BURNSIDE

Functional Servicing and Stormwater Management Report - 3415 Ninth Line, Mississauga, ON

St. Mark and St. Demiana Coptic Orthodox Church,
462 Falgarwood Drive
Oakville, ON L6H 1N3

Functional Servicing and Stormwater Management Report - 3415 Ninth Line, Mississauga, ON

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R.J. Burnside & Associates Limited
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May 2023
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Revision	Date	Description
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1	December 2020	Second Submission
2	January 2022	Third Resubmission
3	May 2023	Fourth Resubmission

R.J. Burnside & Associates Limited

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Vice President, Land Development

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Disclaimer

1.0 Introduction and Background

R.J. Burnside & Associates Limited (Burnside) has been retained by St. Mark and St. Demiana Coptic Orthodox Church to complete a Functional Servicing and Stormwater Management Report (FSR) for a Church Development located at Ninth Line, Mississauga. This report will support applications for a Zoning By-law Amendment and Site Plan Approval by demonstrating that the subject lands can be serviced in accordance with applicable regulatory requirements and criteria.

1.1 Objectives

The objectives of this report are to:

- Identify any applicable engineering constraints on the subject site.
- Verify the location of existing infrastructure both within and adjacent to the site.
- Confirm feasibility of on-site sanitary treatment.
- Assess and confirm that domestic and fire flow requirements are met for the supply and on-site distribution of municipal water.
- Evaluate options and constraints for stormwater management to:
  - Ensure post-development flows from the site are sufficiently controlled to pre-development levels.
  - Confirm adequate stormwater quality controls are provided.

1.2 Site Description

The proposed St. Mark and St. Demiana Coptic Orthodox Church Development is located on Ninth Line in Mississauga, just south-east of Burnhamthorpe Road. The site is bordered by Ninth Line on the southwest property line and Highway 403 on the northeast property line. The neighboring property to the north has a storage building on site and the property to the south is currently vacant. The site is legally described as RCP 1542 Part of Lot 9, RP 43R37503, Part 6, 7 and 9, City of Mississauga, and is zoned as Employment (E2-93). The existing site is 3.93 ha in size and consists of a grassed area with a small portion of the site covered in gravel. The location plan in Figure 1 shows the property in the context of the surrounding area.

KEY MAP OF ONTARIO

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St. MARK AND St. DEMIANA COPTIC ORTHODOX CHURCH

Figure Title

NINTH LINE MISSISSAUGA

SITE LOCATION PLAN

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1.3 Background Information and Documentation

The current report has been prepared in accordance with, and consideration of the information and recommendations provided in the following documents:

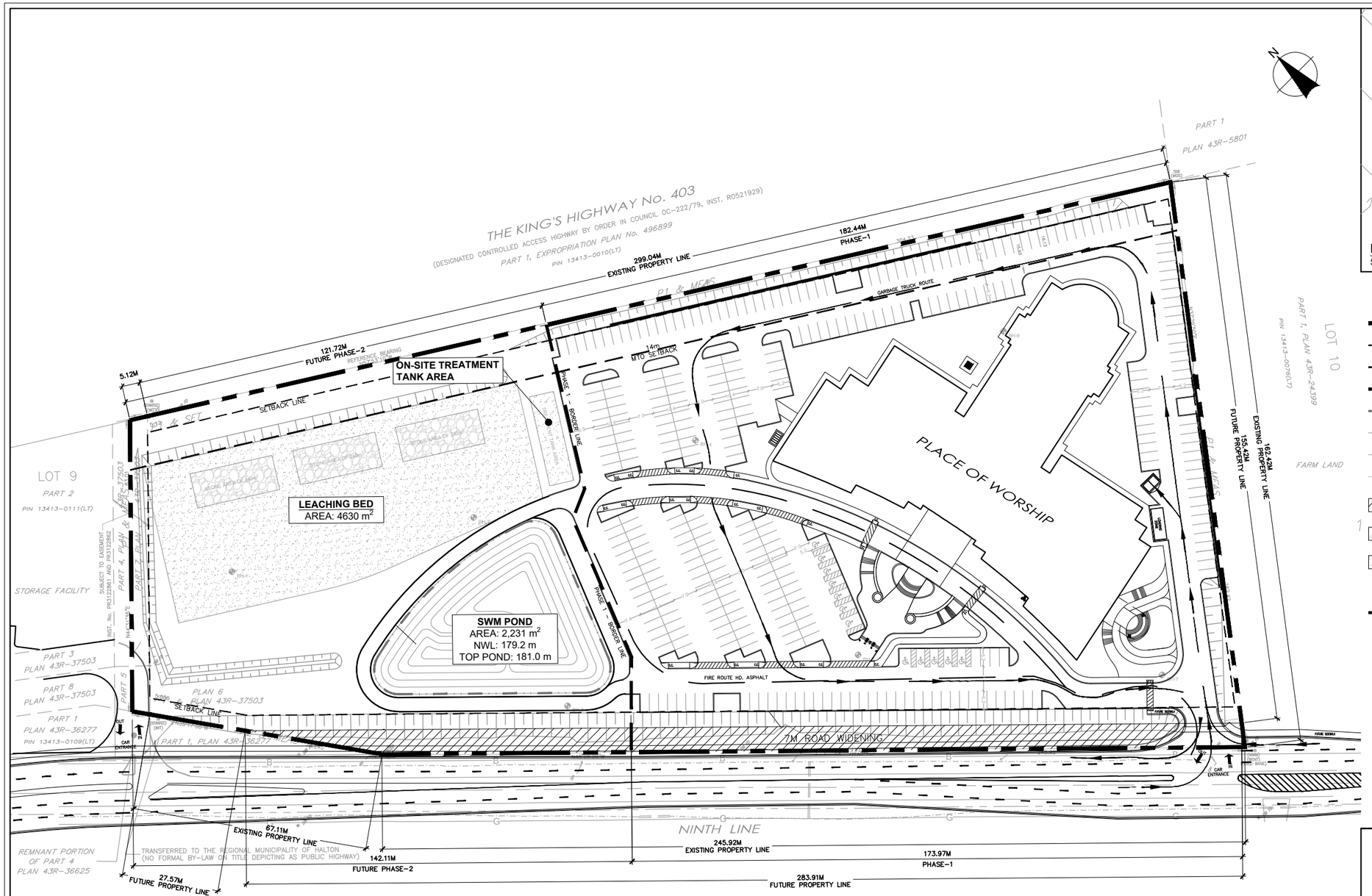
- City of Mississauga Development Requirements - Section 2, January 2020.
- Public Works Design, Specifications & Procedures Manual – Linear Infrastructure - Functional Servicing and Storm Water Management Report - Region of Peel, July 2009.
- Application User Guide for Pre-Application Meetings and Site Plan Approval.
- Topographic Plan of Survey of Part 9, Registrar's Compiled Plan 1542 by Stantec Geomatics Ltd., May 2019.
- Project Status Report DARC 19-164 W8, City of Mississauga, July 2019.
- Class Environmental Assessment Study – Ninth Line (Regional Road 13) Transportation Corridor Improvement – Region of Halton, June 22, 2017.
- St. Mark and St. Demiana Church Parking Utilization Study – Stantec Consulting Ltd., January 8th, 2020.
- Geotechnical Investigation Report – CMT Engineering Inc., February 20, 2020.

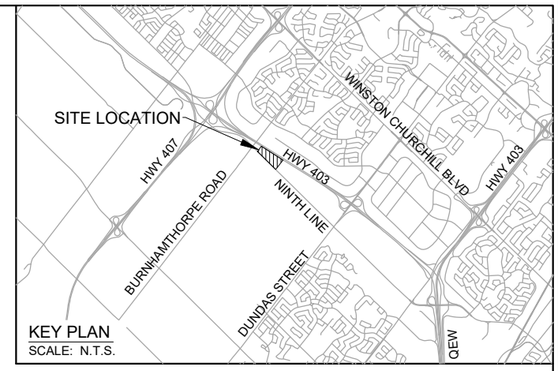
1.4 Proposed Site Plan

The proposed development on the site has been separated into two phases. The first phase of development proposes a new church building 5,016 m^2 in size and accompanying at-grade parking spaces located on the eastern portion of the site, with a single entrance from Ninth Line located at the southern end of the site. The northern portion of the site will be utilized for a stormwater management (SWM) pond and an on-site sanitary wastewater treatment system.

Phase 2 will introduce additional parking spaces and a Community Centre replacing the previously constructed SWM pond and on-site sanitary treatment system as introduced within Phase 1. Phase 2 will be completed once municipal sanitary services are in place along Ninth Line. During Phase 2 additional detailed design will be completed. This report will concentrate only on Phase 1 of the proposed development. Refer to Figure 2 for the Phase 1 development and Figure 3 for the overall site plan with the proposed Phase 2 works.

As part of the proposed development, a portion of the existing site will be dedicated to the Halton Region for future road widening of Ninth Line. A total of 0.18 ha will be dedicated, resulting in a proposed development area of 3.75 ha.





LEGEND

- PROPERTY BOUNDARY
- PROPERTY SETBACK
- MTO SETBACK
- PHASE 1 - BORDER LINE
- POND LIMITS
- EXISTING WATERMAIN
- EXISTING DITCH
- EXISTING BELL
- ROAD WIDENING LANDS TO BE DEDICATED TO THE CITY
- EXISTING STONE AREA
- EXISTING LEACHING BED
- EXISTING BOREHOLE
- PROPOSED RETAINING WALL
- PROPOSED ADA PARKING
- PROPOSED 3:1 MAX GRADING
- PROPOSED CONCRETE CURB
- PROPOSED BIKE RACK
- PROPOSED TRANSFORMER
- PROPOSED GARBAGE STORAGE

0 25 50 75 100
Metres

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St. MARK AND St. DEMIANA COPTIC ORTHODOX CHURCH

Figure Title
NINTH LINE MISSISSAUGA

PROPOSED SITE PLAN - PHASE 1

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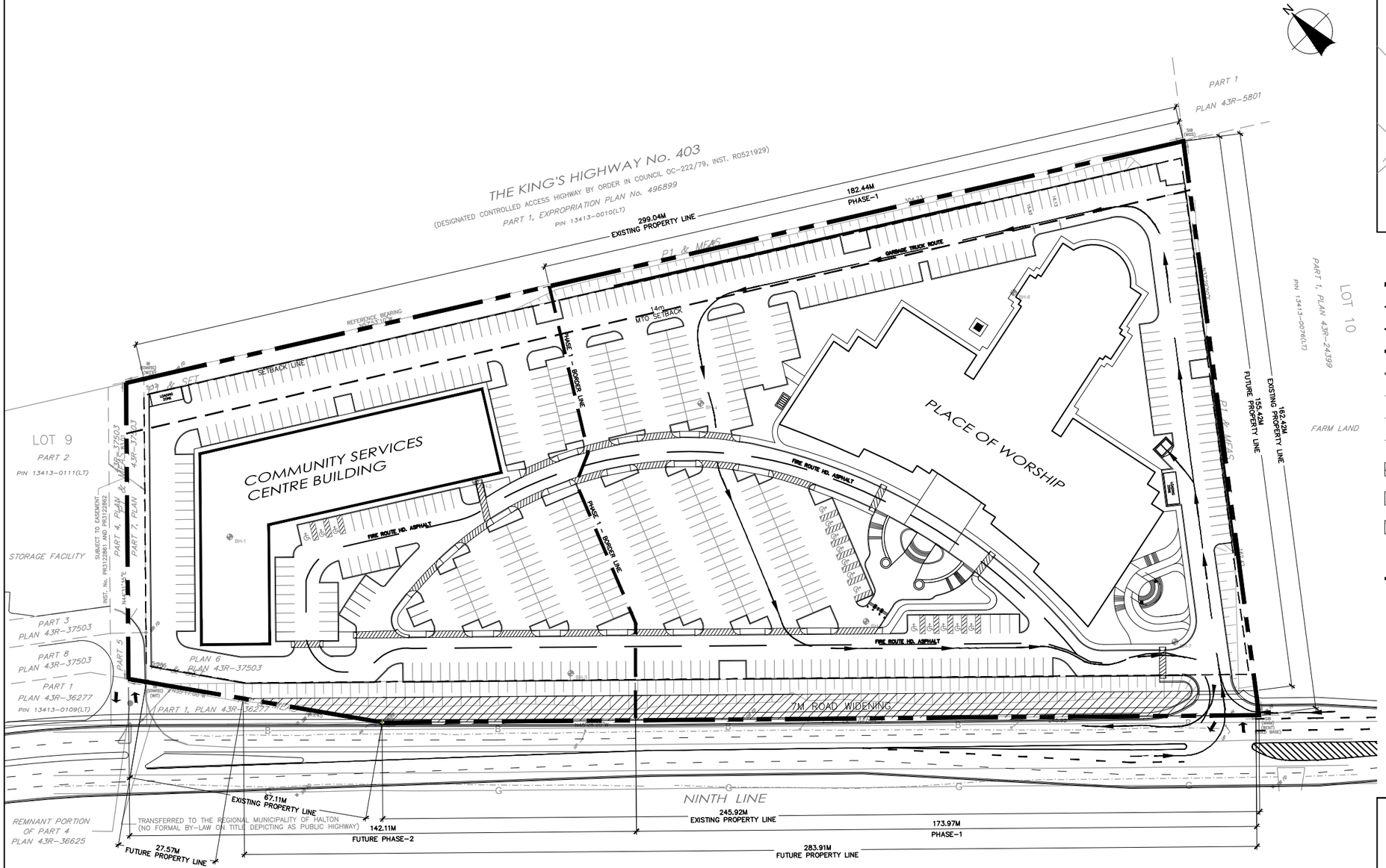

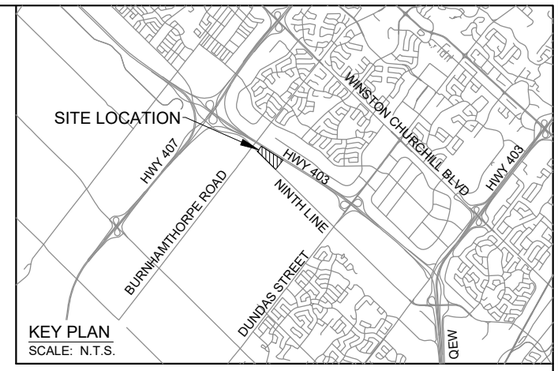

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- PROPOSED GARBAGE STORAGE

0 25 50 75 100
Metres

BURNSIDE

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St. MARK AND St. DEMIANA COPTIC ORTHODOX CHURCH

Figure Title
NINTH LINE MISSISSAUGA

PROPOSED SITE PLAN - OVERALL

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2.0 Existing Storm Drainage

2.1 Drainage Conditions

The existing site slopes from north to south with an approximate overall slope of 4 % across the site. There is an existing berm at the north-east side of the site that runs parallel to Highway 403. This berm is the high point within the site. A small portion of the site drains to the Highway 403 Right-of-Way (ROW), while the remainder of the site discharges towards the ditch that runs along the east side of the Ninth Line ROW. Flow that enters this ditch is conveyed under Ninth Line via a 400 mm CSP culvert.

