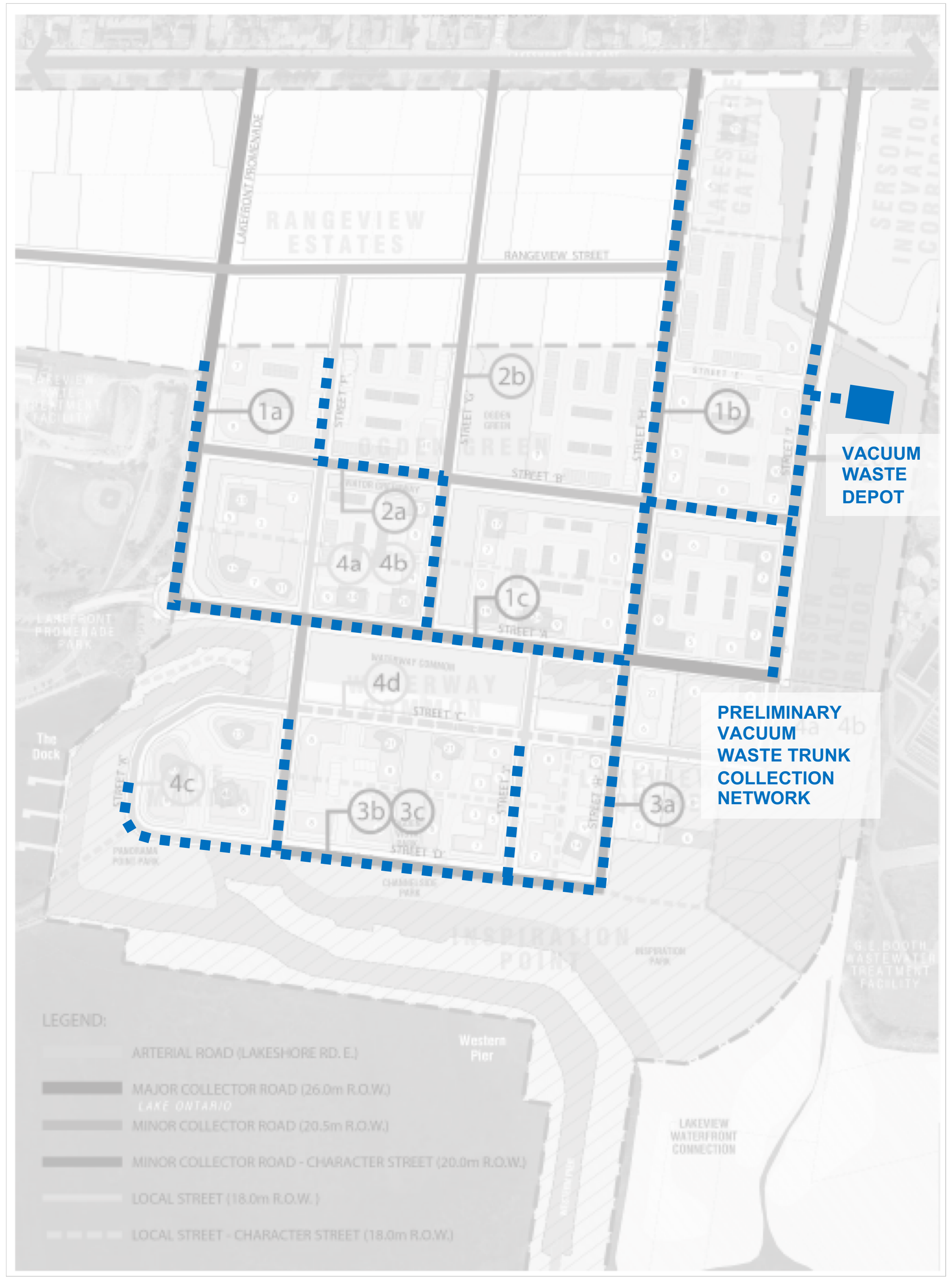
Suitability: Major and Minor Collectors, Special Character Streets, Local Streets

D. BIOSWALES

Dimensions: 1.5m to 1.8m depth and full width of boulevard, 2.25m to 2.9m

Suitability: Major Collectors

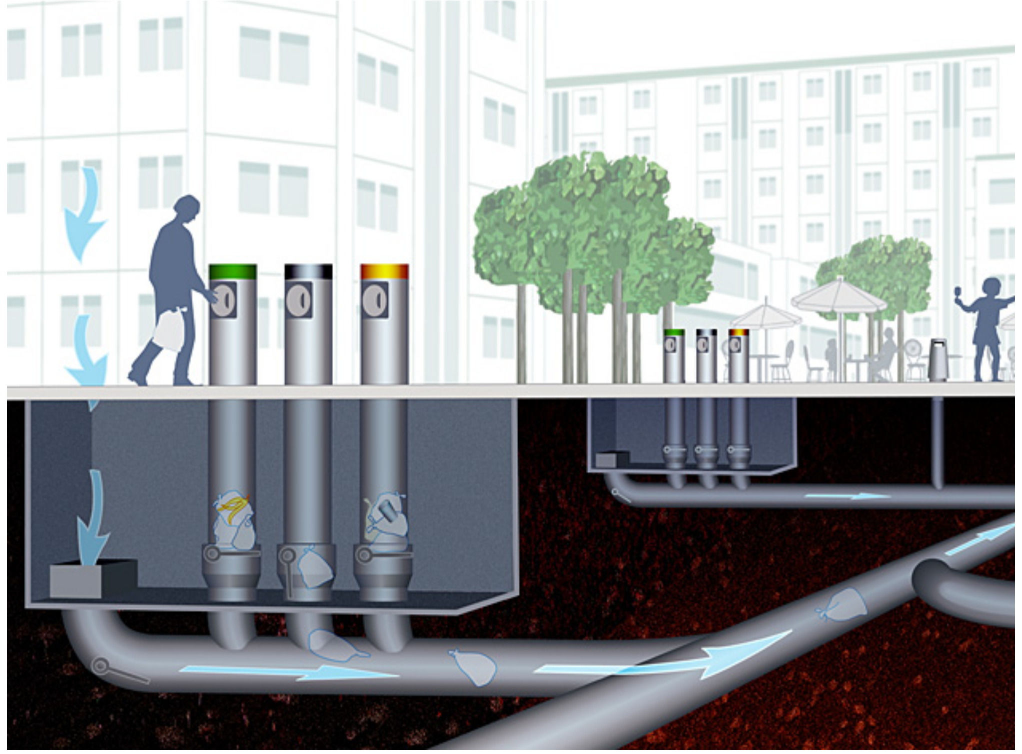
Vacuum Waste Collection



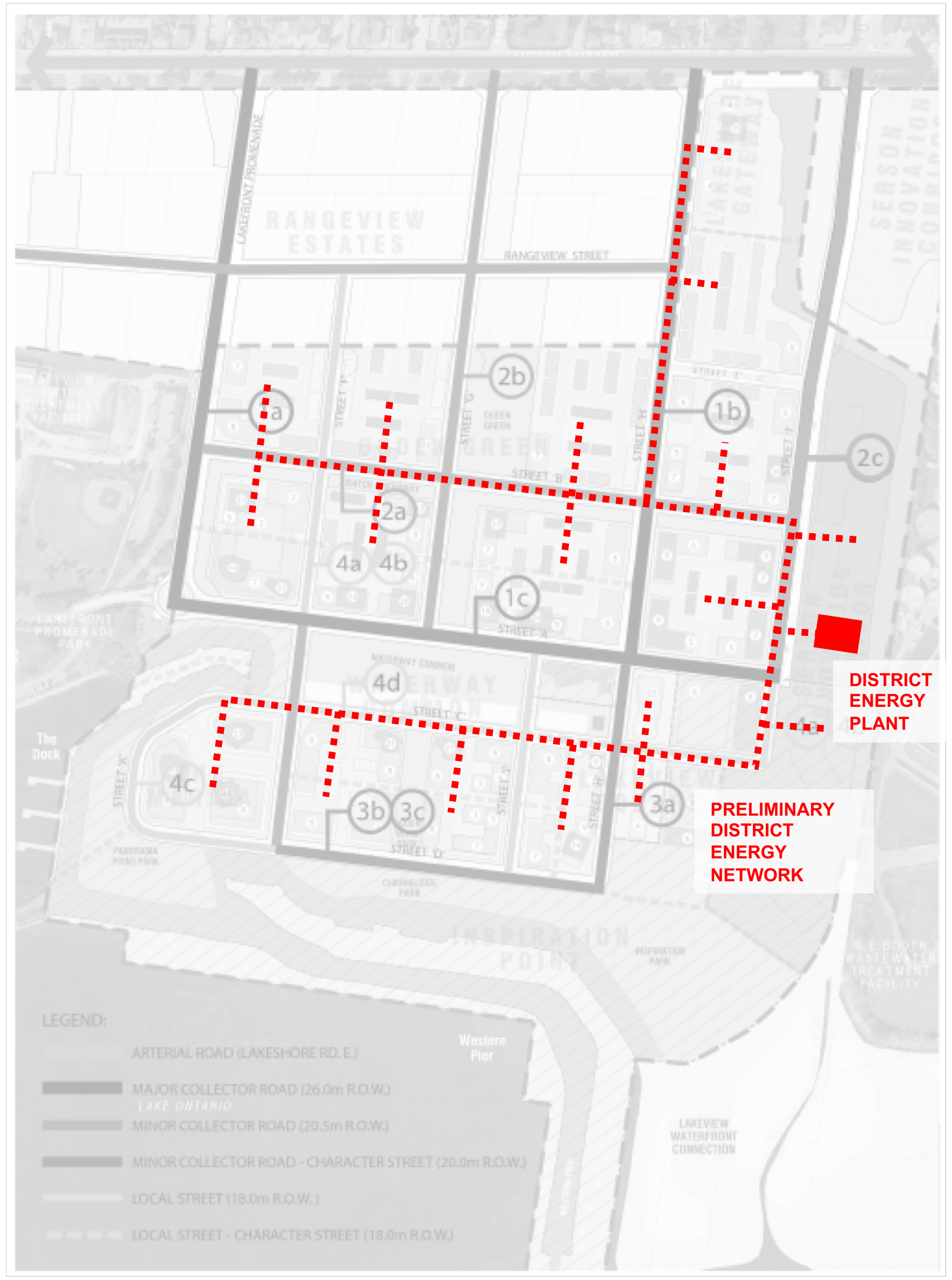
Vacuum waste collection is under consideration for Lakeview Village as an alternative to traditional waste management, due to the location and form of the new community. The technology is not new, and has the potential to elevate the level of service to the community by removing the nuisance and health hazards associated with waste storage and accumulation, and reducing the environmental impact of traditional waste collection.

A trunk network of vacuum tubes will provide connections to each development parcel, along with receptacles distributed throughout public spaces, all connected to a central waste depot from which the three waste streams can be collected daily.

The trunk network is comprised of a 500mm diameter steel pipe located within the right-of-way, which must be coordinated with and respect the other demands on the street corridor.



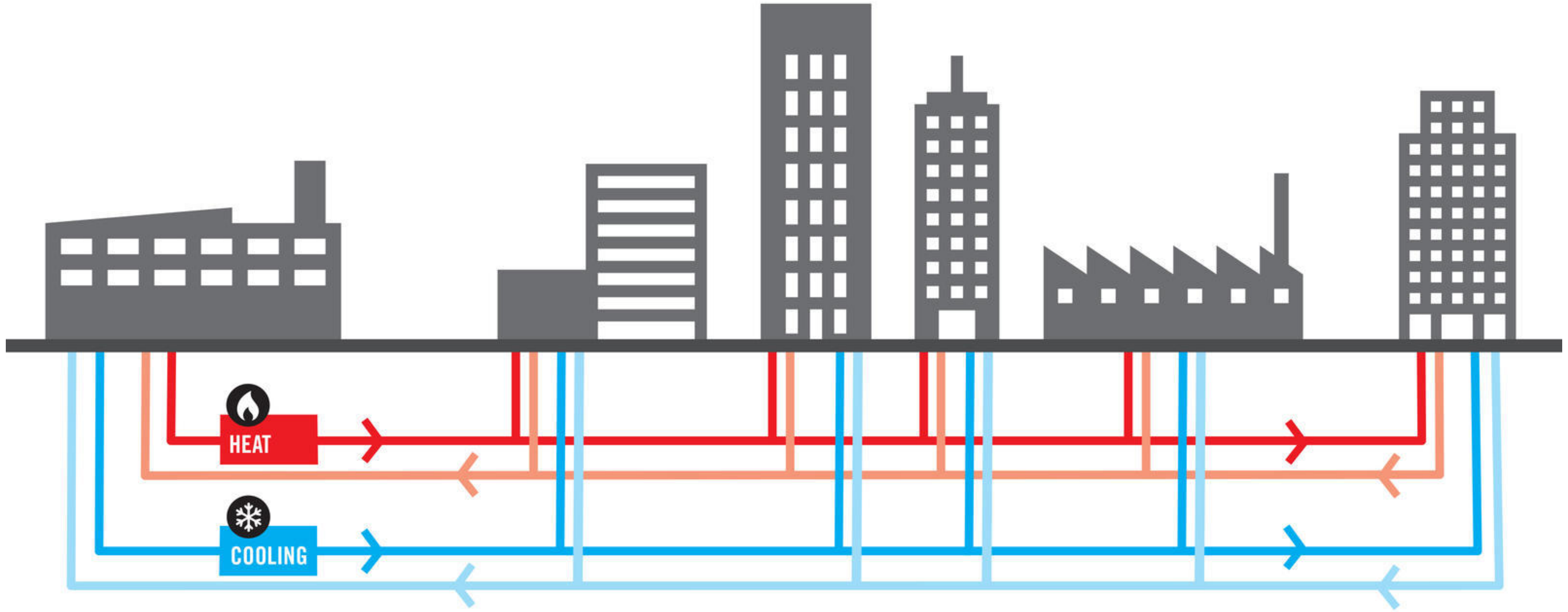
District Heating and Cooling



District heating and cooling provides a centralized plant that supplies hot and cold water to a series of pipes distributed throughout a community, and used by individual buildings in lieu of traditional boilers and chillers.

For Lakeview, one option involves leveraging the waste heat available at the GE Booth Wastewater Treatment Facility to heat and cool water for distribution throughout the community.

This requires a distributed network of pipes within the street corridors to service the community, which must be coordinated with and respect the other demands on the street corridor. The pipe network is typically comprised of a 4-pipe system ranging in diameter from 150mm to 500mm.



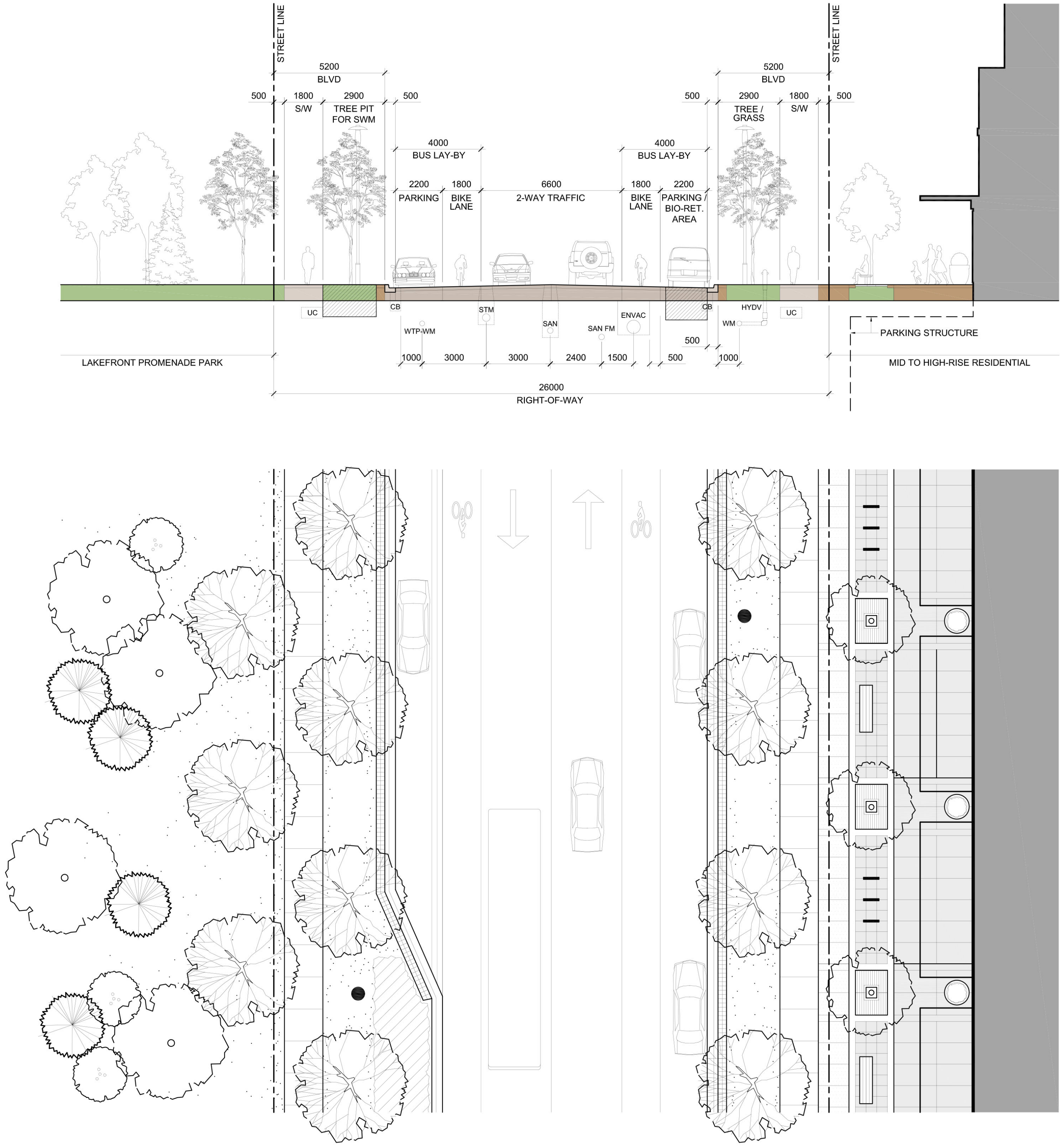
LAKEVIEW
COMMUNITY PARTNERS LIMITED

1a. Major Collector (Lakefront Promenade)

Lakefront Promenade will incorporate urban streetscape treatments characterized by enhanced paving, sidewalks, bike lanes, street furniture as appropriate to adjacent uses, and urban street tree conditions in bioswales boulevards.

KEY FEATURES AND PRINCIPLES:

- 26m wide right-of-way
- 3.3m wide traffic lane in each direction
- 4.0m wide multi-use corridor in each direction to be used for on street parking, bus stop areas, turning lanes, bio-retention areas, etc.
- 5.2m wide boulevards on each side
- 2.9m wide tree pit corridor in boulevards
- 1.80m wide sidewalk in boulevards
- Watermain will be installed 1.0m behind the curb under the eastern boulevard
- Watermain to the sewage treatment plant will be installed 1.0m in front of the curb on the west side of the right-of-way
- 2.3m wide utility corridor under both boulevards
- 1.5m wide trench for Vacuum Waste under the pavement
- Sanitary forcemain will be placed under the pavement
- Sanitary and storm sewers will be placed under the pavement



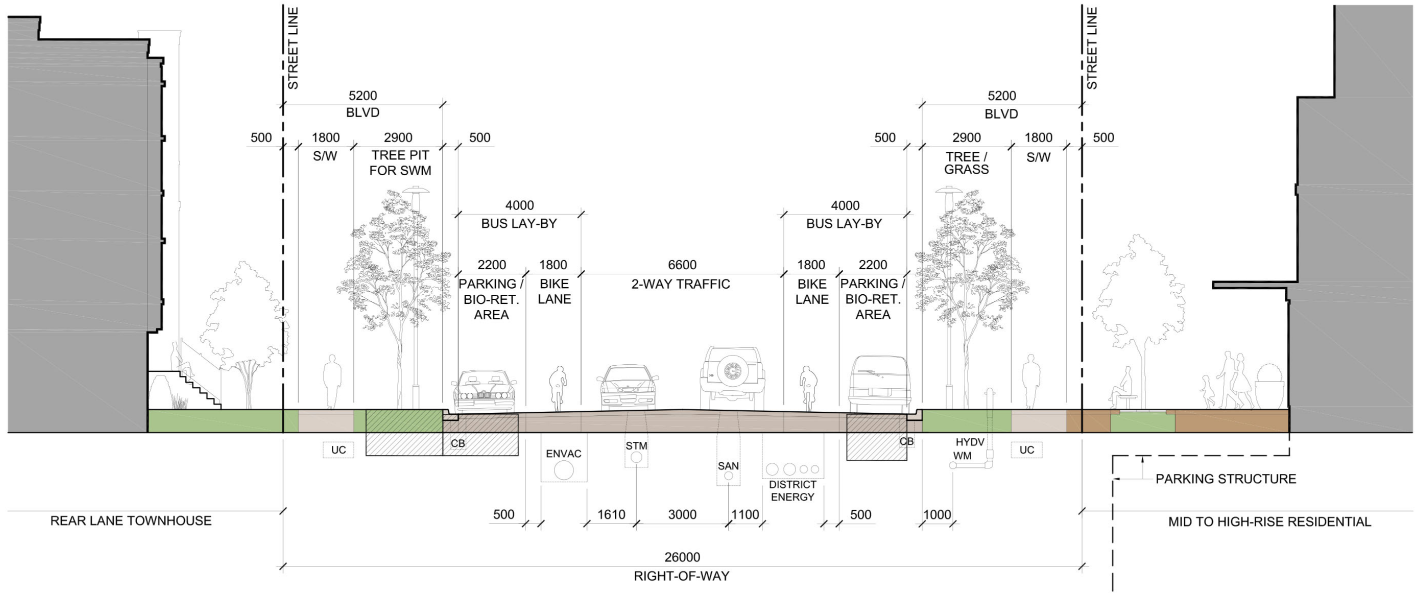
Section 1a:
MAJOR COLLECTOR ROAD - LAKEFRONT PROMENADE (26.0m R.O.W.) (LOOKING NORTH)
SIDEWALK ON BOTH SIDES / 2 THRU LANES / ON-STREET PARKING ON BOTH SIDES, WHICH MAY BE ALTERNATED WITH LID FUNCTIONS, BUS LAY-BY, OR STREET FURNITURE AS BUMP-OUTS / BIKE LANE ON BOTH SIDES / GRASS BOULEVARD ON ONE SIDE AND TREE PIT WITH SWM FUNCTION ON THE OTHER BOULEVARD

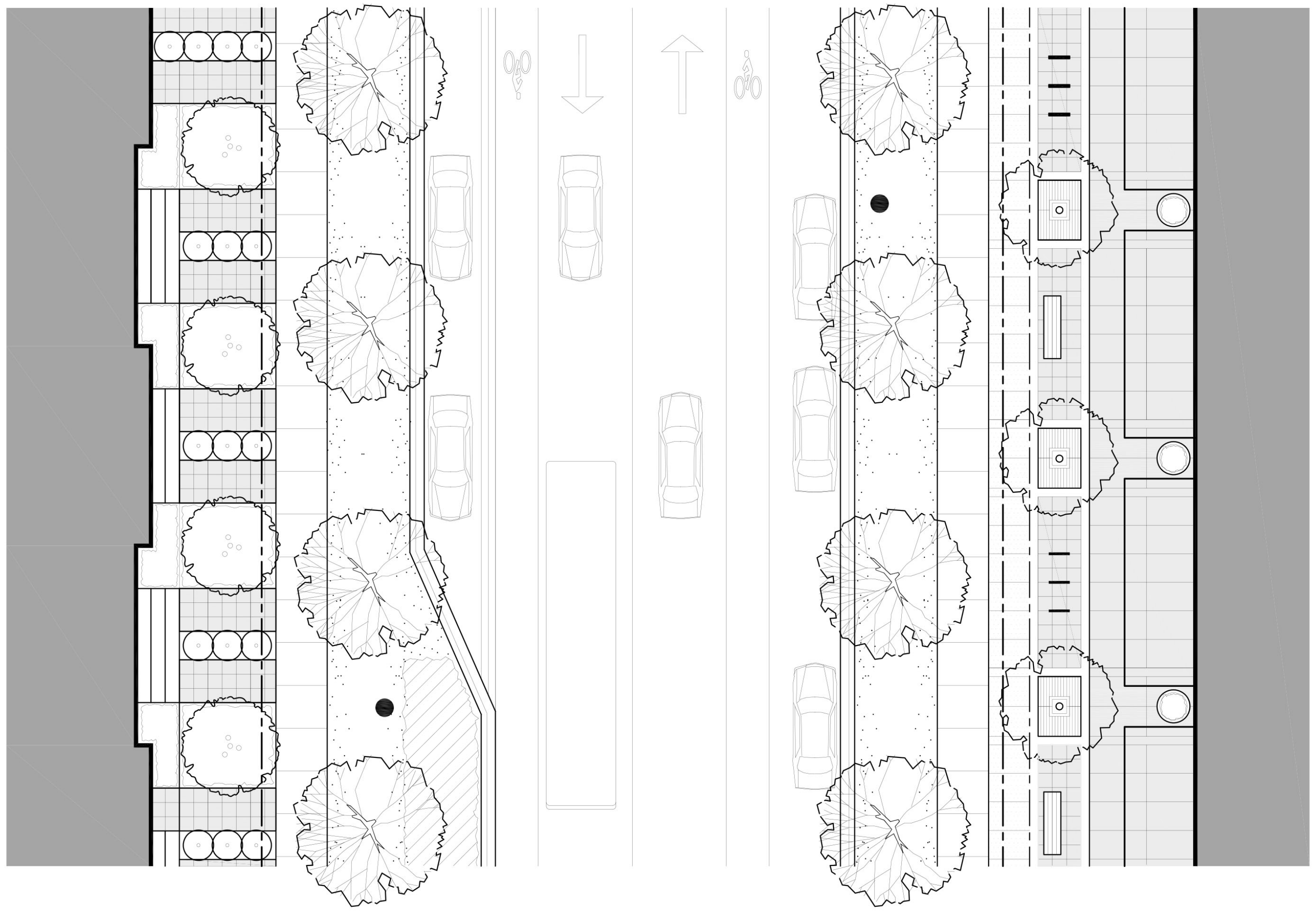
1b. Major Collector (Hydro Road / Street H)

Hydro Road will incorporate urban streetscape treatments characterized by enhanced paving, sidewalks, bike lanes, street furniture as appropriate to adjacent uses, and urban street tree conditions in grass boulevards.

KEY FEATURES AND PRINCIPLES:

- 26m wide right-of-way
- 3.3m wide traffic lane in each direction
- 4.0m wide multi-use corridor in each direction to be used for on street parking, bus stop areas, turning lanes, bio-retention areas, etc.
- 5.2m wide boulevards on each side
- 2.9m wide tree pit corridor in boulevards
- 1.80m wide sidewalk in boulevards
- Watermain will be installed 1.0m behind the curb under the eastern boulevard
- 2.3m wide utility corridor under both boulevards
- 1.5m wide trench for Vacuum Waste under the pavement
- 2.0 wide trench for District Energy under the pavement
- Sanitary and storm sewers will be placed under the pavement





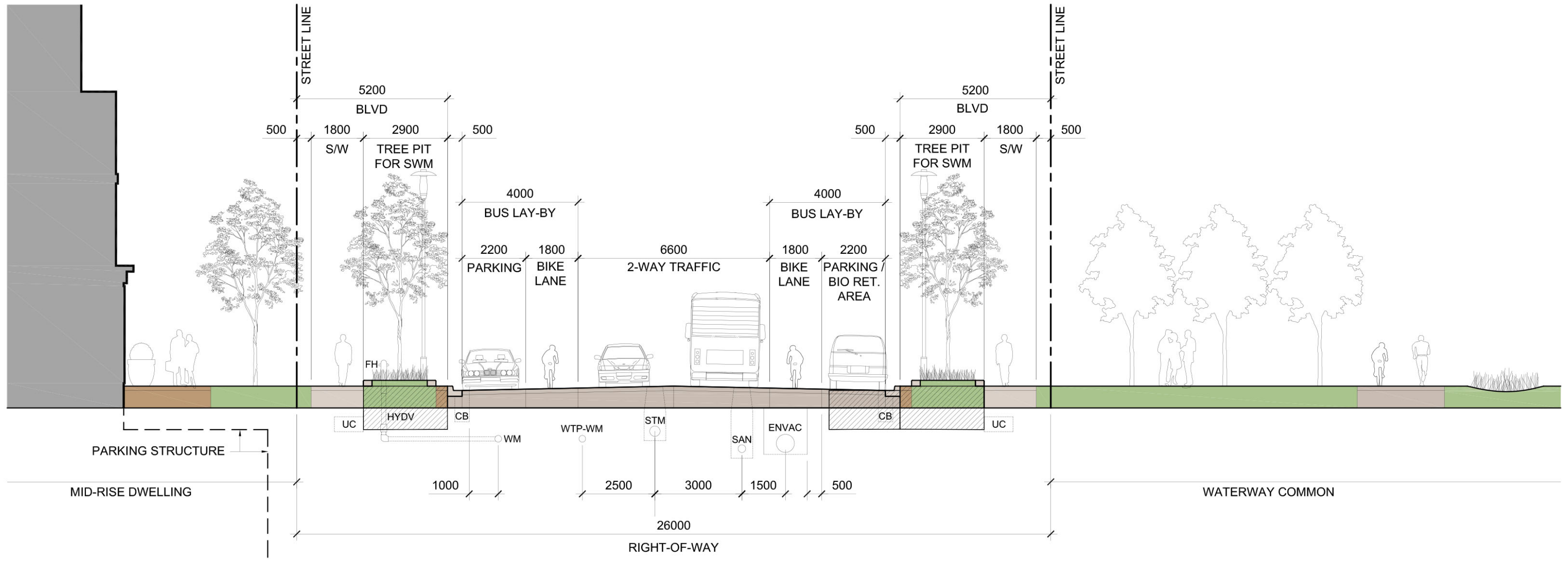
Section 1b:
MAJOR COLLECTOR ROAD - HYDRO ROAD / STREET 'H' (26.0m R.O.W.) (LOOKING NORTH)
SIDEWALK ON BOTH SIDES / 2 THRU LANES / ON-STREET PARKING ON BOTH SIDES, WHICH MAY BE ALTERNATED WITH LID FUNCTIONS, BUS LAY-BY, OR STREET FURNITURE AS BUMP-OUTS / BIKE LANE ON BOTH SIDES / GRASS BOULEVARD ON ONE SIDE AND TREE PIT WITH SWM FUNCTION ON THE OTHER BOULEVARD

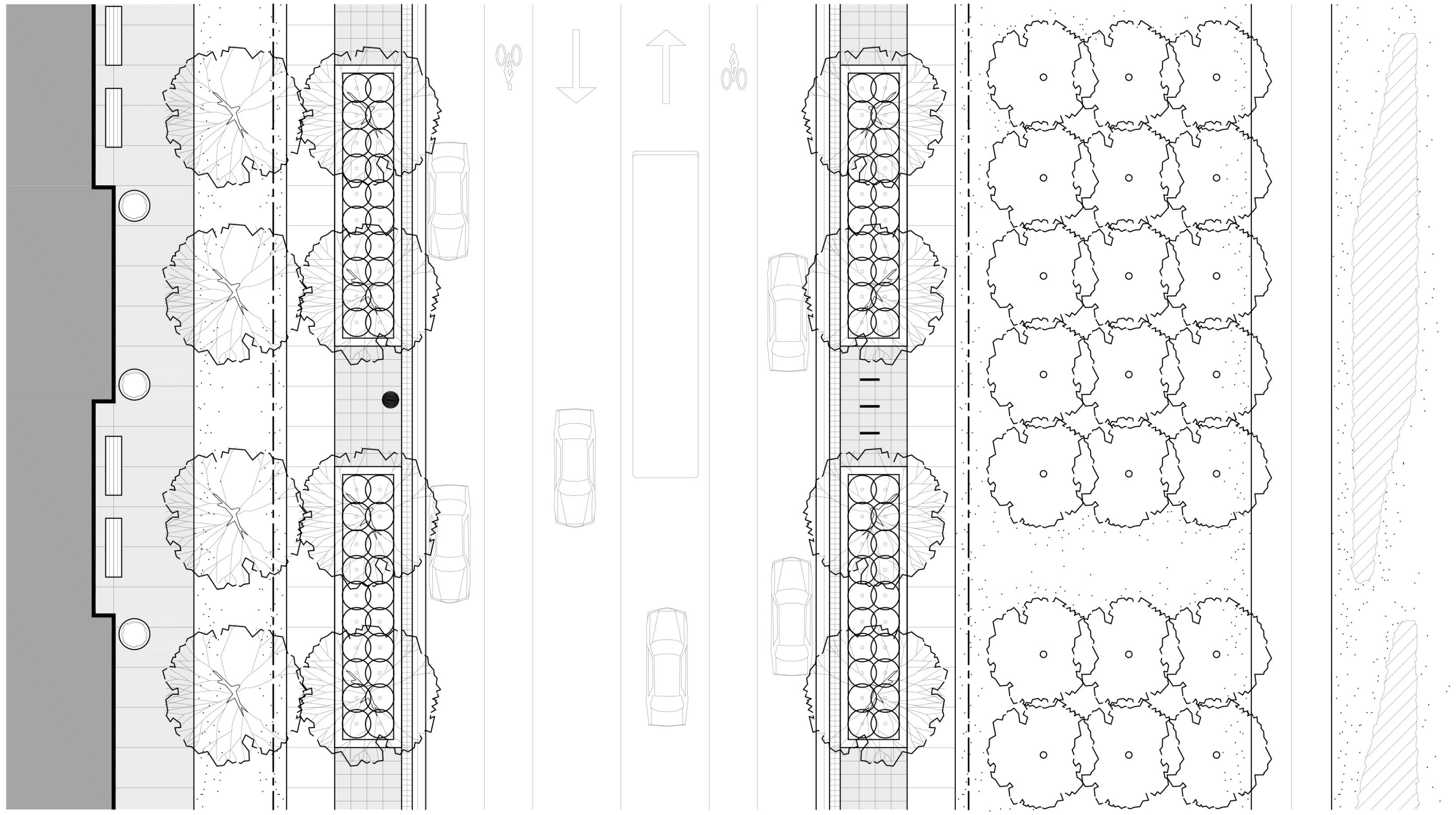
1c. Major Collector (Street A)

Waterway Street will incorporate urban streetscape treatments characterized by enhanced paving, sidewalks, bike lanes, street furniture as appropriate to adjacent uses, and urban street tree conditions in raised curb stormwater management planter boulevards.