2.2 Soil Conditions

In February 2020, CMT Engineering Inc. completed a Geotechnical Investigation for the subject property, which can be found with Appendix A. Based on the preliminary geotechnical investigation, the native soils encountered on the site are generally considered to be suitable for supporting the proposed development. The soil stratigraphy was predominantly sandy clayey silt till. Based on the Geotechnical Investigation the site classification for seismic site response would be considered Site Class D (stiff soils).

As part of the preliminary geotechnical investigation, seven (7) boreholes were advanced to depths ranging from 4.6 to 7.6 m below grade. Boreholes 1, 5 and 6 were equipped with monitoring wells. The monitoring wells recorded groundwater at elevations ranging between 0.15 m and 4.27 m below grade. During the investigation accumulated groundwater was recorded within open BH2 and BH3, at which the groundwater was roughly 2.74 m and 4.72 m below existing grade, respectively.

3.0 Proposed Site Grading

The proposed site grading takes into consideration the following requirements and constraints:

- Conformance to the City of Mississauga's grading and drainage criteria.
- Optimization of required earthworks.
- Provision for adequate cover on proposed services.
- Provision for overland flow conveyance to the proposed SWM pond.
- Maintain a maximum ponding depth of 0.30 m within the parking lot.

The proposed grading plan is largely driven by the following site constraints:

- The highpoint within the site is adjacent to the Highway 403 ROW and results in considerably steep slopes within the site.
- The proposed parking lot and drive aisles are to slope towards the proposed SWM pond which, due to site plan constraints, is not located at the natural low point on the site.
- The proposed SWM pond is to discharge into the existing roadside ditch along Ninth Line, which drains towards the existing 400 mm CSP culvert crossing the road at an inlet invert of 178.26 m.

Based on the site constraints outlined above, the proposed grades within the drive aisles range from 0.50% to 5.00%. The proposed grading is shown on Drawing G1.

4.0 Stormwater Management

4.1 Design Criteria

Based on coordination with the City of Mississauga, the following criteria must be achieved through the stormwater management design for the site:

- Quantity Control: Control the 100-year post-development design storm flow to the 2-year pre-development design storm flow.
- Quality Control: 80% TSS removal, Enhanced Protection Level (Level 1) quality control as specified in the Ministry of Environment's Stormwater Management Planning and Design Manual (2003).
- Water Balance: The 5 mm rainfall event shall be retained on site.
- Low Impact Development (LID) measures are required to be implemented.

4.2 Pre-Development Surface Hydrology

The existing site is delineated as two catchments, as demonstrated in Figure 4. Flows from Catchment 101 discharge to existing ditch along Ninth Line and flows from Catchment 102 are conveyed to the Highway 403 ROW. The peak flows discharged from the site under existing conditions have been calculated using the Visual OTTHYMO hydrologic modelling software. The following table summarizes the parameters for each catchment inputted into the model. The complete model results and supporting calculations are presented in Appendix B.

Table 1: Pre-Development Catchment Parameters

Outlet	Catchment	Area (ha)	SCS Curve Number	Time to Peak (hr)
Ninth Line	101	3.72	89.0	0.19
Highway 403	102	0.21	89.0	0.15*

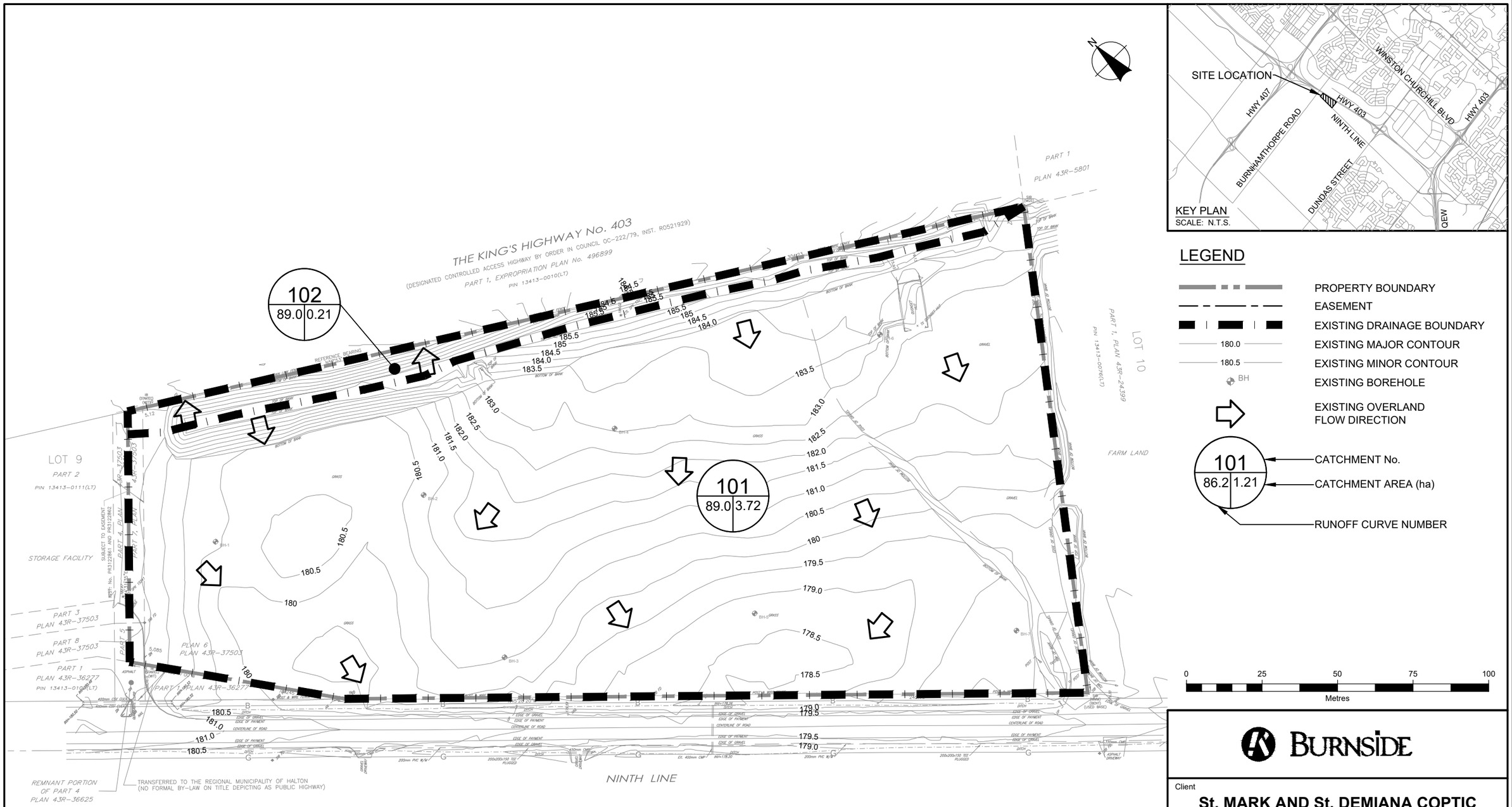
* Based on the City of Mississauga minimum time of concentration (Tc) of 15 minutes. Time to peak = 0.6xTc.

Using Ontario Soil Maps the native soils on the site are considered a mixture of Soil Groups C and D. The site is considered 50% Chinguacousy clay loam and 50% Oneida clay loam. From this and considering that the existing site is a mixture of grass and gravel, composite curve numbers were derived for each catchment. Appendix B contains further detail regarding the curve numbers and time to peaks for the site. The Visual OTTHYMO model was run using 4-hour Chicago storm distribution design storms for the 2, 5, 10, 25, 50 and 100-year design storm events. Table 2 summarizes the output from the model. Refer to Appendix B for the Visual OTTHYMO model output.

Table 2: Pre-Development Visual OTTHYMO Peak Flows

Design Storm	Release Rate (L/s)	
	Catchment 101	Catchment 102
2-year	191	12
5-year	314	20
10-year	435	28
25-year	535	35
50-year	630	41
100-year	730	47

The flows from each catchment during each design storm will be used to determine the post development stormwater management plan. As per the City's quantity control criteria the target release rates from the site will be the 2-year pre-development flows.



LEGEND

- PROPERTY BOUNDARY
- EASEMENT
- EXISTING DRAINAGE BOUNDARY
- 180.0 — EXISTING MAJOR CONTOUR
- 180.5 — EXISTING MINOR CONTOUR
- BH — EXISTING BOREHOLE
- EXISTING OVERLAND FLOW DIRECTION
- 101 / 86.2 | 1.21 — CATCHMENT No. / CATCHMENT AREA (ha) / RUNOFF CURVE NUMBER

0 25 50 75 100
Metres

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Figure Title
NINTH LINE MISSISSAUGA

PRE-DEVELOPMENT DRAINAGE AREA PLAN

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4.3 Post Development Surface Hydrology

4.3.1 Post Development Catchments

The post development catchments have been delineated based on the proposed grading for the site. Under post development conditions the stormwater runoff from the entire site will drain towards Ninth Line. Flows from Catchment 201 will discharge uncontrolled to Ninth Line and flows from Catchment 202 will be directed to the stormwater management (SWM) Pond for attenuation prior to being discharged to the Ninth Line ditch. The proposed site imperviousness was determined based on the pervious and impervious areas shown on the proposed site plan (Figure 2). The following table summarizes the post development catchment parameters. Supporting calculations are included in Appendix B. The proposed catchments are shown on Figure 5.

Table 3: Post Development Catchment Parameters

Outlet	Catchment	Area (ha)	Percent Impervious	SCS Curve Number	Time to Peak (hr)
Ninth Line	201*	0.42	28.0%	85.0	0.15
	202	3.50	56.3%	91.6	-

* Catchment drains uncontrolled from the site

4.3.2 Stormwater Management Design

The stormwater management criteria for the site, as outlined above in Section 4.1, will be achieved through the use of a wet pond and an underground infiltration facility.