KEY FEATURES AND PRINCIPLES:

- 26m wide right-of-way
- 3.3m wide traffic lane in each direction
- 4.0m wide multi-use corridor in each direction to be used for on street parking, bus stop areas, turning lanes, bio-retention areas, etc.
- 5.2m wide boulevards on each side
- 2.9m wide tree pit corridor in boulevards
- 1.80m wide sidewalk in boulevards
- Watermain will be installed in paved portion of the right-of-way
- 2.3m wide utility corridor under both boulevards
- 1.5m wide trench for Vacuum Waste under the pavement
- Sanitary and storm sewers will be placed under the pavement





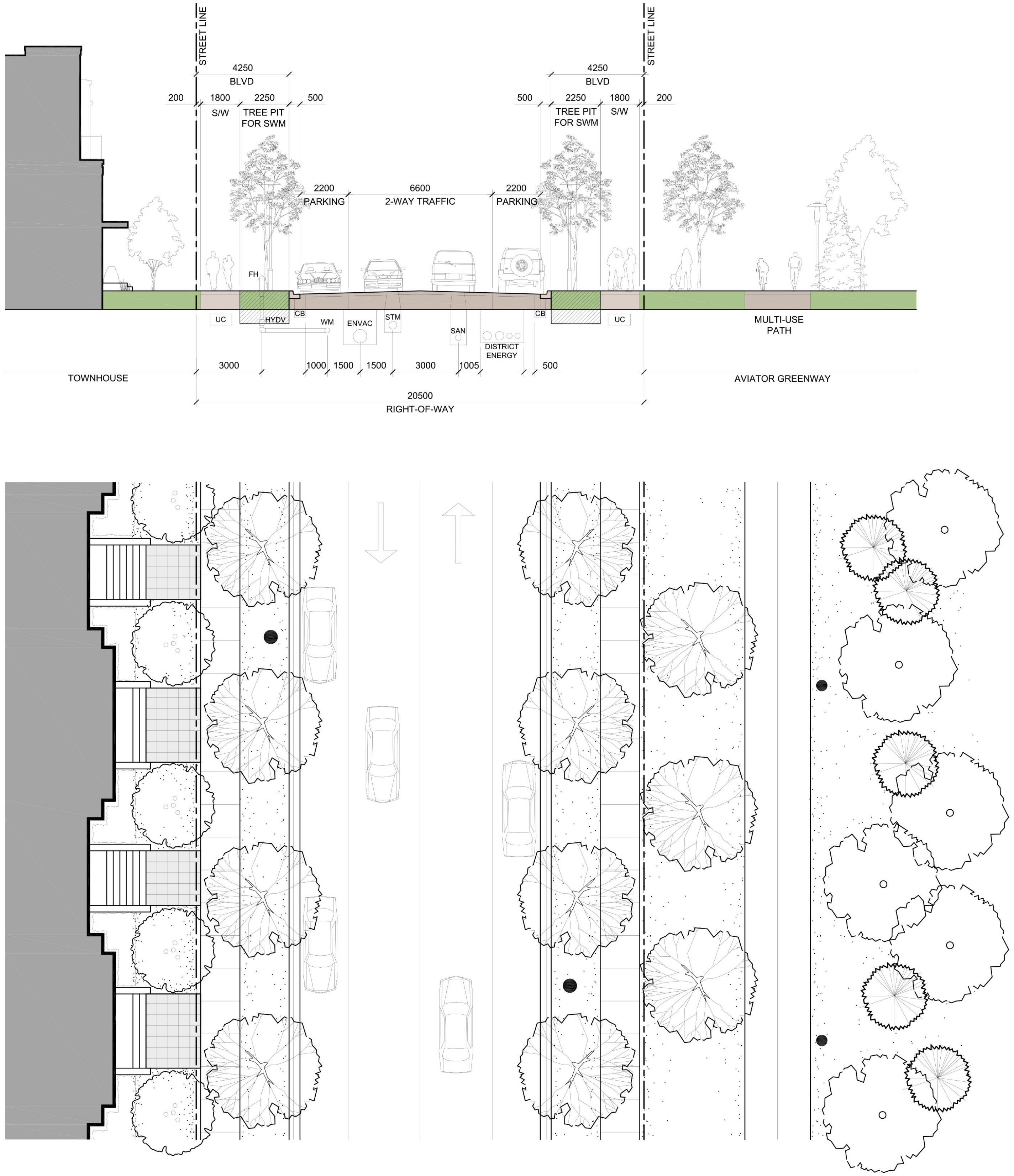
Section 1c:
MAJOR COLLECTOR ROAD - STREET 'A' (26.0m R.O.W.) (LOOKING EAST)
SIDEWALK ON BOTH SIDES / 2 THRU LANES / ON-STREET PARKING ON BOTH SIDES, WHICH MAY BE ALTERNATED WITH LID FUNCTIONS, BUS LAY-BY, OR STREET FURNITURE AS BUMP-OUTS / BIKE LANE ON BOTH SIDES / BOULEVARD WITH TREE PITS FOR SWM FUNCTION.

2a. Minor Collector (Street B / New Aviator Avenue)

New Aviator Avenue will incorporate urban streetscape treatments characterized by enhanced paving, sidewalks, street furniture as appropriate to adjacent uses, and urban street tree conditions in grass boulevards.

KEY FEATURES AND PRINCIPLES:

- 20.5m wide right-of-way
- 3.3m wide traffic lane in each direction
- 2.2m wide on street parking lane
- 4.25m wide boulevards
- 2.25m wide tree pit corridor in boulevards
- 1.80m wide sidewalk in boulevards
- Watermain will be installed in paved portion of the right-of-way
- Watermain for sewage treatment plant will be installed in the paved portion of the road between sanitary and storm sewer with less than the minimum MECP separation distance from sewers at 1.5m.
- 2.0m wide utility corridor under both boulevards
- 1.5m wide trench for Vacuum Waste under the pavement
- 2.0 wide trench for District Energy under the pavement
- Sanitary and storm sewers will be placed under the pavement



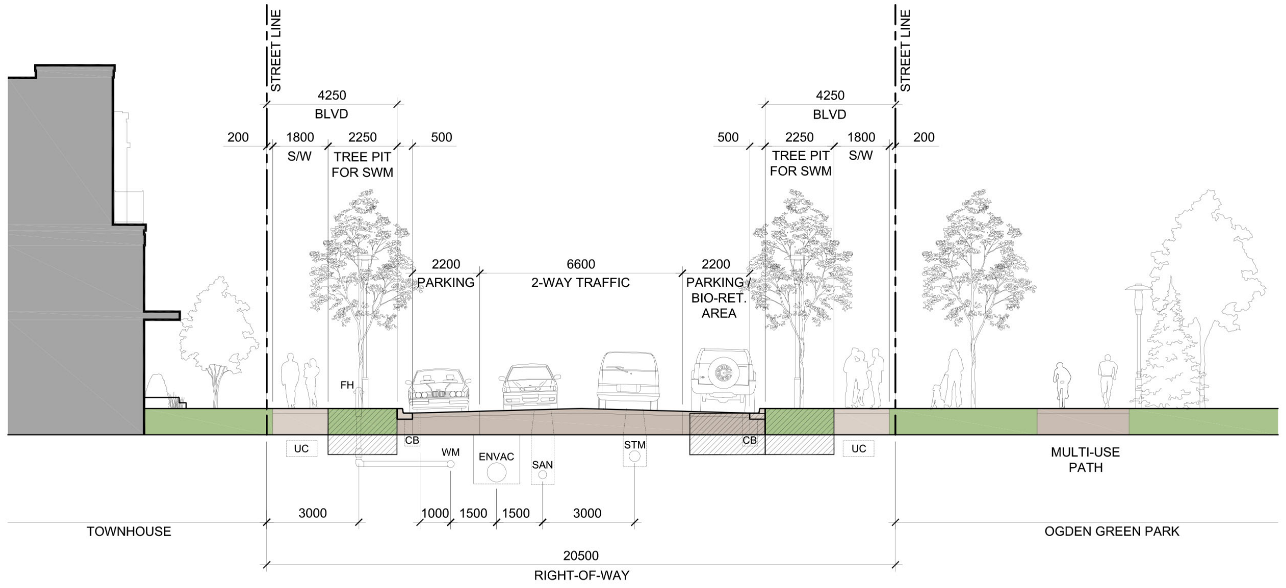
Section 2a:
MINOR COLLECTOR ROAD - STREET 'B' (20.5m R.O.W.) (LOOKING EAST)
SIDEWALK ON BOTH SIDES / 2 THRU LANES / ON-STREET PARKING ON BOTH SIDES / MULTI-USE PATH WITHIN ADJACENT PARK / BOULEVARDS WITH TREE PITS FOR SWM FUNCTION.

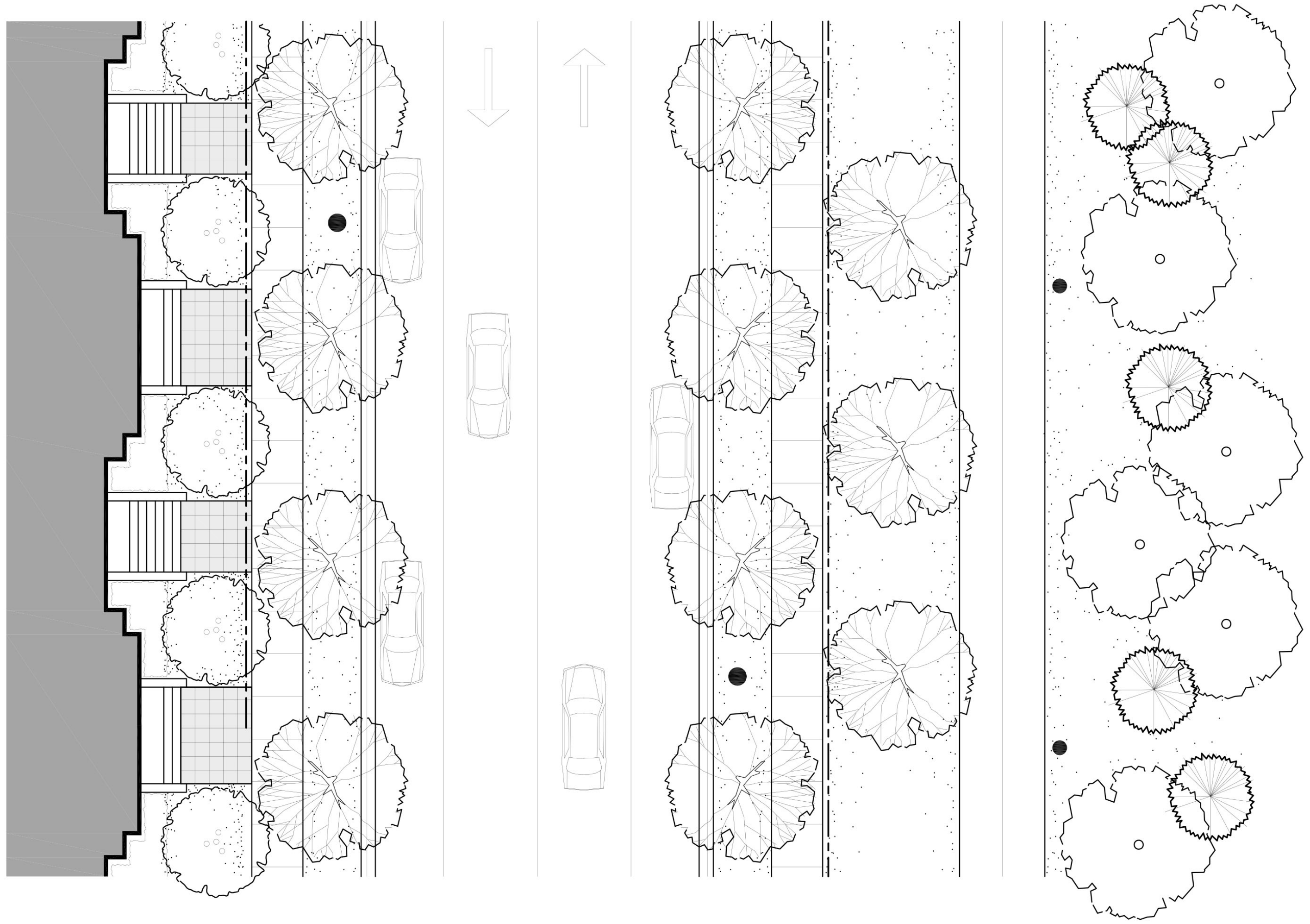
2b. Minor Collector (Street G / New Ogden Avenue)

New Ogden Avenue will incorporate urban streetscape treatments characterized by enhanced paving, sidewalks, street furniture as appropriate to adjacent uses, and urban street tree conditions in grass boulevards.

KEY FEATURES AND PRINCIPLES:

- 20.5m wide right-of-way
- 3.3m wide traffic lane in each direction
- 2.0m wide street parking lane that can be used as bio-retention area
- 4.25m wide boulevards
- 2.25m wide tree pit corridor in the northern boulevard
- 1.80m wide sidewalk in boulevards
- Watermain will be installed in paved portion of the right-of-way
- 2.0m wide utility corridor under both boulevards
- 1.5m wide trench for Vacuum Waste under the pavement
- Sanitary and storm sewers will be placed under the pavement





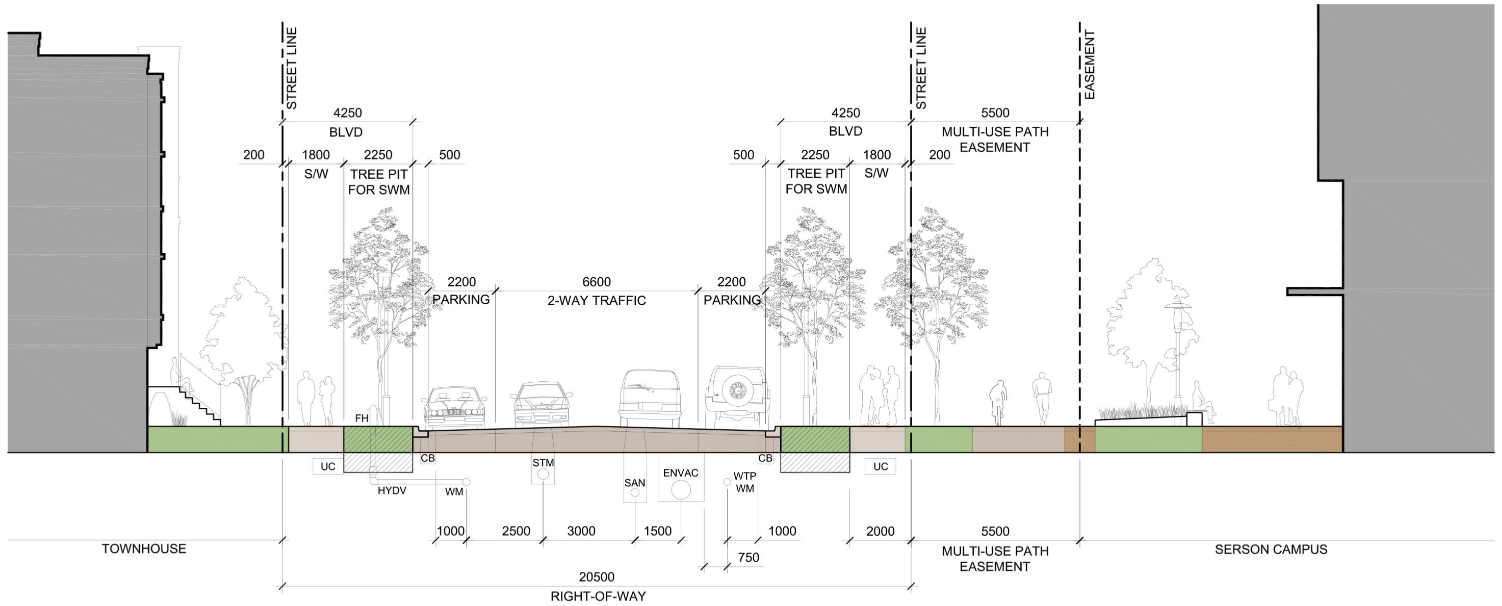
Section 2b:
MINOR COLLECTOR ROAD - STREET 'G' AND STREET 'F' (SOUTH OF IC) (20.5m R.O.W.) (LOOKING NORTH)
SIDEWALK ON BOTH SIDES / 2 THRU LANES / ON-STREET PARKING ON BOTH SIDES, WHICH MAY BE ALTERNATED WITH LID FUNCTIONS OR STREET FURNITURE AS BUMP-OUTS / MULTI-USE PATH WITHIN ADJACENT PARK / TREE PITS IN BOULEVARD FOR SWM FUNCTION.

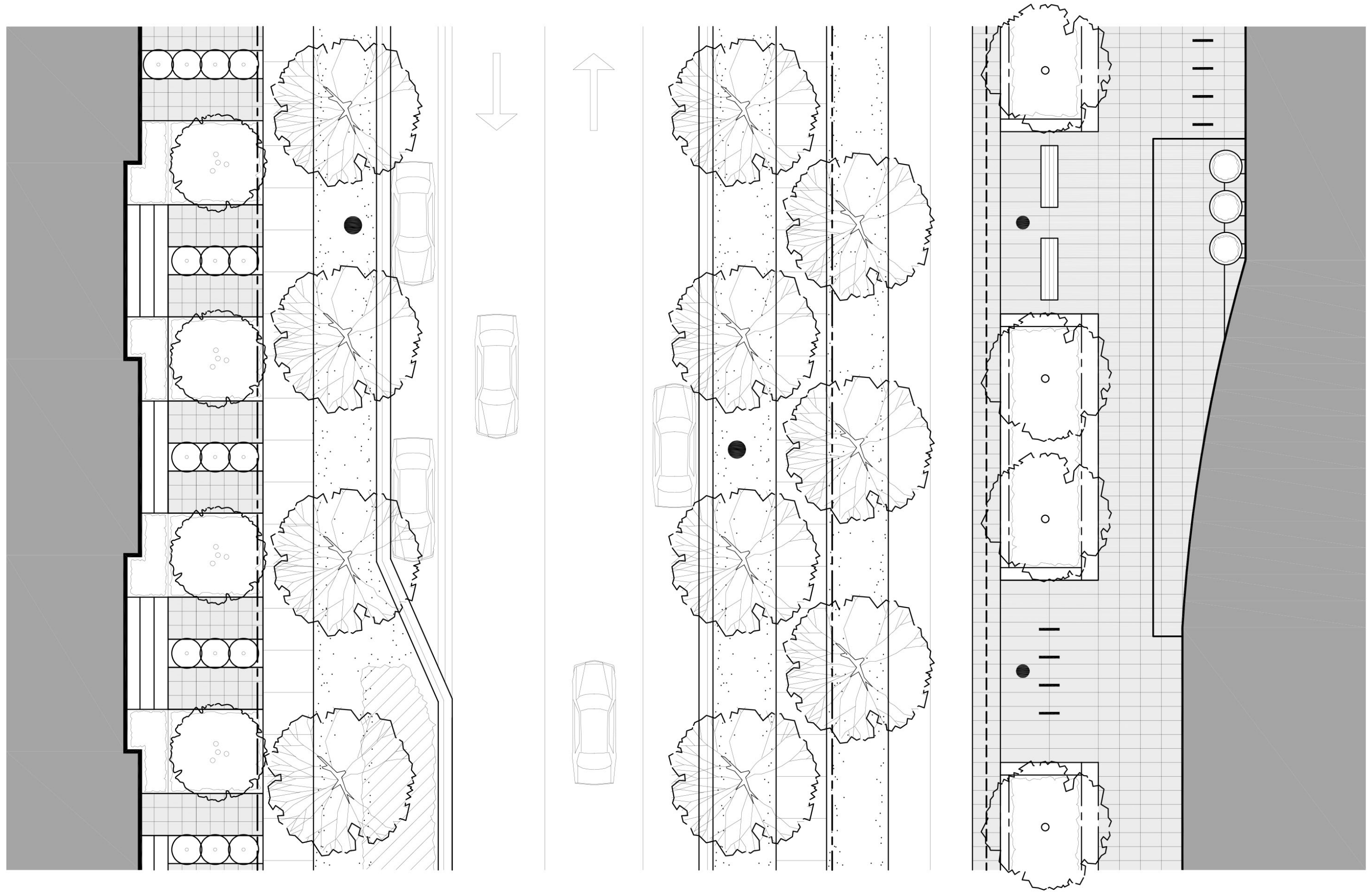
2c. Minor Collector (Street I / New Haig Boulevard)

New Haig Boulevard will incorporate urban streetscape treatments characterized by enhanced paving, sidewalks, and urban street tree conditions in grass boulevards.

KEY FEATURES AND PRINCIPLES:

- 20.5m wide right-of-way
- 3.3m wide traffic lane in each direction
- 2.2m wide on street parking lane
- 4.25m wide boulevard on the west side
- 5.50m wide multi-use path easement on the east side with 3.0m wide bike trail
- 2.25m wide tree pit corridor in boulevards
- 1.80m wide sidewalk in boulevards
- Watermain will be installed in paved portion of the right-of-way
- Watermain for sewage treatment plant will be installed under the tree pit corridor in the eastern boulevard
- 2.0m wide utility corridor under both boulevards
- 1.5m wide trench for Vacuum Waste under the pavement
- Sanitary and storm sewers will be placed under the pavement





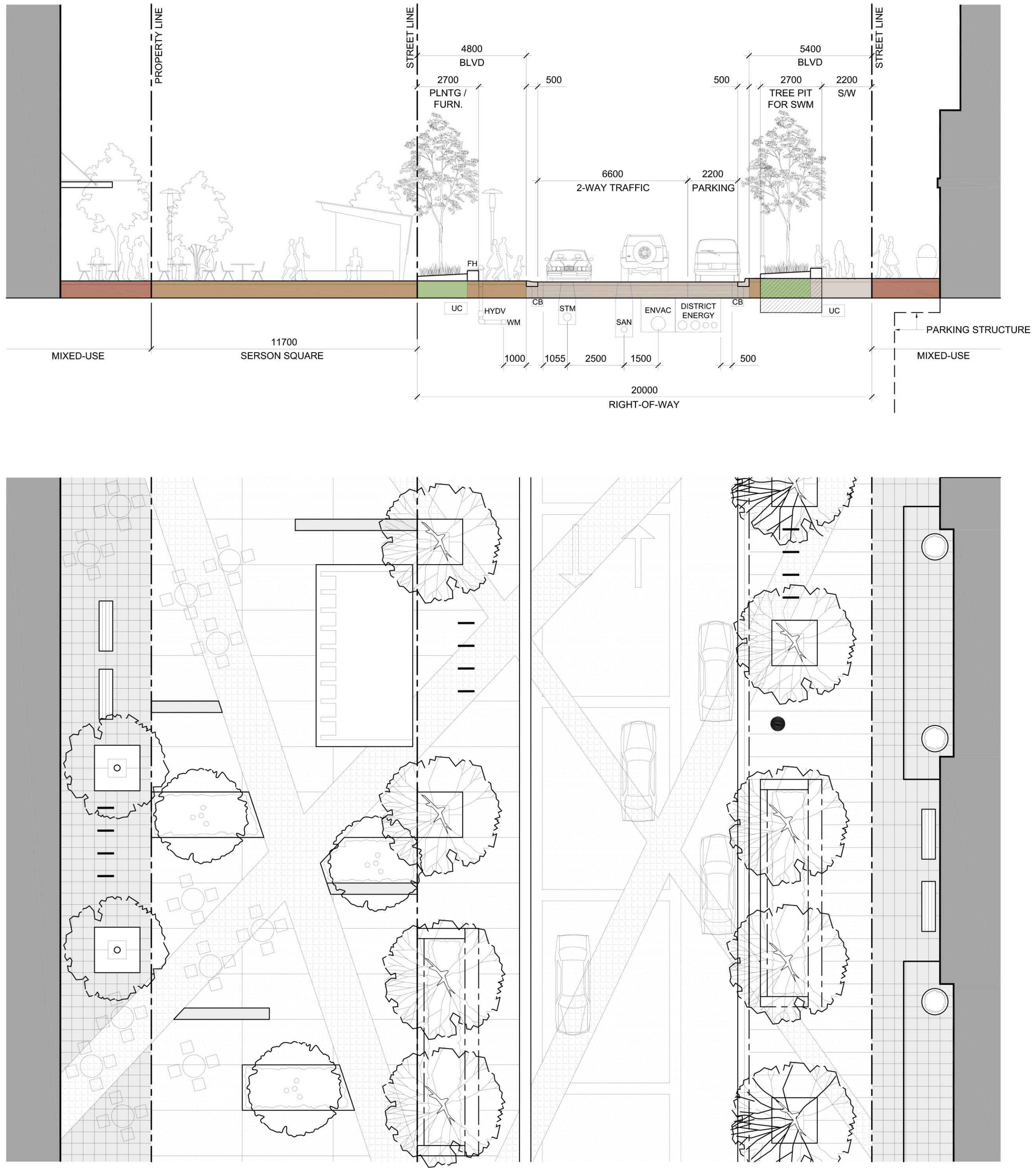
Section 2c:
MINOR COLLECTOR ROAD - STREET 'I' (20.5m R.O.W.) (LOOKING NORTH)
SIDEWALK ON BOTH SIDES / 2 THRU LANES / ON-STREET PARKING ON BOTH SIDES, WHICH MAY BE ALTERNATED WITH STREET FURNITURE AS BUMP-OUTS / BOULEVARDS WITH TREE PITS FOR SWM FUNCTION / MULTI-USE PATH WITHIN EASEMENT ALONG EAST SIDE (ADJACENT TO SERSON CAMPUS)

3a. Minor Collector Special Character Street (Street H)

Special Character A will be integrated with Lakeview Square and will incorporate urban streetscape treatments characterized by a shared street with pedestrian priority, a sidewalk on one side, urban street tree conditions and plantings, and street furniture.

KEY FEATURES AND PRINCIPLES:

- 20.0m wide right-of-way
- 3.3m wide traffic lane in each direction
- 2.2m wide street parking lane on the west side
- 4.80m wide boulevard on the east side and 5.40m wide boulevard on the west side
- 2.70m wide tree pit corridor in the western boulevard
- 1.80m wide sidewalk in boulevards
- Watermain will be installed under the eastern boulevard 1.0m behind the curb
- 2.0m wide utility corridor under both boulevards
- 1.5m wide trench for Vacuum Waste under the pavement
- 2.0 wide trench for District Energy under the pavement adjacent to Vacuum Waste
- Sanitary and storm sewers will be placed under the pavement. Separation distance between sewers will be less than the City of Mississauga standard of 3.0m



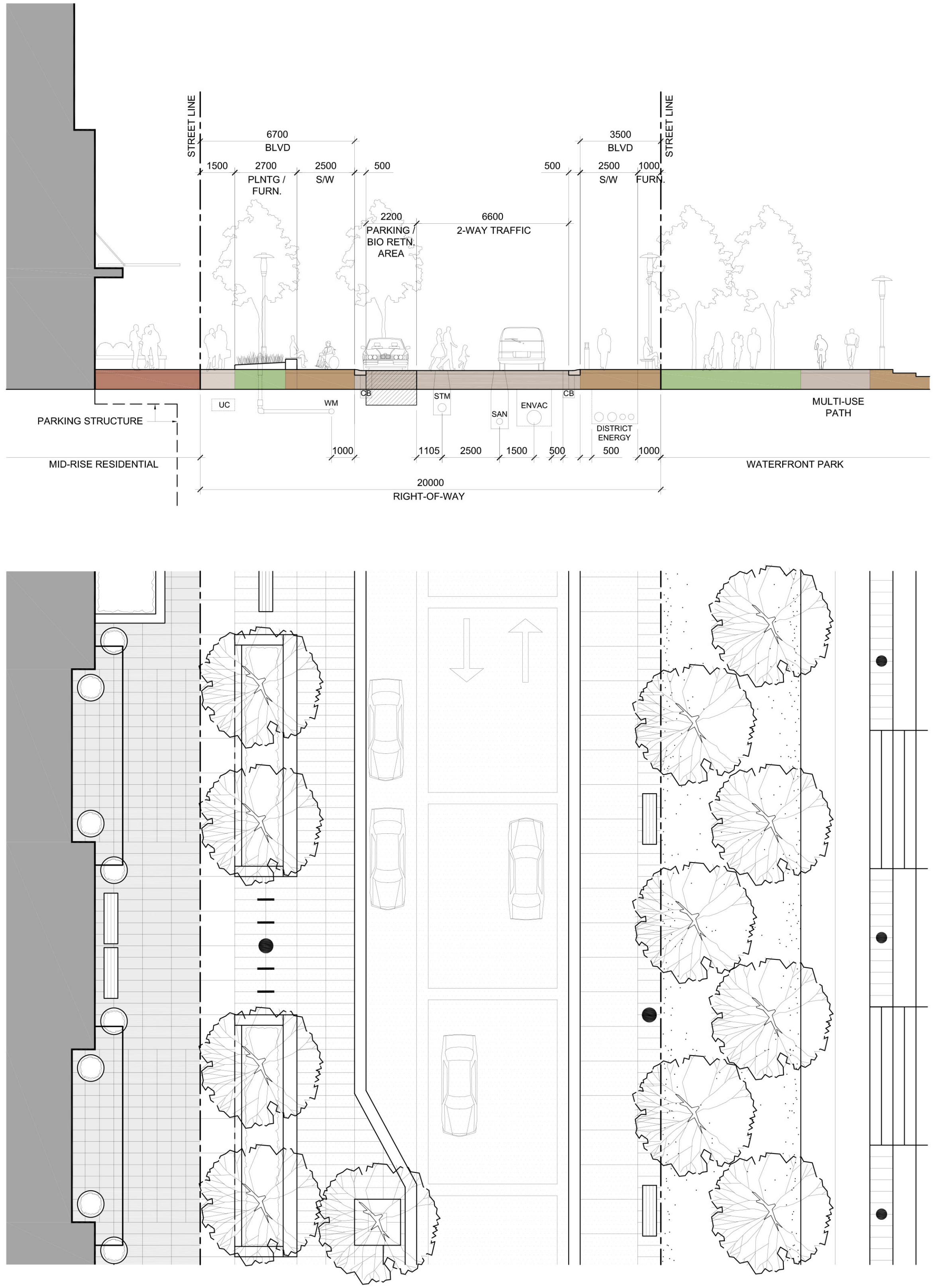
Section 3a:
MINOR COLLECTOR - SPECIAL CHARACTER STREET / STREET 'H' (20m R.O.W. - THE SQUARE) (LOOKING SOUTH)
SHARED STREET WITH PEDESTRIAN PRIORITY / INTEGRATED WITH SERSON SQUARE / 2-THRU LANES / ON STREET PARKING ON ONE SIDE / TREE PLANTER AND STREET FURNITURE ON ONE BOULEVARD AND TREE PIT FOR SWM FUNCTION ON THE OTHER BOULEVARD.

3b. Minor Collector Special Character Street (Street D / The Esplanade)

The Esplanade will incorporate urban streetscape treatments characterized by a shared street with pedestrian priority, a sidewalk on both sides, urban street tree conditions and plantings, and street furniture.

KEY FEATURES AND PRINCIPLES:

- 20.0m wide right-of-way
- 3.3m wide traffic lane in each direction
- 2.2m wide street parking lane on the north side that can be used as bio-retention area
- 3.50m wide boulevard on the south side and 6.70m wide boulevard on the north side
- 2.70m wide tree pit corridor in the northern boulevard
- 2.50m wide sidewalks in boulevards
- Watermain will be installed under the northern sidewalk 1.0m behind the curb
- 1.5m wide utility corridor under the northern boulevard
- 1.5m wide trench for Vacuum Waste under the pavement
- 2.0 wide trench for District Energy under the southern sidewalk
- Sanitary and storm sewers will be placed under the pavement



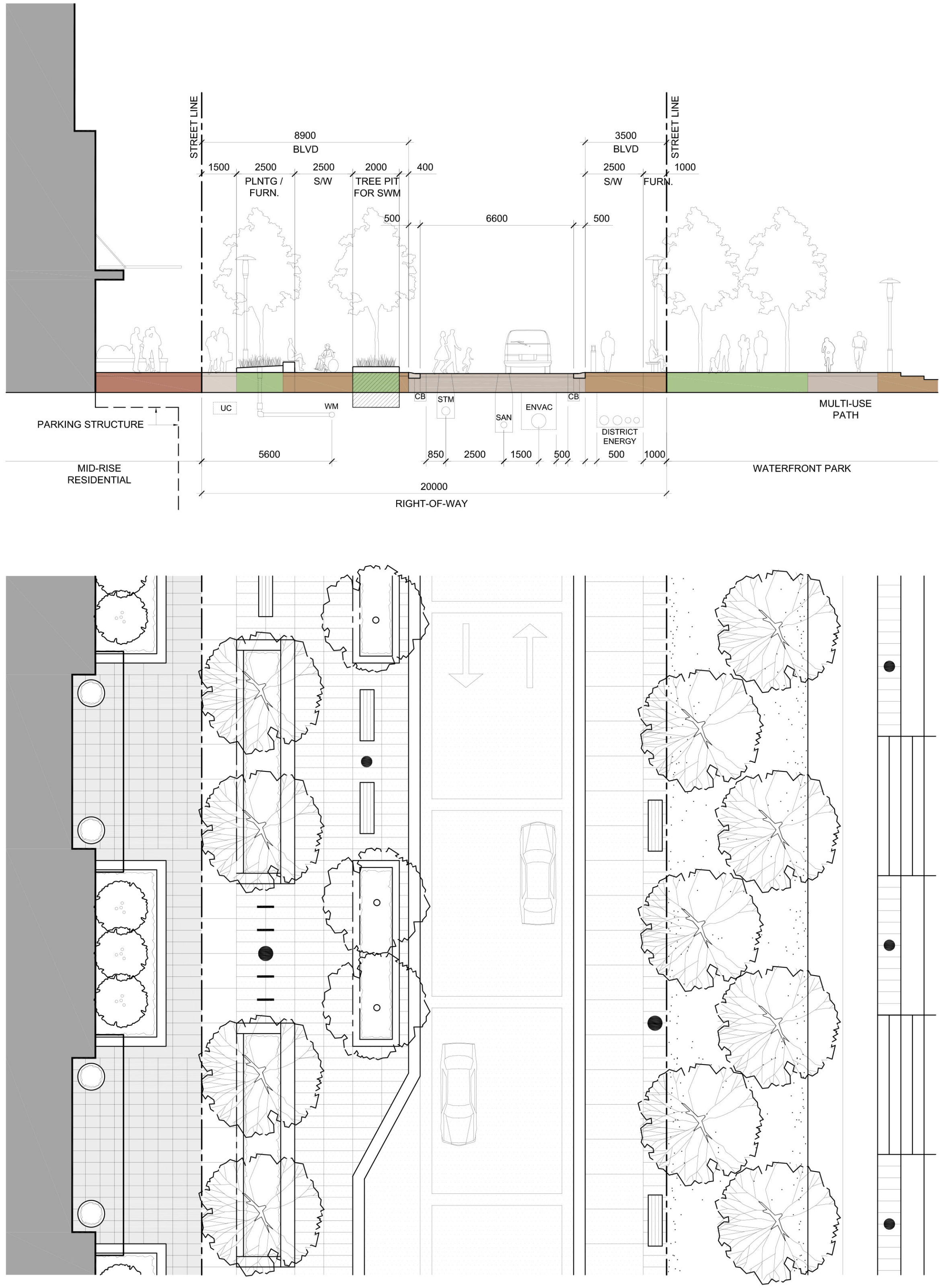
Section 3b:
MINOR COLLECTOR ROAD - SPECIAL CHARACTER STREET / STREET 'D' (20m R.O.W. - THE ESPLANADE) (LOOKING EAST)
SPECIAL CHARACTER - SHARED STREET WITH PEDESTRIAN PRIORITY / ON STREET PARKING ON DEVELOPMENT SIDE, WHICH MAY BE ALTERNATED WITH LID FUNCTIONS AS BUMP-OUTS

3c. Minor Collector Special Character Street (Street D / The Esplanade)

The Esplanade will incorporate urban streetscape treatments characterized by a shared street with pedestrian priority, a sidewalk on both sides, urban street tree conditions and plantings, and street furniture.

KEY FEATURES AND PRINCIPLES:

- 20.0m wide right-of-way
- 3.3m wide traffic lane in each direction
- 2.50m wide boulevard on the south side and 8.90m wide boulevard on the north side
- 2.00m wide tree pit corridor in the northern boulevard
- 2.50m wide sidewalks in boulevards
- Watermain will be installed under the northern sidewalk 5.6m from the property line
- 1.5m wide utility corridor under the northern boulevard
- 1.5m wide trench for Vacuum Waste under the pavement
- 2.0 wide trench for District Energy under the southern sidewalk
- Sanitary and storm sewers will be placed under the pavement



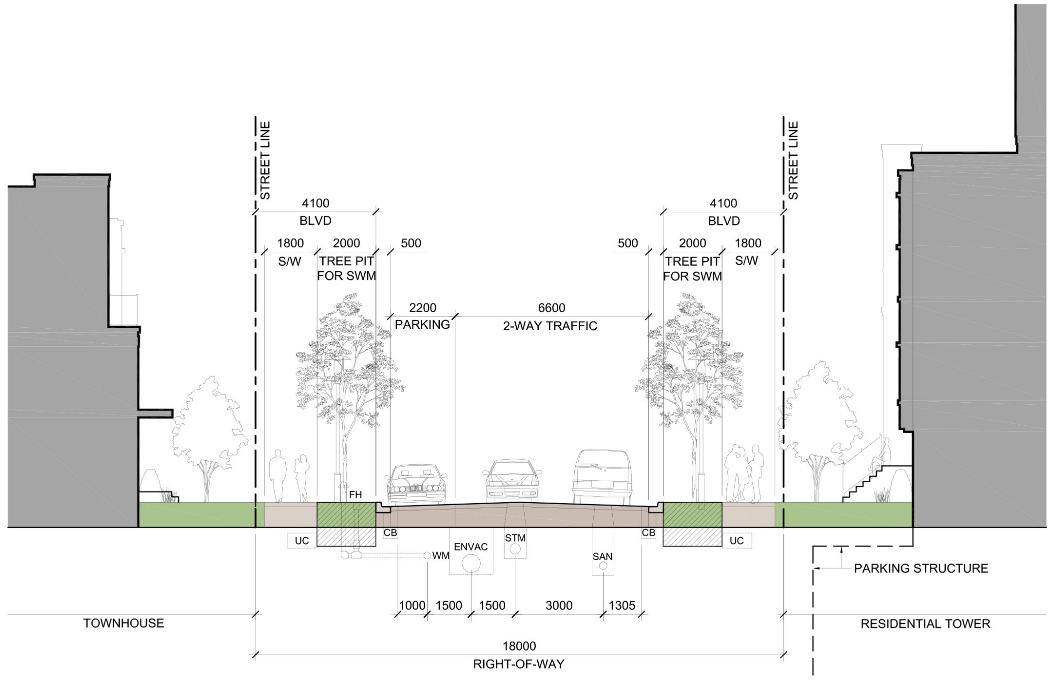
Section 3c:
MINOR COLLECTOR ROAD - SPECIAL CHARACTER STREET / STREET 'D' (20m R.O.W. - THE ESPLANADE)
SPECIAL CHARACTER - SHARED STREET WITH PEDESTRIAN PRIORITY / BETWEEN LAY-BY PARKING

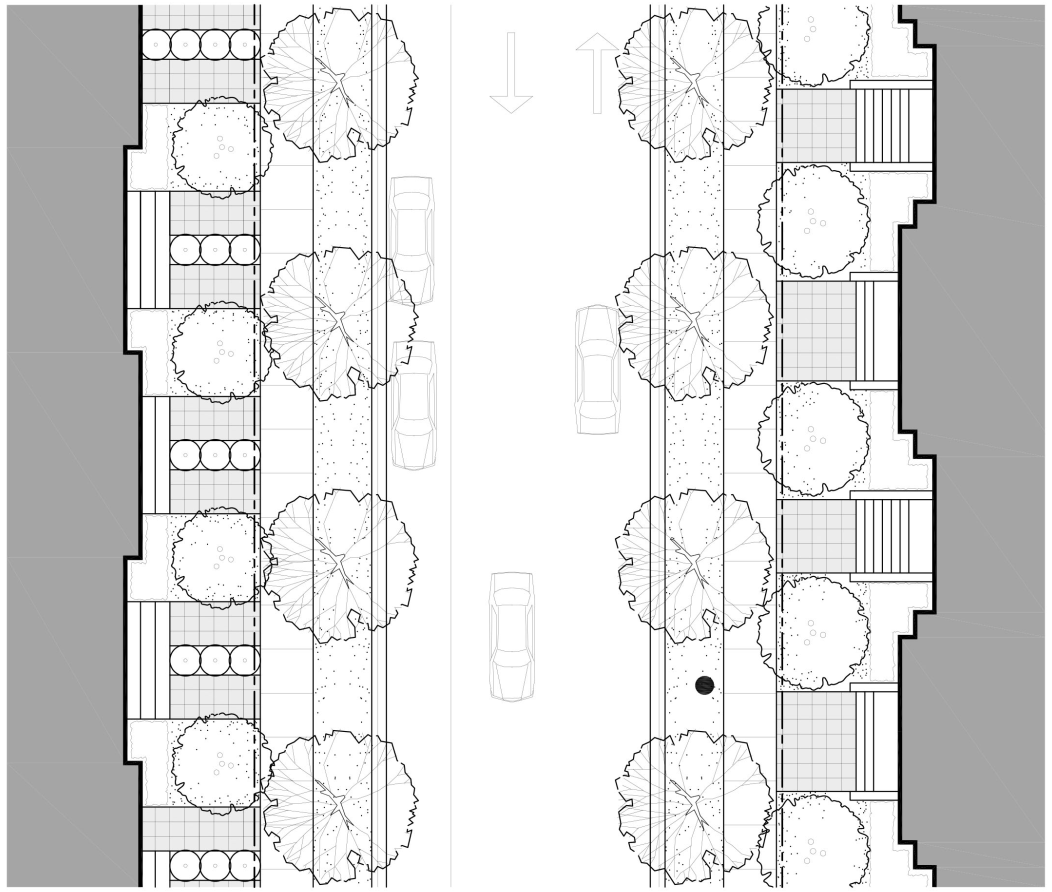
4a. Local Road A

Local Road A will incorporate urban streetscape treatments characterized by adjacent land uses, a sidewalk on both sides of the street, urban street tree conditions and plantings, and street furniture.

KEY FEATURES AND PRINCIPLES:

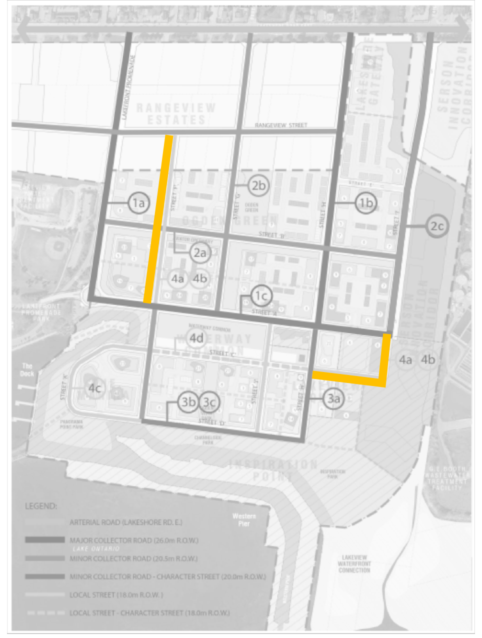
- 18.0m wide right-of-way
- 3.3m wide traffic lane in each direction
- 2.2m wide street parking lane on one side
- 4.10m wide boulevards
- 2.00m wide tree pit corridor in each boulevard
- 1.80m wide sidewalks in boulevards
- Watermain will be installed in the paved portion of the right-of-way
- 2.1m wide utility corridor under the northern boulevard
- Sanitary and storm sewers will be placed under the pavement





Section 4a:
LOCAL ROAD A - 18.0m R.O.W.
SIDEWALK ON BOTH SIDES / 2 THRU LANES / ON-STREET PARKING ON ONE SIDE / BOULEVARDS WITH TREE PITS FOR SWM FUNCTION

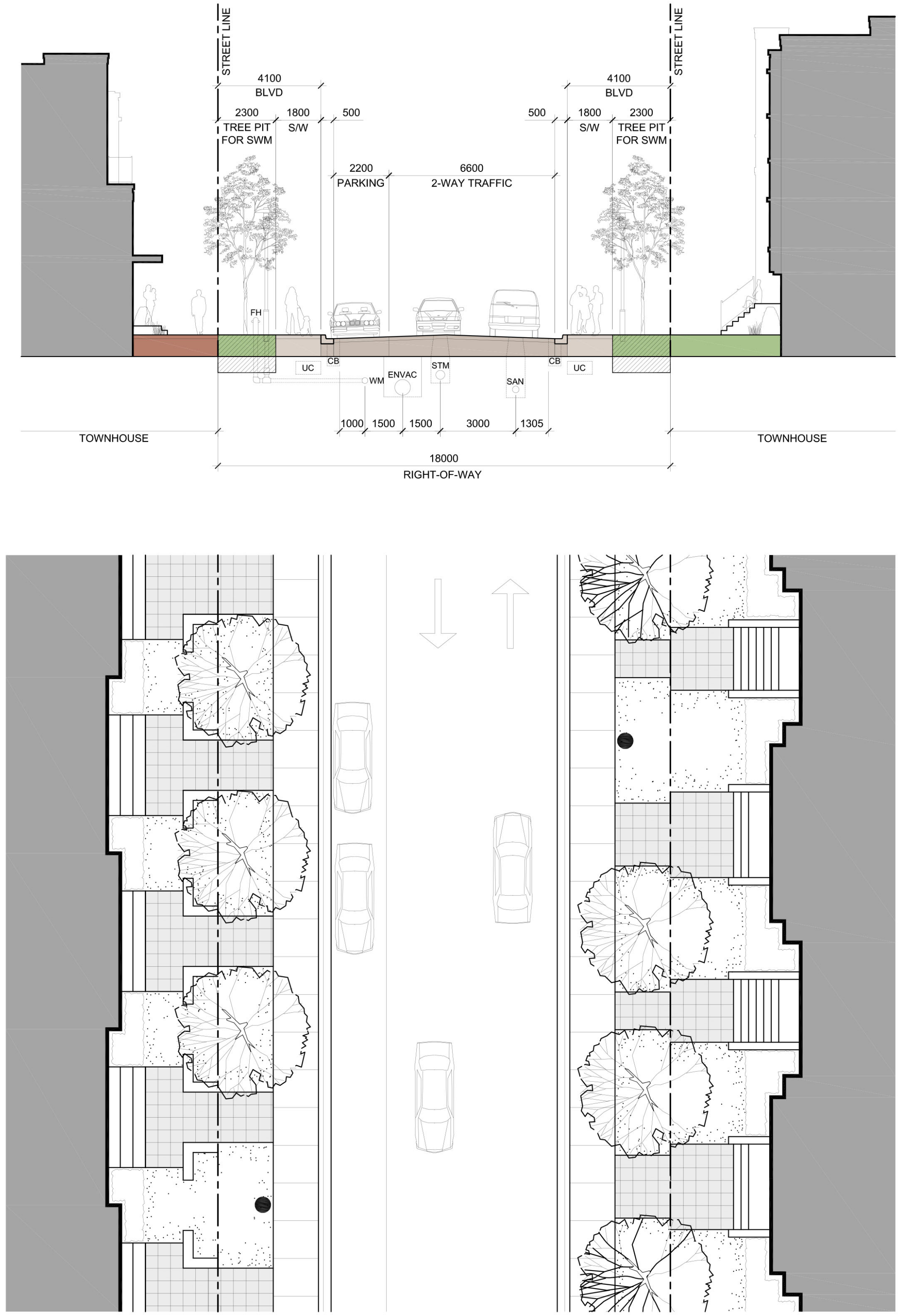
4b. Local Road B



Local Road B will incorporate urban streetscape treatments characterized by adjacent land uses, a sidewalk on both sides of the street, urban street tree conditions and plantings, and street furniture.

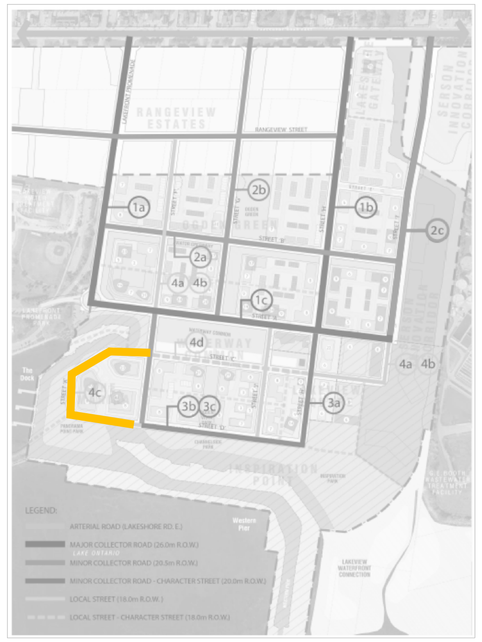
KEY FEATURES AND PRINCIPLES:

- 18.0m wide right-of-way
- 3.3m wide traffic lane in each direction
- 2.2m wide street parking lane on one side
- 4.10m wide boulevards
- 2.00m wide tree pit corridor in each boulevard
- 1.80m wide sidewalks in boulevards against the curb
- Watermain will be installed in the paved portion of the right-of-way
- 1.8m wide utility corridor under the sidewalks
- Sanitary and storm sewers will be placed under the pavement



Section 4b:
LOCAL ROAD B - 18.0m R.O.W.
SIDEWALK ON BOTH SIDES AT CURB EDGE / 2 THRU LANES / ON-STREET PARKING ON ONE SIDE / BOULEVARDS WITH TREE PITS FOR SWM FUNCTION

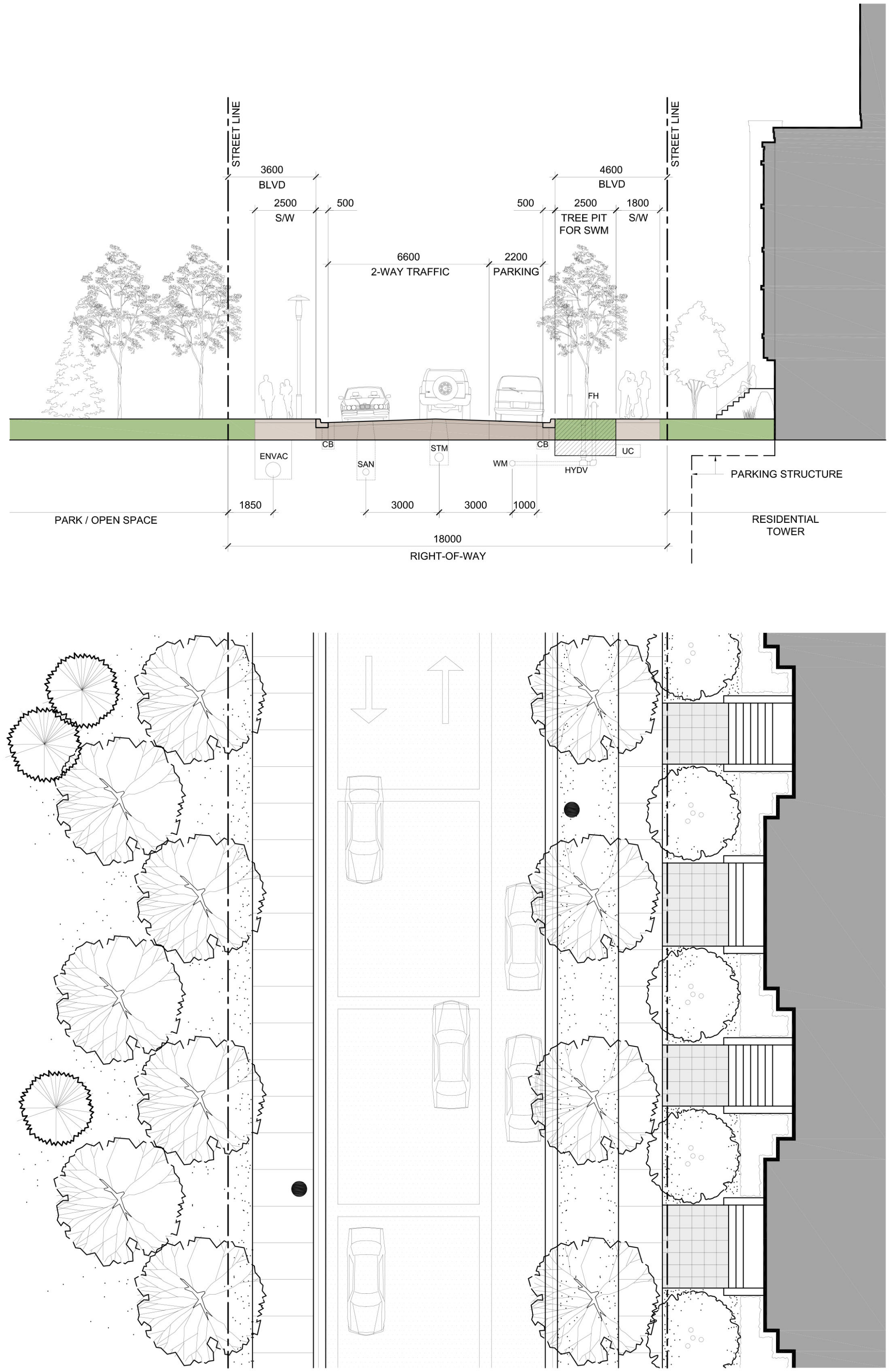
4c. Local Road A



Serson Promenade will incorporate urban streetscape treatments characterized by adjacent land uses, a sidewalk on both sides of the street, urban street tree conditions and plantings, and street furniture.

KEY FEATURES AND PRINCIPLES:

- 18.0m wide right-of-way
- 3.3m wide traffic lane in each direction
- 2.2m wide street parking lane on one side
- 4.6m and 3.6m wide boulevards
- 2.5m wide tree pit corridor in one boulevard
- 1.80m and 2.5m wide sidewalks in boulevards
- Watermain will be installed in the paved portion of the right-of-way
- 1.8m wide utility corridor under the sidewalks
- Sanitary and storm sewers will be placed under the pavement



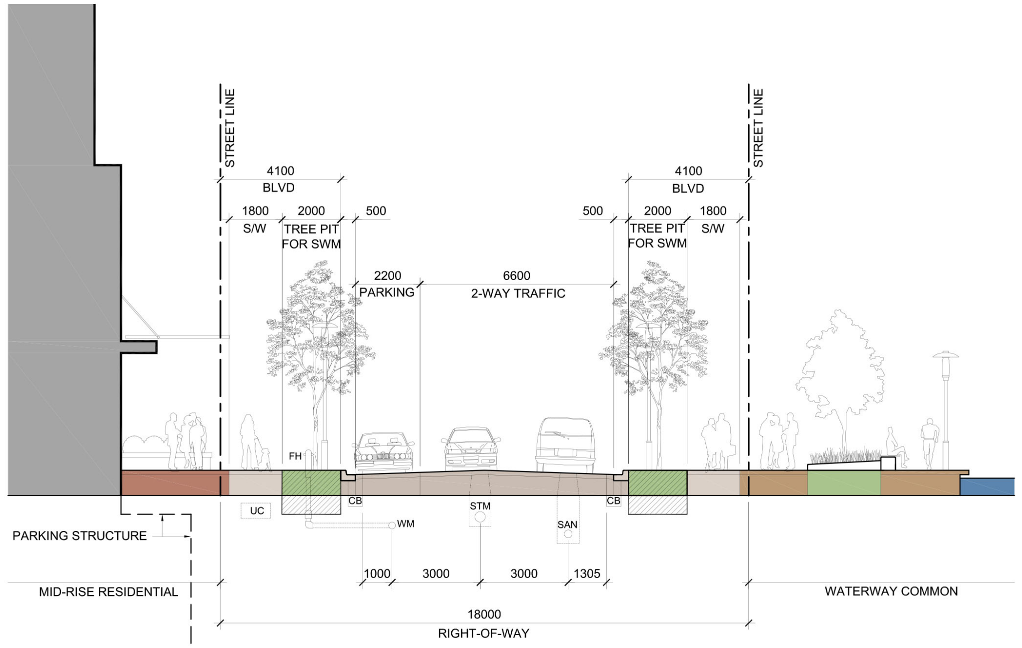
Section 4c:
LOCAL ROAD A - 18.0m R.O.W.
SIDEWALK ON BOTH SIDES / PARK SIDE SIDEWALK AT CURB / 2 THRU LANES / ON-STREET PARKING ON ONE SIDE / / BOULEVARDS WITH TREE PITS FOR SWM FUNCTION

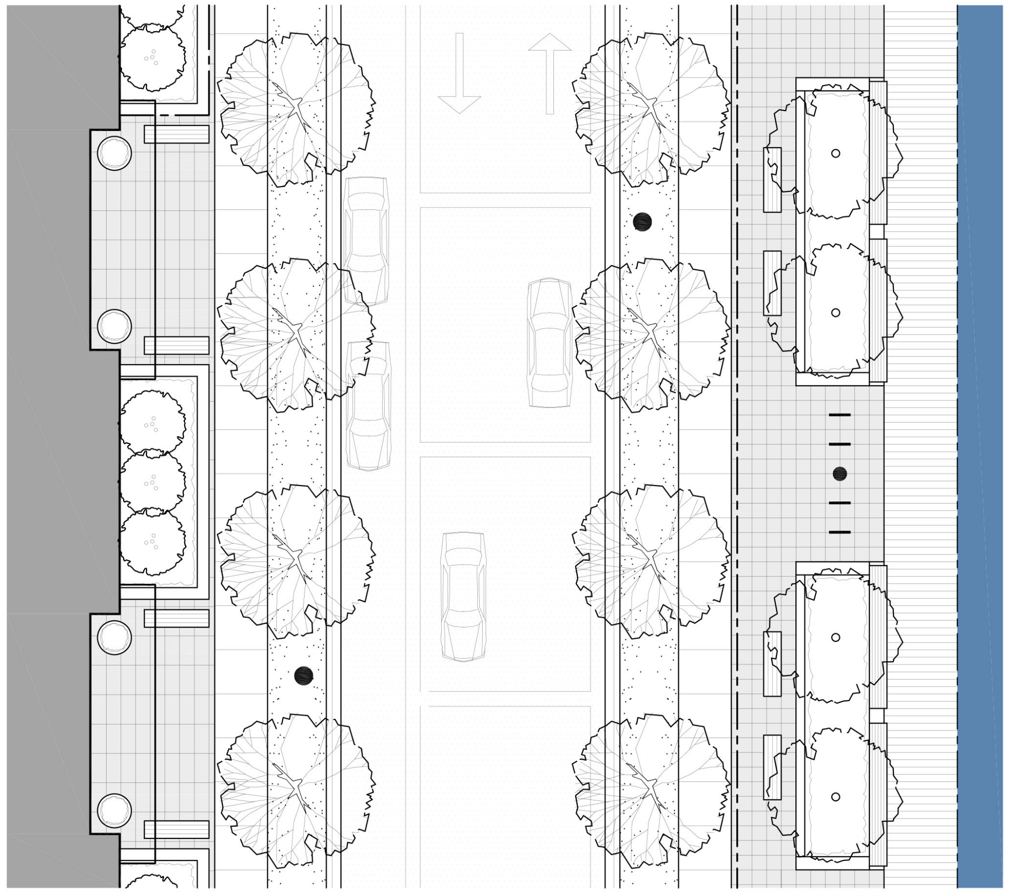
4d. Local Road C

Serson Promenade will incorporate urban streetscape treatments characterized by adjacent land uses, a sidewalk on both sides of the street, urban street tree conditions and plantings, and street furniture.

KEY FEATURES AND PRINCIPLES:

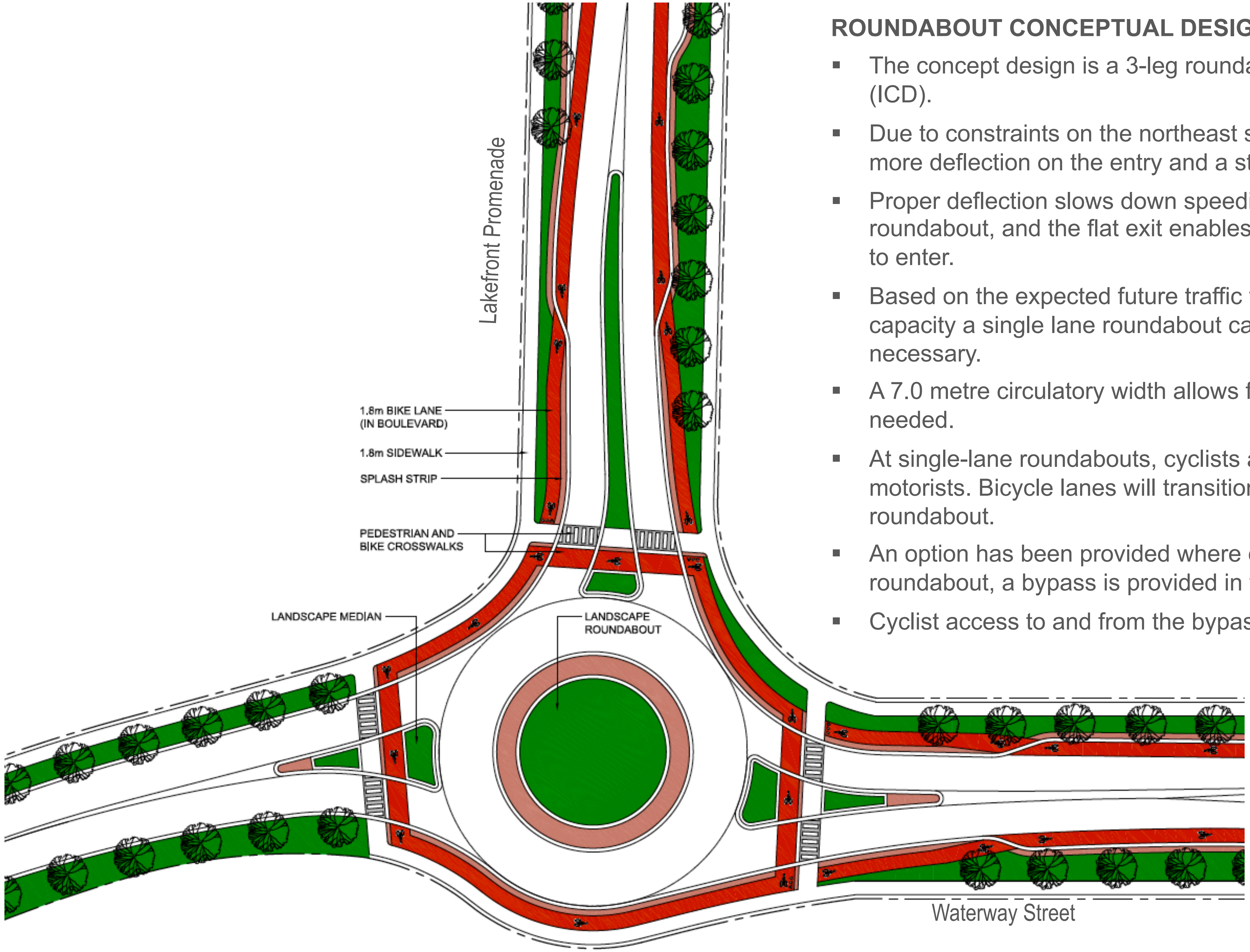
- 18.0m wide right-of-way
- 3.3m wide traffic lane in each direction
- 2.2m wide street parking lane on one side
- 4.1m wide boulevards
- 2.0m wide tree pit corridor in boulevards
- 1.80m wide sidewalks in boulevards
- Watermain will be installed in the paved portion of the right-of-way
- 2.1m wide utility corridor under the sidewalks
- Sanitary and storm sewers will be placed under the pavement





Section 4d:
LOCAL ROAD C - SPECIAL CHARACTER STREET / STREET 'C' - 18.0m R.OW. (LOOKING WEST)
SIDEWALK ON BOTH SIDES / 2 THRU LANES / ON-STREET PARKING ON ONE SIDE / WATERWAY COMMON INTERFACE / BOULEVARDS WITH TREE PITS FOR SWM FUNCTION

Roundabout

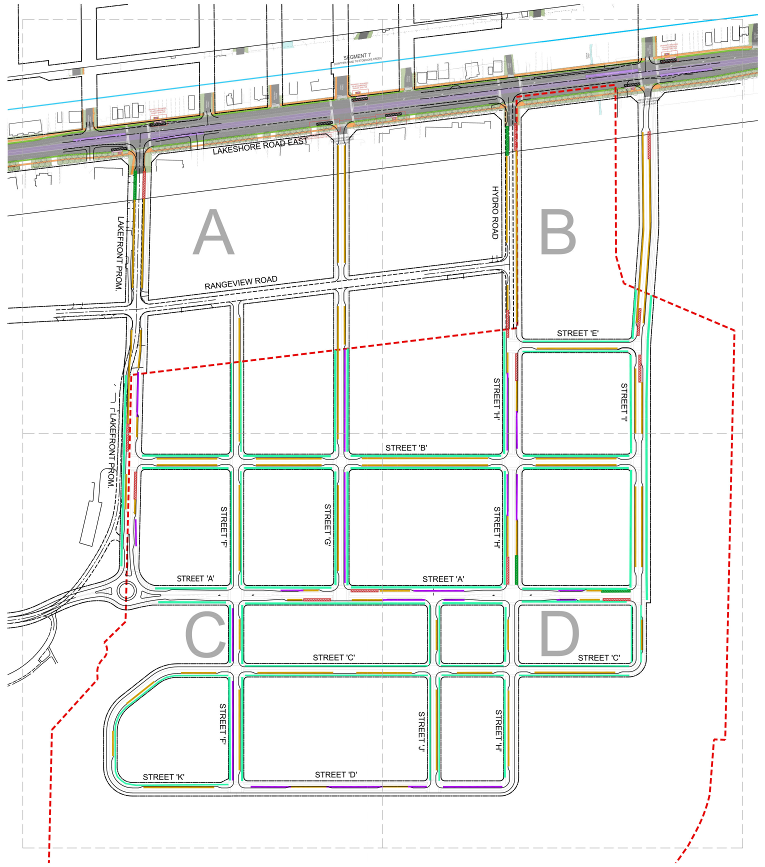


ROUNDABOUT CONCEPTUAL DESIGN PRINCIPLES

- The concept design is a 3-leg roundabout using a 40m Inscribed Circle Diameter (ICD).
- Due to constraints on the northeast side, the roundabout has shifted west to create more deflection on the entry and a straighter exit on the north leg.
- Proper deflection slows down speeding vehicles so they may safely enter the roundabout, and the flat exit enables vehicles to exit quicker allowing more vehicles to enter.
- Based on the expected future traffic volumes at the intersection, considering the capacity a single lane roundabout can handle, a two-lane roundabout would not be necessary.
- A 7.0 metre circulatory width allows for an emergency vehicle to pass a car safely if needed.
- At single-lane roundabouts, cyclists are expected to share the roadway with motorists. Bicycle lanes will transition to a shared roadway in advance of the roundabout.
- An option has been provided where cyclists are likely to take the first exit of the roundabout, a bypass is provided in the form of an in-boulevard shared use path.
- Cyclist access to and from the bypass facility is provided by tapered ramps.