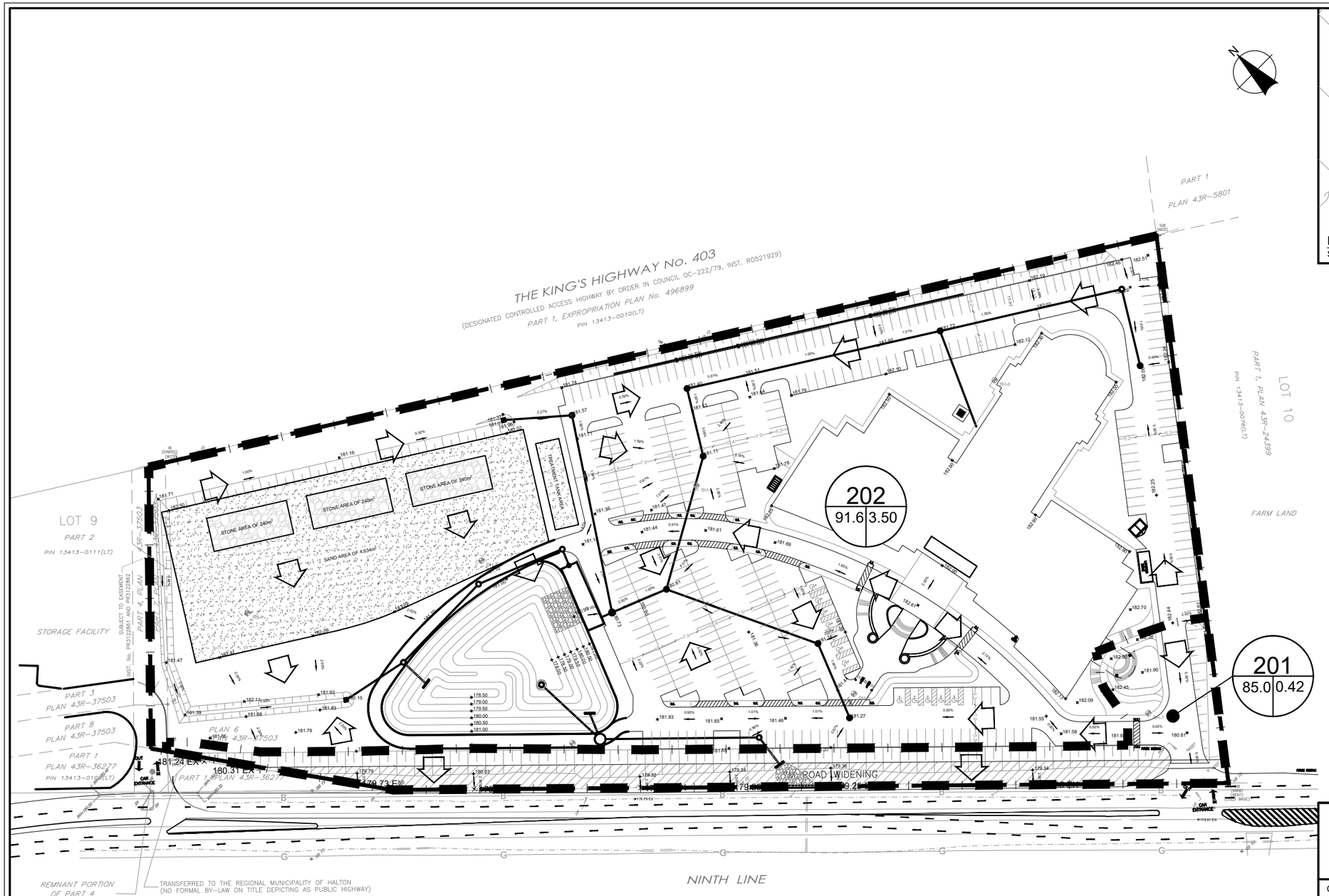
4.3.2.1 Quality Control

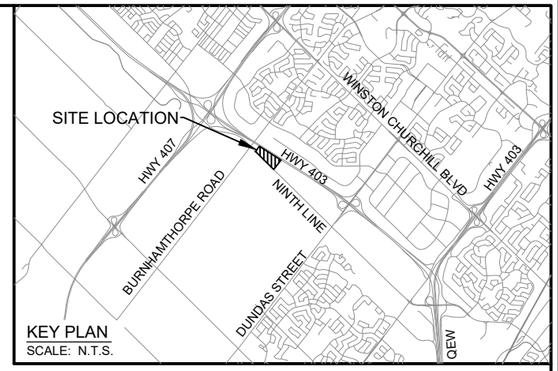
The SWM pond has been designed to provide Enhanced Protection water quality control. This level of quality control will be achieved through the permanent pool volume in the SWM pond, designed in accordance with Table 3.2 from the MOE Stormwater Management Planning and Design Manual (2003). Table 4 shows the permanent pool volume required to achieve the required quality control level.

Table 4: Permanent Pool

Storage Volume (m^3/ha)	Volume Required (m^3)	Volume Provided (m^3)
154.6	541	676

As shown in the table above, the permanent pool volume provided in the pond exceeds the required volume. This volume is measured from the bottom of the pond (178.0 m) to the normal water level (NWL) for the pond which is set at 179.20 m. The plan view of the proposed pond is shown in Figure 6.





LEGEND

- PROPERTY BOUNDARY
- EASEMENT
- PROPOSED DRAINAGE BOUNDARY
- ×182.28 PROPOSED SPOT ELEVATION
- 2.00% PROPOSED SLOPE TRANSITION
- PROPOSED STORM DRAIN
- PROPOSED STORM STRUCTURE
- BH EXISTING BOREHOLE
- PROPOSED OVERLAND FLOW DIRECTION
- 101 / 86.2 | 1.21 — CATCHMENT No. / CATCHMENT AREA (ha) / RUNOFF CURVE NUMBER

0 25 50 75 100
Metres

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Figure Title
NINTH LINE MISSISSAUGA

POST-DEVELOPMENT DRAINAGE AREA PLAN

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The other component of quality control in the pond is the forebay. The forebay is sized based on the greater of the settling length or dispersion length required based on the incoming flow. The forebay is sized to have a maximum allowable average flow velocity of 0.15 m/s. Forebay sizing calculations have been completed in accordance with the MOE Stormwater Management Planning and Design Manual. The following table outlines the forebay sizing requirements. Detailed calculations are included in Appendix B.

Table 5: Forebay Size

Inlet	Calculation Method	Design Flow (m^3/s)	L:W Ratio	Required Dimensions		Provided Dimensions	
				Length (m)	Width (m)	Length (m)	Width (m)
East	Settling Length	0.013	2	9.3	4.6	26.0	13.0
	Dispersion Length	0.673	2	25.8	12.9	26.0	13.0

The design flow for the settling length is based on the extended detention release rate and the design flow for the dispersion length is based on the 10-year flow from the inletting sewer. The table above demonstrates that the size of the designed forebay exceeds the requirements for both settling length and dispersion length.

4.3.2.2 Extended Detention

The proposed pond has been designed to include erosion control in the form of extended detention. The required extended detention volume has been calculated based on the 25 mm storm event. Extended detention requirements are summarized in the table below.

Table 6: Extended Detention

Volume Required (m^3)	Volume Provided (m^3)
493	713

The extended detention volume will pond to a depth of 0.60 m above the NWL. The release rate from the pond will occur over a 24-hour period and will be released via a perforated extended detention riser that is connected to a maintenance hole structure via a reverse sloped pipe. The release rate from the structure will be controlled by an 80 mm diameter orifice plate. The preliminary schematic of the proposed outlet structure layout is shown in Figure 7.

4.3.2.3 Quantity Control

Quantity control of the post development flows will be accomplished in the proposed SWM facility located in the southwest portion of the site. The proposed SWM facility is a wet pond with a drainage area of 3.50 ha and an average imperviousness of 56.3%. Post development catchment areas are shown in Figure 5. The calculations for the post development parameters are included in Appendix B.

The Visual OTTHYMO hydrologic model was used to determine the post development flows and storage volumes required to meet the target flow rates. A 4-hour Chicago storm distribution using the City of Mississauga rainfall data was used to analyze the 2, 5, 10, 25, 50, and 100-year design storm events. Table 3 presents the catchment characteristics of each drainage area used in the Visual OTTHYMO hydrologic model.

The target release rates from the site will be the 2-year pre-development flow to the Ninth Line ditch, therefore the overall allowable flow from the site was determined to be 191 L/s.

Catchment 202 will be routed through the SWM pond while Catchment 201 will drain uncontrolled to the Ninth Line ditch. To meet the target flow rates, the combination of hydrographs from the SWM pond and the uncontrolled area results in the following stage-storage discharge characteristics in the SWM pond (refer to Table 4). The detailed Visual OTTHYMO model output is provided in Appendix B.

Table 7: SWM Facility Stage-Storage-Discharge

Design Storm	Outlet Flow (m^3/s)	Storage Volume Required (m^3)	Water Level Elevation (m)
25 mm	0.009	493	179.8
100-Year	0.082	1,694	180.42

The SWM pond has a maximum storage volume of 2,218 m^3 at an elevation of 180.70 m. This is the maximum high-water level for the pond, which does not include the 0.3 m of freeboard provided between 180.70 m and 181.00 m. The pond provides a greater volume than required. The above noted stage-storage-discharge curve will be achieved through the proposed outlet control structure. The control structure includes the 80 mm extended detention outlet orifice plate and a 170 mm orifice plate to control flows up to the 100-year storm event. Preliminary outlet control calculations are provided in Appendix B. The preliminary schematic of the proposed outlet structure layout is shown in Figure 7.

Under emergency conditions, the pond will overflow into the roadside ditch along Ninth Line. The overflow will be controlled via a weir built into the side of the pond which will be designed as a part of detailed design.

Drainage from Catchment 202 will be captured in the on-site storm sewer system. Sewers have been sized for the 10-year design storm, as specified in the City's criteria. Stormwater discharged in the sewers will ultimately be conveyed to the SWM pond. However, to achieve the City's criteria of retaining the 5 mm event on-site, an infiltration system will be placed upstream of the SWM pond. This system will capture and infiltrate the 5 mm rain event. Detailed sizing and drawings from the infiltration system supplier will be provided as part of the detailed design.

Based on the proposed developable site area of 3.75 ha, with an average imperviousness of 54.2%, a storage volume of 101.4 m^3 is required to retain the 5 mm storm event on-site. Detailed calculations are provided in Appendix B.

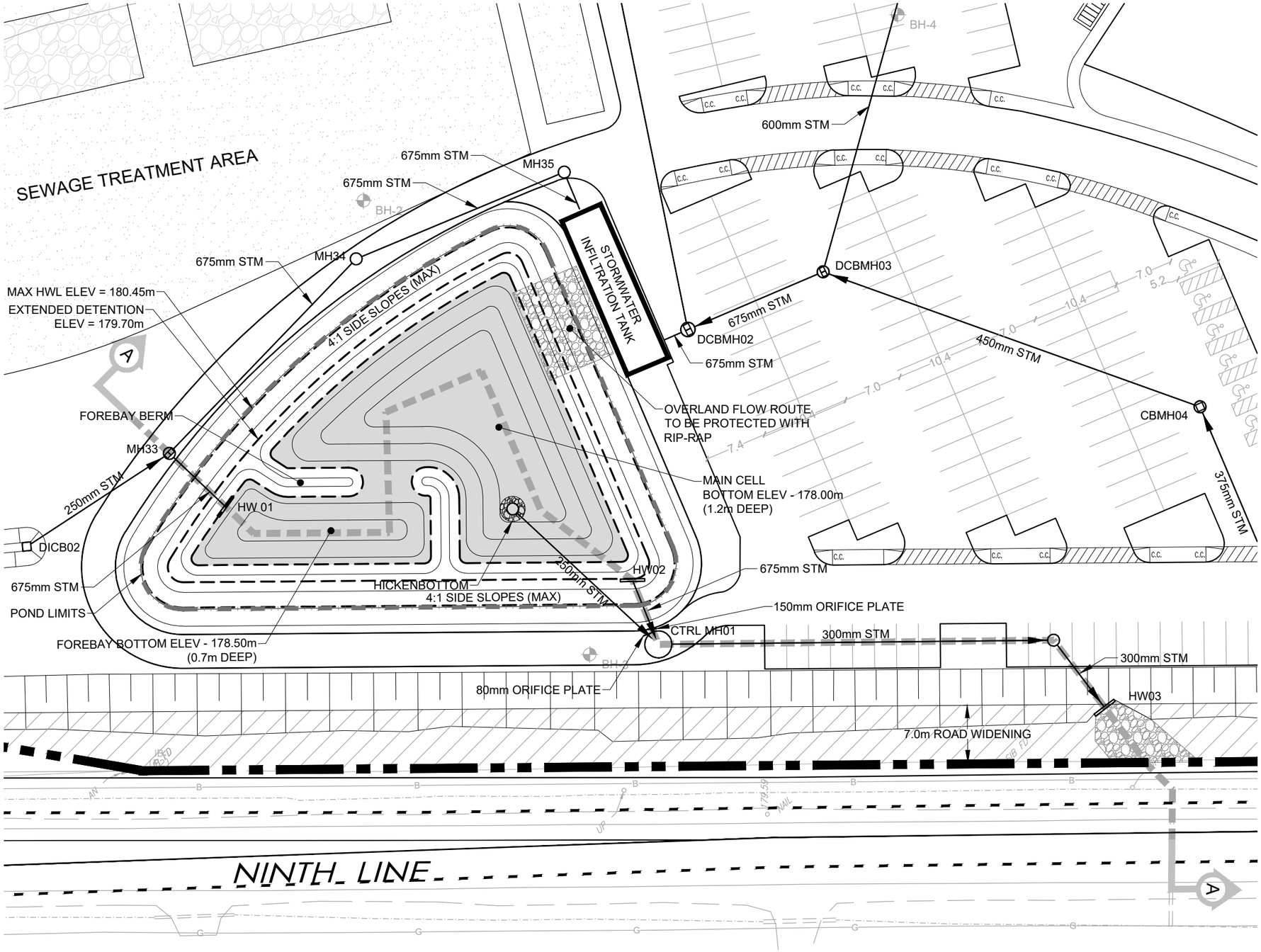
During storms larger than the 5 mm event, stormwater will overflow from the infiltration system to the downstream sewers which then outlet into the forebay of the proposed SWM pond. During storms greater than the 10-year event, stormwater will be conveyed overland across the site and will discharge into the main cell of the SWM pond.

As shown in Table 3, Catchment 201 flows uncontrolled from the site. This uncontrolled flow has been accounted for when designing a stormwater management plan to ensure the allowable release rates were achieved. The flow from Catchment 201 is unable to be captured by the on-site storm sewer system due to restrictions associated with grading requirements to make the driveway in this area feasible. The flow from Catchment 201 will discharge directly to the Ninth Line ROW and into the roadside ditch. The following table outlines the post development flows to the Ninth Line outlet, considering the discharge from both Catchments 201 and 202.

Table 8: Post Development to Ninth Line

Design Storm	Uncontrolled Flow – Catchment 201 (L/s)[1]	Release Rate from Pond – Catchment 202 (L/s)[1]	Total Release Rate (L/s)[1]	Allowable Release Rate (L/s)[2]
2-year	20	17	27	-
5-year	33	60	68	-
10-year	47	67	99	-
25-year	59	72	119	-
50-year	70	77	134	-
100-year	82	82	149	191

Note: [1] Flow from the Visual OTTMYO model output. Refer to Appendix B for further details.
[2] 2-Year pre-development flow to the Ninth Line Ditch (Catchment 101). Refer to Table 2.