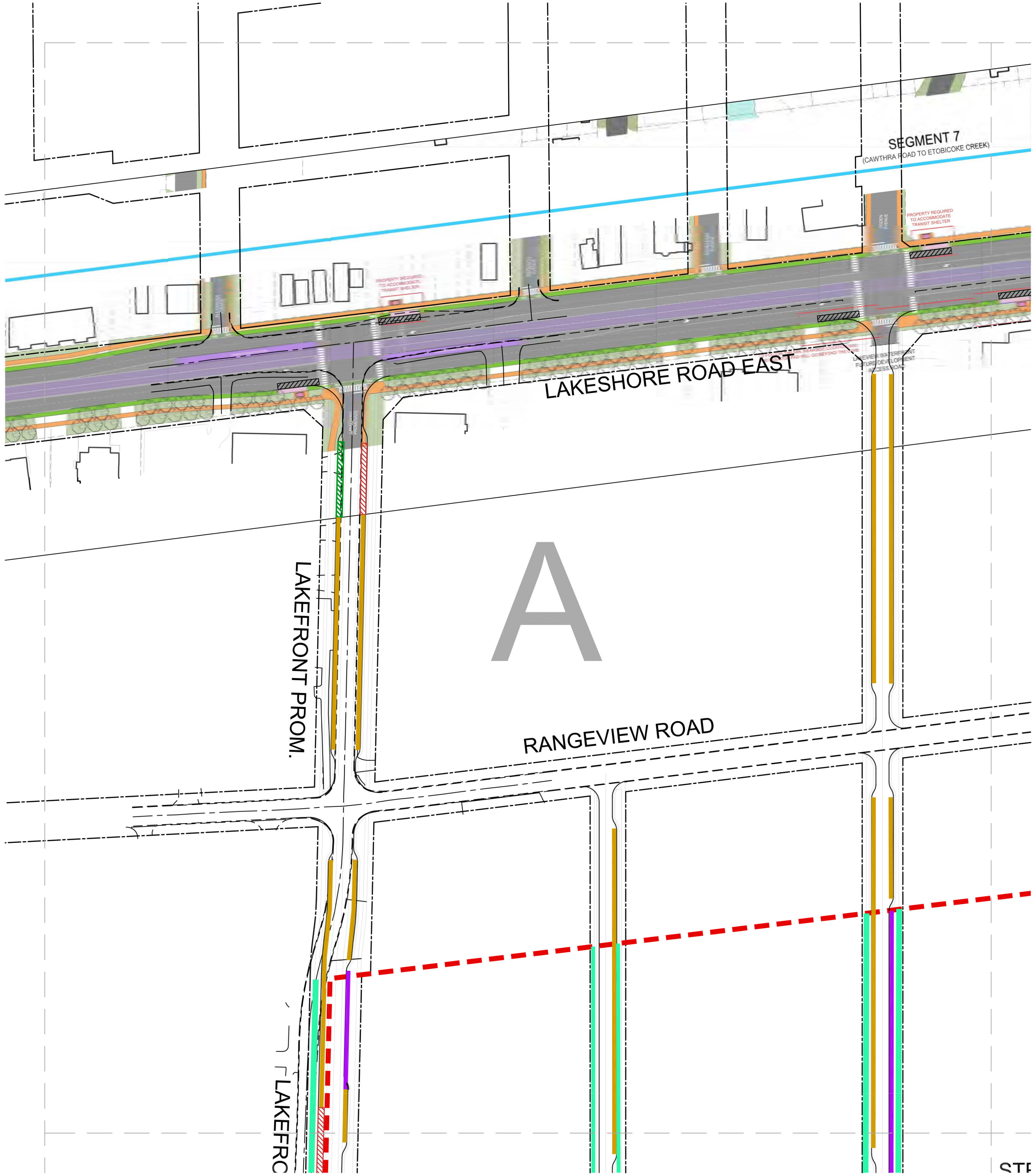
Composite Plan View: Quadrant A

The Composite Plan View schematically illustrates the spatial organization of the different ROW layers.



LEGEND:

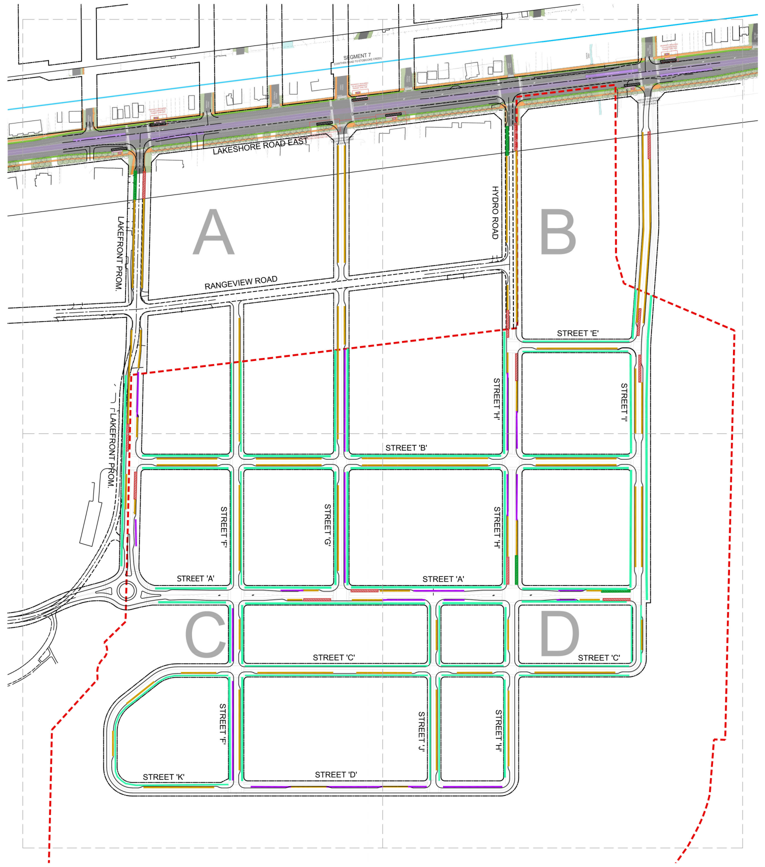
- BIO-RETENTION BUMP-OUT
- TREE TRENCH / RAISED PLANTER
- LAYBY PARKING
- FARSIDE BUS STOP
- NEARSIDE BUS STOP
- LCC PROPOSED LOCAL BUS STOPS
- PROPOSE RIGHT-OF-WAY



LAKEVIEW COMMUNITY PARTNERS LIMITED

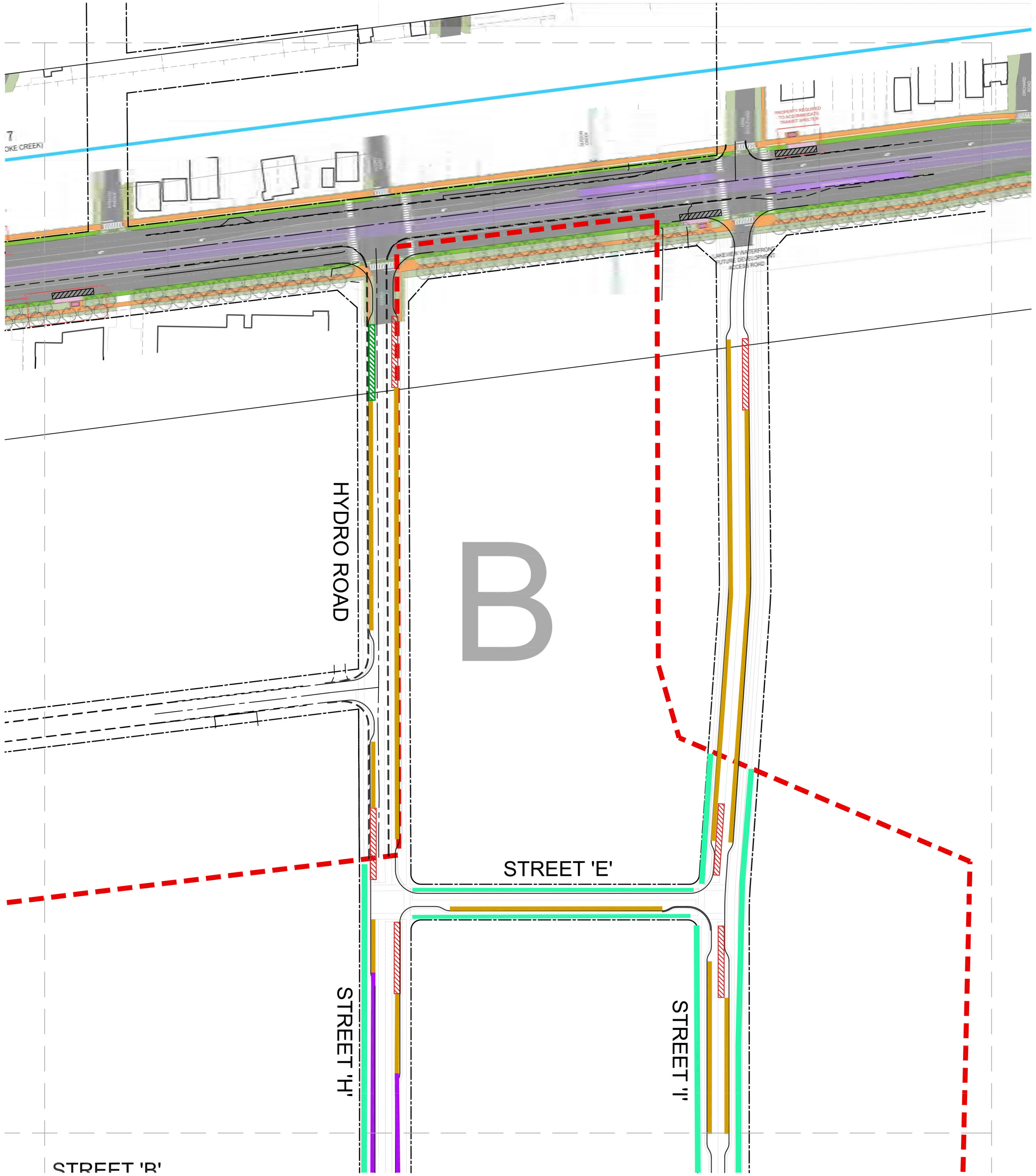
Composite Plan View: Quadrant B

The Composite Plan View schematically illustrates the spatial organization of the different ROW layers.



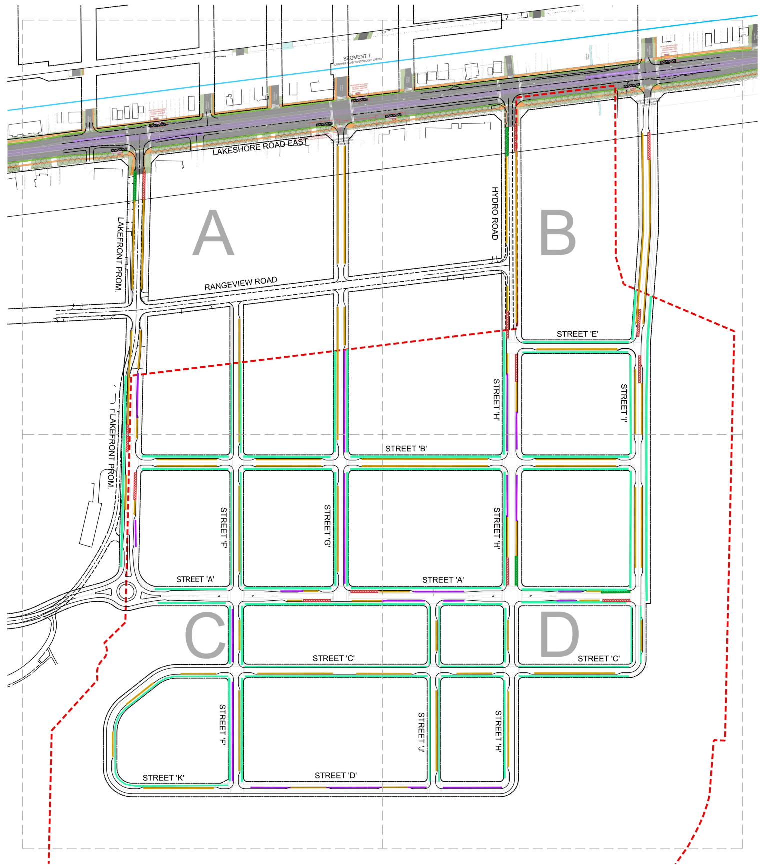
LEGEND:

- BIO-RETENTION BUMP-OUT
- TREE TRENCH / RAISED PLANTER
- LAYBY PARKING
- FARSIDE BUS STOP
- NEARSIDE BUS STOP
- LCC PROPOSED LOCAL BUS STOPS
- PROPOSE RIGHT-OF-WAY



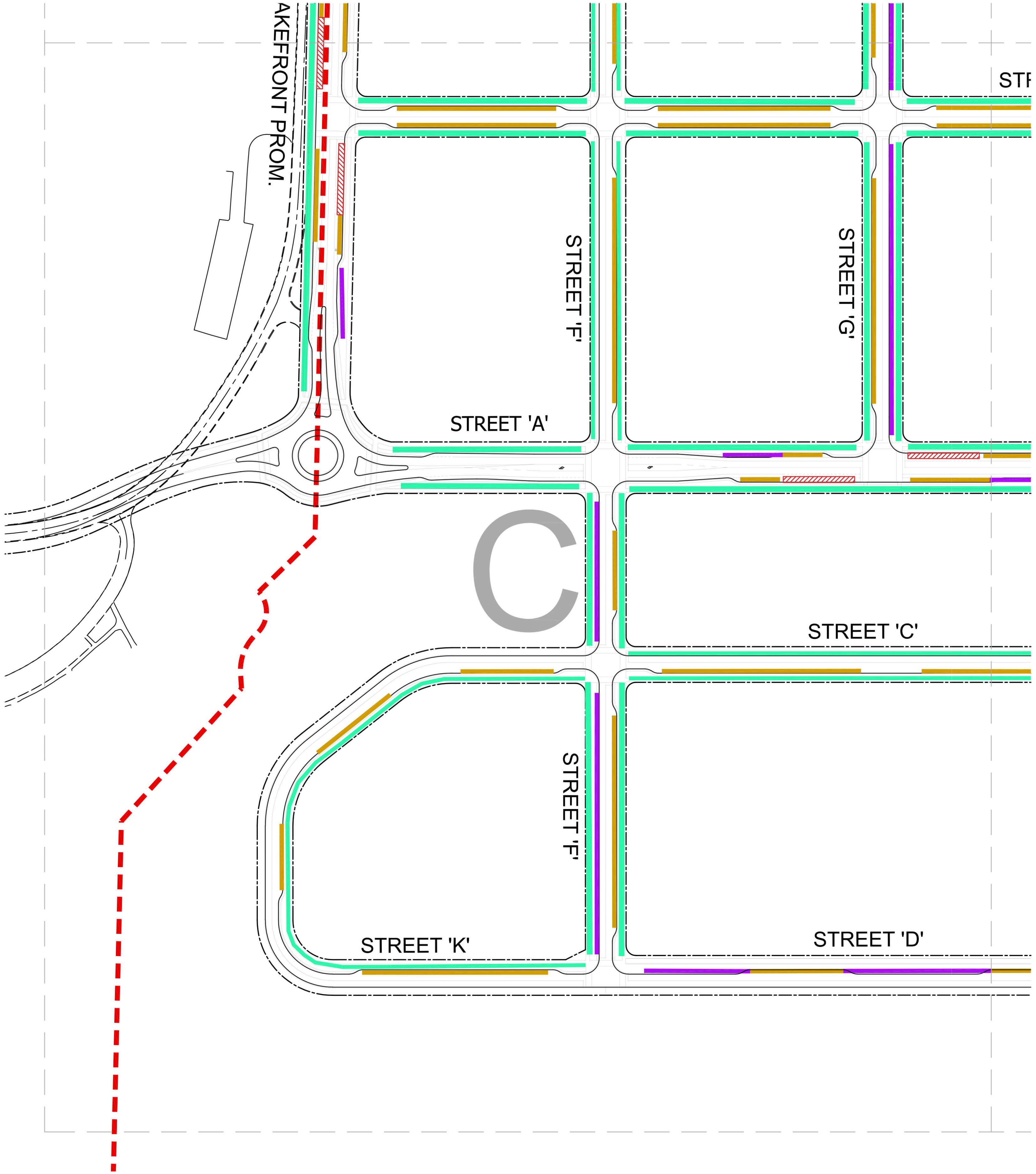
Composite Plan View: Quadrant C

The Composite Plan View schematically illustrates the spatial organization of the different ROW layers.



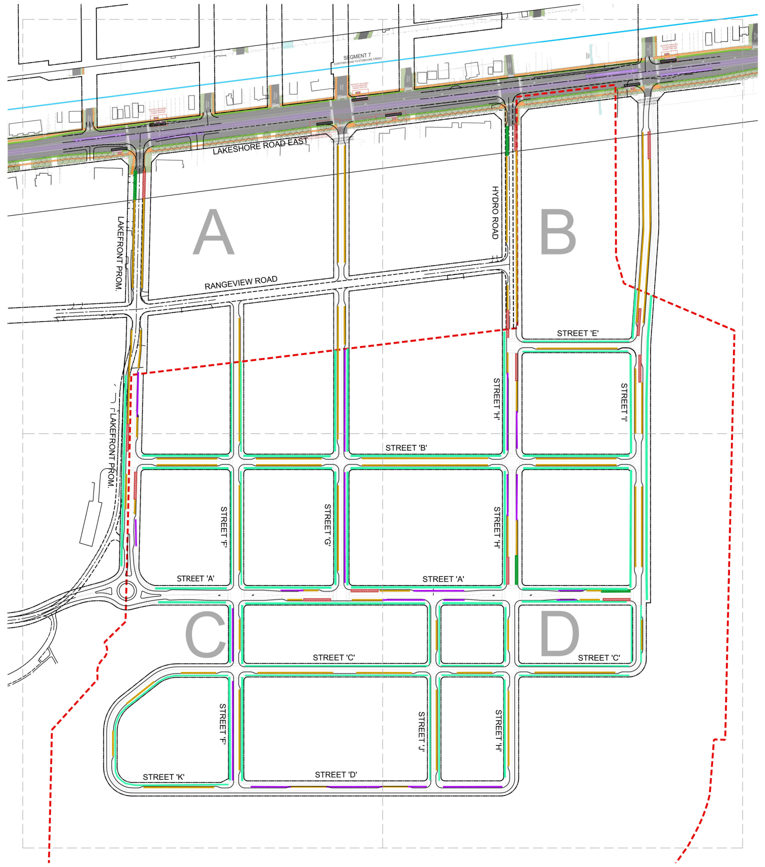
LEGEND:

- BIO-RETENTION BUMP-OUT
- TREE TRENCH / RAISED PLANTER
- LAYBY PARKING
- FARSIDE BUS STOP
- NEARSIDE BUS STOP
- LCC PROPOSED LOCAL BUS STOPS
- PROPOSE RIGHT-OF-WAY



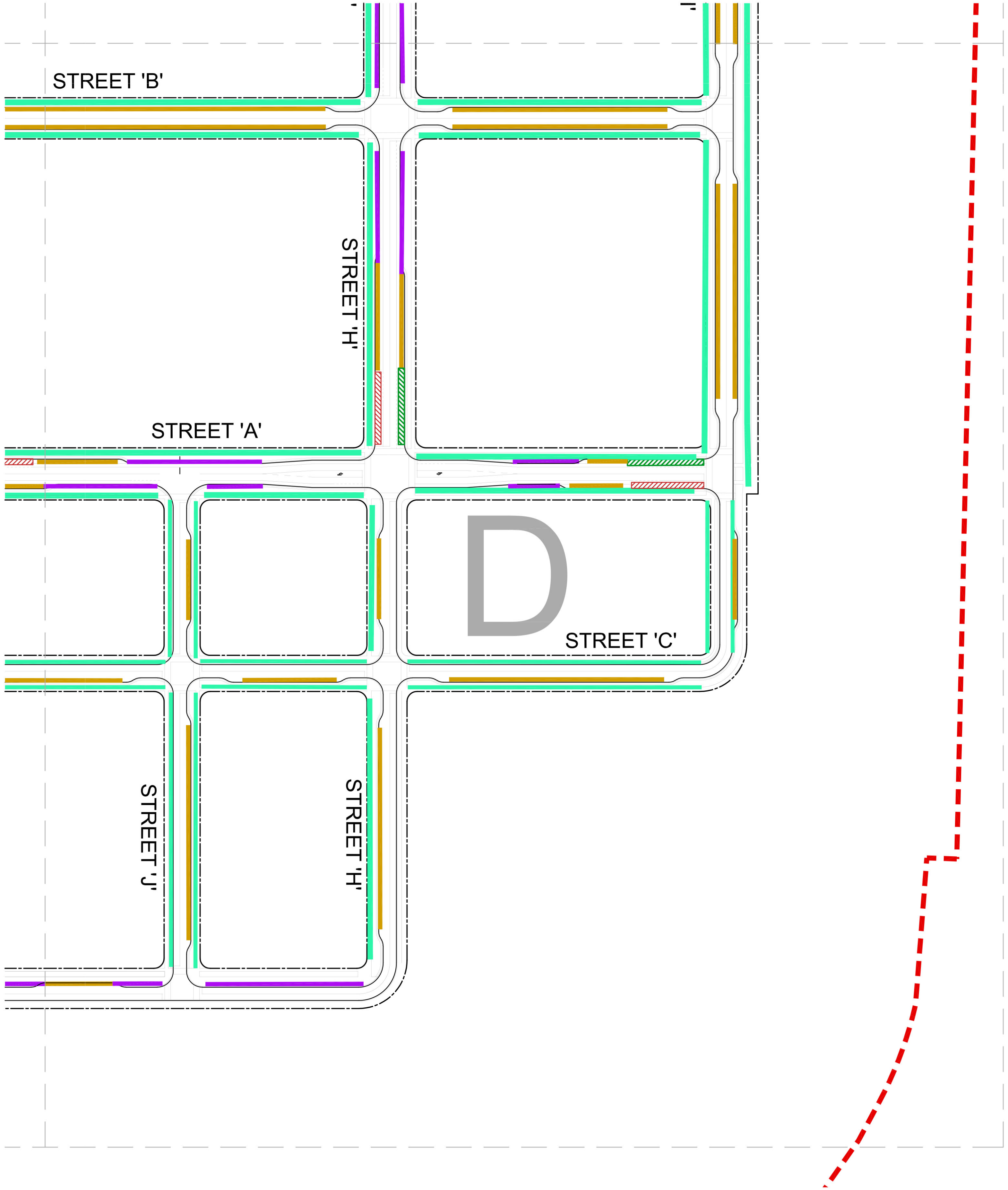
Composite Plan View: Quadrant D

The Composite Plan View schematically illustrates the spatial organization of the different ROW layers.



LEGEND:

- BIO-RETENTION BUMP-OUT
- TREE TRENCH / RAISED PLANTER
- LAYBY PARKING
- FARSIDE BUS STOP
- NEARSIDE BUS STOP
- LCC PROPOSED LOCAL BUS STOPS
- PROPOSE RIGHT-OF-WAY



LAKEVIEW COMMUNITY PARTNERS LIMITED

Appendix F – Stormwater Management Calculations

ROW Capacity Calculations

ROW LID Sizing Calculations

Runoff Coefficient Reduction Calculations

LAKEVIEW
COMMUNITY PARTNERS LIMITED

urbantech

PROJECT DETAILS

Title1:	**STORM SEWER DESIGN SHEET**
Title2:	**Major System Flows**
Project Name:	**Lakeview Lands (OPG)**
Municipality:	**City of Mississauga**
Project No:	**17-549**
Date:	**13-Feb-19**
Designed by:	**NM**
Checked by:	**AF**

IDF Parameters			
		10-yr	100-yr
$I=A/(T+b)^{c}$	A	1010	1450
	B	4.6	4.9
	C	0.78	0.78

CAPTURE LOCATION	Street Name	Street Classification ROW	AR From Design Sheet	Area ha	R_{10}	R_{100}	AR R_{100}	Flow Length m	Velocity m/s	Tc* min	I10 mm/hr	I100 mm/hr	Q10 m3/s	Q100 m3/s	Q100-Q10 m3/s	Const. flow m3/s
MH150	Lakefront Promenade	1a. Major Collector	0.89	22.60	0.75	0.94	1.11	880.00	1.50	19.78	83.7	119.0	0.259	0.368	0.109	0.109
MH110	Hydro Road	1b. Major Collector	5.77	11.17	0.75	0.94	7.22	650.00	1.50	17.22	91.2	129.5	1.828	2.596	0.768	0.768
MH128	Street A	1c. Major Collector	20.63	23.58	0.75	0.94	25.79	1000.00	1.50	21.11	80.2	114.2	5.748	8.177	2.430	2.430
MH149	Street B	2a. Minor Collector	1.75	9.99	0.75	0.94	2.19	350.00	1.50	13.89	103.8	147.1	0.631	0.894	0.264	0.264
MH127	Street G	2b. Minor Collector	1.40	4.09	0.75	0.94	1.75	200.00	1.50	12.22	111.7	158.2	0.544	0.770	0.226	0.226
MH312	Street I	2c. Minor Collector	1.75	5.56	0.75	0.94	2.19	200.00	1.50	12.22	111.7	158.2	0.678	0.961	0.282	0.282
MH110	Street H	3a. Minor Collector-Special Character	5.77	11.17	0.75	0.94	7.22	405.00	1.50	14.50	101.2	143.5	2.028	2.876	0.848	0.848
MH207	Street D	3b. Minor Collector-Special Character	5.83	8.22	0.75	0.94	7.29	200.00	1.50	12.22	111.7	158.2	2.262	3.203	0.941	0.941
MH207	Street D (Controlling)	3c. Minor Collector-Special Character	5.83	8.22	0.75	0.94	7.29	200.00	1.50	12.22	111.7	158.2	2.262	3.203	0.941	0.941
MH141	Street C, Street F, Street K	4a. Local Road A	0.59	1.90	0.75	0.94	0.73	200.00	1.50	12.22	111.7	158.2	0.227	0.321	0.094	0.094
MH141	Street C, Street F	4b. Local Road B	0.59	1.90	0.75	0.94	0.73	200.00	1.50	12.22	111.7	158.2	0.227	0.321	0.094	0.094
MH211	Street K	4c. Local Road A (v2)	3.79	1.99	0.75	0.94	4.73	200.00	1.50	12.22	111.7	158.2	1.469	2.080	0.611	0.611
MH141	Street C (central)	4d. Local Road C	0.59	1.29	0.75	0.94	0.73	200.00	1.50	12.22	111.7	158.2	0.227	0.321	0.094	0.094

*Where available, Tc is calculated from design sheet or overland flow calculatior

Tc calcs *where Tc = starting Tc + flow length/velocity*
(starting Tc = 10min)

Assumed Velocities for Calculation of time of Concentration

Pipe Flow Velocity=	2.0 m/s
OLF Velocity=	1.5 m/s
External Flow Velocity	0.25 m/s

Urbantech Consulting, A Division of Leighton-Zec Ltd.
3760 14th, Suite 301 Markham, Ontario L3R 3T7
TEL: 905.946.9461 FAX: 905.946.9595
www.urbantech.com

MAJOR SYSTEM CAPACITY CALCULATIONS
ROW Analysis

Project Name: OPG Lakeview
Municipality: City of Mississauga
Project No.: 17-549
Date: 12-Feb-19

Prepared by: KG
Checked by: NMF
Date Modified: 27-Feb-19

Section	Street Name	Street Classification (From Lakeview Village ROW Study)	ROW Slope (%)	ROW Width	Pavement Width	Peak Flow on ROW (Q100-Q10)	ROW Capacity at Top of Curb (Depth = 0.15m) From Hydraflow Express	Maximum Depth	Maximum ROW Capacity
				(m)	(m)	(m^3/s)	(m^3/s)		(m^3/s)
1	Lakefront Promenade	1a. Major Collector	1.00%	26	14.6	0.11	1.61		
	Hydro Road	1b. Major Collector	0.50%	26	14.6	0.77	1.14		
	Street A	1c. Major Collector	0.50%	26	14.6	2.43	**1.14**	0.220	2.495
2	Street B	2a. Minor Collector	0.50%	20.5	11	0.26	1.21		
	Street G	2b. Minor Collector	1.00%	20.5	11	0.23	1.72		
	Street I	2c. Minor Collector	0.50%	20.5	11	0.28	1.21		
3	Street H	3a. Minor Collector-Special Character	1.00%	20	8.8	0.85	1.65		
	Street D	3b. Minor Collector-Special Character	0.50%	20	8.8	0.94	1.13		
	Street D (Controlling)	3c. Minor Collector-Special Character	1.00%	20	6.6	0.94	1.46		
4	Street C, Street F, Street K	4a. Local Road A	0.50%	18	8.8	0.09	1.17		
	Street C, Street F	4b. Local Road B	0.50%	18	8.8	0.09	1.17		
	Street K	4c. Local Road A (v2)	0.50%	18	8.8	0.61	1.17		
	Street C (central)	4d. Local Road C	0.50%	18	8.8	0.09	1.17		

Channel Report

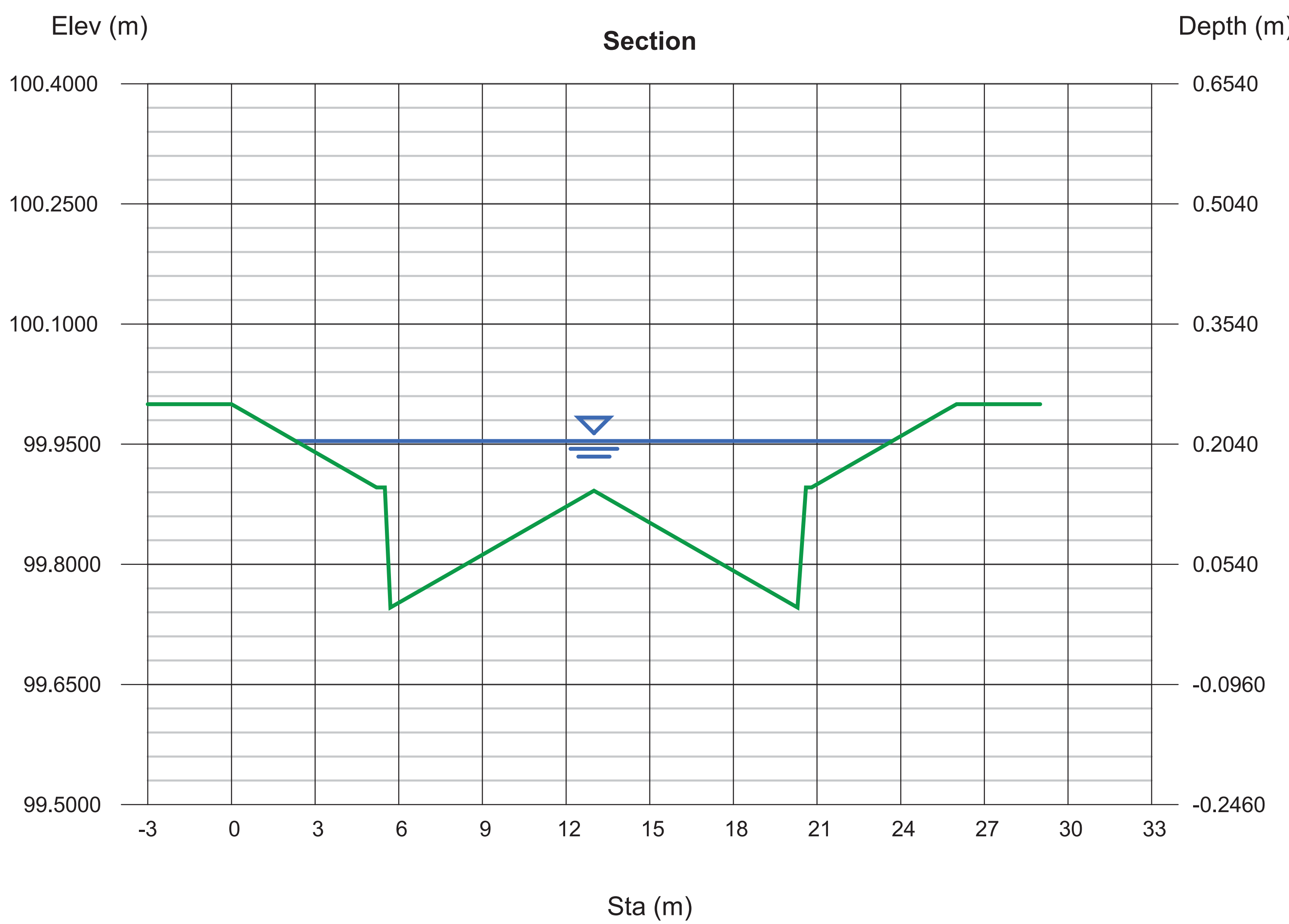
Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Feb 26 2019

1a. Major Collector - Lakefront Prom

User-defined		**Highlighted**	
Invert Elev (m)	= 99.7460	Depth (m)	= 0.2080
Slope (%)	= 1.0000	Q (cms)	= 2.9725
N-Value	= 0.017	Area (sqm)	= 2.2347
		Velocity (m/s)	= 1.3302
Calculations		Wetted Perim (m)	= 21.4895
Compute by:	Known Depth	Crit Depth, Yc (m)	= 0.2347
Known Depth (m)	= 0.2080	Top Width (m)	= 21.4000
		EGL (m)	= 0.2983

(Sta, El, n)-(Sta, El, n)...

(0.0000, 100.0000)-(0.5000, 99.9900, 0.025)-(2.3000, 99.9540, 0.013)-(5.2000, 99.8960, 0.025)-(5.5000, 99.8960, 0.013)-(5.7000, 99.7460, 0.013)-(7.9000, 99.790(
-(9.7000, 99.8260, 0.013)-(13.0000, 99.8920, 0.013)-(16.3000, 99.8260, 0.013)-(18.1000, 99.7900, 0.013)-(20.3000, 99.7460, 0.013)-(20.6000, 99.8960, 0.013)-(20.8
-(23.7000, 99.9540, 0.025)-(25.5000, 99.9900, 0.013)-(26.0000, 100.0000, 0.025)



Channel Report

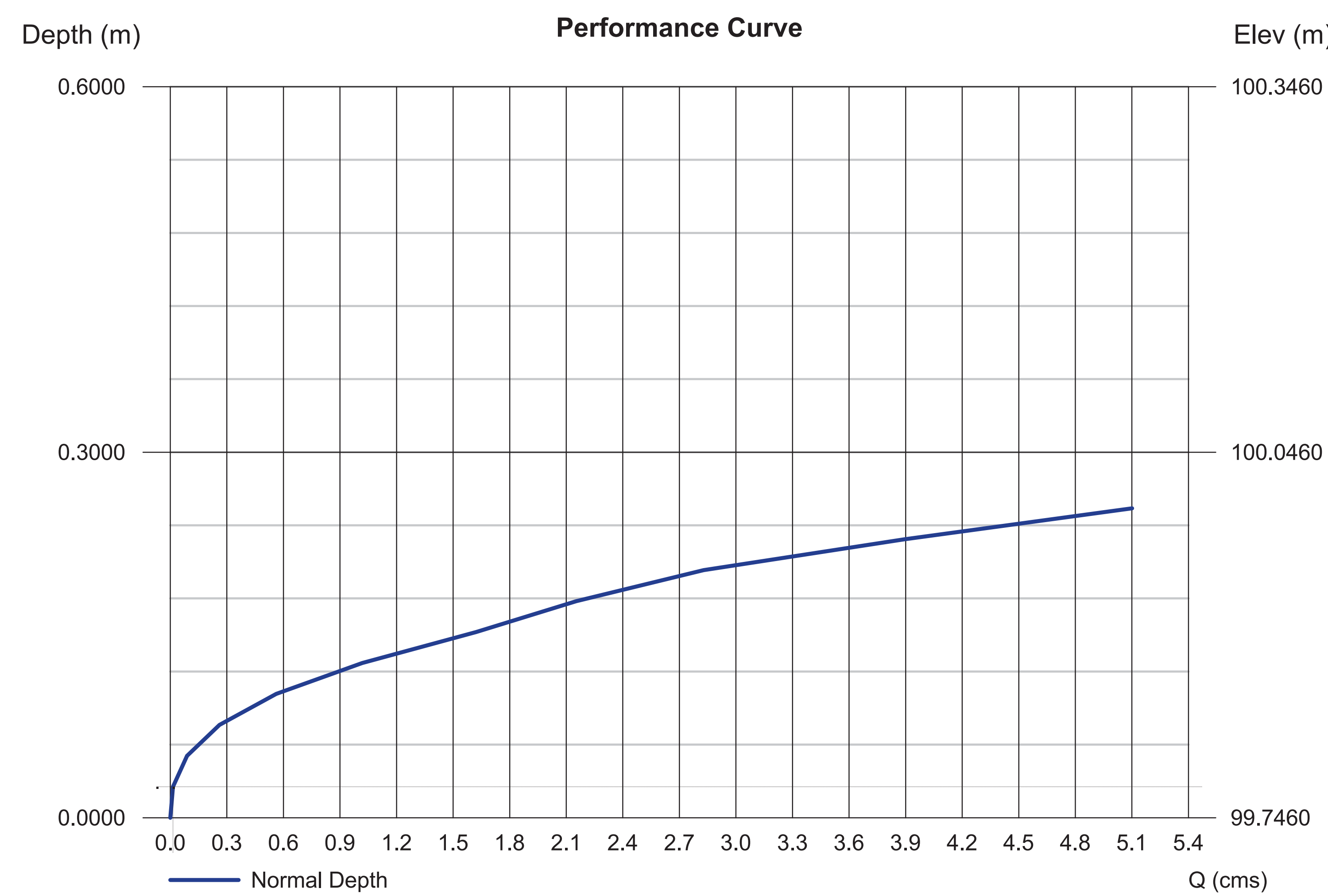
Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Feb 26 2019

1a. Major Collector - Lakefront Prom

User-defined		**Highlighted**	
Invert Elev (m)	= 99.7460	Depth (m)	= 0.0254
Slope (%)	= 1.0000	Q (cms)	= 0.014
N-Value	= Composite	Area (sqm)	= 0.0333
		Velocity (m/s)	= 0.4177
Calculations		Wetted Perim (m)	= 2.6401
Compute by:	Q vs Depth	Crit Depth, Yc (m)	= 0.0274
No. Increments	= 10	Top Width (m)	= 2.6251
		EGL (m)	= 0.0343

(Sta, El, n)-(Sta, El, n)...

(0.0000, 100.0000)-(0.5000, 99.9900, 0.025)-(2.3000, 99.9540, 0.013)-(5.2000, 99.8960, 0.025)-(5.5000, 99.8960, 0.013)-(5.7000, 99.7460, 0.013)-(7.9000, 99.790(
-(9.7000, 99.8260, 0.013)-(13.0000, 99.8920, 0.013)-(16.3000, 99.8260, 0.013)-(18.1000, 99.7900, 0.013)-(20.3000, 99.7460, 0.013)-(20.6000, 99.8960, 0.013)-(20.8
-(23.7000, 99.9540, 0.025)-(25.5000, 99.9900, 0.013)-(26.0000, 100.0000, 0.025)



Depth	Q	Area	Veloc
(m)	(cms)	(sqm)	(m/s)
0.0254	0.014	0.033	0.4177
0.0508	0.088	0.133	0.6631
0.0762	0.261	0.300	0.8690
0.1016	0.561	0.533	1.0528
0.1270	1.018	0.833	1.2218
0.1524	1.621	1.199	1.3516
0.1778	2.153	1.634	1.3179
0.2032	2.829	2.133	1.3261
0.2286	3.896	2.697	1.4447
0.2540	5.101	3.325	1.5343

Wp	Yc	TopWidth	Energy
(m)	(m)	(m)	(m)
2.6401	0.0274	2.6251	0.0343
5.2793	0.0579	5.2493	0.0732
7.9194	0.0884	7.8745	0.1147
10.5585	0.1219	10.4987	0.1581
13.1986	0.1524	13.1238	0.2031
15.9284	0.1829	15.8400	0.2456
18.4684	0.2042	18.3795	0.2664
21.0094	0.2286	20.9200	0.2929
23.5494	0.2540	23.4595	0.3351
26.0904	0.2540	26.0000	0.3741

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Feb 26 2019

1b. Major Collector - Hydro Road / Street H

User-defined

Invert Elev (m)	= 99.7460
Slope (%)	= 0.5000
N-Value	= 0.017

Calculations

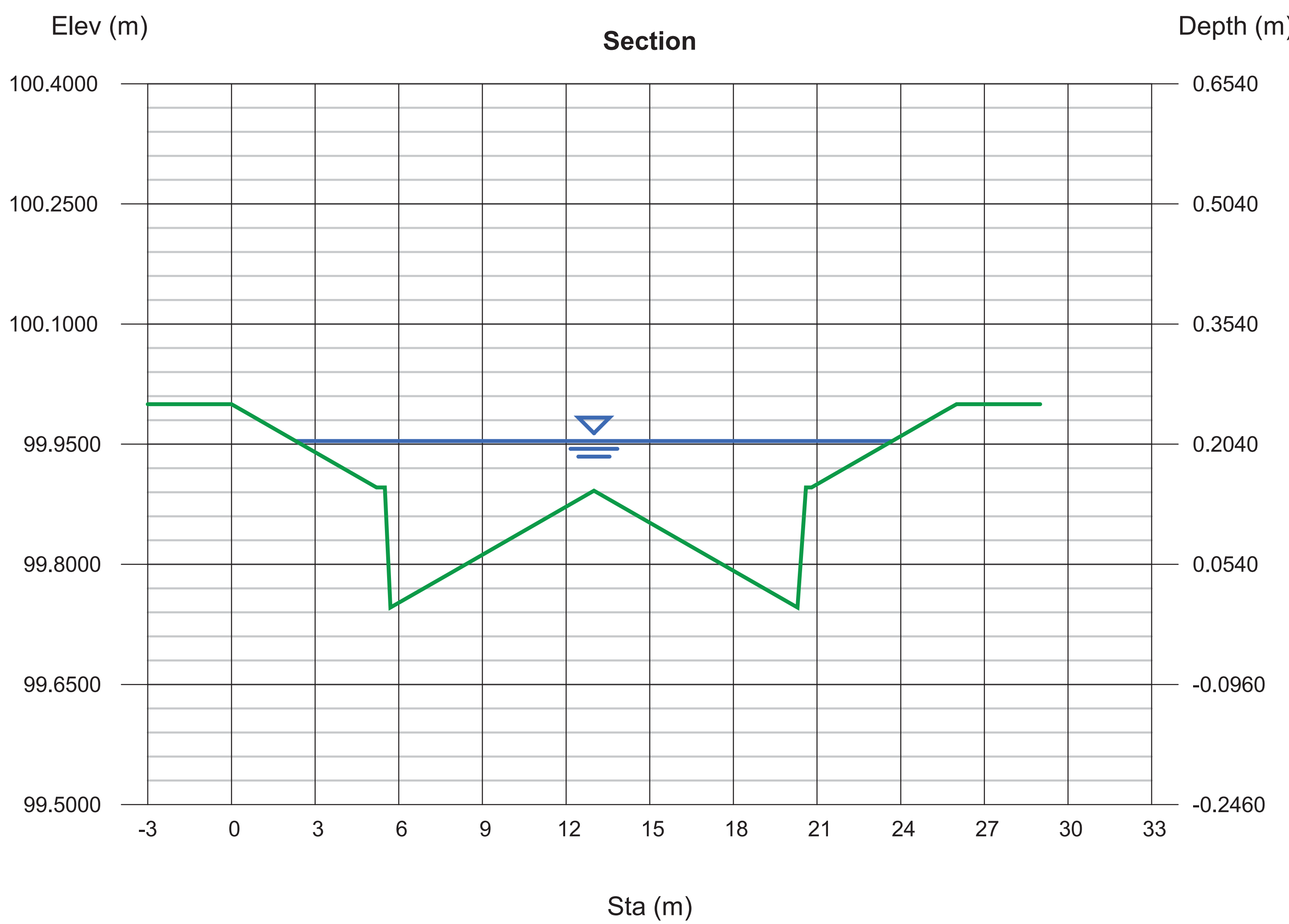
Compute by:	Known Depth
Known Depth (m)	= 0.2080

Highlighted

Depth (m)	= 0.2080
Q (cms)	= 2.1019
Area (sqm)	= 2.2347
Velocity (m/s)	= 0.9406
Wetted Perim (m)	= 21.4895
Crit Depth, Yc (m)	= 0.2042
Top Width (m)	= 21.4000
EGL (m)	= 0.2531

(Sta, El, n)-(Sta, El, n)...

(0.0000, 100.0000)-(0.5000, 99.9900, 0.025)-(2.3000, 99.9540, 0.013)-(5.2000, 99.8960, 0.025)-(5.5000, 99.8960, 0.013)-(5.7000, 99.7460, 0.013)-(7.9000, 99.790(
-(9.7000, 99.8260, 0.013)-(13.0000, 99.8920, 0.013)-(16.3000, 99.8260, 0.013)-(18.1000, 99.7900, 0.013)-(20.3000, 99.7460, 0.013)-(20.6000, 99.8960, 0.013)-(20.8
-(23.7000, 99.9540, 0.025)-(25.5000, 99.9900, 0.013)-(26.0000, 100.0000, 0.025)



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Feb 26 2019

1b. Major Collector - Hydro Road / Street H

User-defined

Invert Elev (m)	= 99.7460
Slope (%)	= 0.5000
N-Value	= Composite

Calculations

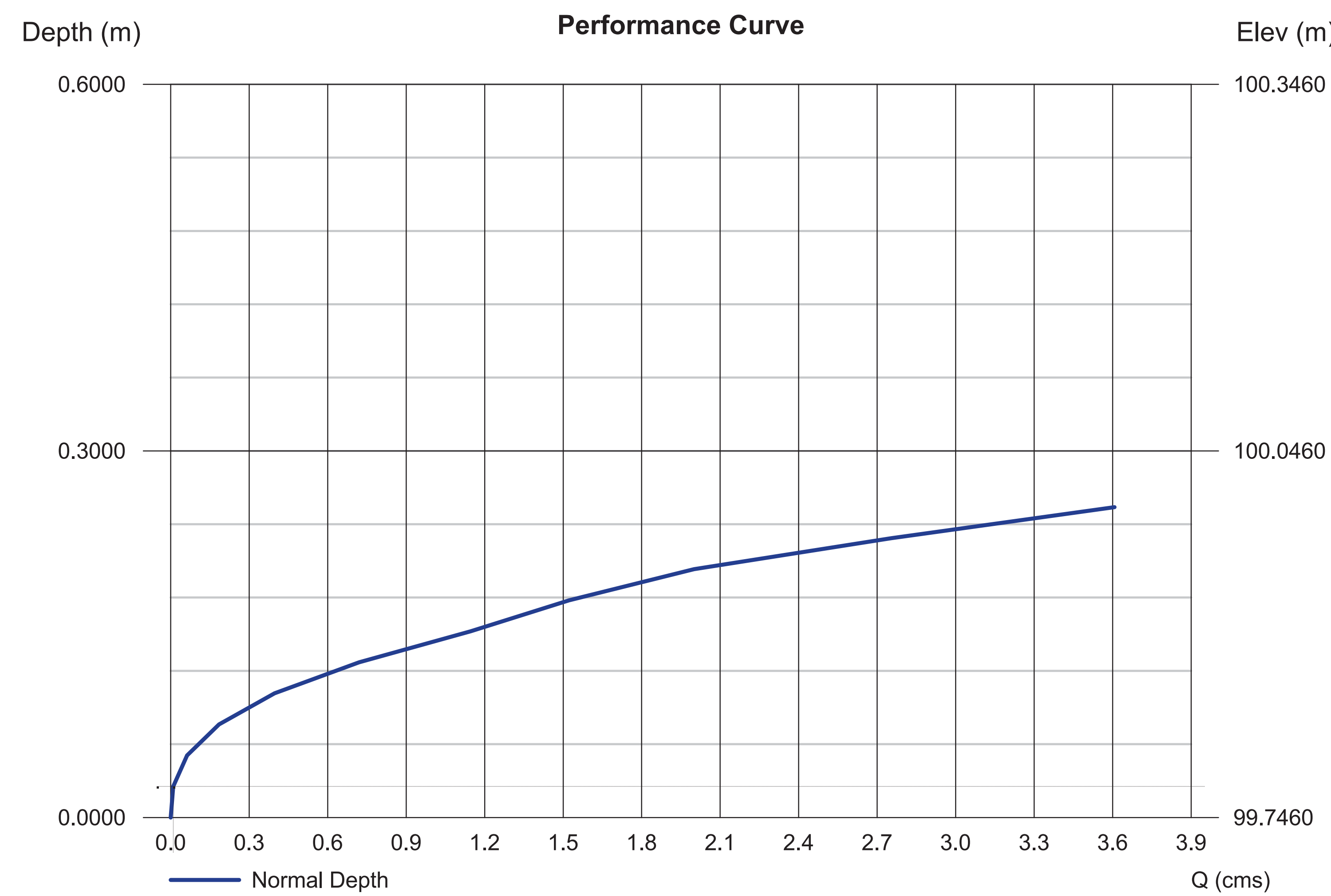
Compute by:	Q vs Depth
No. Increments	= 10

Highlighted

Depth (m)	= 0.0254
Q (cms)	= 0.010
Area (sqm)	= 0.0333
Velocity (m/s)	= 0.2953
Wetted Perim (m)	= 2.6401
Crit Depth, Yc (m)	= 0.0244
Top Width (m)	= 2.6251
EGL (m)	= 0.0298

(Sta, El, n)-(Sta, El, n)...

(0.0000, 100.0000)-(0.5000, 99.9900, 0.025)-(2.3000, 99.9540, 0.013)-(5.2000, 99.8960, 0.025)-(5.5000, 99.8960, 0.013)-(5.7000, 99.7460, 0.013)-(7.9000, 99.790(
-(9.7000, 99.8260, 0.013)-(13.0000, 99.8920, 0.013)-(16.3000, 99.8260, 0.013)-(18.1000, 99.7900, 0.013)-(20.3000, 99.7460, 0.013)-(20.6000, 99.8960, 0.013)-(20.8
-(23.7000, 99.9540, 0.025)-(25.5000, 99.9900, 0.013)-(26.0000, 100.0000, 0.025)



Depth	Q	Area	Veloc
(m)	(cms)	(sqm)	(m/s)
0.0254	0.010	0.033	0.2953
0.0508	0.063	0.133	0.4689
0.0762	0.184	0.300	0.6145
0.1016	0.397	0.533	0.7444
0.1270	0.720	0.833	0.8639
0.1524	1.146	1.199	0.9557
0.1778	1.523	1.634	0.9319
0.2032	2.000	2.133	0.9377
0.2286	2.755	2.697	1.0216
0.2540	3.607	3.325	1.0849

Wp	Yc	TopWidth	Energy
(m)	(m)	(m)	(m)
2.6401	0.0244	2.6251	0.0298
5.2793	0.0518	5.2493	0.0620
7.9194	0.0792	7.8745	0.0955
10.5585	0.1067	10.4987	0.1299
13.1986	0.1341	13.1238	0.1651
15.9284	0.1615	15.8400	0.1990
18.4684	0.1798	18.3795	0.2221
21.0094	0.1981	20.9200	0.2480
23.5494	0.2256	23.4595	0.2818
26.0904	0.2530	26.0000	0.3140

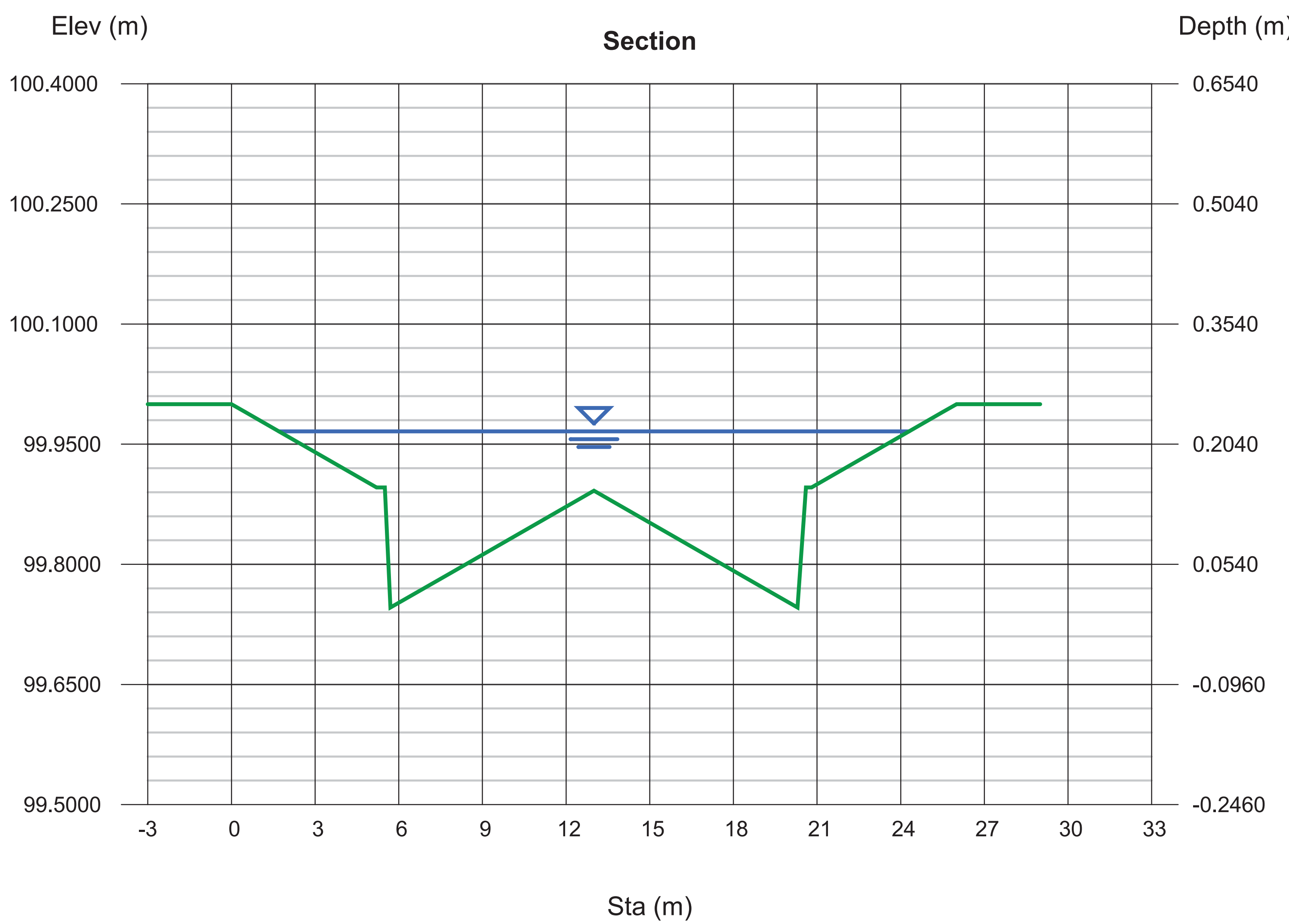
Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Feb 26 2019

1c. Major Collector - Street A

User-defined		**Highlighted**	
Invert Elev (m)	= 99.7460	Depth (m)	= 0.2200
Slope (%)	= 0.5000	Q (cms)	= 2.4689
N-Value	= 0.016	Area (sqm)	= 2.4987
		Velocity (m/s)	= 0.9881
Calculations		Wetted Perim (m)	= 22.6897
Compute by:	Known Depth	Crit Depth, Yc (m)	= 0.2164
Known Depth (m)	= 0.2200	Top Width (m)	= 22.6000
		EGL (m)	= 0.2698

(Sta, El, n)-(Sta, El, n)...
(0.0000, 100.0000)-(0.5000, 99.9900, 0.025)-(2.3000, 99.9540, 0.013)-(5.2000, 99.8960, 0.025)-(5.5000, 99.8960, 0.013)-(5.7000, 99.7460, 0.013)-(7.9000, 99.790(
-(9.7000, 99.8260, 0.013)-(13.0000, 99.8920, 0.013)-(16.3000, 99.8260, 0.013)-(18.1000, 99.7900, 0.013)-(20.3000, 99.7460, 0.013)-(20.6000, 99.8960, 0.013)-(20.8
-(23.7000, 99.9540, 0.025)-(25.5000, 99.9900, 0.013)-(26.0000, 100.0000, 0.025)



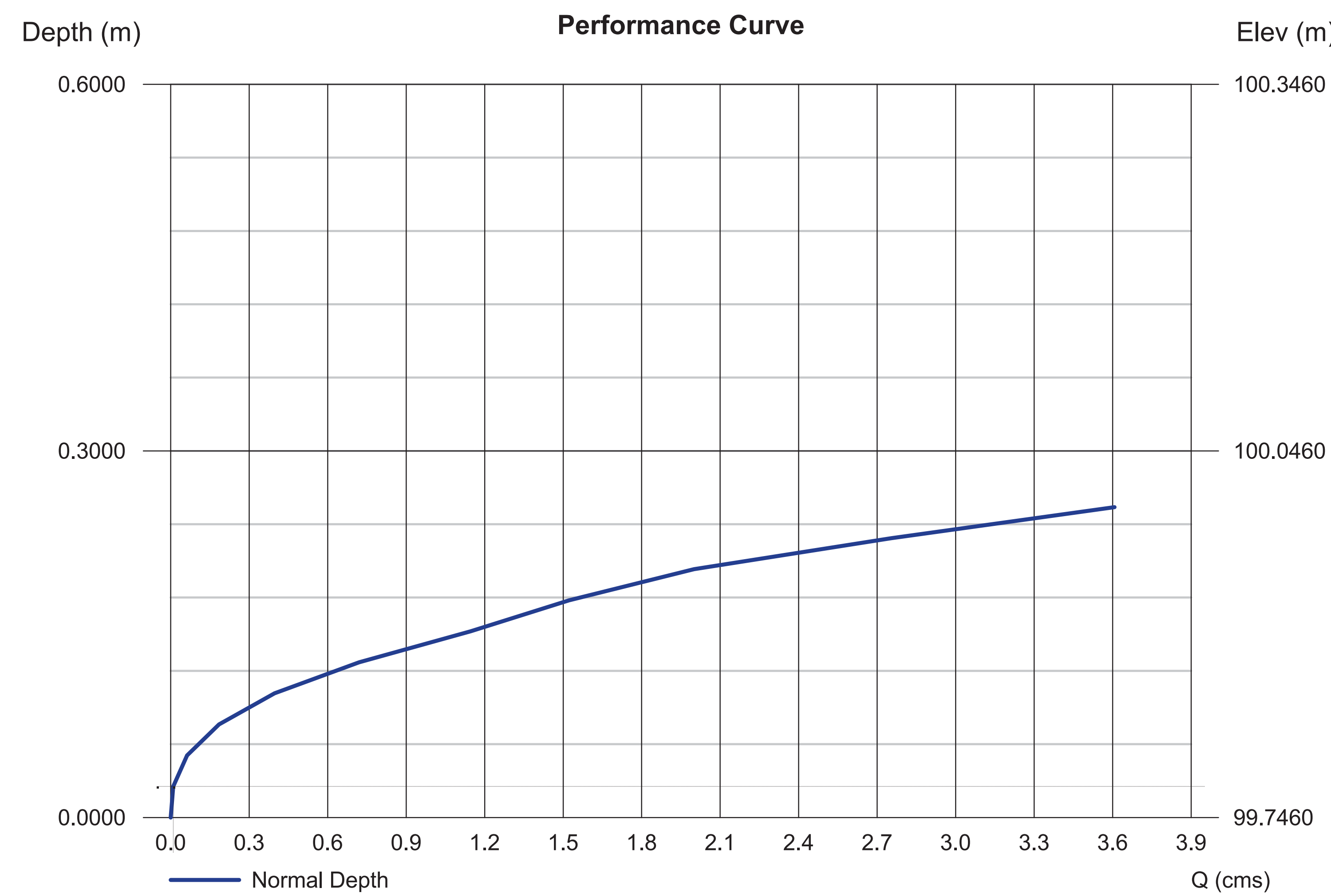
Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Feb 26 2019

1c. Major Collector - Street A

User-defined		**Highlighted**	
Invert Elev (m)	= 99.7460	Depth (m)	= 0.0254
Slope (%)	= 0.5000	Q (cms)	= 0.010
N-Value	= Composite	Area (sqm)	= 0.0333
		Velocity (m/s)	= 0.2953
Calculations		Wetted Perim (m)	= 2.6401
Compute by:	Q vs Depth	Crit Depth, Yc (m)	= 0.0244
No. Increments	= 10	Top Width (m)	= 2.6251
		EGL (m)	= 0.0298

(Sta, El, n)-(Sta, El, n)...
(0.0000, 100.0000)-(0.5000, 99.9900, 0.025)-(2.3000, 99.9540, 0.013)-(5.2000, 99.8960, 0.025)-(5.5000, 99.8960, 0.013)-(5.7000, 99.7460, 0.013)-(7.9000, 99.790(
-(9.7000, 99.8260, 0.013)-(13.0000, 99.8920, 0.013)-(16.3000, 99.8260, 0.013)-(18.1000, 99.7900, 0.013)-(20.3000, 99.7460, 0.013)-(20.6000, 99.8960, 0.013)-(20.8
-(23.7000, 99.9540, 0.025)-(25.5000, 99.9900, 0.013)-(26.0000, 100.0000, 0.025)



Depth	Q	Area	Veloc
(m)	(cms)	(sqm)	(m/s)
0.0254	0.010	0.033	0.2953
0.0508	0.063	0.133	0.4689
0.0762	0.184	0.300	0.6145
0.1016	0.397	0.533	0.7444
0.1270	0.720	0.833	0.8639
0.1524	1.146	1.199	0.9557
0.1778	1.523	1.634	0.9319
0.2032	2.000	2.133	0.9377
0.2286	2.755	2.697	1.0216
0.2540	3.607	3.325	1.0849

Wp	Yc	TopWidth	Energy
(m)	(m)	(m)	(m)
2.6401	0.0244	2.6251	0.0298
5.2793	0.0518	5.2493	0.0620
7.9194	0.0792	7.8745	0.0955
10.5585	0.1067	10.4987	0.1299
13.1986	0.1341	13.1238	0.1651
15.9284	0.1615	15.8400	0.1990
18.4684	0.1798	18.3795	0.2221
21.0094	0.1981	20.9200	0.2480
23.5494	0.2256	23.4595	0.2818
26.0904	0.2530	26.0000	0.3140

Channel Report

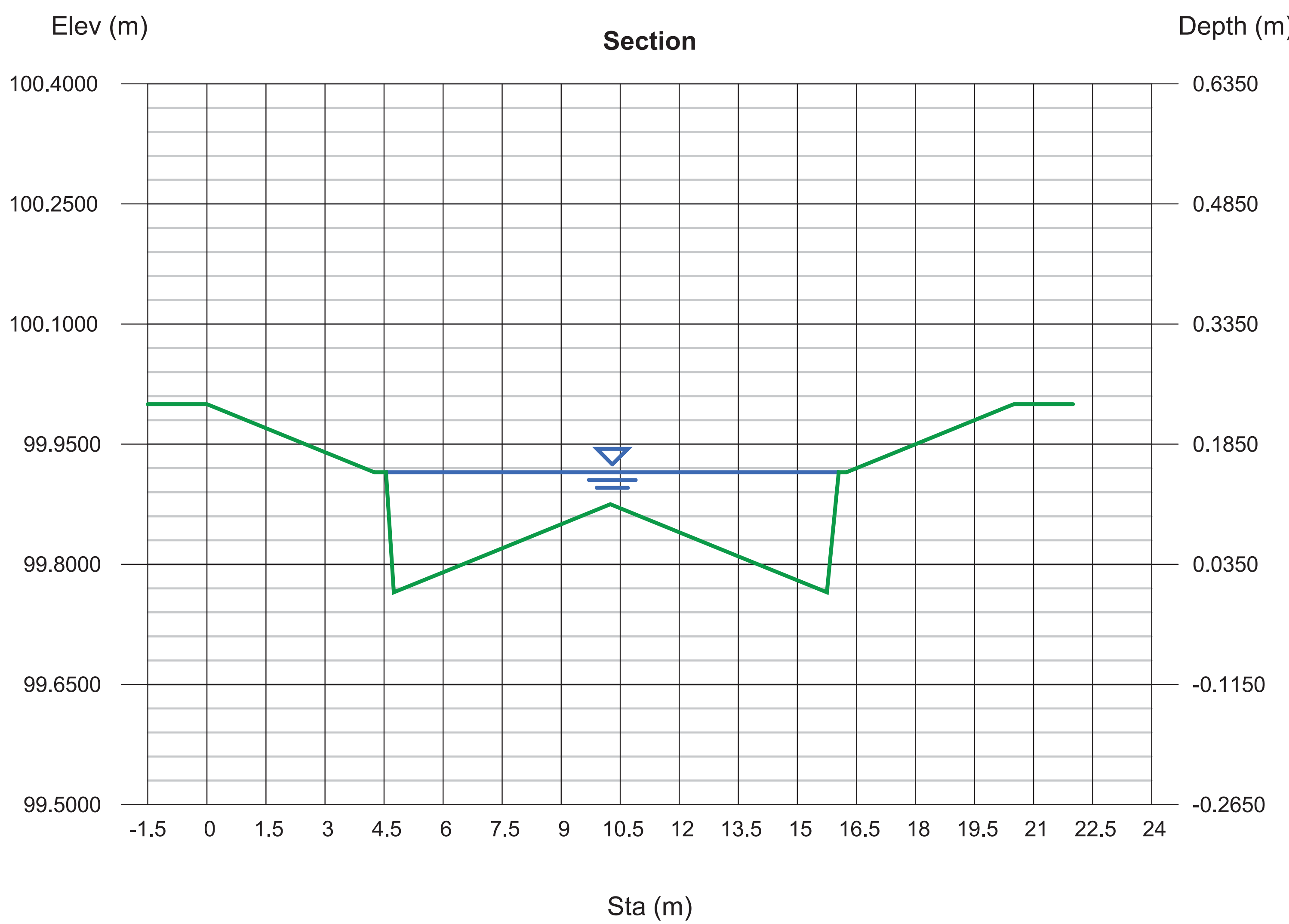
Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Feb 26 2019

2a. Minor Collector - Street B / New Aviator Ave.

User-defined		**Highlighted**	
Invert Elev (m)	= 99.7650	Depth (m)	= 0.1500
Slope (%)	= 0.5000	Q (cms)	= 1.2145
N-Value	= 0.013	Area (sqm)	= 1.0825
		Velocity (m/s)	= 1.1219
Calculations		Wetted Perim (m)	= 11.5876
Compute by:	Known Depth	Crit Depth, Yc (m)	= 0.1646
Known Depth (m)	= 0.1500	Top Width (m)	= 11.5000
		EGL (m)	= 0.2142

(Sta, El, n)-(Sta, El, n)...

(0.0000, 100.0000)-(0.2000, 99.9960, 0.025)-(2.0000, 99.9600, 0.013)-(4.2500, 99.9150, 0.025)-(4.5500, 99.9150, 0.013)-(4.7500, 99.7650, 0.013)-(6.9500, 99.809(
-(10.2500, 99.8750, 0.013)-(13.5500, 99.8090, 0.013)-(15.7500, 99.7650, 0.013)-(16.0500, 99.9150, 0.013)-(16.2500, 99.9150, 0.013)-(18.5000, 99.9600, 0.025)-(20
-(20.5000, 100.0000, 0.025)



Channel Report

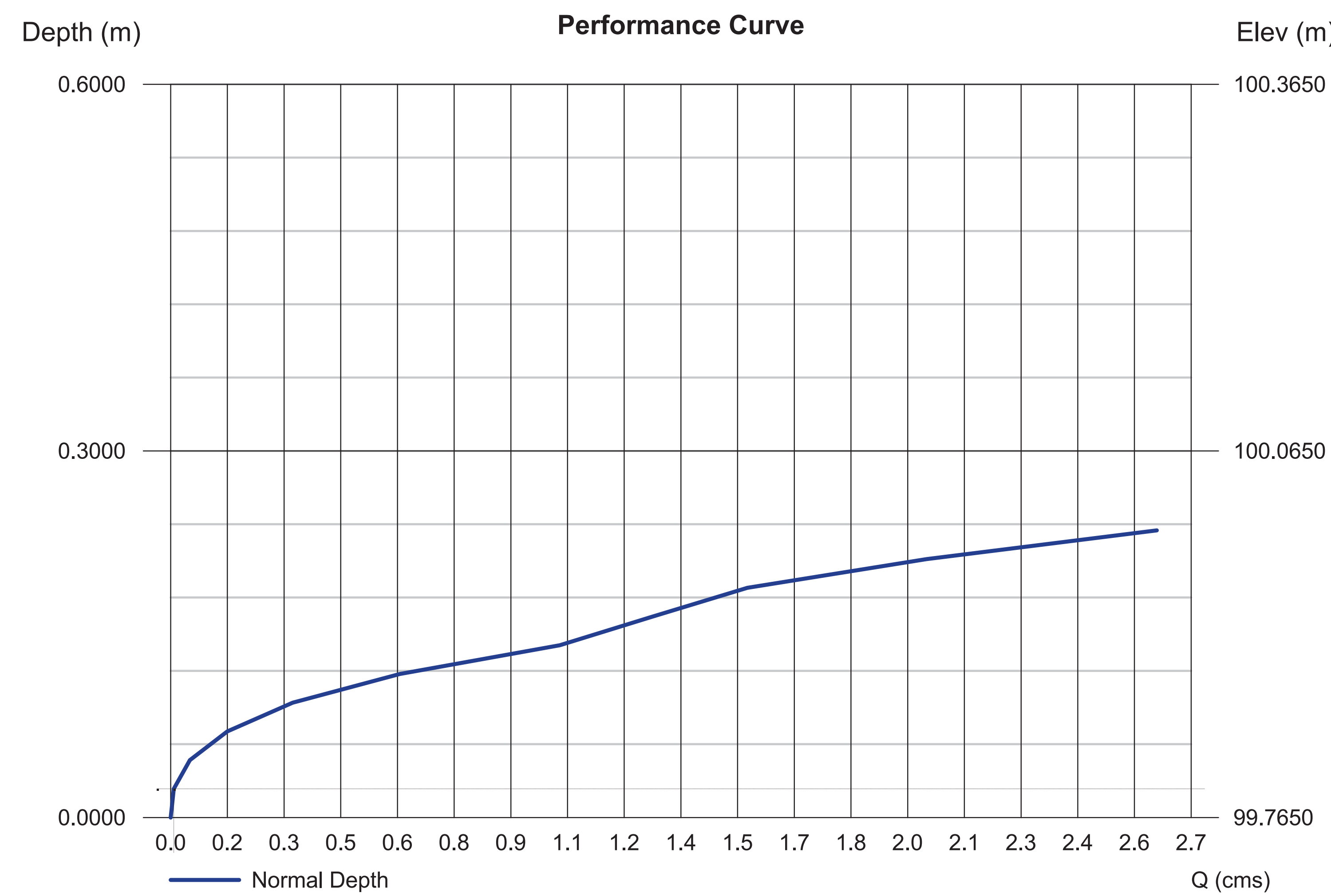
Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Feb 26 2019

2a. Minor Collector - Street B / New Aviator Ave.