LEGEND

- PROPERTY BOUNDARY
- PROPOSED POND LIMITS
- EXISTING DITCH CENTERLINE
- 182.28 — PROPOSED SPOT ELEVATION
- 2.00% — PROPOSED SLOPE TRANSITION
- PROPOSED STORM DRAIN
- CBMH02 — PROPOSED STORM STRUCTURE
- ROAD WIDENING LANDS TO BE DEDICATED TO THE CITY
- PROPOSED STONE AREA
- PROPOSED RIPRAP OVERFLOW
- PROPOSED LEACHING BED
- BH — EXISTING BOREHOLE
- PROPOSED 3:1 MAX GRADING

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0 5.0 10.0 20.0 30.0 40.0
Metres

BURNSIDE

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Figure Title
NINTH LINE MISSISSAUGA

STORMWATER MANAGEMENT POND

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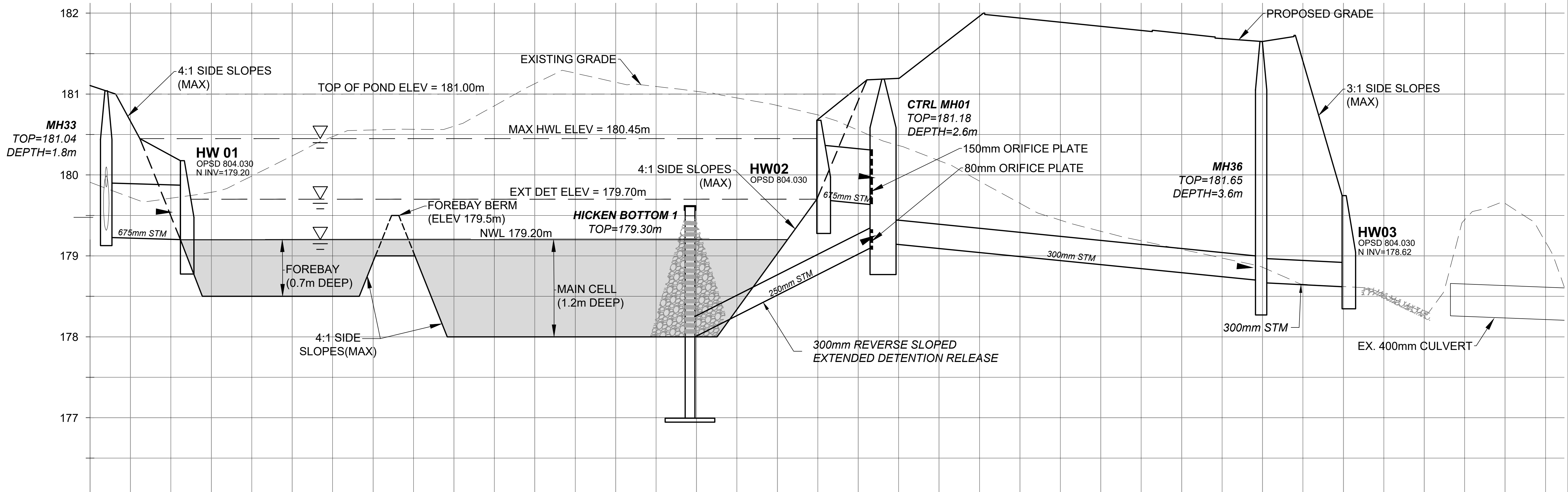
File: \\elmo\Shared Work Areas\044049 - Ninth Line Mississauga\07_Figures\044049 - SWM FIG.dwg Date Plotted: May 10, 2023 - 10:27 AM



CHAINAGE	0+000	0+010	0+020	0+030	0+040	0+050	0+060	0+070	0+080	0+090	0+100	0+110	0+120	0+130	0+140	0+150	0+160	0+170	0+180
EXIST\PROP CENTERLINE ELEVATION (exist.)	*179.91*	*179.71*	*179.99*	*180.47*	*180.56*	*180.85*	*181.26*	*181.09*	*180.95*	*180.74*	*180.36*	*179.92*	*179.44*	*179.19*	*178.97*	*178.65*	*178.52*	*179.45*	*179.17*
EXIST\PROP CENTERLINE ELEVATION (prop.)	179.909	179.713	179.987	180.474	180.564	180.855	181.259	181.094	180.952	180.743	180.365	179.924	179.442	179.186	178.974	178.650	178.523	179.447	179.172

XSECT A-A

SCALE H 1:500
V 1:50

BURNSIDE

Client
St. MARK AND St. DEMIANA COPTIC ORTHODOX CHURCH

Figure Title
NINTH LINE MISSISSAUGA

STORMWATER MANAGEMENT POND SECTION

Drawn	Checked	Date	Figure No.
TR	SR	23/05/10	**7**
Scale		Project No.	
AS NOTED		300044049	

5.0 Wastewater Servicing

5.1 Design Criteria

The onsite sewage system design is based on both the requirements of Part 8 of the Ontario Building Code (OBC) and Ministry of the Environment, Conservation and Parks (MECP) Design Guidelines.

5.2 Wastewater Quantity

Daily design sanitary flows for the sewage system have been estimated using building floor plans provided to us, in conjunction with Table 8.2.1.3.B. of the OBC. The proposed development will consist of a church with a sanctuary accommodating up to 800 people, along with associated facilities and uses including administrative offices, a kitchen/cafeteria, and Sunday school classrooms. The lower level contains additional classrooms and office spaces to support church functions, as well as a gym and other activity spaces. The following table summarizes the total daily sanitary sewage flows for this facility.

Table 9: Maximum Daily Sanitary Sewage Flow

	OBC Reference	Unit	OBC Flow/Unit	Number of Units	Total Daily Flow (L/day)
Sunday					
Sanctuary	Churches with kitchen facilities	per seat	36	800	28,800
Cafeteria	Food service operation, cafeteria	per meal	12	300	3,600
Sunday School	Churches no kitchen facilities	per seat	8	200	1,600
Total Daily Sewage Flow:					**34,000 L/day**
Rounded Daily Sewage Design Flow:					**36,000 L/day**

The onsite sewage system has been sized to accommodate the estimated maximum daily flow of 36,000 L/day. Based on information provided to us, it is assumed that maximum uses of multiple facilities concurrently would be limited, and that this maximum flow rate is a conservative daily flow estimate, adequate to accommodate the maximum day of use at the facility in the future. We understand that some components of the building may be constructed in phases. During detailed design of the sewage system, options for phasing the construction of the sewage system can be reviewed and considered, as can other design optimization techniques such as flow balancing. For the purposes of this report, the intent is to demonstrate that the proposed building in its entirety can be serviced with the onsite system.

5.3 Impact Assessment

The proposed sewage system must meet MECP requirements in terms of the level of treatment provided. A Hydrogeological Assessment (prepared under separate cover by

Burnside) has evaluated the site and the potential impact on both groundwater and surface resources from the proposed sewage system. In order to meet MECP requirements, we estimate that the sewage system will need to be capable of providing removal of nitrogen to an effluent concentration of approximately 5.4 mg/L or less.

Conventional septic systems do not provide nitrogen removal; therefore, an advanced wastewater treatment system with additional denitrification equipment will be required to provide sufficient nitrogen removal. Typically, this would include a two-stage process to remove nitrogen from the wastewater. The ammonia will be converted into nitrate in the aerobic treatment process, and then subsequently converted from nitrate to nitrogen gas in an anoxic reactor (i.e., lacking in dissolved oxygen) with a carbon source. The effluent from the anoxic reactor will then be polished and sent to the leaching bed for dispersal into the soil.

The proposed effluent objectives in treated wastewater for the proposed sewage treatment system are as follows:

Table 10: Proposed Effluent Objectives

Parameter	Units	Effluent Objective
Total Biochemical Oxygen Demand – 5 days (cBOD5)	mg/L	<10
Total Suspended Solids	mg/L	<10
Total Inorganic Nitrogen	mg/L	<5.4

5.4 Proposed Sewage Treatment System

Based on the results of the Hydrogeological Assessment it is our recommendation that the sewage system incorporate a treatment technology capable of Level IV effluent quality as defined by the Ontario Building Code (OBC), as well as supplementary equipment for denitrification to suitable levels. There are several packaged onsite wastewater treatment technologies that are capable of providing high quality treatment as required. The proposed sewage treatment system will in general consist of a septic or pre-settling tanks, a treatment unit for the treatment of organic matter and nitrification/denitrification and a subsurface leaching bed for disposal of treated effluent. Pumping elements will also be incorporated as required, depending on the location and configuration of the treatment tanks. The onsite sewage system will require regular ongoing maintenance and monitoring to ensure a properly functioning system. Specific requirements will be developed in consultation with the Ministry of the Environment, Conservation and Parks during the approval process.

As noted above the existing soil conditions consist of a sandy clayey silt till, which are not conducive to an in-ground leaching bed. Therefore, a fill based (i.e., raised) leaching bed will be required. A design T-time greater than 50 min/cm is assigned to the underlying soils.

The use of an advanced treatment system meeting Level IV effluent quality will allow the use of a reduced size leaching bed as compared to a conventional septic system. The recommended leaching bed is a Type A Dispersal bed, which consists of a 200 mm stone layer protected by geotextile and underlain by a sand layer. The overall size of the bed is dictated by the hydraulic properties of the underlying soil, and the ability to infiltrate the treated effluent into the ground under the bed.

For preliminary sizing purposes, we have used the maximum day flow of 36,000 L/day in order to provide a conservative estimate of the footprint required.

The minimum stone area is calculated according to the following relationship for daily flows (Q) exceeding 3,000 L/day:

$$A_{stone} = Q/50$$

Therefore, for the design flow of 36,000 L/day, the minimum stone area required is 720 m^2.

The T-time of the underlying soils is greater than 50 min/cm. The minimum sand area for underlying soil with a T-time that is greater than 15 min/cm is calculated according to the following formula:

$$A_{sand} = QT/400$$

Where:

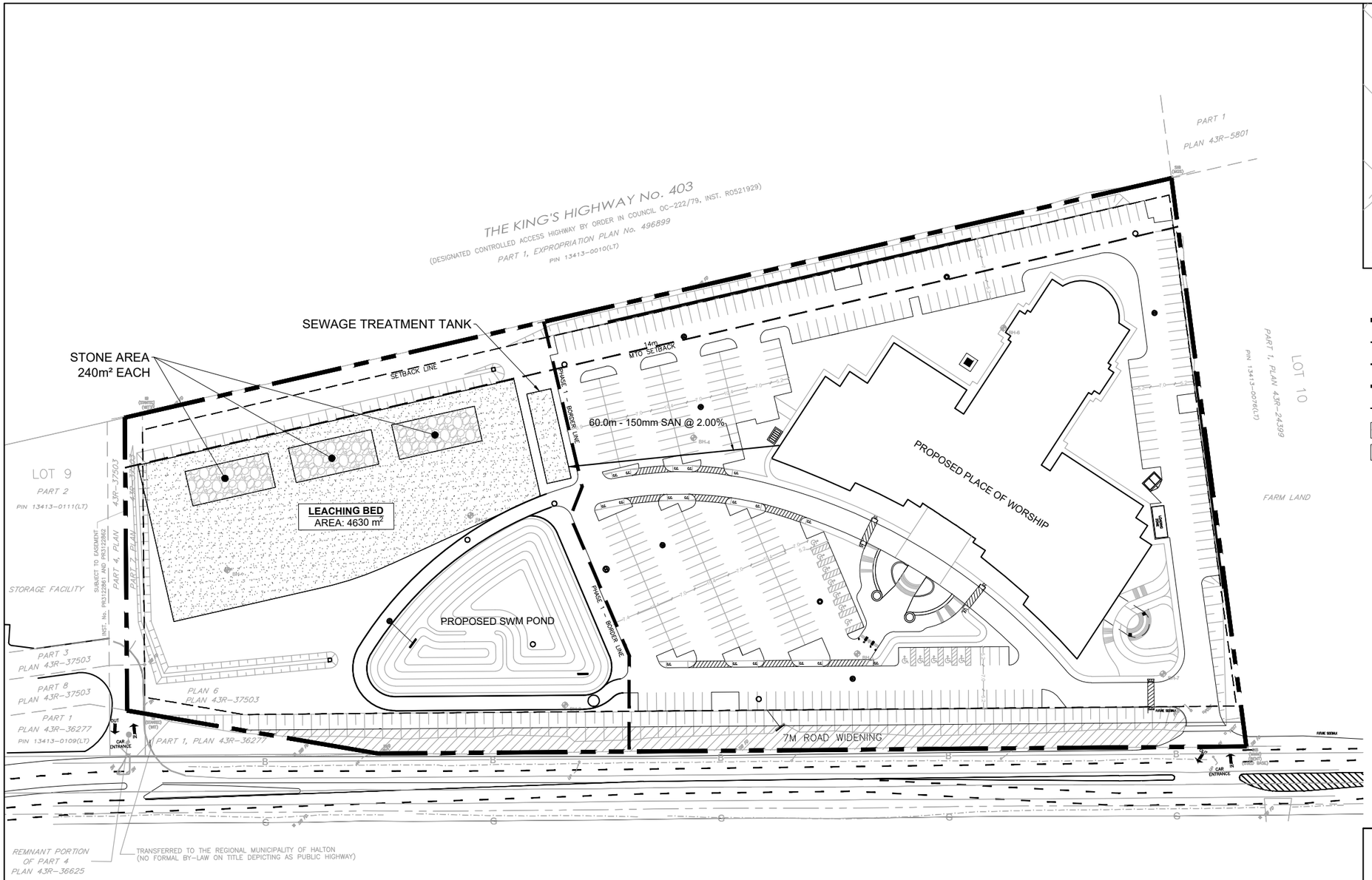
Q = daily design flow (L/day)

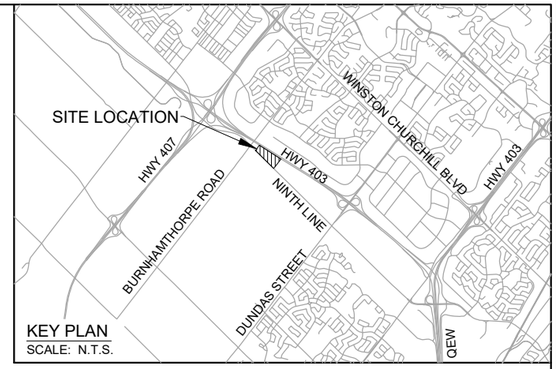
T = percolation rate (T-time) of underlying native soil

For the design flow of 36,000 L/day and a T-time of 50 min/cm, the minimum sand area required is 4,500 m^2. This area represents the minimum total area required for the Type A Dispersal Bed based on the underlying soil properties and regulatory requirements. Figure 8 shows the preliminary layout of the sewage system.