User-defined		**Highlighted**	
Invert Elev (m)	= 99.7650	Depth (m)	= 0.0235
Slope (%)	= 0.5000	Q (cms)	= 0.008
N-Value	= Composite	Area (sqm)	= 0.0285
		Velocity (m/s)	= 0.2804
Calculations		Wetted Perim (m)	= 2.4419
Compute by:	Q vs Depth	Crit Depth, Yc (m)	= 0.0244
No. Increments	= 10	Top Width (m)	= 2.4281
		EGL (m)	= 0.0275

(Sta, El, n)-(Sta, El, n)...

(0.0000, 100.0000)-(0.2000, 99.9960, 0.025)-(2.0000, 99.9600, 0.013)-(4.2500, 99.9150, 0.025)-(4.5500, 99.9150, 0.013)-(4.7500, 99.7650, 0.013)-(6.9500, 99.809(
-(10.2500, 99.8750, 0.013)-(13.5500, 99.8090, 0.013)-(15.7500, 99.7650, 0.013)-(16.0500, 99.9150, 0.013)-(16.2500, 99.9150, 0.013)-(18.5000, 99.9600, 0.025)-(20
-(20.5000, 100.0000, 0.025)



Depth	Q	Area	Veloc
(m)	(cms)	(sqm)	(m/s)
0.0235	0.008	0.029	0.2804
0.0470	0.051	0.114	0.4452
0.0705	0.150	0.257	0.5834
0.0940	0.323	0.457	0.7069
0.1175	0.606	0.711	0.8535
0.1410	1.029	0.979	1.0514
0.1645	1.276	1.267	1.0067
0.1880	1.526	1.611	0.9472
0.2115	2.000	2.010	0.9953
0.2350	2.609	2.464	1.0590

Wp	Yc	TopWidth	Energy
(m)	(m)	(m)	(m)
2.4419	0.0244	2.4281	0.0275
4.8848	0.0457	4.8571	0.0571
7.3264	0.0732	7.2849	0.0879
9.7690	0.0975	9.7136	0.1195
11.4608	0.1219	11.3917	0.1547
11.5525	0.1524	11.4700	0.1974
13.5380	0.1707	13.4501	0.2162
15.8880	0.1859	15.7996	0.2338
18.2391	0.2103	18.1502	0.2620
20.5893	0.2347	20.5000	0.2922

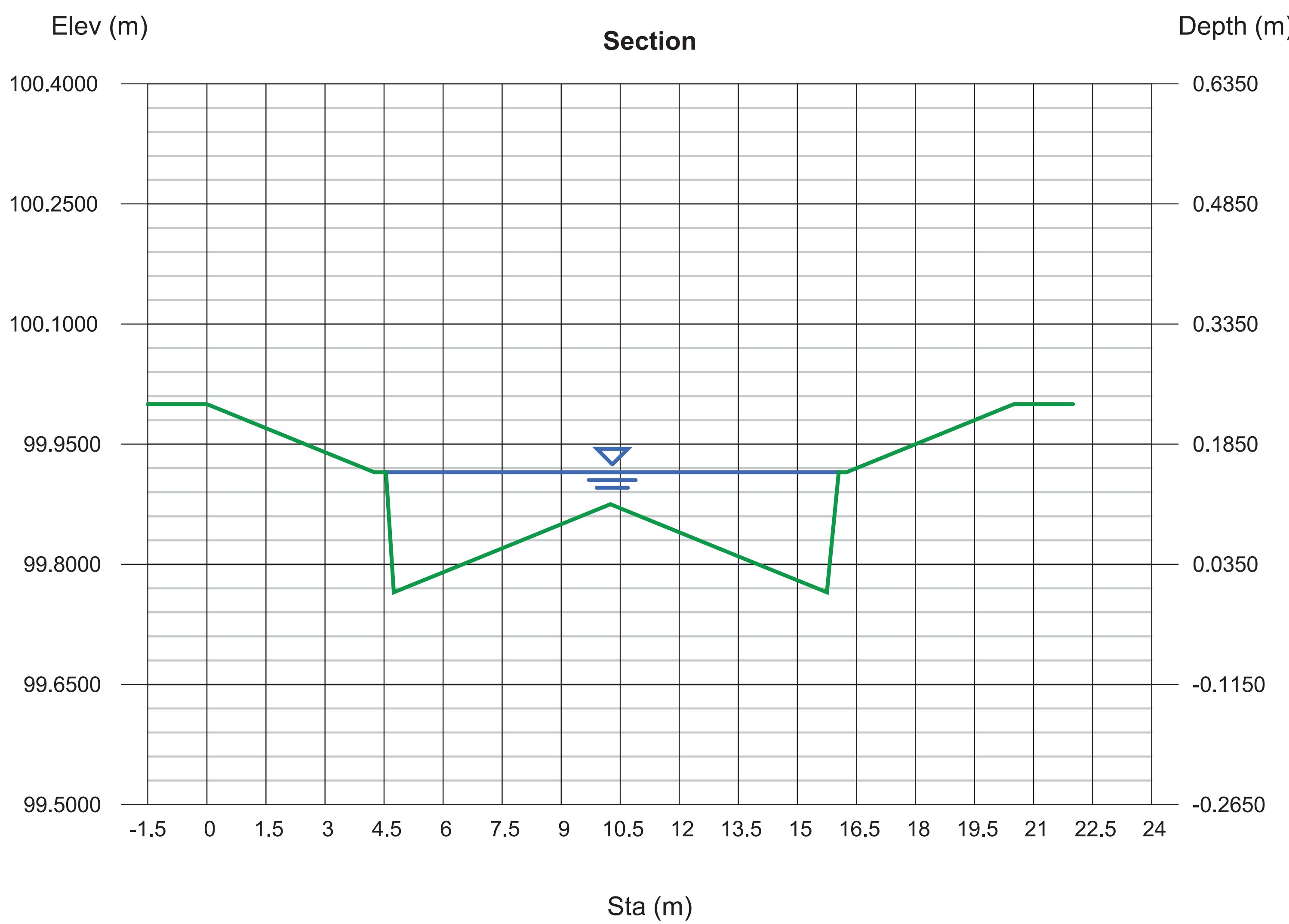
Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Feb 26 2019

2b. Minor Collector - Street G / New Ogden Ave.

User-defined		**Highlighted**	
Invert Elev (m)	= 99.7650	Depth (m)	= 0.1500
Slope (%)	= 1.0000	Q (cms)	= 1.7176
N-Value	= 0.013	Area (sqm)	= 1.0825
		Velocity (m/s)	= 1.5866
Calculations		Wetted Perim (m)	= 11.5876
Compute by:	Known Depth	Crit Depth, Yc (m)	= 0.1951
Known Depth (m)	= 0.1500	Top Width (m)	= 11.5000
		EGL (m)	= 0.2784

(Sta, El, n)-(Sta, El, n)...
(0.0000, 100.0000)-(0.2000, 99.9960, 0.025)-(2.0000, 99.9600, 0.013)-(4.2500, 99.9150, 0.025)-(4.5500, 99.9150, 0.013)-(4.7500, 99.7650, 0.013)-(6.9500, 99.809(
-(10.2500, 99.8750, 0.013)-(13.5500, 99.8090, 0.013)-(15.7500, 99.7650, 0.013)-(16.0500, 99.9150, 0.013)-(16.2500, 99.9150, 0.013)-(18.5000, 99.9600, 0.025)-(20
-(20.5000, 100.0000, 0.025)



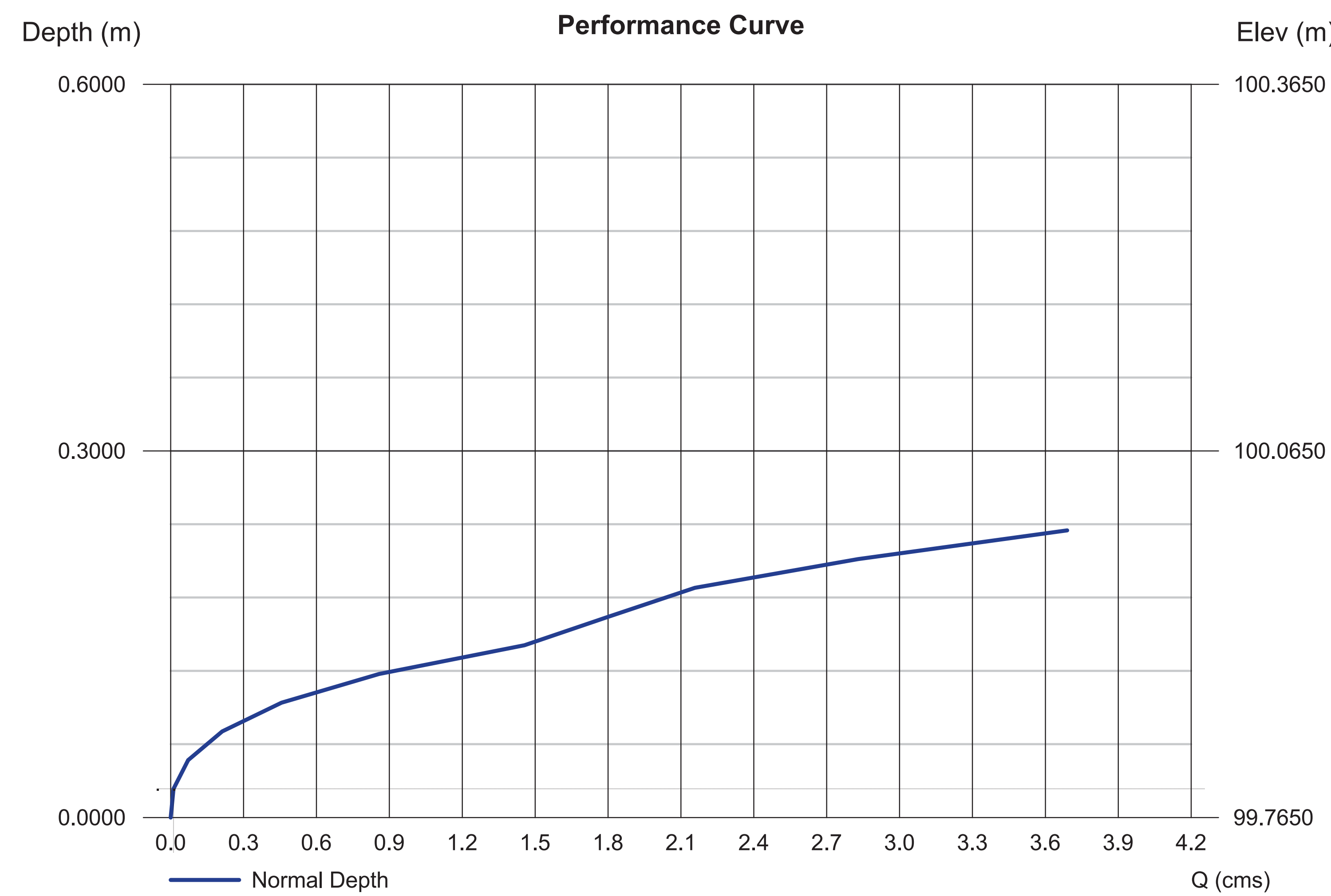
Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Feb 26 2019

2b. Minor Collector - Street G / New Ogden Ave.

User-defined		**Highlighted**	
Invert Elev (m)	= 99.7650	Depth (m)	= 0.0235
Slope (%)	= 1.0000	Q (cms)	= 0.011
N-Value	= Composite	Area (sqm)	= 0.0285
		Velocity (m/s)	= 0.3965
Calculations		Wetted Perim (m)	= 2.4419
Compute by:	Q vs Depth	Crit Depth, Yc (m)	= 0.0274
No. Increments	= 10	Top Width (m)	= 2.4281
		EGL (m)	= 0.0315

(Sta, El, n)-(Sta, El, n)...
(0.0000, 100.0000)-(0.2000, 99.9960, 0.025)-(2.0000, 99.9600, 0.013)-(4.2500, 99.9150, 0.025)-(4.5500, 99.9150, 0.013)-(4.7500, 99.7650, 0.013)-(6.9500, 99.809(
-(10.2500, 99.8750, 0.013)-(13.5500, 99.8090, 0.013)-(15.7500, 99.7650, 0.013)-(16.0500, 99.9150, 0.013)-(16.2500, 99.9150, 0.013)-(18.5000, 99.9600, 0.025)-(20
-(20.5000, 100.0000, 0.025)



Depth	Q	Area	Veloc
(m)	(cms)	(sqm)	(m/s)
0.0235	0.011	0.029	0.3965
0.0470	0.072	0.114	0.6296
0.0705	0.212	0.257	0.8251
0.0940	0.456	0.457	0.9997
0.1175	0.858	0.711	1.2070
0.1410	1.456	0.979	1.4869
0.1645	1.804	1.267	1.4237
0.1880	2.158	1.611	1.3395
0.2115	2.829	2.010	1.4076
0.2350	3.690	2.464	1.4976

Wp	Yc	TopWidth	Energy
(m)	(m)	(m)	(m)
2.4419	0.0274	2.4281	0.0315
4.8848	0.0549	4.8571	0.0672
7.3264	0.0823	7.2849	0.1052
9.7690	0.1128	9.7136	0.1450
11.4608	0.1402	11.3917	0.1918
11.5525	0.1798	11.4700	0.2538
13.5380	0.1981	13.4501	0.2679
15.8880	0.2164	15.7996	0.2795
18.2391	0.2350	18.1502	0.3126
20.5893	0.2350	20.5000	0.3494

Channel Report

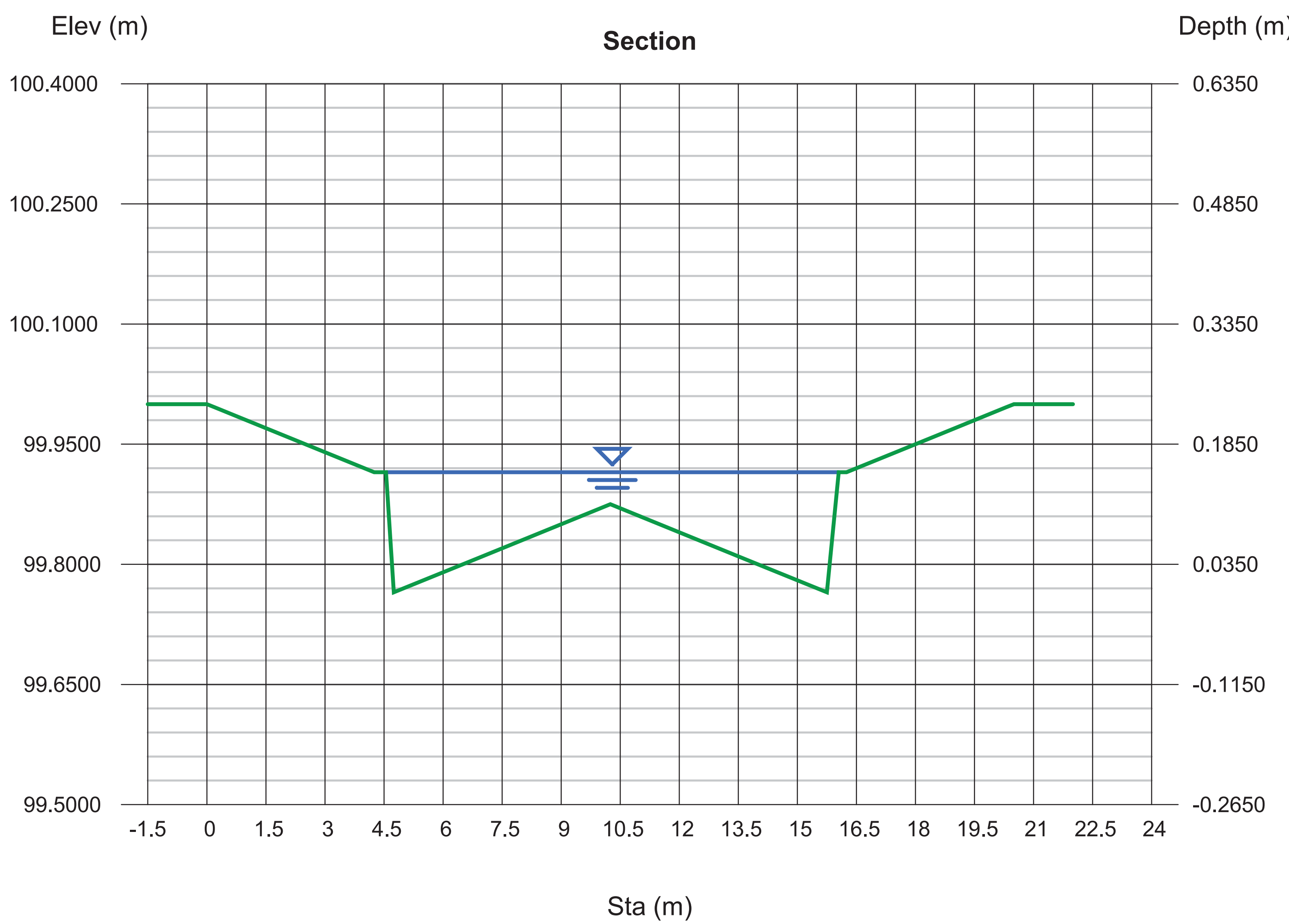
Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Feb 26 2019

2c. Minor Collector - Street I / New-Haig Blvd

User-defined		**Highlighted**	
Invert Elev (m)	= 99.7650	Depth (m)	= 0.1500
Slope (%)	= 0.5000	Q (cms)	= 1.2145
N-Value	= 0.013	Area (sqm)	= 1.0825
		Velocity (m/s)	= 1.1219
Calculations		Wetted Perim (m)	= 11.5876
Compute by:	Known Depth	Crit Depth, Yc (m)	= 0.1646
Known Depth (m)	= 0.1500	Top Width (m)	= 11.5000
		EGL (m)	= 0.2142

(Sta, El, n)-(Sta, El, n)...

(0.0000, 100.0000)-(0.2000, 99.9960, 0.025)-(2.0000, 99.9600, 0.013)-(4.2500, 99.9150, 0.025)-(4.5500, 99.9150, 0.013)-(4.7500, 99.7650, 0.013)-(6.9500, 99.809(
-(10.2500, 99.8750, 0.013)-(13.5500, 99.8090, 0.013)-(15.7500, 99.7650, 0.013)-(16.0500, 99.9150, 0.013)-(16.2500, 99.9150, 0.013)-(18.5000, 99.9600, 0.025)-(20
-(20.5000, 100.0000, 0.025)



Channel Report

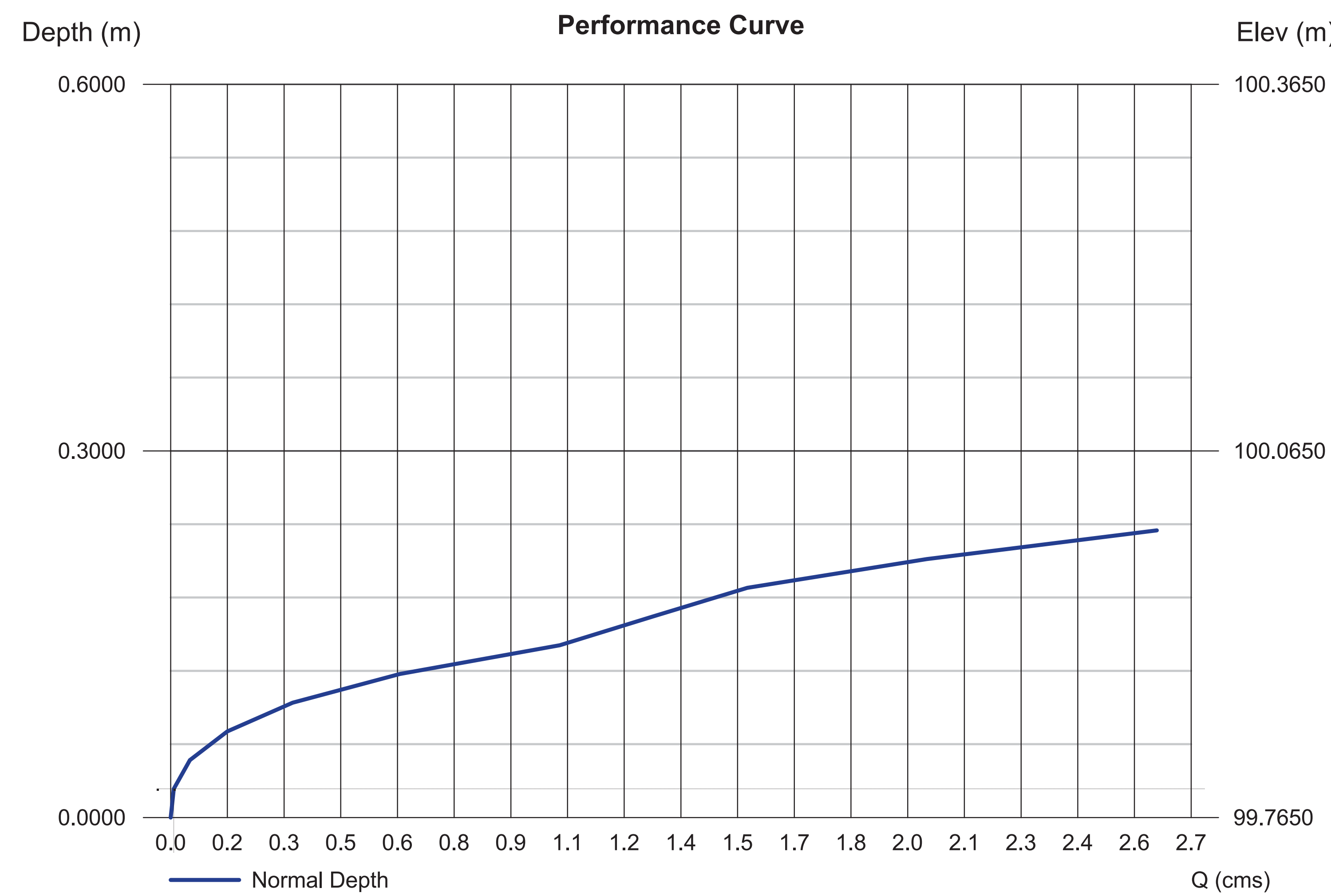
Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Feb 26 2019

2c. Minor Collector - Street I / New-Haig Blvd

User-defined		**Highlighted**	
Invert Elev (m)	= 99.7650	Depth (m)	= 0.0235
Slope (%)	= 0.5000	Q (cms)	= 0.008
N-Value	= Composite	Area (sqm)	= 0.0285
		Velocity (m/s)	= 0.2804
Calculations		Wetted Perim (m)	= 2.4419
Compute by:	Q vs Depth	Crit Depth, Yc (m)	= 0.0244
No. Increments	= 10	Top Width (m)	= 2.4281
		EGL (m)	= 0.0275

(Sta, El, n)-(Sta, El, n)...

(0.0000, 100.0000)-(0.2000, 99.9960, 0.025)-(2.0000, 99.9600, 0.013)-(4.2500, 99.9150, 0.025)-(4.5500, 99.9150, 0.013)-(4.7500, 99.7650, 0.013)-(6.9500, 99.809(
-(10.2500, 99.8750, 0.013)-(13.5500, 99.8090, 0.013)-(15.7500, 99.7650, 0.013)-(16.0500, 99.9150, 0.013)-(16.2500, 99.9150, 0.013)-(18.5000, 99.9600, 0.025)-(20
-(20.5000, 100.0000, 0.025)



Depth	Q	Area	Veloc
(m)	(cms)	(sqm)	(m/s)
0.0235	0.008	0.029	0.2804
0.0470	0.051	0.114	0.4452
0.0705	0.150	0.257	0.5834
0.0940	0.323	0.457	0.7069
0.1175	0.606	0.711	0.8535
0.1410	1.029	0.979	1.0514
0.1645	1.276	1.267	1.0067
0.1880	1.526	1.611	0.9472
0.2115	2.000	2.010	0.9953
0.2350	2.609	2.464	1.0590

Wp	Yc	TopWidth	Energy
(m)	(m)	(m)	(m)
2.4419	0.0244	2.4281	0.0275
4.8848	0.0457	4.8571	0.0571
7.3264	0.0732	7.2849	0.0879
9.7690	0.0975	9.7136	0.1195
11.4608	0.1219	11.3917	0.1547
11.5525	0.1524	11.4700	0.1974
13.5380	0.1707	13.4501	0.2162
15.8880	0.1859	15.7996	0.2338
18.2391	0.2103	18.1502	0.2620
20.5893	0.2347	20.5000	0.2922

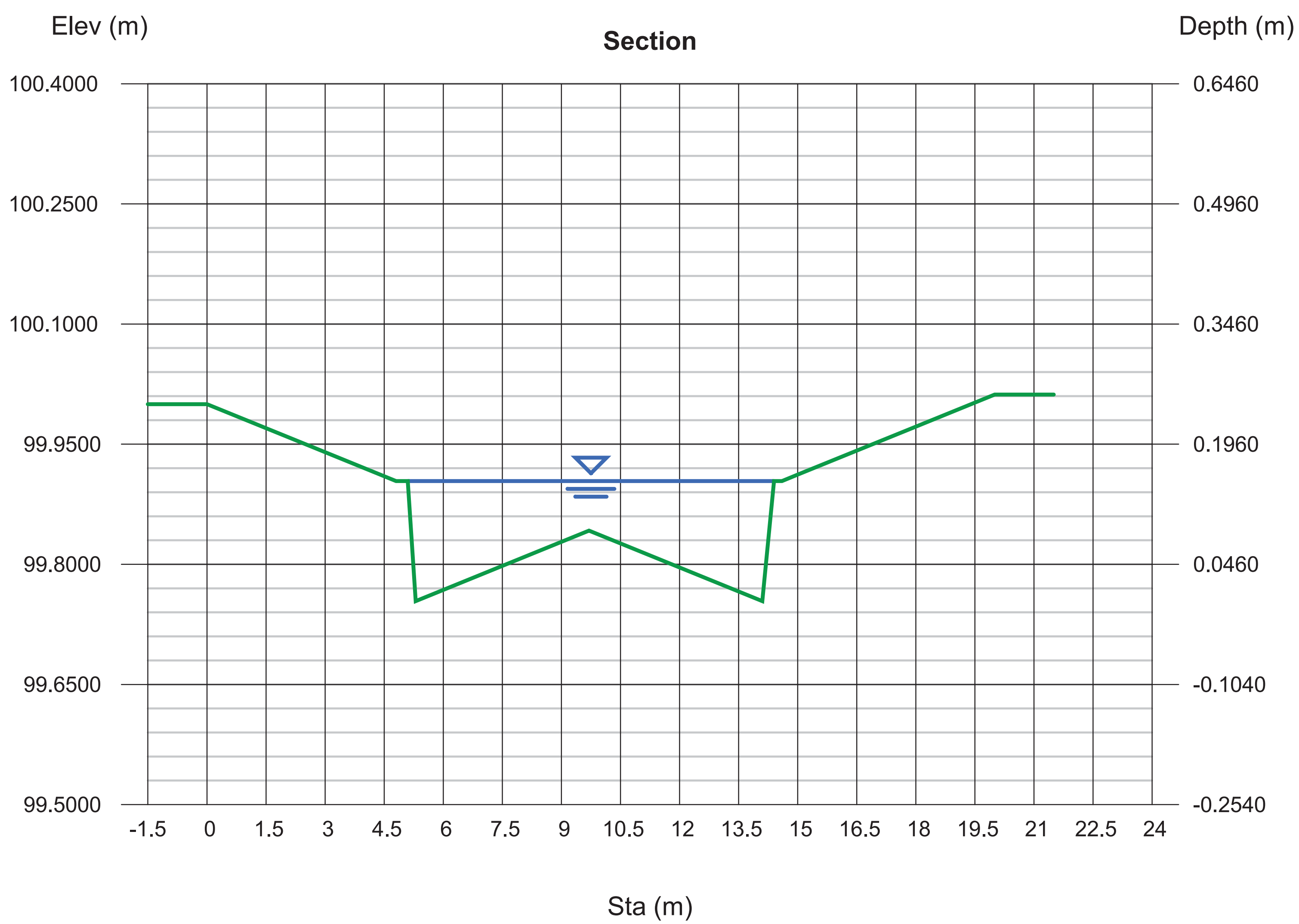
Channel Report

3a. Minor Collector Special Character Street - Street H

User-defined		**Highlighted**	
Invert Elev (m)	= 99.7540	Depth (m)	= 0.1500
Slope (%)	= 0.5000	Q (cms)	= 1.1646
N-Value	= 0.013	Area (sqm)	= 0.9703
		Velocity (m/s)	= 1.2002
Calculations		Wetted Perim (m)	= 9.3872
Compute by:	Known Depth	Crit Depth, Yc (m)	= 0.1707
Known Depth (m)	= 0.1500	Top Width (m)	= 9.3000
		EGL (m)	= 0.2235

(Sta, El, n)-(Sta, El, n)...

(0.0000, 100.0000)-(2.7000, 99.9460, 0.025)-(4.8000, 99.9040, 0.013)-(5.1000, 99.9040, 0.013)-(5.3000, 99.7540, 0.013)-(9.7000, 99.8420, 0.013)-(14.1000, 99.754
-(14.4000, 99.9040, 0.013)-(14.6000, 99.9040, 0.013)-(15.1000, 99.9140, 0.013)-(17.8000, 99.9680, 0.025)-(20.0000, 100.0120, 0.013)



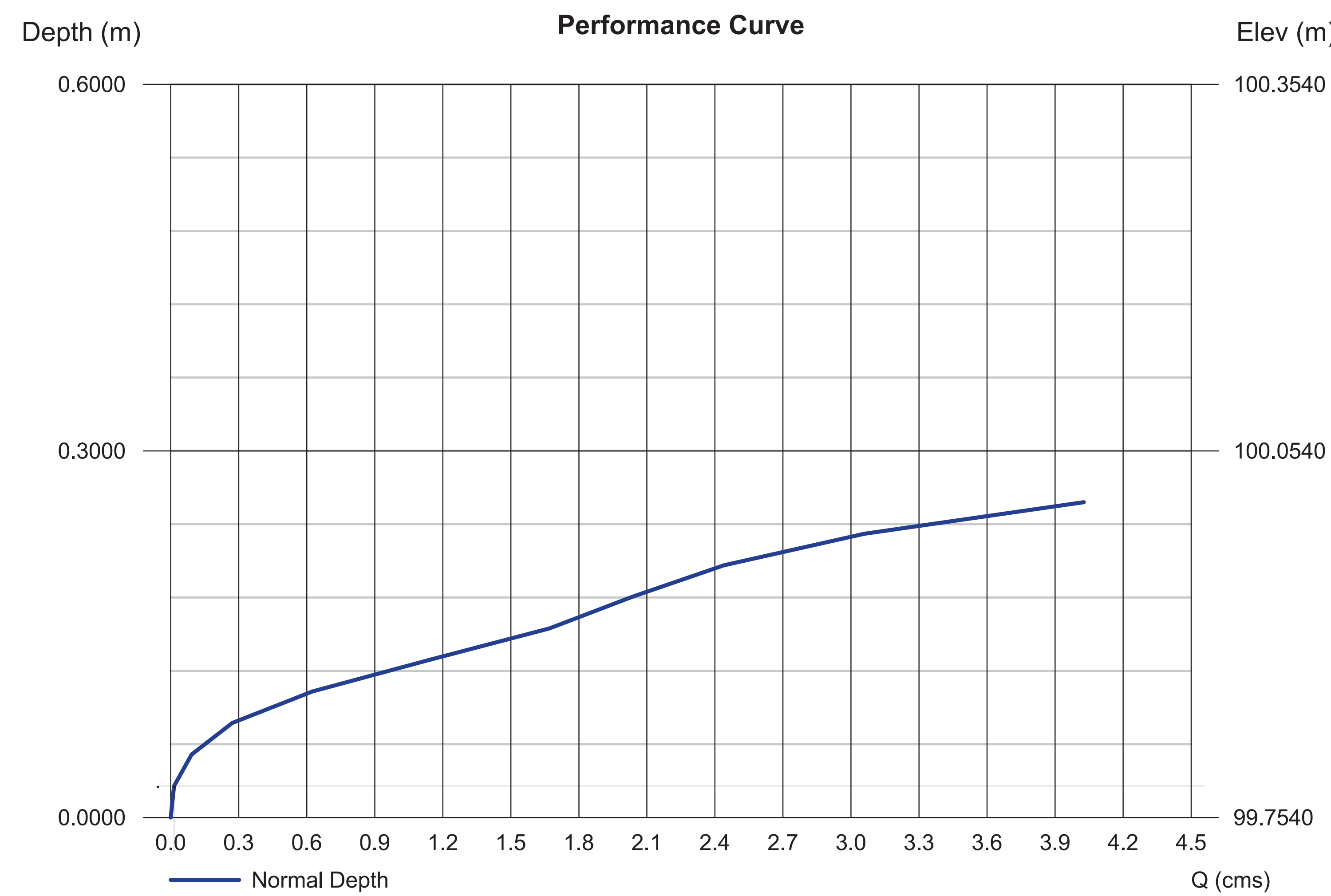
Channel Report

3a. Minor Collector Special Character Street - Street H

User-defined		**Highlighted**	
Invert Elev (m)	= 99.7540	Depth (m)	= 0.0258
Slope (%)	= 1.0000	Q (cms)	= 0.015
N-Value	= Composite	Area (sqm)	= 0.0344
		Velocity (m/s)	= 0.4220
Calculations		Wetted Perim (m)	= 2.6814
Compute by:	Q vs Depth	Crit Depth, Yc (m)	= 0.0305
No. Increments	= 10	Top Width (m)	= 2.6662
		EGL (m)	= 0.0349

(Sta, El, n)-(Sta, El, n)...