As shown, the site has adequate space to accommodate a sewage treatment system for the proposed changes to the property and to meet all OBC setback distances. The leaching bed should be backfilled with porous material and topsoil to promote grass growth on the finished surface and must be protected from future vehicular traffic and parking. No construction vehicles may be permitted on the leaching bed after it has been constructed, therefore, development of the property will have to be carefully staged to protect this area.

Details of the type of treatment system, leaching bed design, and proposed phasing will be advanced during detailed design.





LEGEND

- PROPERTY BOUNDARY
- PROPERTY SETBACK
- MTO SETBACK
- PHASE 1 - BORDER LINE
- PROPOSED SANITARY SEWER
- PROPOSED LEACHING BED
- PROPOSED STONE AREA

0 25 50 75 100
Metres

BURNSIDE

Client
St. MARK AND St. DEMIANA COPTIC ORTHODOX CHURCH

Figure Title
NINTH LINE MISSISSAUGA

PROPOSED SANITARY PLAN

Drawn	Checked	Date	Figure No.
TR	SR	23/05/10	8
Scale		Project No.	
1:1250		300044049	

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6.0 Water Supply and Distribution

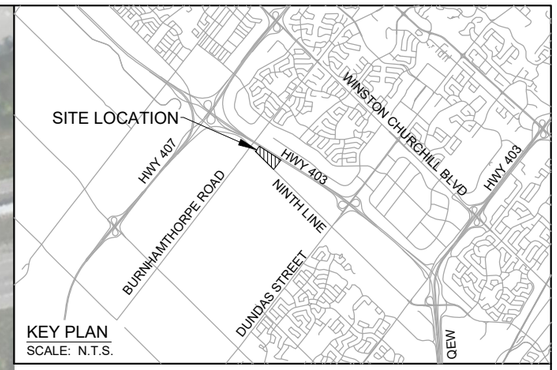
6.1 Design Criteria

The following Region of Peel criteria have been applied in establishing the sizing of the watermain required to support the proposed institutional development:

- Average Day Per Capita Flow – 140 L per capita per day.
- Maximum Day Factor – peaking factor of 1.4.
- Peak Hour Factor – peaking factor of 2.5.
- Fire Flow per Fire Underwriters Survey (FUS) requirements - minimum non-fire pressure: 40 psi and minimum fire pressure: 20 psi.

6.2 Proposed Layout and Sizing

An existing 200 mm watermain is located on the west side of Ninth Line. In early 2019, the City of Mississauga and the Region of Peel modeled two development scenarios for the subject lands. Phase 1 of modeling was for the church and Phase 2 of modeling was for future uses. The modeling exercise determined that the existing 200 mm watermain on Ninth Line does not have sufficient capacity to service the Phase 1 maximum daily demand and fire flow. The Region of Peel design criteria states that a development of this size requires a connection to a minimum municipal watermain size of 300 mm. Therefore, the existing 200 mm watermain on Ninth Line will require an upgrade to a 300 mm watermain prior to servicing any phase of the proposed development. The results of the water modeling and assumed water demand calculations can be found in Appendix C. A proposed water service layout can be seen in Figure 9 and Drawing S1.



LEGEND

- PROPERTY BOUNDARY
- PROPERTY SETBACK
- MTO SETBACK
- PHASE 1 - BORDER LINE
- EXISTING WATERMAIN
- PROPOSED WATERMAIN
- PROPOSED SIAMESE CONNECTION
- PROPOSED HYDRANT AND VALVE
- PROPOSED VALVE AND BOX

0 40 80 120 160
Metres

BURNSIDE

Client
St. MARK AND St. DEMIANA COPTIC ORTHODOX CHURCH

Figure Title
NINTH LINE MISSISSAUGA

PROPOSED WATERMAIN LAYOUT

Drawn	Checked	Date	Figure No.
TR	SR	23/05/10	9
Scale		Project No.	
1:2000		300044049	

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7.0 Erosion and Sediment Control

During the site grading and servicing works, there is potential for sediment -runoff to be directed toward the adjoining properties and the municipal street. Therefore, prior to any grading activity, the erosion and sediment control strategies in accordance with the City of Mississauga (Erosion and Sediment Control Design Requirements (Section 2.08) and The Greater Golden Horseshoe Area Conservation Authorities (Erosion and Sediments Control Guidelines for Urban Construction) will be applied as follows:

- All activities on the site shall be conducted in a logical sequence to minimize the area of bare soil exposed at any one time.
- All disturbed ground left inactive shall be stabilized by seeding, sodding, mulching, or covering, or other equivalent control measure. The period of time of inactivity shall not exceed 30 days, unless otherwise authorized by the Commissioner of Transportation and Works.
- Temporary sediment basins shall be constructed on sites having a disturbed drainage area of greater than 2 ha or having an average slope greater than 12 %.
- Sediment control fences shall be placed along all downslope sides of a site along the edges of a drainage channel passing through the site, and along the perimeter of all other areas sensitive to sediment accumulation. The sediment control fence shall be constructed in accordance with City Standard Drawing No. 2940.010
- Catch basin sediment traps shall be provided for unpaved areas draining 2 ha or greater and less than 4 ha and shall be constructed in accordance with City Standard Drawing No. 2930.010.
- A minimum 3 m wide undisturbed buffer strip shall be maintained along the limits of the development adjacent to existing road boulevards. Where a sediment control fence is required, it shall be constructed in front of the buffer strip.
- All topsoil stockpiles containing more than 100 m3 of material shall be located a minimum of 10 m away from a roadway, drainage channel or an occupied residential lot. The maximum side slopes for topsoil stockpiles shall be 1.5 horizontal to 1.0 vertical.
- In order to reduce the tracking of mud onto a paved street, a pad of crushed stone shall be constructed at the site entrance and exit leading onto any existing road. The stone pad shall be a minimum of 300 mm thick, 15 m long and 10 m wide. The first 10 m from the entrance/exit shall be constructed with 50 mm clear stone. The remaining 5 m shall be constructed with 150 mm rip-rap. This stone pad must be maintained as required given the site conditions to ensure mud tracking is kept to a minimum. The Stone Pad Construction Entrance shall be constructed in accordance with City Standard Drawing No. 2970.010
- Rock check dams are to be installed in ditches and swales in accordance with City Standard Drawing No. 2980.010.

Erosion and Sediment control details are provided on drawing ESC1.

8.0 Summary Conclusion

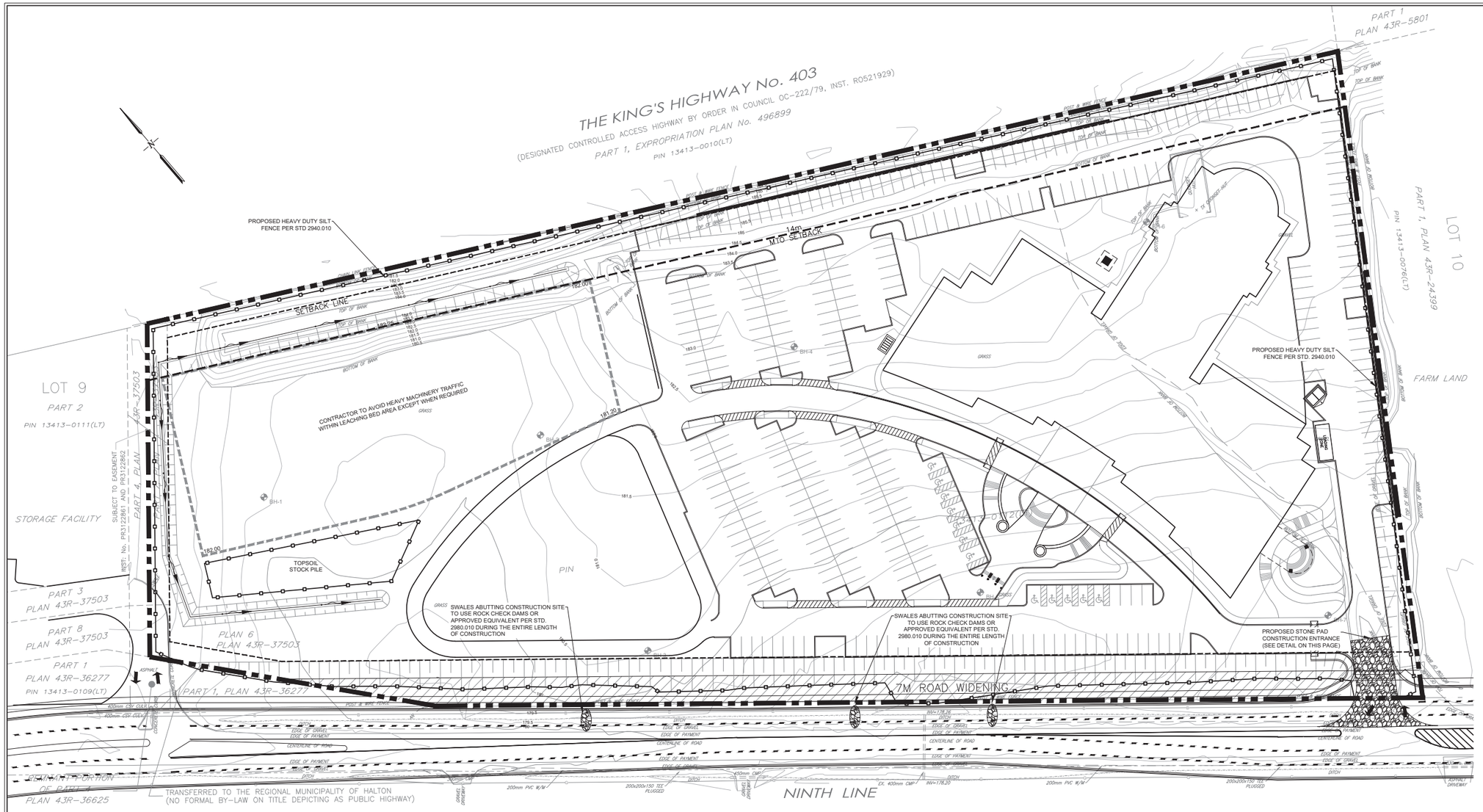
The preceding report provides investigation of existing servicing capacities and a review of the proposed servicing for the proposed development at Ninth Line in Mississauga. The proposed servicing and grading address the requirements of the City of Mississauga. An external upgrade is required to the existing watermain on Ninth Line, no other upgrades to the existing external municipal infrastructure will be required.

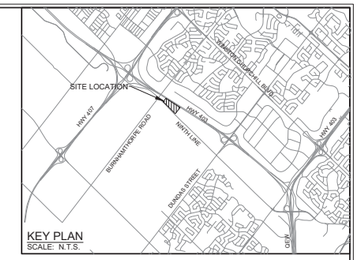
This report addresses the servicing related requirements associated with the Zoning By-law Amendment and Site Plan Approval applications for the subject property. We therefore propose that the preceding Functional Servicing and Stormwater Management Report be accepted for review and approval by the City of Mississauga in order to facilitate the Planning Approvals for the subject property.

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Drawings



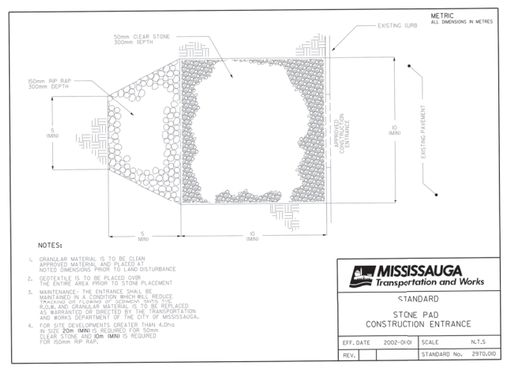


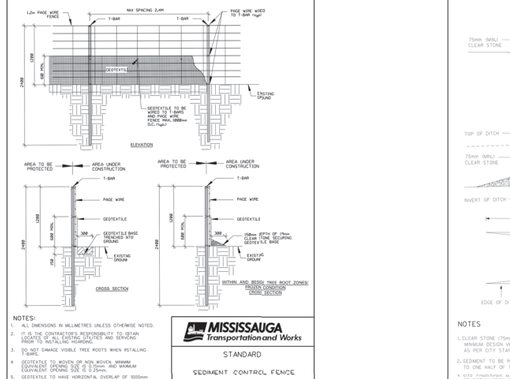
LEGEND

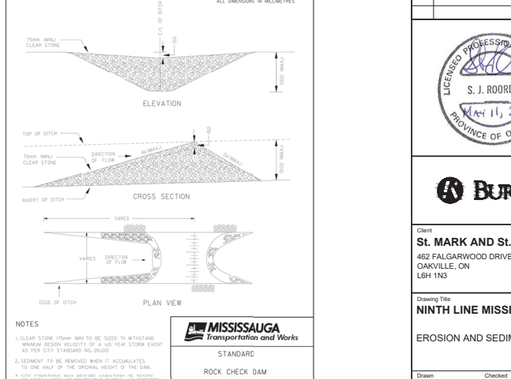
- PROPERTY BOUNDARY
- ADJACENT PROPERTY BOUNDARY
- EXISTING EASEMENT
- 180.0 EXISTING MAJOR CONTOUR
- 180.5 EXISTING MINOR CONTOUR
- EXISTING SETBACK LIMIT
- EXISTING 14m MTO SETBACK
- PROPOSED SILT FENCE
- PROPOSED ROCK CHECK DAM
- BH EXISTING BOREHOLE

EROSION AND SEDIMENT CONTROL NOTES

1. EROSION AND SEDIMENT CONTROL (ESC) MEASURES WILL BE IMPLEMENTED PRIOR TO AND MAINTAINED DURING THE CONSTRUCTION PHASES, TO PREVENT ENTRY OF SEDIMENT INTO THE WATER. ALL DAMAGED EROSION AND SEDIMENT CONTROL MEASURES TO BE REPAIRED AND/OR REPLACED WITHIN 48 HOURS OF THE INSPECTION.
2. ALL IN-WATER AND NEAR WATER WORKS SHALL BE CONDUCTED IN THE DRY (I.E., ISOLATION AND PROTECTION OF WATERCOURSE/WATERBODY) WITH APPROPRIATE EROSION AND SEDIMENT CONTROLS.
3. UNDER NO CIRCUMSTANCES SHALL THE CONTRACTOR LEAVE A WORK AREA INCOMPLETE AND EXPOSED FOR MORE THAN 10 DAYS WITHOUT PROPER PROTECTION OF THE SLOPE AND EXCAVATED SURFACES AS REQUIRED UNDER THIS CONTRACT, ESPECIALLY WITHIN THE VICINITY OF WATER CROSSINGS/WETLANDS. THIS MAY INCLUDE SEED, SOD, EROSION CONTROL BLANKET, AND/OR HYDRAULIC MULCH GROUND COVER. IN ADDITION, ALL TEMPORARY AND PERMANENT DITCHES AND EMBANKMENT SLOPES WITHIN 30M OF WATERCOURSES, WETLANDS AND STORM PONDS ARE TO BE STABILIZED WITH TOPSOIL, SEED AND EROSION CONTROL BLANKET IMMEDIATELY FOLLOWING GRADING AND PRIOR TO RECEIVING STORMWATER RUNOFF FLOWS.
4. ALL DISTURBED VEGETATED AREAS SHALL BE STABILIZED AND RESTORED WITH NATIVE/NON-INVASIVE SPECIES UPON COMPLETION OF THE WORK IN ACCORDANCE WITH ESC PLANS.
5. ADDITIONAL ESC SUPPLIES ARE TO BE STOCKPILED ON-SITE IN ORDER TO UPGRADE ESC DEVICES AS NECESSARY.
6. ALL DITCHES SHALL BE STABILIZED WITH TOPSOIL, SEED AND EROSION CONTROL BLANKET IMMEDIATELY FOLLOWING THEIR FINAL GRADING AND PRIOR TO RECEIVING RUNOFF FLOWS.
7. SPILL KITS ARE TO BE KEPT ON-SITE.
8. REGULAR MONITORING SHALL BE COMPLETED AS PER THE EROSION & SEDIMENT CONTROL GUIDELINE FOR URBAN CONSTRUCTION (GREATER GOLDEN HORSESHOE CONSERVATION AUTHORITIES, 2006), WHICH INCLUDES THE FOLLOWING MONITORING FREQUENCIES:
   - ON A WEEKLY BASIS
   - AFTER EVERY RAINFALL
   - AFTER SIGNIFICANT SNOWMELT EVENTS, AND
   - DAILY DURING EXTENDED RAIN OR SNOWMELT PERIODS.
9. THE CONTRACTOR MAY CONSIDER ALTERNATIVE SEDIMENT AND EROSION CONTROL MEASURES. SUCH MEASURES MUST BE PRESENTED IN WRITING FOR APPROVAL OF THE ENGINEER AND THE CITY OF MISSISSAUGA.
10. STREET SWEEPING, CATCHBASIN CLEANING AND DUST CONTROL ARE THE RESPONSIBILITY OF THE CONTRACTOR AND MUST BE KEPT UNDER CONTROL ON ALL ROADWAYS TO THE SATISFACTION OF THE TOWN AND THE ENGINEER
11. DURING INACTIVE CONSTRUCTION PERIODS, WHERE THE SITE IS LEFT ALONE FOR 30 DAYS OR LONGER, A MONTHLY INSPECTION SHOULD BE CONDUCTED.
12. DOCUMENTATION OF ALL INSPECTIONS SHOULD BE KEPT ON SITE FOR A MINIMUM OF ONE (1) YEAR AFTER THE DEVELOPMENT IS SUBSTANTIALLY COMPLETED.
13. IN ORDER TO COMPLY WITH THE MIGRATORY BIRDS CONVENTION ACT, IT IS RECOMMENDED THAT TREE REMOVALS BE COMPLETED BETWEEN AUGUST 1 AND APRIL 1.







Notes
1. This drawing is the exclusive property of R. J. Burnside & Associates Limited. The reproduction of any part without prior written consent of this office is strictly prohibited.
2. The contractor shall verify all dimensions, levels, and datums on site and report any discrepancies or omissions to this office prior to construction.
3. This drawing is to be read and understood in conjunction with all other plans and documents applicable to this project.

NOT FOR CONSTRUCTION

No.	Issue / Revision	Date	Auth.
1	ISSUED FOR SITE PLAN APPROVAL	21/04/20	DN
2	RE-ISSUED FOR SITE PLAN APPROVAL	22/01/11	DN
3	RE-ISSUED FOR SITE PLAN APPROVAL	23/05/10	TR

LICENSED PROFESSIONAL ENGINEER S. J. ROORDA May 11, 2023 PROVINCE OF ONTARIO

BURNSIDE
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Guelph, Ontario, N1H 1C4
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web www.rjburnside.com

Client
St. MARK AND St. DEMIANA COPTIC ORTHODOX CHURCH
462 FALGARWOOD DRIVE
OAKVILLE, ON
L6H 1N3

Drawing Title
NINTH LINE MISSISSAUGA

EROSION AND SEDIMENT CONTROL PLAN

Drawn	Checked	Designed	Checked	Date	Drawing No.
TR	SR	TR	SR	23/05/10	ESC1
Project No. 300044049		Contract No. CONTRACT NO.		Revision No. 0	
Scale 1:500		0 5.0 10.0 20.0 30.0m			

SITE GRADING NOTES:

1. ALL DISTURBED GRASSED AREAS SHALL BE RESTORED TO ORIGINAL CONDITION OR BETTER. THE RELOCATION OF TREES AND SHRUBS SHALL BE SUBJECT TO APPROVAL BY THE PROJECT LANDSCAPE ARCHITECT OR ENGINEER.

2. ALL GRANULAR BASE AND SUB-BASE MATERIALS SHALL BE GRADED AND COMPACTED TO 98% STANDARD PROCTOR DENSITY, FREE OF DEPRESSIONS.

3. THE PAVEMENT STRUCTURE SHALL BE CONSTRUCTED OF THE MINIMUM THICKNESSES OF MATERIALS AS PER THE GEOTECHNICAL REPORT BY CMT ENGINEERING INC. DATED FEBRUARY 20, 2020.

4. ALL BARRIER CURB WITHIN THE SITE TO BE CONSTRUCTED AS PER DETAIL ON DRAWING D1, UNLESS OTHERWISE SPECIFIED.

5. FROST SLABS ARE REQUIRED AT ALL DOOR LOCATIONS WHERE PROPOSED OUTSIDE GRADE IS FLUSH WITH FINISHED FLOOR ELEVATION.

6. REFER TO SITE PLAN FOR DIMENSIONS AND SITE DETAILS.

7. STEP JOINTS ARE TO BE USED WHERE PROPOSED ASPHALT MEETS EXISTING ASPHALT AS PER DETAIL ON DRAWING D1. ALL JOINTS MUST BE SEALED AS PER DETAIL.

8. TRANSITIONS WITHIN THE SUBGRADE WITHIN 1.2M FROM THE TOP OF PAVEMENT SHOULD INCLUDE 3H:1V TRANSITIONS AS PER DETAIL ON DRAWING D1.

9. EMBANKMENTS TO BE SLOPED AT MAX. 3:1, UNLESS OTHERWISE SPECIFIED.

10. ALL PAVEMENT MARKING, LINE PAINTING, DIRECTIONAL LINES/ARROWS ETC. SHALL BE PLACED IN ACCORDANCE WITH THE ARCHITECTURAL SITE PLAN OR THE OWNER'S TRAFFIC ENGINEERING CONSULTANT'S DRAWINGS.

11. THE CONTRACTOR SHALL PROVIDE TO THE ENGINEER 1 (ONE) SET OF AS CONSTRUCTED SITE SERVICING AND GRADING DRAWINGS.

12. SECTION A-A INCLUDED ON SEPARATE FIGURE ENTITLED "FIGURE 7 - STORMWATER MANAGEMENT POND SECTION".

GENERAL NOTES:

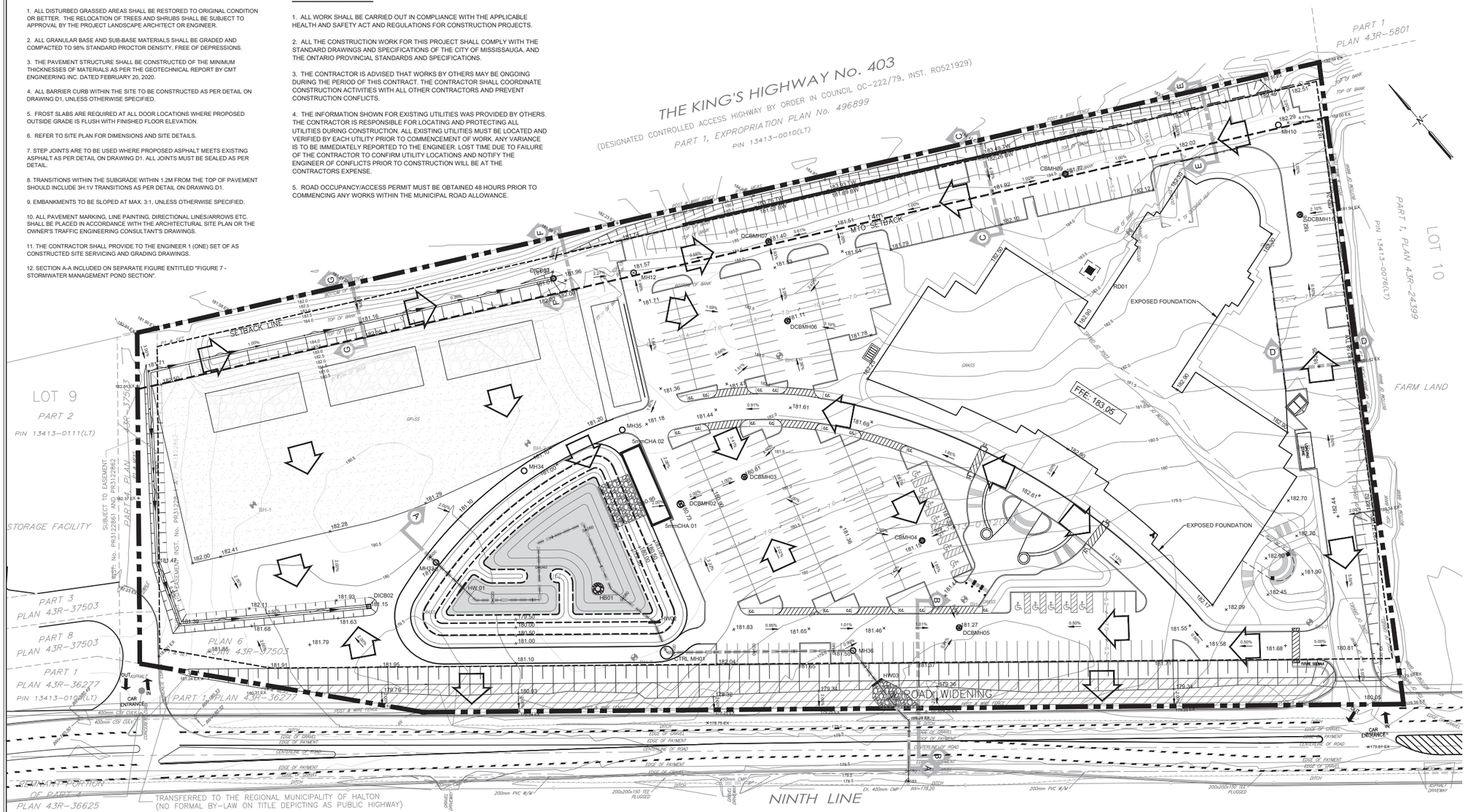
1. ALL WORK SHALL BE CARRIED OUT IN COMPLIANCE WITH THE APPLICABLE HEALTH AND SAFETY ACT AND REGULATIONS FOR CONSTRUCTION PROJECTS.

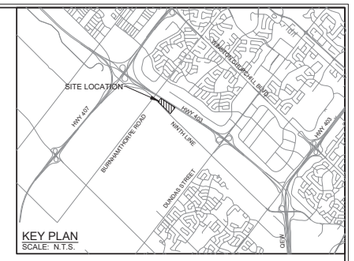
2. ALL THE CONSTRUCTION WORK FOR THIS PROJECT SHALL COMPLY WITH THE STANDARD DRAWINGS AND SPECIFICATIONS OF THE CITY OF MISSISSAUGA, AND THE ONTARIO PROVINCIAL STANDARDS AND SPECIFICATIONS.