(0.0000, 100.0000)-(2.7000, 99.9460, 0.025)-(4.8000, 99.9040, 0.013)-(5.1000, 99.9040, 0.013)-(5.3000, 99.7540, 0.013)-(9.7000, 99.8420, 0.013)-(14.1000, 99.754
-(14.4000, 99.9040, 0.013)-(14.6000, 99.9040, 0.013)-(15.1000, 99.9140, 0.013)-(17.8000, 99.9680, 0.025)-(20.0000, 100.0120, 0.013)



Depth	Q	Area	Veloc
(m)	(cms)	(sqm)	(m/s)
0.0258	0.015	0.034	0.4220
0.0516	0.092	0.138	0.6700
0.0774	0.272	0.310	0.8781
0.1032	0.626	0.539	1.1615
0.1290	1.141	0.776	1.4706
0.1548	1.671	1.018	1.6408
0.1806	2.035	1.317	1.5455
0.2064	2.440	1.682	1.4506
0.2322	3.060	2.114	1.4476
0.2580	4.026	2.608	1.5437

Wp	Yc	TopWidth	Energy
(m)	(m)	(m)	(m)
2.6814	0.0305	2.6662	0.0349
5.3619	0.0579	5.3314	0.0745
8.0433	0.0914	7.9976	0.1167
9.2045	0.1250	9.1440	0.1720
9.3052	0.1676	9.2300	0.2393
10.3670	0.2042	10.2797	0.2921
12.9474	0.2225	12.8597	0.3024
15.5283	0.2408	15.4400	0.3137
18.1084	0.2580	18.0195	0.3391
20.0892	0.2580	20.0000	0.3796

Channel Report

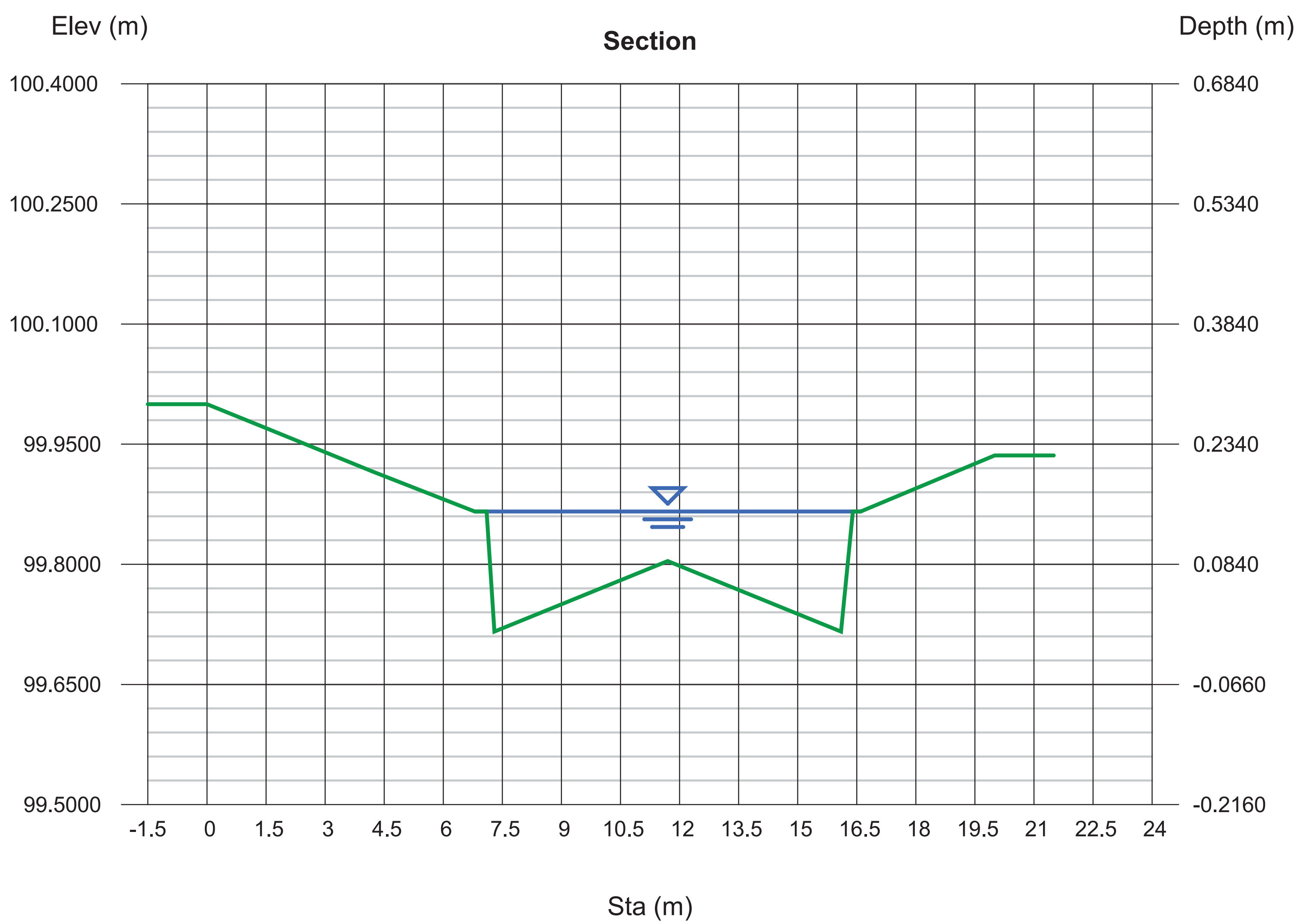
Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, Feb 27 2019

3b. Minor Collector Special Character Street - Street D / The Esplanade

User-defined		**Highlighted**	
Invert Elev (m)	= 99.7160	Depth (m)	= 0.1500
Slope (%)	= 0.5000	Q (cms)	= 1.1250
N-Value	= 0.013	Area (sqm)	= 0.9703
		Velocity (m/s)	= 1.1594
Calculations		Wetted Perim (m)	= 9.8881
Compute by:	Known Depth	Crit Depth, Yc (m)	= 0.1676
Known Depth (m)	= 0.1500	Top Width (m)	= 9.8009
		EGL (m)	= 0.2186

(Sta, El, n)-(Sta, El, n)...

(0.0000, 100.0000)-(1.5000, 99.9700, 0.013)-(4.2000, 99.9160, 0.025)-(6.8000, 99.8660, 0.013)-(7.1000, 99.8660, 0.013)-(7.3000, 99.7160, 0.013)-(11.7000, 99.80
-(16.1000, 99.7160, 0.013)-(16.4000, 99.8660, 0.013)-(16.6000, 99.8660, 0.013)-(20.0000, 99.9360, 0.013)



Channel Report

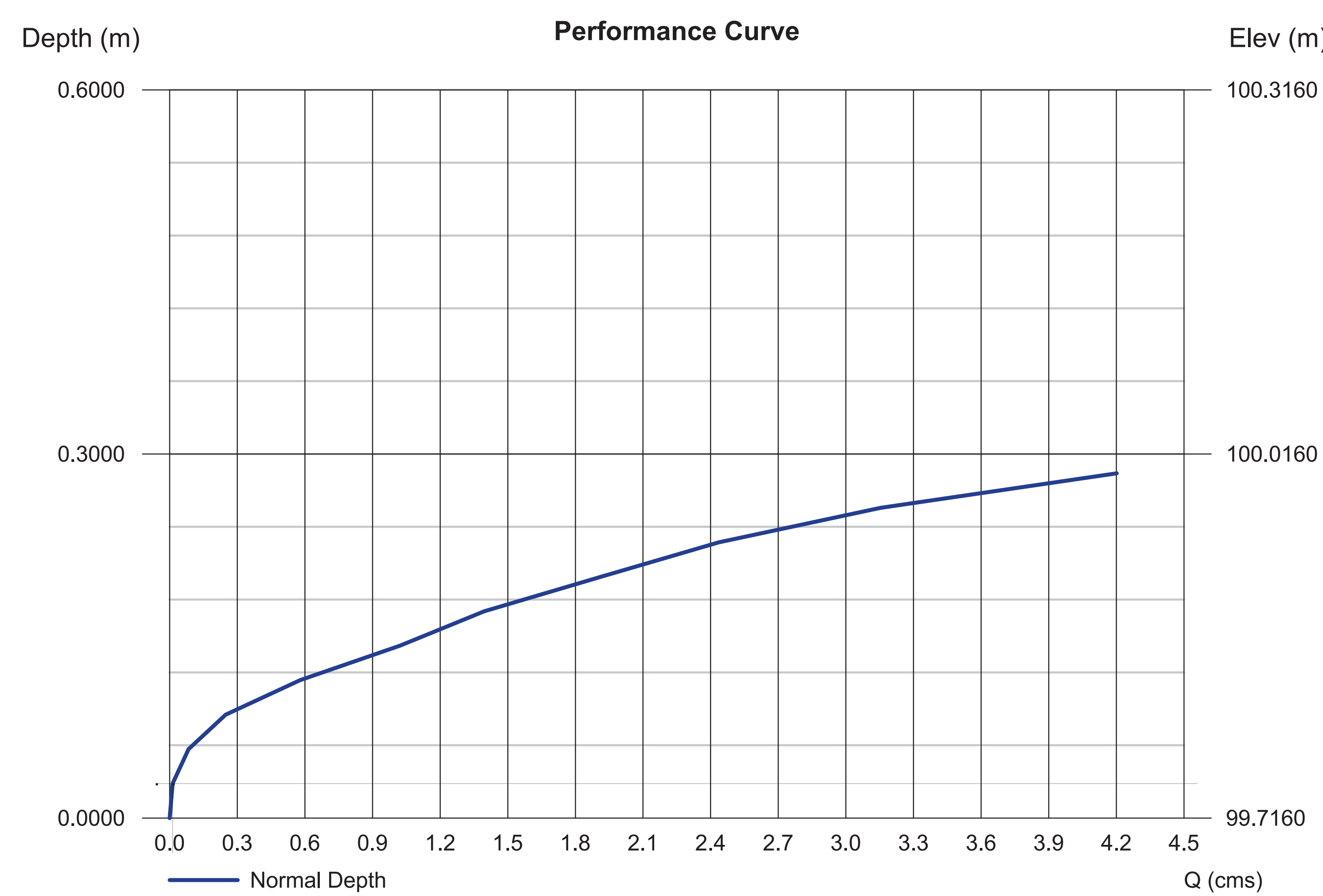
Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, Feb 27 2019

3b. Minor Collector Special Character Street - Street D / The Esplanade

User-defined		**Highlighted**	
Invert Elev (m)	= 99.7160	Depth (m)	= 0.0284
Slope (%)	= 0.5000	Q (cms)	= 0.013
N-Value	= Composite	Area (sqm)	= 0.0417
		Velocity (m/s)	= 0.3181
Calculations		Wetted Perim (m)	= 2.9514
Compute by:	Q vs Depth	Crit Depth, Yc (m)	= 0.0274
No. Increments	= 10	Top Width (m)	= 2.9347
		EGL (m)	= 0.0336

(Sta, El, n)-(Sta, El, n)...

(0.0000, 100.0000)-(1.5000, 99.9700, 0.013)-(4.2000, 99.9160, 0.025)-(6.8000, 99.8660, 0.013)-(7.1000, 99.8660, 0.013)-(7.3000, 99.7160, 0.013)-(11.7000, 99.80
-(16.1000, 99.7160, 0.013)-(16.4000, 99.8660, 0.013)-(16.6000, 99.8660, 0.013)-(20.0000, 99.9360, 0.013)



Depth	Q	Area	Veloc	Wp	Yc
(m)	(cms)	(sqm)	(m/s)	(m)	(m)
0.0284	0.013	0.042	0.3181	2.9514	0.0274
0.0568	0.084	0.167	0.5051	5.9028	0.0579
0.0852	0.248	0.375	0.6620	8.8542	0.0884
0.1136	0.579	0.634	0.9128	9.2451	0.1189
0.1420	1.022	0.896	1.1406	9.3559	0.1585
0.1704	1.396	1.191	1.1722	11.9400	0.1859
0.1988	1.914	1.568	1.2205	14.7965	0.2164
0.2272	2.436	2.025	1.2031	17.2486	0.2377
0.2556	3.154	2.532	1.2456	18.6689	0.2652
0.2840	4.202	3.080	1.3642	20.0892	0.2840

TopWidth	Energy
(m)	(m)
2.9347	0.0336
5.8693	0.0698
8.8040	0.1075
9.1787	0.1561
9.2733	0.2084
11.8524	0.2405
14.7084	0.2748
17.1600	0.3010
18.5800	0.3347
20.0000	0.3789

Channel Report

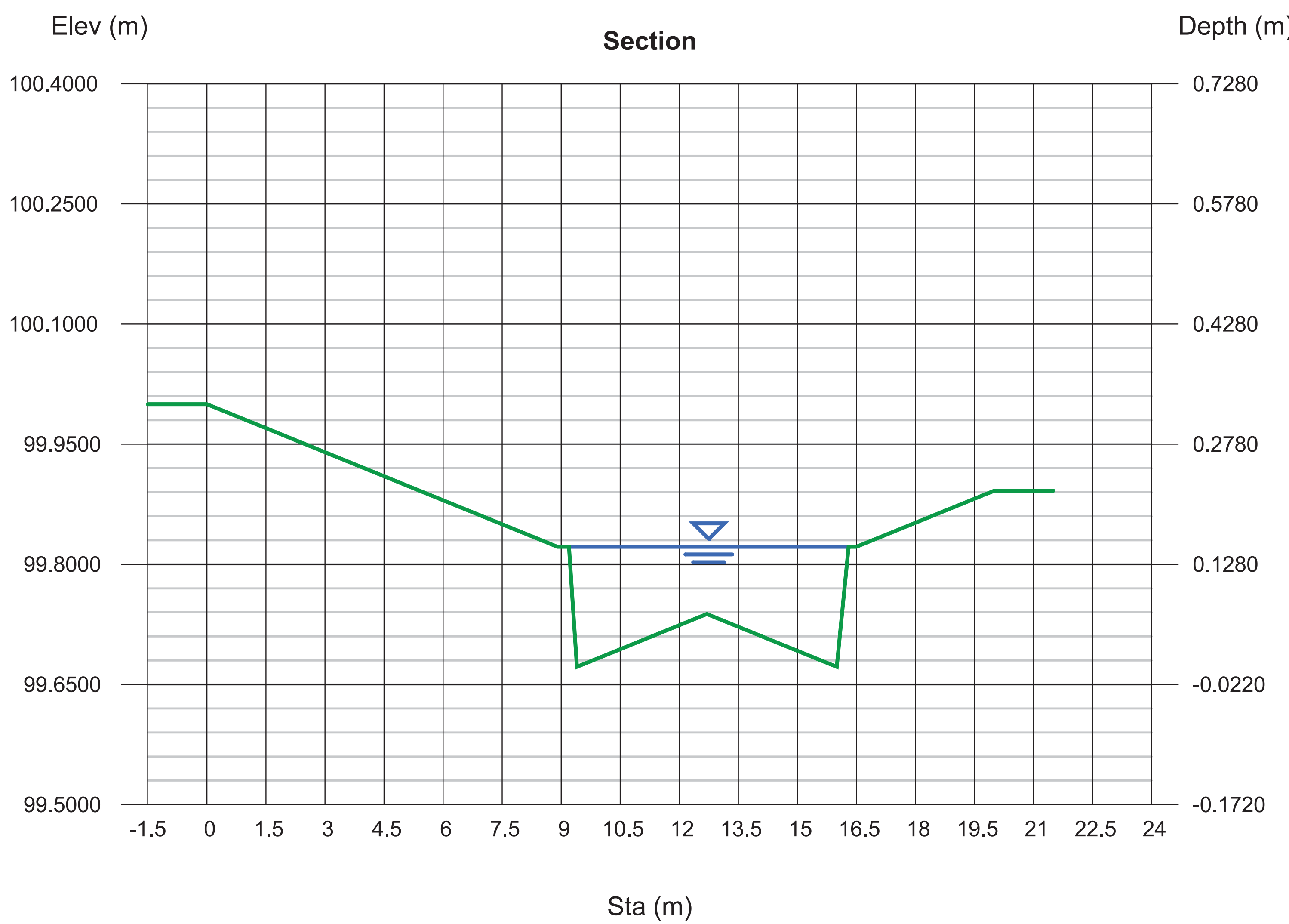
3c. Minor Collector Special Character Street - Street D / The Esplanade

User-defined
Invert Elev (m) = 99.6720
Slope (%) = 1.0000
N-Value = 0.013

Calculations
Compute by: Known Depth
Known Depth (m) = 0.1500

Highlighted
Depth (m) = 0.1500
Q (cms) = 1.4557
Area (sqm) = 0.8097
Velocity (m/s) = 1.7978
Wetted Perim (m) = 7.1867
Crit Depth, Yc (m) = 0.2103
Top Width (m) = 7.1000
EGL (m) = 0.3149

(Sta, El, n)-(Sta, El, n)...
(0.0000, 100.0000)-(1.5000, 99.9700, 0.013)-(4.0000, 99.9200, 0.025)-(6.5000, 99.8700, 0.013)-(8.5000, 99.8300, 0.025)-(8.9000, 99.8220, 0.013)-(9.2000, 99.822(
-(9.4000, 99.6720, 0.013)-(12.7000, 99.7380, 0.013)-(16.0000, 99.6720, 0.013)-(16.3000, 99.8220, 0.013)-(16.5000, 99.8220, 0.013)-(20.0000, 99.8920, 0.013)



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Feb 26 2019

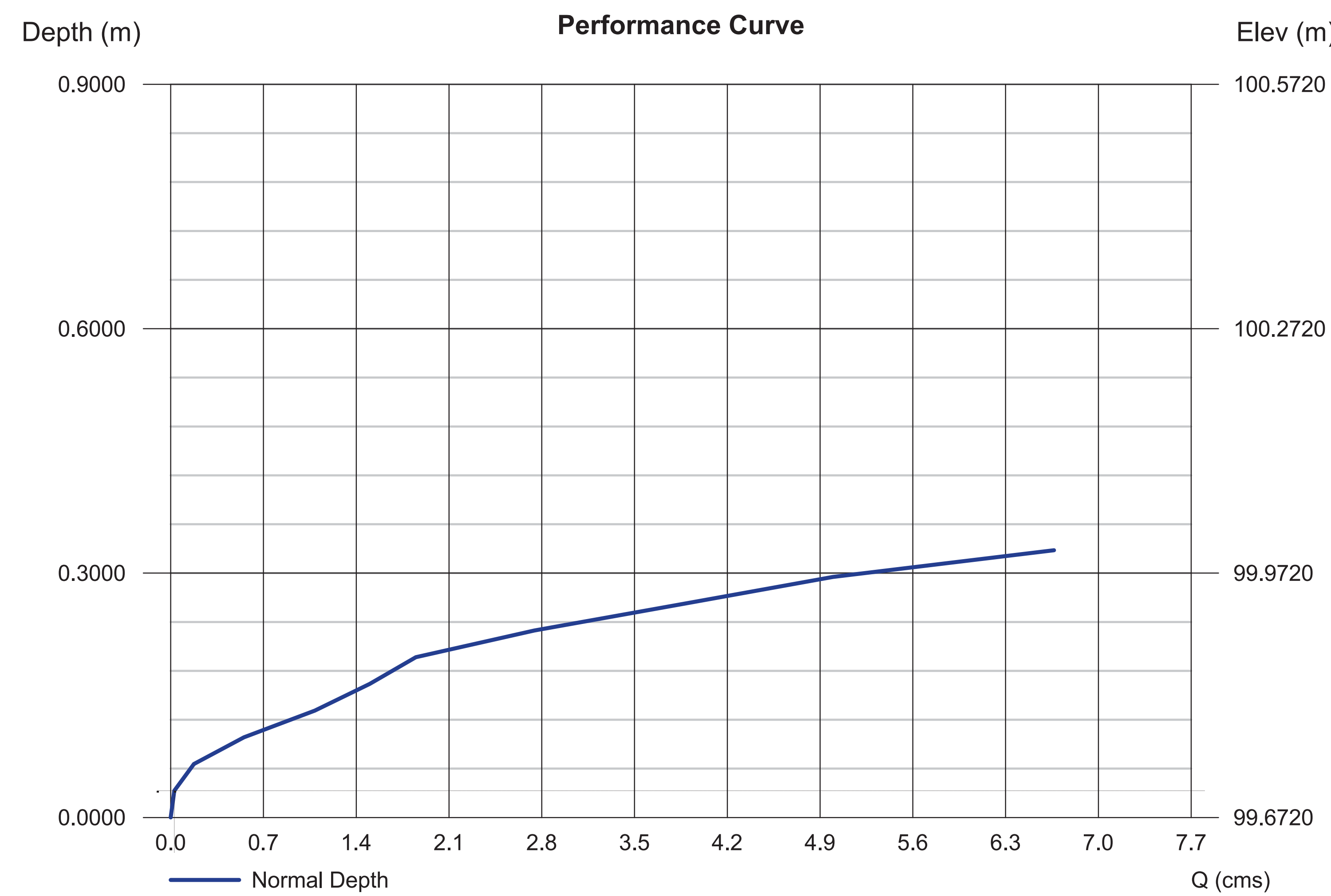
3c. Minor Collector Special Character Street - Street D / The Esplanade

User-defined
Invert Elev (m) = 99.6720
Slope (%) = 1.0000
N-Value = Composite

Calculations
Compute by: Q vs Depth
No. Increments = 10

Highlighted
Depth (m) = 0.0328
Q (cms) = 0.028
Area (sqm) = 0.0556
Velocity (m/s) = 0.4953
Wetted Perim (m) = 3.4087
Crit Depth, Yc (m) = 0.0366
Top Width (m) = 3.3893
EGL (m) = 0.0453

(Sta, El, n)-(Sta, El, n)...
(0.0000, 100.0000)-(1.5000, 99.9700, 0.013)-(4.0000, 99.9200, 0.025)-(6.5000, 99.8700, 0.013)-(8.5000, 99.8300, 0.025)-(8.9000, 99.8220, 0.013)-(9.2000, 99.822(
-(9.4000, 99.6720, 0.013)-(12.7000, 99.7380, 0.013)-(16.0000, 99.6720, 0.013)-(16.3000, 99.8220, 0.013)-(16.5000, 99.8220, 0.013)-(20.0000, 99.8920, 0.013)



Depth	Q	Area	Veloc
(m)	(cms)	(sqm)	(m/s)
0.0328	0.028	0.056	0.4953
0.0656	0.175	0.222	0.7864
0.0984	0.553	0.448	1.2343
0.1312	1.087	0.677	1.6062
0.1640	1.502	0.926	1.6222
0.1968	1.850	1.275	1.4511
0.2296	2.744	1.729	1.5870
0.2624	3.872	2.251	1.7202
0.2952	4.997	2.826	1.7681
0.3280	6.665	3.455	1.9291

Wp	Yc	TopWidth	Energy
(m)	(m)	(m)	(m)
3.4087	0.0366	3.3893	0.0453
6.8173	0.0762	6.7787	0.0971
6.9854	0.1219	6.9280	0.1761
7.1134	0.1829	7.0373	0.2628
9.0870	0.2134	9.0000	0.2982
12.3677	0.2316	12.2800	0.3042
15.1682	0.2713	15.0800	0.3581
16.8089	0.3109	16.7203	0.4133
18.4489	0.3280	18.3600	0.4547
20.0892	0.3280	20.0000	0.5178

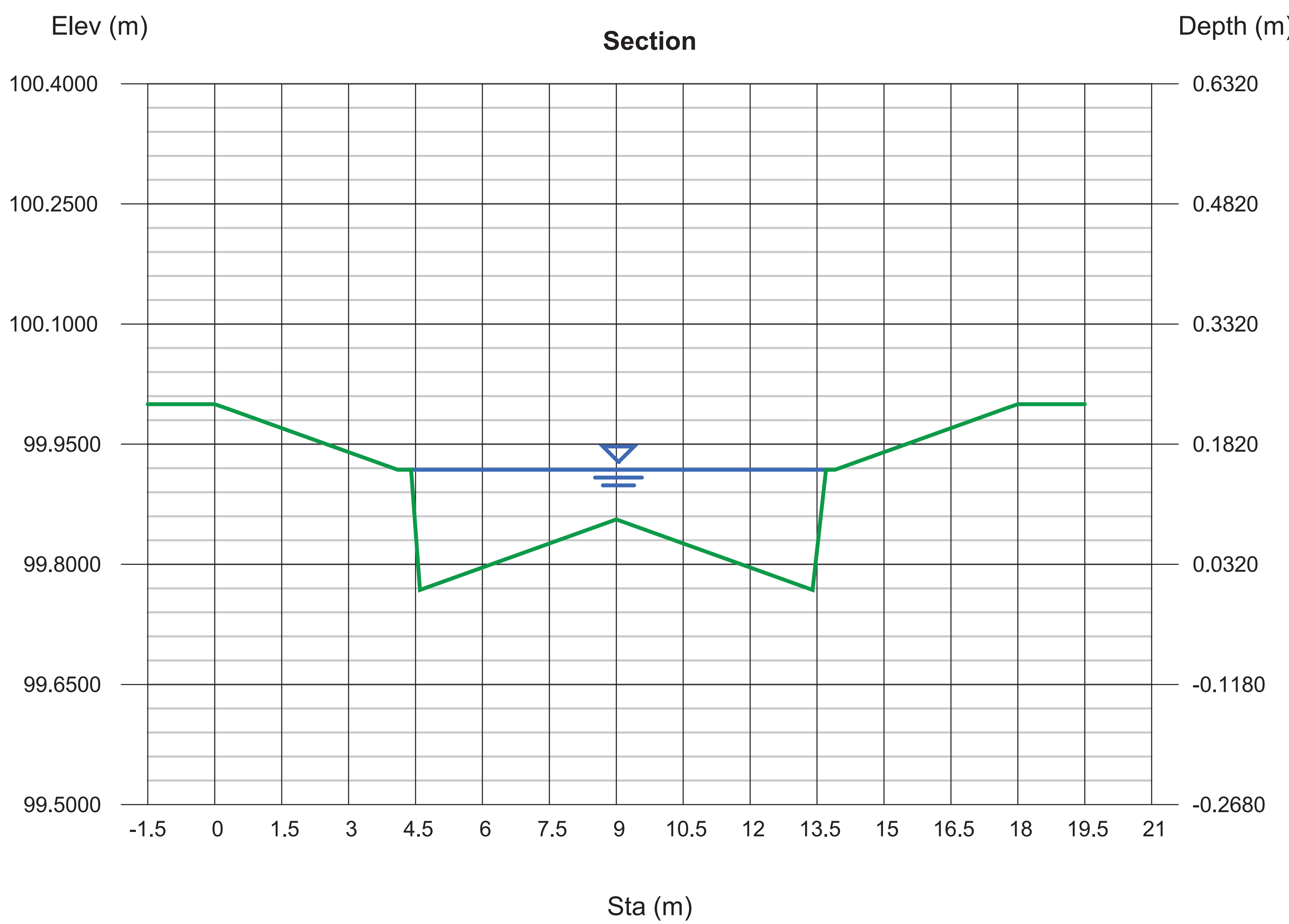
Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Feb 26 2019

4a. Local Road A

User-defined		**Highlighted**	
Invert Elev (m)	= 99.7680	Depth (m)	= 0.1500
Slope (%)	= 0.5000	Q (cms)	= 1.1646
N-Value	= 0.013	Area (sqm)	= 0.9703
		Velocity (m/s)	= 1.2002
Calculations		Wetted Perim (m)	= 9.3872
Compute by:	Known Depth	Crit Depth, Yc (m)	= 0.1707
Known Depth (m)	= 0.1500	Top Width (m)	= 9.3000
		EGL (m)	= 0.2235

(Sta, El, n)-(Sta, El, n)...
(0.0000, 100.0000)-(0.3000, 99.9940, 0.025)-(2.1000, 99.9580, 0.013)-(4.1000, 99.9180, 0.025)-(4.4000, 99.9180, 0.013)-(4.6000, 99.7680, 0.013)-(9.0000, 99.856
-(13.4000, 99.7680, 0.013)-(13.7000, 99.9180, 0.013)-(13.9000, 99.9180, 0.013)-(15.9000, 99.9580, 0.025)-(17.7000, 99.9940, 0.013)-(18.0000, 100.0000, 0.025)



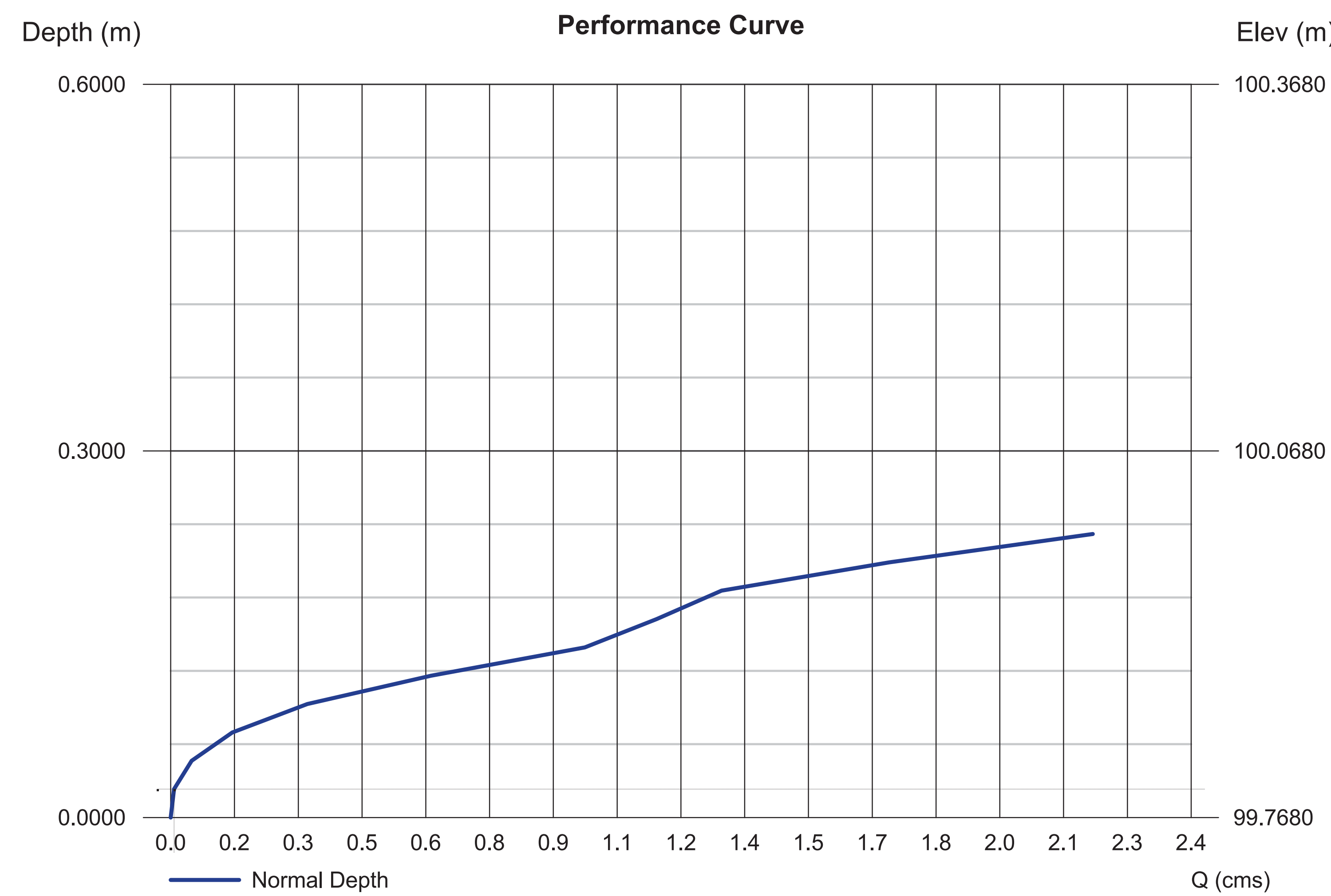
Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Feb 26 2019

4a. Local Road A

User-defined		**Highlighted**	
Invert Elev (m)	= 99.7680	Depth (m)	= 0.0232
Slope (%)	= 0.5000	Q (cms)	= 0.008
N-Value	= Composite	Area (sqm)	= 0.0278
		Velocity (m/s)	= 0.2780
Calculations		Wetted Perim (m)	= 2.4108
Compute by:	Q vs Depth	Crit Depth, Yc (m)	= 0.0244
No. Increments	= 10	Top Width (m)	= 2.3971
		EGL (m)	= 0.0271

(Sta, El, n)-(Sta, El, n)...
(0.0000, 100.0000)-(0.3000, 99.9940, 0.025)-(2.1000, 99.9580, 0.013)-(4.1000, 99.9180, 0.025)-(4.4000, 99.9180, 0.013)-(4.6000, 99.7680, 0.013)-(9.0000, 99.856
-(13.4000, 99.7680, 0.013)-(13.7000, 99.9180, 0.013)-(13.9000, 99.9180, 0.013)-(15.9000, 99.9580, 0.025)-(17.7000, 99.9940, 0.013)-(18.0000, 100.0000, 0.025)



Depth	Q	Area	Veloc
(m)	(cms)	(sqm)	(m/s)
0.0232	0.008	0.028	0.2780
0.0464	0.049	0.111	0.4414
0.0696	0.145	0.250	0.5785
0.0928	0.321	0.444	0.7239
0.1160	0.612	0.656	0.9333
0.1392	0.974	0.870	1.1194
0.1624	1.143	1.099	1.0396
0.1856	1.296	1.383	0.9372
0.2088	1.690	1.719	0.9831
0.2320	2.169	2.110	1.0278

Wp	Yc	TopWidth	Energy
(m)	(m)	(m)	(m)
2.4108	0.0244	2.3971	0.0271
4.8215	0.0457	4.7942	0.0563
7.2332	0.0701	7.1922	0.0867
9.1639	0.0945	9.1093	0.1195
9.2545	0.1219	9.1867	0.1604
9.3450	0.1524	9.2640	0.2031
11.1271	0.1676	11.0397	0.2175
13.4480	0.1798	13.3601	0.2304
15.7684	0.2042	15.6800	0.2581
18.0888	0.2286	18.0000	0.2859

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Feb 26 2019

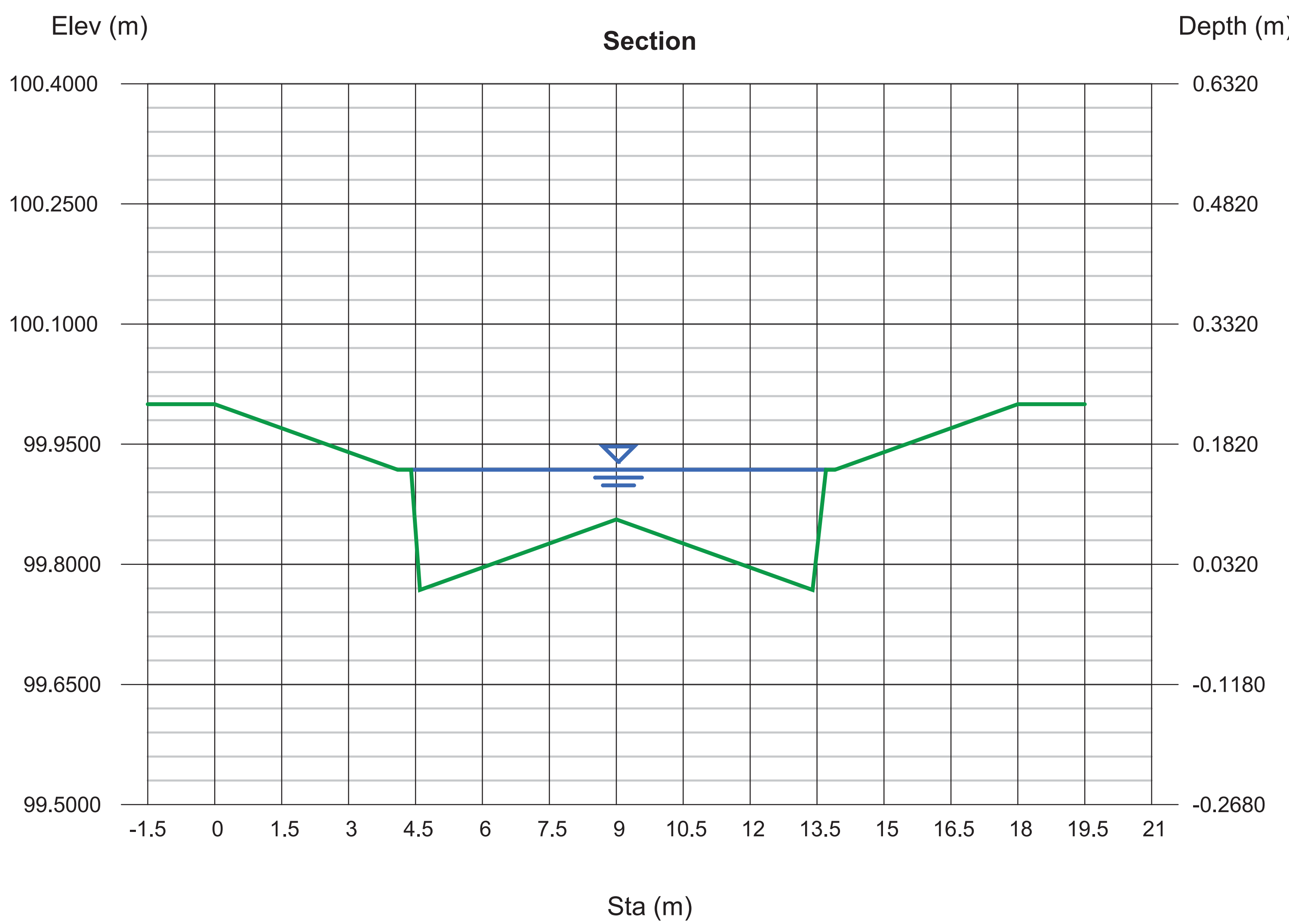
4b. Local Road B

User-defined
Invert Elev (m) = 99.7680
Slope (%) = 0.5000
N-Value = 0.013

Calculations
Compute by: Known Depth
Known Depth (m) = 0.1500

Highlighted
Depth (m) = 0.1500
Q (cms) = 1.1646
Area (sqm) = 0.9703
Velocity (m/s) = 1.2002
Wetted Perim (m) = 9.3872
Crit Depth, Yc (m) = 0.1707
Top Width (m) = 9.3000
EGL (m) = 0.2235

(Sta, El, n)-(Sta, El, n)...
(0.0000, 100.0000)-(2.3000, 99.9540, 0.025)-(4.1000, 99.9180, 0.013)-(4.4000, 99.9180, 0.013)-(4.6000, 99.7680, 0.013)-(9.0000, 99.8560, 0.013)-(13.4000, 99.768
-(13.7000, 99.9180, 0.013)-(13.9000, 99.9180, 0.013)-(15.7000, 99.9540, 0.013)-(18.0000, 100.0000, 0.025)



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Feb 26 2019

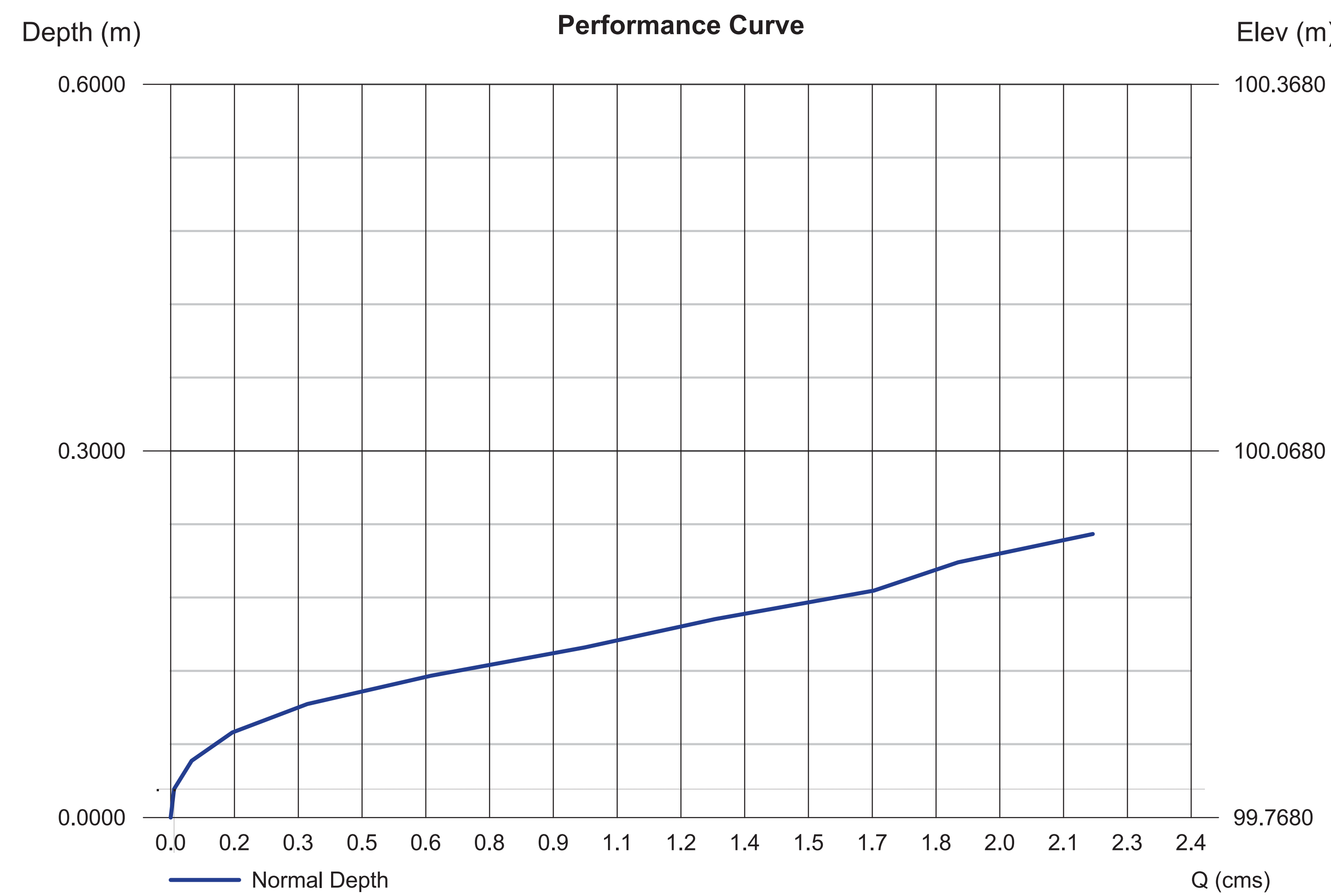
4b. Local Road B

User-defined
Invert Elev (m) = 99.7680
Slope (%) = 0.5000
N-Value = Composite

Calculations
Compute by: Q vs Depth
No. Increments = 10

Highlighted
Depth (m) = 0.0232
Q (cms) = 0.008
Area (sqm) = 0.0278
Velocity (m/s) = 0.2780
Wetted Perim (m) = 2.4108
Crit Depth, Yc (m) = 0.0244
Top Width (m) = 2.3971
EGL (m) = 0.0271

(Sta, El, n)-(Sta, El, n)...
(0.0000, 100.0000)-(2.3000, 99.9540, 0.025)-(4.1000, 99.9180, 0.013)-(4.4000, 99.9180, 0.013)-(4.6000, 99.7680, 0.013)-(9.0000, 99.8560, 0.013)-(13.4000, 99.768
-(13.7000, 99.9180, 0.013)-(13.9000, 99.9180, 0.013)-(15.7000, 99.9540, 0.013)-(18.0000, 100.0000, 0.025)



Depth	Q	Area	Veloc
(m)	(cms)	(sqm)	(m/s)
0.0232	0.008	0.028	0.2780
0.0464	0.049	0.111	0.4414
0.0696	0.145	0.250	0.5785
0.0928	0.321	0.444	0.7239
0.1160	0.612	0.656	0.9333
0.1392	0.974	0.870	1.1194
0.1624	1.281	1.099	1.1647
0.1856	1.654	1.383	1.1960
0.2088	1.852	1.719	1.0770
0.2320	2.169	2.110	1.0278

Wp	Yc	TopWidth	Energy
(m)	(m)	(m)	(m)
2.4108	0.0244	2.3971	0.0271
4.8215	0.0457	4.7942	0.0563
7.2332	0.0701	7.1922	0.0867
9.1639	0.0945	9.1093	0.1195
9.2545	0.1219	9.1867	0.1604
9.3450	0.1524	9.2640	0.2031
11.1271	0.1798	11.0397	0.2316
13.4479	0.2042	13.3600	0.2586
15.7684	0.2134	15.6800	0.2680
18.0888	0.2286	18.0000	0.2859

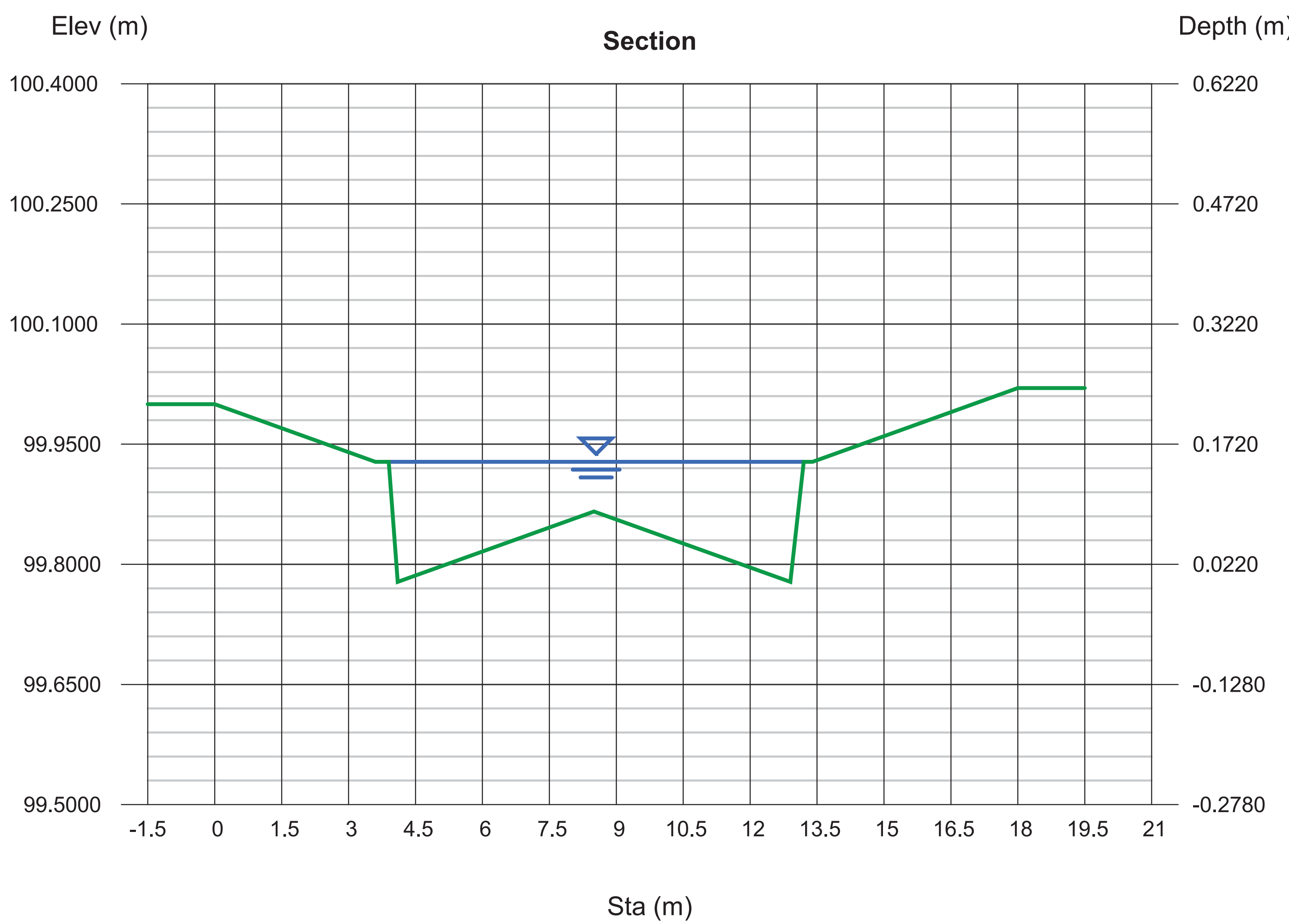
Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Feb 26 2019

4c. Local Road A

User-defined		Highlighted	
Invert Elev (m)	= 99.7780	Depth (m)	= 0.1500
Slope (%)	= 0.5000	Q (cms)	= 1.1646
N-Value	= 0.013	Area (sqm)	= 0.9703
		Velocity (m/s)	= 1.2003
Calculations		Wetted Perim (m)	= 9.3872
Compute by:	Known Depth	Crit Depth, Yc (m)	= 0.1707
Known Depth (m)	= 0.1500	Top Width (m)	= 9.3000
		EGL (m)	= 0.2235

(Sta, El, n)-(Sta, El, n)...
(0.0000, 100.0000)-(1.1000, 99.9780, 0.025)-(3.6000, 99.9280, 0.013)-(3.9000, 99.9280, 0.013)-(4.1000, 99.7780, 0.013)-(8.5000, 99.8660, 0.013)-(12.9000, 99.778
-(13.2000, 99.9280, 0.013)-(13.4000, 99.9280, 0.013)-(15.9000, 99.9780, 0.025)-(17.7000, 100.0140, 0.013)-(18.0000, 100.0200, 0.025)



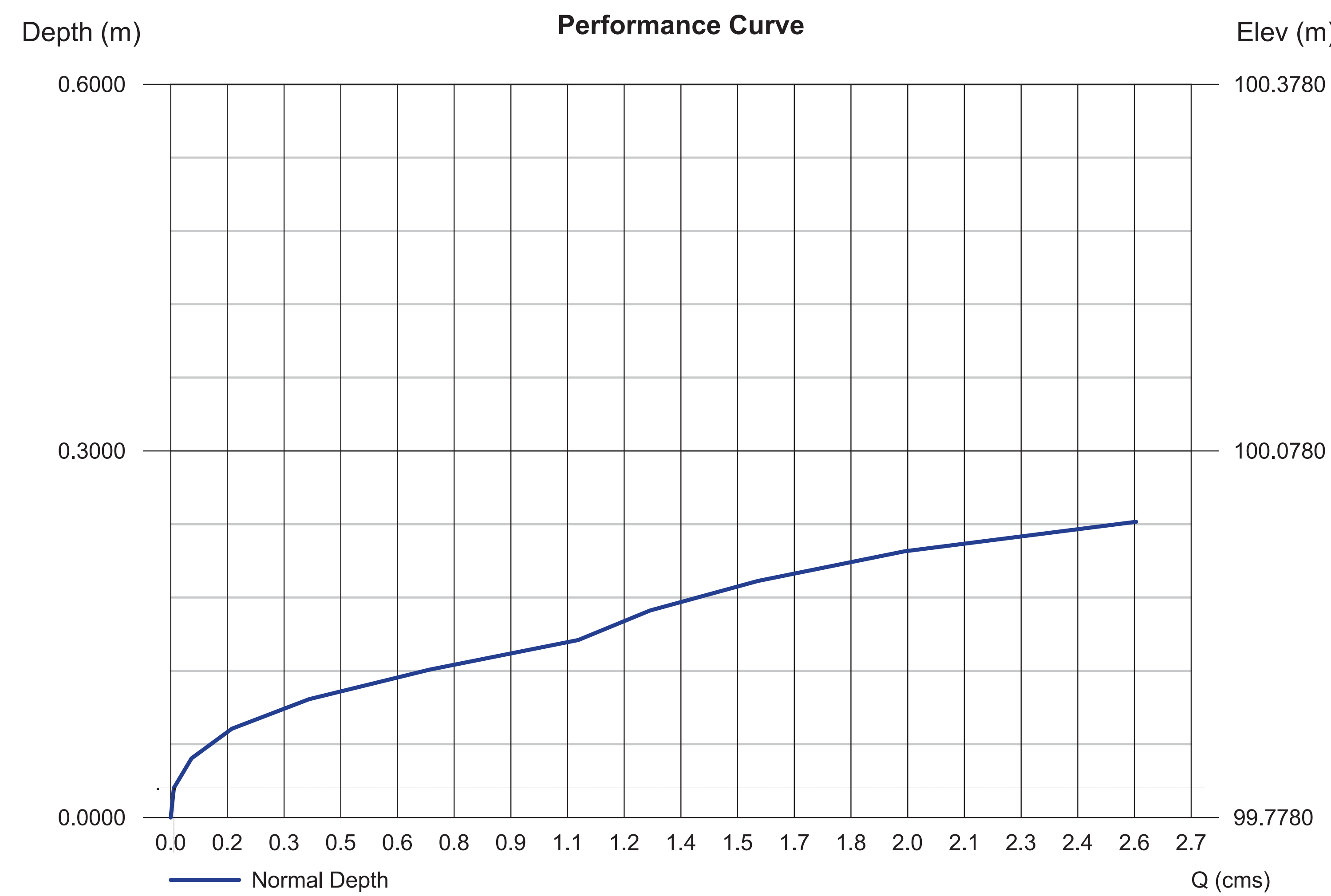
Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Feb 26 2019

4c. Local Road A

User-defined		Highlighted	
Invert Elev (m)	= 99.7780	Depth (m)	= 0.0242
Slope (%)	= 0.5000	Q (cms)	= 0.009
N-Value	= Composite	Area (sqm)	= 0.0303
		Velocity (m/s)	= 0.2859
Calculations		Wetted Perim (m)	= 2.5154
Compute by:	Q vs Depth	Crit Depth, Yc (m)	= 0.0244
No. Increments	= 10	Top Width (m)	= 2.5011
		EGL (m)	= 0.0284

(Sta, El, n)-(Sta, El, n)...
(0.0000, 100.0000)-(1.1000, 99.9780, 0.025)-(3.6000, 99.9280, 0.013)-(3.9000, 99.9280, 0.013)-(4.1000, 99.7780, 0.013)-(8.5000, 99.8660, 0.013)-(12.9000, 99.778
-(13.2000, 99.9280, 0.013)-(13.4000, 99.9280, 0.013)-(15.9000, 99.9780, 0.025)-(17.7000, 100.0140, 0.013)-(18.0000, 100.0200, 0.025)



Depth	Q	Area	Veloc
(m)	(cms)	(sqm)	(m/s)
0.0242	0.009	0.030	0.2859
0.0484	0.055	0.121	0.4540
0.0726	0.162	0.272	0.5950
0.0968	0.366	0.480	0.7621
0.1210	0.684	0.702	0.9750
0.1452	1.078	0.926	1.1647
0.1694	1.269	1.179	1.0757
0.1936	1.553	1.493	1.0407
0.2178	1.941	1.864	1.0413
0.2420	2.555	2.285	1.1179

Wp	Yc	TopWidth	Energy
(m)	(m)	(m)	(m)
2.5154	0.0244	2.5011	0.0284
5.0298	0.0488	5.0013	0.0589
7.5453	0.0732	7.5025	0.0907
9.1795	0.1006	9.1226	0.1264
9.2740	0.1280	9.2033	0.1695
9.3684	0.1646	9.2840	0.2144
11.8271	0.1798	11.7395	0.2284
14.2480	0.1981	14.1600	0.2488
16.6681	0.2195	16.5795	0.2731
18.0888	0.2420	18.0000	0.3057

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Feb 26 2019

4d. Local Road C

User-defined

Invert Elev (m)	= 99.7680
Slope (%)	= 0.5000
N-Value	= 0.013

Calculations

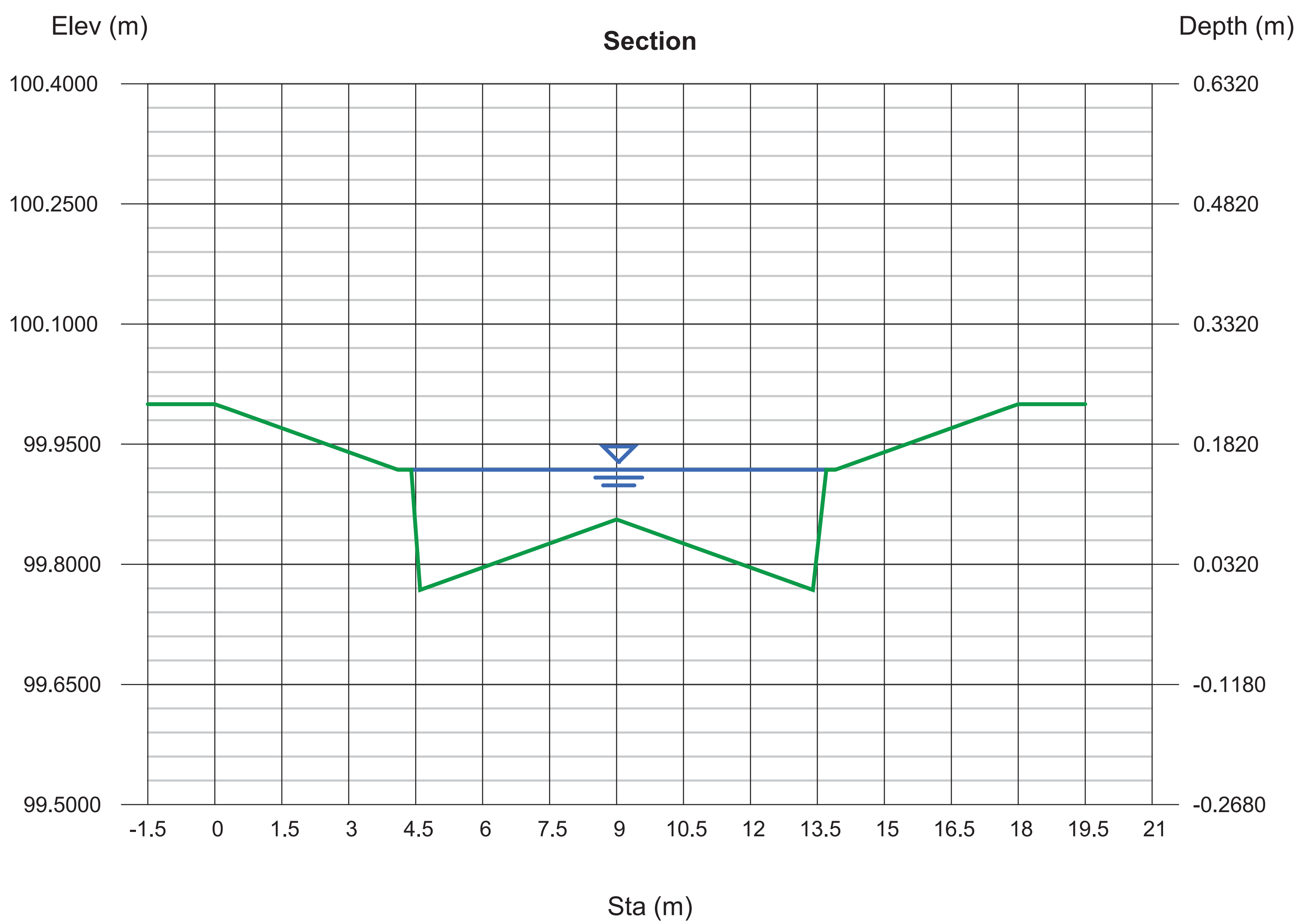
Compute by:	Known Depth
Known Depth (m)	= 0.1500

Highlighted

Depth (m)	= 0.1500
Q (cms)	= 1.1646
Area (sqm)	= 0.9703
Velocity (m/s)	= 1.2002
Wetted Perim (m)	= 9.3872
Crit Depth, Yc (m)	= 0.1707
Top Width (m)	= 9.3000
EGL (m)	= 0.2235

(Sta, El, n)-(Sta, El, n)...

(0.0000, 100.0000)-(0.3000, 99.9940, 0.025)-(2.1000, 99.9580, 0.013)-(4.1000, 99.9180, 0.025)-(4.4000, 99.9180, 0.025)-(4.6000, 99.7680, 0.013)-(9.0000, 99.856(
-(13.4000, 99.7680, 0.013)-(13.7000, 99.9180, 0.013)-(13.9000, 99.9180, 0.013)-(15.9000, 99.9580, 0.013)-(17.7000, 99.9940, 0.025)-(18.0000, 100.0000, 0.013)



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Feb 26 2019

4d. Local Road C

User-defined

Invert Elev (m)	= 99.7680
Slope (%)	= 0.5000
N-Value	= Composite

Calculations

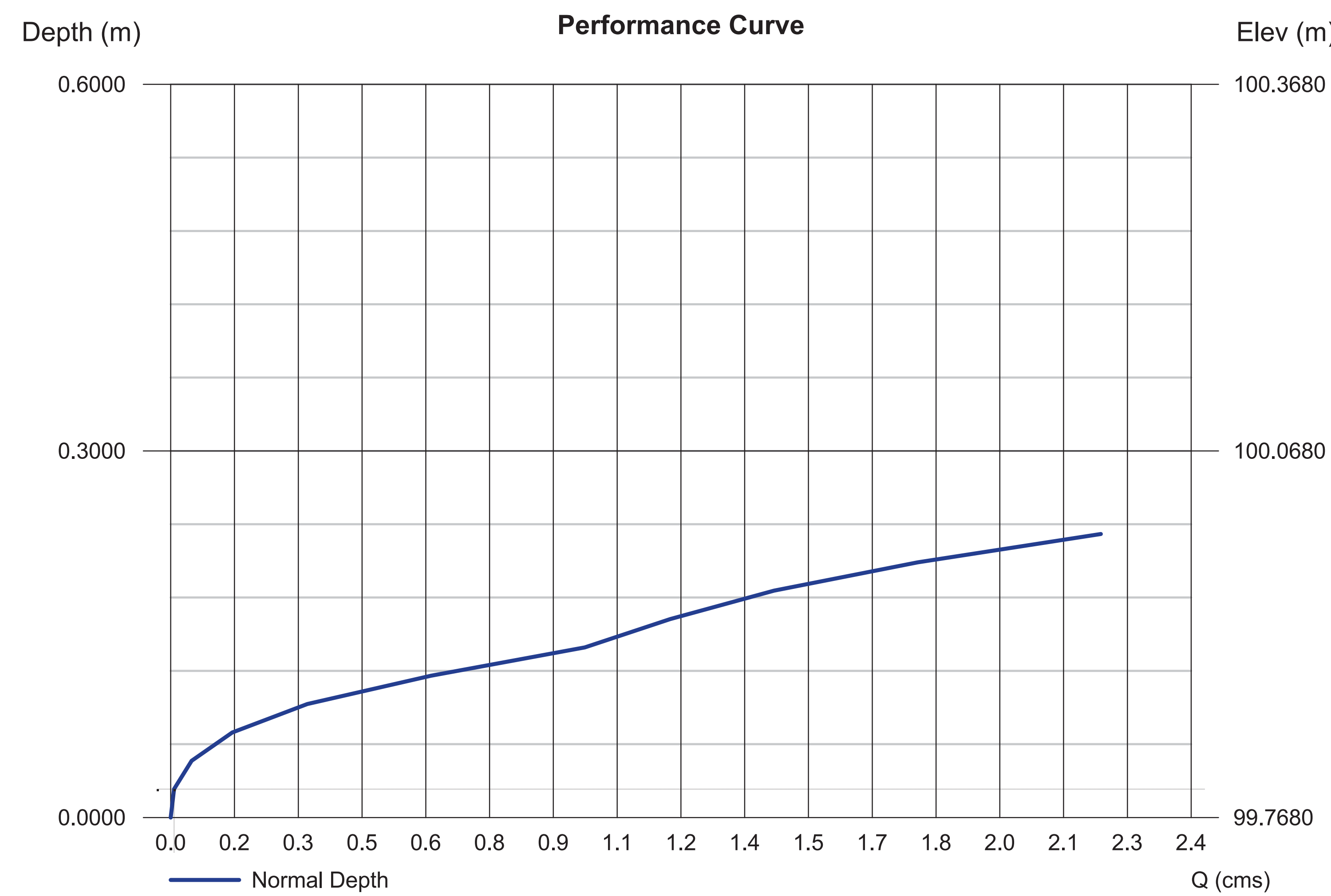
Compute by:	Q vs Depth
No. Increments	= 10

Highlighted

Depth (m)	= 0.0232
Q (cms)	= 0.008
Area (sqm)	= 0.0278
Velocity (m/s)	= 0.2780
Wetted Perim (m)	= 2.4108
Crit Depth, Yc (m)	= 0.0244
Top Width (m)	= 2.3971
EGL (m)	= 0.0271

(Sta, El, n)-(Sta, El, n)...

(0.0000, 100.0000)-(0.3000, 99.9940, 0.025)-(2.1000, 99.9580, 0.013)-(4.1000, 99.9180, 0.025)-(4.4000, 99.9180, 0.025)-(4.6000, 99.7680, 0.013)-(9.0000, 99.856(
-(13.4000, 99.7680, 0.013)-(13.7000, 99.9180, 0.013)-(13.9000, 99.9180, 0.013)-(15.9000, 99.9580, 0.013)-(17.7000, 99.9940, 0.025)-(18.0000, 100.0000, 0.013)



Depth	Q	Area	Veloc
(m)	(cms)	(sqm)	(m/s)
0.0232	0.008	0.028	0.2780
0.0464	0.049	0.111	0.4414
0.0696	0.145	0.250	0.5785
0.0928	0.321	0.444	0.7239
0.1160	0.612	0.656	0.9333
0.1392	0.974	0.870	1.1194
0.1624	1.175	1.099	1.0686
0.1856	1.419	1.383	1.0263
0.2088	1.757	1.719	1.0220
0.2320	2.188	2.110	1.0368

Wp	Yc	TopWidth	Energy
(m)	(m)	(m)	(m)
2.4108	0.0244	2.3971	0.0271
4.8215	0.0457	4.7942	0.0563
7.2332	0.0701	7.1922	0.0867
9.1639	0.0945	9.1093	0.1195
9.2545	0.1219	9.1867	0.1604
9.3450	0.1524	9.2640	0.2031
11.1271	0.1707	11.0397	0.2206
13.4480	0.1890	13.3601	0.2393
15.7684	0.2103	15.6800	0.2621
18.0888	0.2316	18.0000	0.2868

Right-of-Way LID Capacity per 1m Road

Minor Collector - 20m wide ROW

Characteristics

ROW Area = 20 m^2

The LID are to be sized to provide filtration for minimum the full 90th percentile event, which for the City of Mississauga is the 27mm storm event. Since the majority of the TSS is from the first flush of a major storm event, the performance for the LID is expected to exceed the 80% TSS removal target.

Water Retention Required = 0.54 m^3 (27mm retention x Area)

Requirement

Storage Required per 1 m Road = 0.54 m^3

LID Characteristics

Soil Filter Media Width =	3.8	m	(LID on both side of street)
Soil Filter Media Depth Above Underdrain =	1.5	m	
Void Space =	0.3		
Filter Volume Provided per 1 m =	1.71	m^3	
Filter Can treat	3.17	m of Road/ m of Filter	

Summary

Therefore, for every meter of Minor Collector Road with a width of 20.0m and 1.9m wide LID on both sides (3.8m total) of the road, then 3.17m of road can be treated to provide sufficient water quality treatment.

Major Collector - 26m wide ROW

Characteristics

ROW Area = 26 m^2

The LID are to be sized to provide filtration for minimum the full 90th percentile event, which for the City of Mississauga is the 27mm storm event. Since the majority of the TSS is from the first flush of a major storm event, the performance for the LID is expected to exceed the 80% TSS removal target.

Water Retention Required = 0.70 m^3 (27mm retention x Area)

Requirement

Storage Required per 1 m Road = 0.70 m^3

LID Characteristics

Soil Filter Media Width =	3.8	m	(LID on both side of street)
Soil Filter Media Depth Above Underdrain =	1.8	m	
Void Space =	0.3		
Filter Volume Provided per 1 m =	2.05	m^3	
Filter Can treat	2.92	m of Road/ m of Filter	

Summary

Therefore, for every meter of Major Collector Road with a width of 26.0m and 1.9m wide LID on both sides (3.8m total) of the road, then 2.92m of road can be treated to provide sufficient water quality treatment.

Storm Volume (City of Mississauga Design Storms)

Storm Event	Rainfall Depth (mm)
25mm	25.00
2-Year	33.44
5-Year	44.95
10-Year	55.37
25-Year	63.59
50-Year	71.24
100-Year	79.41

Base run-off coefficient = **0.90** (High Rise Residential/Commercial)
Runoff reduction = **7.5** **mm** (7.5mm of runoff from the block will be captured)

Adjustment to Building Runoff Coefficient to Account for On-site Measures

Storm Event	Rainfall Depth (mm)	Base Runoff (mm)	Runoff Reduced by 7.5mm	Reduced Runoff Coefficient
25mm	25.00	22.50	15.00	0.60
2-Year	33.44	30.10	22.60	0.68
5-Year	44.95	40.46	32.96	0.73
10-Year	55.37	49.83	42.33	0.76
25-Year	63.59	57.23	49.73	0.78
50-Year	71.24	64.12	56.62	0.79
100-Year	79.41	71.47	63.97	0.81

Base run-off coefficient = **0.65** (Townhouses)
Runoff reduction = **7.5** **mm** (7.5mm of runoff from the block will be captured)

Adjustment to Building Runoff Coefficient to Account for On-site Measures

Storm Event	Rainfall Depth (mm)	Base Runoff (mm)	Runoff Reduced by 7.5mm	Reduced Runoff Coefficient
25mm	25.00	16.25	8.75	0.35
2-Year	33.44	21.74	14.24	0.43
5-Year	44.95	29.22	21.72	0.48
10-Year	55.37	35.99	28.49	0.51
25-Year	63.59	41.33	33.83	0.53
50-Year	71.24	46.31	38.81	0.54
100-Year	79.41	51.62	44.12	0.56