3. THE CONTRACTOR IS ADVISED THAT WORKS BY OTHERS MAY BE ONGOING DURING THE PERIOD OF THIS CONTRACT. THE CONTRACTOR SHALL COORDINATE CONSTRUCTION ACTIVITIES WITH ALL OTHER CONTRACTORS AND PREVENT CONSTRUCTION CONFLICTS.

4. THE INFORMATION SHOWN FOR EXISTING UTILITIES WAS PROVIDED BY OTHERS. THE CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL UTILITIES DURING CONSTRUCTION. ALL EXISTING UTILITIES MUST BE LOCATED AND VERIFIED BY EACH UTILITY PRIOR TO COMMENCEMENT OF WORK. ANY VARIANCE IS TO BE IMMEDIATELY REPORTED TO THE ENGINEER. LOST TIME DUE TO FAILURE OF THE CONTRACTOR TO CONFIRM UTILITY LOCATIONS AND NOTIFY THE ENGINEER OF CONFLICTS PRIOR TO CONSTRUCTION WILL BE AT THE CONTRACTORS EXPENSE.

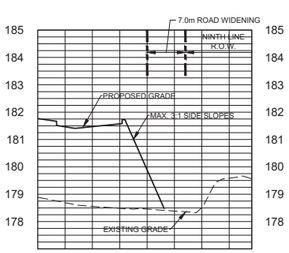
5. ROAD OCCUPANCY/ACCESS PERMIT MUST BE OBTAINED 48 HOURS PRIOR TO COMMENCING ANY WORKS WITHIN THE MUNICIPAL ROAD ALLOWANCE.



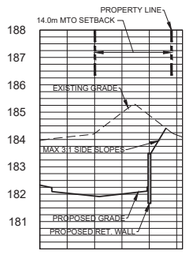


LEGEND

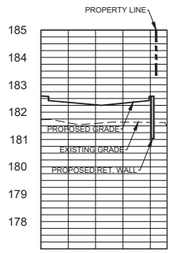
- PROPERTY BOUNDARY
- ADJACENT PROPERTY BOUNDARY
- EXISTING EASEMENT
- 180.0 — EXISTING MAJOR CONTOUR
- 180.5 — EXISTING MINOR CONTOUR
- EXISTING SETBACK LIMIT
- EXISTING 14m MTO SETBACK
- PROPOSED POND LIMITS
- PROPOSED RETAINING WALL
- PROPOSED RIPRAP
- BH — EXISTING BOREHOLE
- ×166.22 — PROPOSED GRADE
- PROPOSED STORM MANHOLE
- PROPOSED STORM DOUBLE CATCHBASIN MANHOLE,
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED DITCH INLET CATCHBASIN
- PROPOSED SWALE
- PROPOSED GRADING (3:1 MAX.)
- PROPOSED SLOPE ARROW



SECTION B-B
SCALE H1:500 V1:100



SECTION C-C
SCALE H1:500 V1:100



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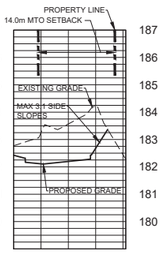

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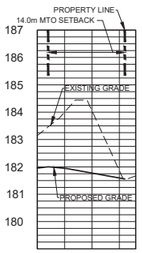

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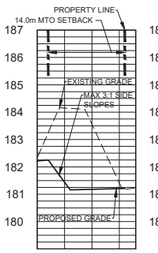

SECTION G-G
SCALE H1:500 V1:100

BENCHMARK
ELEVATIONS ARE REFERRED TO THE CANADIAN GEODETIC VERTICAL DATUM (CGVD-1928: PRE 1978) AND ARE DERIVED FROM CITY OF MISSISSAUGA BENCHMARK MONUMENT No. 1065, HAVING A PUBLISHED ELEVATION OF 178.912 METRES.

Notes
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No.	Issue / Revision	Date	Auth.
1	ISSUED FOR SITE PLAN APPROVAL	21/04/20	DN
2	RE-ISSUED FOR SITE PLAN APPROVAL	22/01/11	DN
3	RE-ISSUED FOR SITE PLAN APPROVAL	23/05/10	TR

LICENSED PROFESSIONAL ENGINEER S. J. ROORDA May 11, 2023 PROVINCE OF ONTARIO

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2188 ROBINWOOD COURT
MISSISSAUGA, ON
L5M 3B9

Drawing Title
NINTH LINE MISSISSAUGA

GRADING PLAN

Drawn	Checked	Designed	Checked	Date	Drawing No.
TR	SR	TR	SR	23/05/10	G1
Project No. 300044049		Contract No. CONTRACT NO.		Revision No. 0	
Scale 1:500		0 5.0 10.0 20.0 30.0m			

STORM AND SANITARY SEWER:

1. MANHOLES SHALL BE AS PER OPSD 701.010 AND OPSD 701.011; FRAMES AND COVERS SHALL BE AS PER OPSD 401.010. SAFETY PLATFORMS TO BE INSTALLED AS PER REGION OF PEEL STANDARDS 2-2-1 WHERE DEPTH EXCEEDS 5.0m.

2. SINGLE CATCH BASINS SHALL BE AS PER OPSD 705.010, WITH FRAMES AND COVERS AS PER OPSD 400.020. DOUBLE CATCH BASINS SHALL BE AS PER OPSD 705.020.

3. CONCRETE PIPE SEWER BEDDING SHALL BE AS PER OPSD 802.030. PVC PIPE SEWER BEDDING SHALL BE CLASS 'B' AS PER OPSD 802.030 TO TOP OF SEWER. NATIVE BACKFILL TO BE COMPACTED TO A MIN. 98% STANDARD PROCTOR DENSITY WITH A MINIMUM 300mm SAND COVER OVER PIPE.

4. ALL STORM SEWER PIPES UP TO 450mm DIA. SHALL BE PVC SDR-35 OR APPROVED EQUIVALENT. ALL STORM SEWER PIPES 525mm DIA. AND LARGER SHALL BE CONCRETE AND EQUAL TO C.S.A. SPECIFICATIONS A257.2 REINFORCED CLASSES AS SPECIFIED (65-D, 100-D, 140-D,) OR LATEST AMENDMENT UNLESS OTHERWISE SPECIFIED.

5. ALL SANITARY PVC SEWER PIPES SHALL BE SDR-35 EQUAL CSA SPECIFICATIONS B182.2-M 1990 OR LATEST AMENDMENT UNLESS OTHERWISE NOTED.

6. ALL MANHOLE AND CATCH BASIN EXCAVATIONS TO BE BACKFILLED WITH GRANULAR MATERIAL COMPACTED TO 98% STANDARD PROCTOR DENSITY.

7. ALL CATCH BASINS AND CATCH BASIN MANHOLES ARE TO INCLUDE SUBDRAIN TREATMENT AS PER DETAIL ON DRAWING D2.

8. ALL BLIND CONNECTIONS TO MATCH THE INVERT OF THE CATCH BASIN LEAD TO THE SPRINGLINE OF THE STORM PIPE. OTHERWISE INSTALL THE CATCH BASIN LEAD AT A MAXIMUM 2.00% AND DROP INTO PIPE.

9. UNLESS NOTED OTHERWISE, CATCH BASIN LEADS SHALL BE 250mmØ AT MINIMUM 1.00% SLOPE.

10. THE CONTRACTOR IS TO PROVIDE CCTV CAMERA INSPECTIONS OF ALL SANITARY AND STORM SEWERS, INCLUDING PICTORIAL REPORT AND TWO (2) CD COPIES IN A FORMAT SATISFACTORY TO THE ENGINEER. ALL SEWERS ARE TO BE FLUSHED PRIOR TO CAMERA INSPECTION.

GENERAL NOTES:

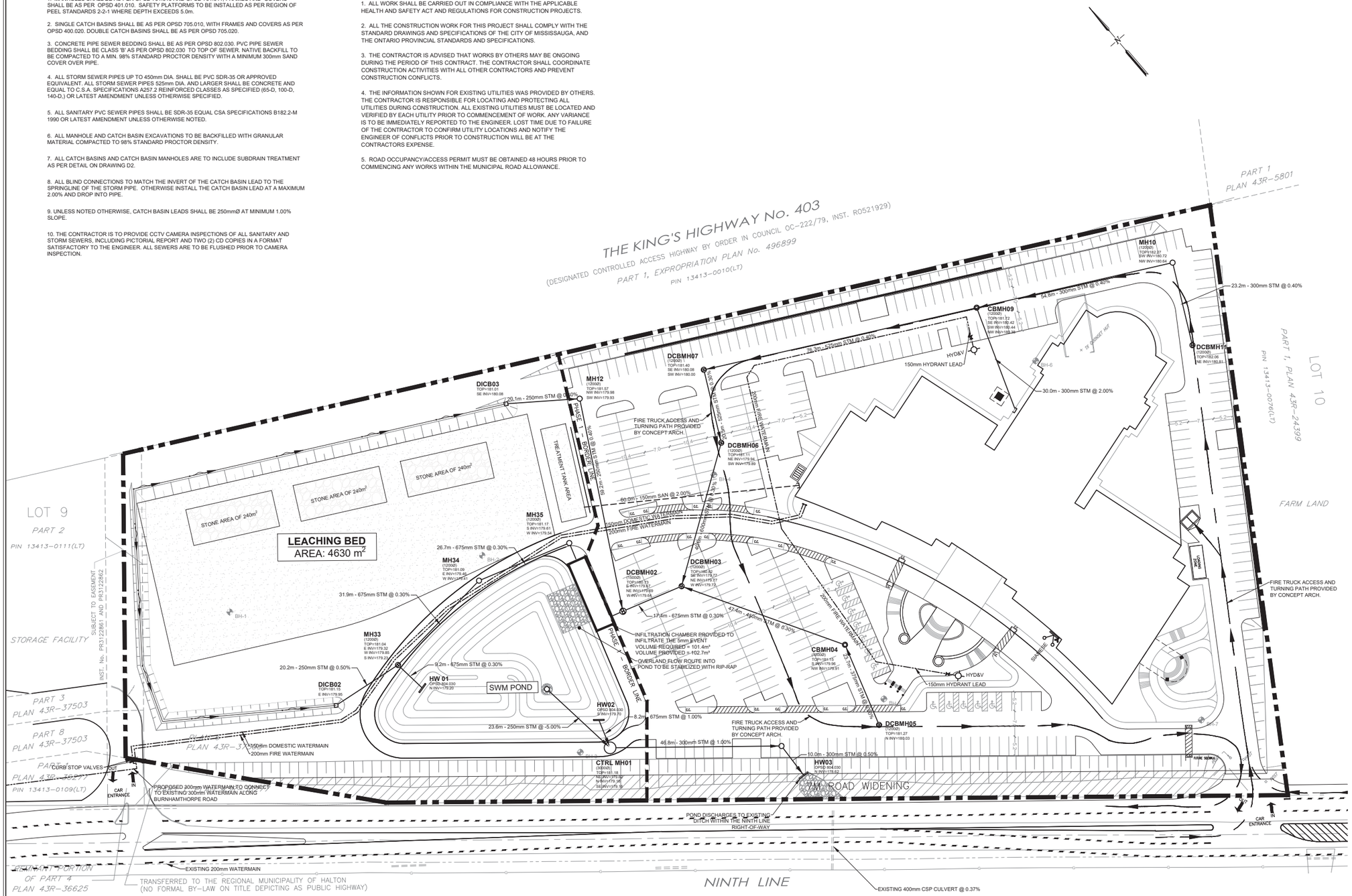
1. ALL WORK SHALL BE CARRIED OUT IN COMPLIANCE WITH THE APPLICABLE HEALTH AND SAFETY ACT AND REGULATIONS FOR CONSTRUCTION PROJECTS.

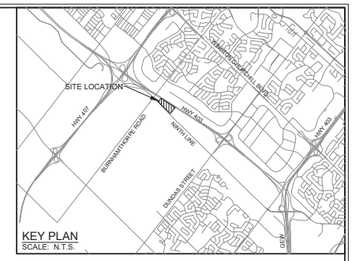
2. ALL THE CONSTRUCTION WORK FOR THIS PROJECT SHALL COMPLY WITH THE STANDARD DRAWINGS AND SPECIFICATIONS OF THE CITY OF MISSISSAUGA, AND THE ONTARIO PROVINCIAL STANDARDS AND SPECIFICATIONS.

3. THE CONTRACTOR IS ADVISED THAT WORKS BY OTHERS MAY BE ONGOING DURING THE PERIOD OF THIS CONTRACT. THE CONTRACTOR SHALL COORDINATE CONSTRUCTION ACTIVITIES WITH ALL OTHER CONTRACTORS AND PREVENT CONSTRUCTION CONFLICTS.

4. THE INFORMATION SHOWN FOR EXISTING UTILITIES WAS PROVIDED BY OTHERS. THE CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL UTILITIES DURING CONSTRUCTION. ALL EXISTING UTILITIES MUST BE LOCATED AND VERIFIED BY EACH UTILITY PRIOR TO COMMENCEMENT OF WORK. ANY VARIANCE IS TO BE IMMEDIATELY REPORTED TO THE ENGINEER. LOST TIME DUE TO FAILURE OF THE CONTRACTOR TO CONFIRM UTILITY LOCATIONS AND NOTIFY THE ENGINEER OF CONFLICTS PRIOR TO CONSTRUCTION WILL BE AT THE CONTRACTORS EXPENSE.

5. ROAD OCCUPANCY/ACCESS PERMIT MUST BE OBTAINED 48 HOURS PRIOR TO COMMENCING ANY WORKS WITHIN THE MUNICIPAL ROAD ALLOWANCE.





LEGEND

- PROPERTY BOUNDARY
- ADJACENT PROPERTY BOUNDARY
- EXISTING EASEMENT
- 180.0 — EXISTING MAJOR CONTOUR
- 180.5 — EXISTING MINOR CONTOUR
- EXISTING SETBACK LIMIT
- EXISTING 14m MTO SETBACK
- PROPOSED POND LIMITS
- PROPOSED RETAINING WALL
- PROPOSED RIPRAP
- BH — EXISTING BOREHOLE
- ×166.22 — PROPOSED GRADE
- PROPOSED STORM MANHOLE
- PROPOSED STORM DOUBLE CATCHBASIN MANHOLE,
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED DITCH INLET CATCHBASIN
- PROPOSED SANITARY SEWER
- EXISTING WATERMAIN
- PROPOSED WATERMAIN
- PROPOSED SIAMESE CONNECTION
- PROPOSED HYDRANT AND VALVE
- PROPOSED VALVE AND BOX

BENCHMARK
ELEVATIONS ARE REFERRED TO THE CANADIAN GEODETIC VERTICAL DATUM (CGVD-1928: PRE 1978) AND ARE DERIVED FROM CITY OF MISSISSAUGA BENCHMARK MONUMENT No. 1065, HAVING A PUBLISHED ELEVATION OF 178.912 METRES.

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No.	Issue / Revision	Date	Auth.
1	ISSUED FOR SITE PLAN APPROVAL	20/03/20	DN
2	RE-ISSUED FOR SITE PLAN APPROVAL	22/01/11	DN
3	RE-ISSUED FOR SITE PLAN APPROVAL	23/05/10	TR

LICENSED PROFESSIONAL ENGINEER S. J. ROORDA May 11, 2023 PROVINCE OF ONTARIO

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2188 ROBINWOOD COURT
MISSISSAUGA, ON
L5M 3B9

Drawing Title
NINTH LINE MISSISSAUGA

SERVICING PLAN

Drawn	Checked	Designed	Checked	Date	Drawing No.
TR	SR	TR	SR	23/05/10	S1
Project No. 300044049		Contract No. CONTRACT NO.		Revision No. 0	
Scale 1:500	0 5.0 10.0 20.0 30.0m				

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix A

Geotechnical Report

GEOTECHNICAL INVESTIGATION

PROPOSED CHURCH
NINTH LINE
MISSISSAUGA, ONTARIO

CMT Project 20-026.R01

Prepared for:

St. Mark and St. Demiana Coptic Orthodox Church

February 20, 2020

CMT ENGINEERING INC.

CMT Engineering Inc.
1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
Tel: 519-699-5775
Fax: 519-699-4664
www.cmtinc.net

February 20, 2020 20-026.R01

St. Mark and St. Demiana Coptic Orthodox Church
The Diocese of Mississauga, Vancouver and Western Canada
2188 Robinwood Court
Mississauga, Ontario
L5M 5B9

Dear Sir/Madame:

Re: Geotechnical Investigation
Proposed Church
Ninth Line, Mississauga

As requested, CMT Engineering Inc. conducted a geotechnical investigation at the above-referenced site, and we are pleased to present the enclosed report.

We trust that this information meets your present requirements and we thank you for allowing us to undertake this project. Should you have any questions, please do not hesitate to contact our office.

Yours truly,

FOR Shawn Wheatley, M.Eng.

ks

1cc: R.J. Burnside and Associates Limited - Angela Mason

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1.0 INTRODUCTION

The services of CMT Engineering Inc. (CMT Inc.) were retained by Ms. Angela Mason, M.Sc., P.Geo., of R.J. Burnside & Associates Limited, on behalf of the St. Mark and St. Demiana Coptic Orthodox Church, to conduct a geotechnical investigation for a proposed church building to be located at Ninth Line in Mississauga, Ontario. The geotechnical investigation was carried out in conjunction with a hydrogeology study completed by R.J. Burnside & Associates Limited, which will be provided under separate cover. The location of the site is shown on Drawing 1.

The purpose of the geotechnical investigation was to assess the existing soil and groundwater conditions encountered in the boreholes. Included in the assessment are the soil classification and groundwater observations, as well as comments and recommendations regarding geotechnical resistance (bearing capacity); serviceability limit states (anticipated settlement); dewatering considerations; site classification for seismic site response; recommendations for site grading, site servicing, excavations and backfilling, recommendations for slab-on-grade construction; pavement design/drainage; soil design properties; storm water infiltration, and a summary of the laboratory results.

2.0 EXISTING SITE CONDITIONS

The site is currently primarily used for agricultural crop production. An unpaved parking area and temporary work/storage area for lumber currently exists at the east side of the property. The site has undulating topography, with a range in elevation of approximately 4.5 m across the borehole locations. The site is bounded by Ninth Line to the south, Highway 403 to the north, a commercial storage facility to the west, and vacant land to the east.

3.0 FIELD AND LABORATORY PROCEDURES

Prior to the commencement of the field drilling program, ON1Call locates were organized by CMT Inc. to ensure that underground utilities would not be damaged.

The field investigation was conducted on February 10 and February 12, 2020, and comprised the advancement of seven (7) boreholes (referenced as Boreholes 1 to 7), utilizing a Geoprobe 7822DT drillrig operated by employees of CMT Drilling Inc.

The borehole depths ranged from approximately 4.57 m (15.0 ft) to 7.62 m (25.0 ft) below the existing ground surface elevations as directed by R.J. Burnside & Associates Limited. Standard penetration testing (SPT) and sampling was carried out in all boreholes using 38 mm inside diameter split spoon sampling equipment and an automatic hammer, in accordance with ASTM D 1586 "Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils". SPT soil sampling was generally conducted at 0.76 m (2.5 ft) intervals to approximately 3.0 m (10.0 ft) and about every 1.52 m (5.0 ft) thereafter to borehole termination. Macro core (MC5) soil sampling was conducted between the deeper SPT samples in the majority of the

boreholes. Technical staff from CMT Inc. observed the drilling operation and collected and logged the recovered soil samples. A small portion of each sample was placed in a sealed, marked jar for moisture content determinations.

As requested, representative samples from the following boreholes and depths were submitted to our laboratory for grain size analyses:

- Borehole 1 – approximate depth 0.76 m to 1.37 m (2.5 ft to 4.5 ft)
- Borehole 2 - approximate depth 1.52 m to 2.13 m (5.0 ft to 7.0 ft)
- Borehole 4 - approximate depth 3.66 m to 4.57 m (12.0 ft to 15.0 ft)
- Borehole 6 - approximate depth 3.05 m to 3.66 m (10.0 ft to 12.0 ft)

The borehole logs are provided in Appendix A and the resulting grain size analyses can be found in Appendix B.

CMT Inc. may be contacted for additional laboratory testing on samples should it be required. Samples are typically kept for three months, unless other arrangements are made.

Boreholes 1, 5 and 6 were equipped with 50 mm diameter PVC monitoring wells comprising a 1.5 m long prepacked screen backfilled with #2 sand filter and then riser pipe, backfilled with bentonite. The monitoring wells were installed according with the Ontario Water Resources Act, Regulation 903 (O.Reg. 903) by well technicians licensed by the Ministry of the Environment, Conservation and Parks (MECP), working for a contractor also licensed by the MECP. The monitoring wells are registered with the MECP and must be decommissioned in accordance with O.Reg. 903 prior to future construction. The well log records are provided in Appendix C.

CMT Inc. surveyed the ground surface elevations at the borehole locations (using laser survey equipment) on February 12, 2020. A geodetic monument, located immediately west of the intersection of Ninth Line and Burnhamthorpe Road, was used as a benchmark with a reported elevation of 181.90 m above sea level. The ground surface elevations at the borehole locations ranged from about 177.84 m to 182.49 m. The locations of the boreholes are shown on Drawing 2.

4.0 SUBSOIL CONDITIONS

The soils encountered in the boreholes are described briefly below and a more detailed stratigraphic description is provided on the borehole logs in Appendix A. The following paragraphs have been simplified into terms of major soil strata. The soil boundaries indicated have been inferred from non-continuous samples and observations of sampling and drilling resistance and typically represent transitions from one soil type to another rather than exact planes of geological change. Further, the subsurface conditions are anticipated to vary between and beyond the borehole locations.

4.1. Topsoil

Very loose to loose, dark brown, silty, organic topsoil was encountered at the surface of all boreholes. The topsoil was considered to be in a moist state. The topsoil ranged in thickness from approximately 50 mm to 120 mm (average 90 mm) at the borehole locations. Given the variation in topsoil thicknesses at the borehole locations, and the undulating nature of the topography, some variance in the topsoil thickness should be expected outside of the sampled areas. It would be expected that topsoil thicknesses would be thinner on the hill tops, with more significant accumulation expected in the low-lying areas. Materials designated as topsoil in this report were classified based solely on visual and textural evidence. Testing of organic content or for other nutrients was not carried out. Therefore, materials classified herein as topsoil cannot necessarily be relied upon for support and growth of landscaping vegetation without supplemental soil nutrient analyses.

4.2. Clayey Silt

Brown to grey, clayey silt, clay and silt, or clayey sandy silt, with some sand and up to some gravel, was encountered underlying the topsoil in all boreholes. The clayey silt immediately underlying the topsoil was observed to be mottled red, brown and dark brown, and contained trace amounts of organic material from root structures. The clayey silt was considered to be very soft to hard, with SPT N-values ranging from 1 to in excess of 100 blows per 0.3 m (average 28 blows per 0.3 m). Typically, the soft to firm clayey silt was encountered directly underlying the topsoil. It is expected that this material has become loosened/soft from frost action and may require further inspection and remedial action (further compactive effort) at the time of construction, if it will be intended to be utilized during site grading. The clayey silt was considered to be moist, with moisture contents ranging from about 8.5% to 29.9% (average 14.5%).

4.3. Sand

Brown to grey sand with trace to some gravel and silt, and up to trace amounts of clay was encountered underlying the clayey silt in Boreholes 1 and 6, underlying the silt till in Borehole 2, and underlying the sandy clayey silt till in Boreholes 1 and 6. The sand was considered to be dense to very dense, with SPT N-values ranging from 44 to in excess of 100 blows per 0.3 m (average 72 blows per 0.3 m). The sand was considered to be moist to wet, with moisture contents ranging from about 10.0% to 20.9% (average 17.7%).

4.4. Sandy Clayey Silt Till

Brown to grey sandy clayey silt till with trace to some gravel was encountered underlying the sand in Borehole 1, underlying the silt till in Boreholes 3 and 6, as well as underlying the clayey silt in Boreholes 4 and 5. The sandy clayey silt till was considered to be dense

to very dense, with SPT N-values ranging from 36 to in excess of 100 blows per 0.3 m (average 66 blows per 0.3 m). The sandy clayey silt till was observed to be moist to wet, with moisture contents ranging from about 9.4% to 13.8% (average 11.1%).

4.5. Silt Till

Brown to grey silt till with some sand and clay, and up to trace amounts of gravel was encountered underlying the clayey silt in Boreholes 2, 3 and 7, underlying the sandy clayey silt till in Boreholes 4 and 5, as well as underlying the sand in Borehole 6. The silt till was considered to be compact to very dense, with SPT N-values ranging from 28 to in excess of 100 blows per 0.3 m (average 67 blows per 0.3 m). The sandy clayey silt till was observed to be moist to wet, with moisture contents ranging from about 7.6% to 24.4% (average 12.5%).

4.6. Groundwater

Boreholes 1, 5 and 6 were equipped with monitoring wells. The monitoring wells were installed and registered in accordance with the Ontario Water Resources Act, Regulation 903 (O.Reg. 903) by well technicians licensed by the Ministry of the Environment (MOE), working for a contractor also licensed by the MOE. The boreholes that were not instrumented with a monitoring well were backfilled with bentonite in accordance with O.Reg. 903.

CMT Engineering Inc. staff measured the water levels in the wells on February 12, 2020. The following table summarizes the borehole number, ground surface elevation, elevation of water in the monitoring well upon completion of drilling, cave elevation, and the bottom of borehole elevation for each borehole:

Borehole No.	Ground Surface Elevation (m)	Measured Elevation of Water in Monitoring Well February 12, 2020 (m)	Measured Elevation of Water in Open Borehole (m)	Cave Elevation (m)	Bottom of Borehole Elevation (m)
1	179.66	177.92	--	--	172.04
2	179.52	--	176.78	176.47	174.95
3	180.13	--	175.41	175.10	174.95
4	182.49	--	--	177.82	177.31
5	177.84	177.69	--	--	171.74

Borehole No.	Ground Surface Elevation (m)	Measured Elevation of Water in Monitoring Well February 12, 2020 (m)	Measured Elevation of Water in Open Borehole (m)	Cave Elevation (m)	Bottom of Borehole Elevation (m)
6	181.68	177.41	--	--	174.06
7	179.02	--	--	--	173.84

It should be noted that the hard and/or fine-grained, less permeable clayey silt, sandy clayey silt till, and silt till soils have the potential to create perched water conditions. Groundwater conditions are generally dependent on the amount of precipitation, control of surface water, as well as the time of year, and can fluctuate significantly in elevation and volume. As such, provisions for site dewatering should be part of the site development and construction process. Recommendations with respect to dewatering conditions are provided in Section 5.8 of this report.

5.0 DISCUSSION AND RECOMMENDATIONS

This section of the report provides CMT Inc.'s interpretation of the factual geotechnical data obtained during the investigation and is intended for the guidance of the owner and design engineer. Where comments are made on construction, they are provided only to highlight those aspects which could affect the design of the project. Contractors bidding on or undertaking the work should make their own independent interpretation of the factual subsurface information provided as it affects their proposed construction means and methods, equipment selection, scheduling, pricing, and the like.

Utilizing the information gathered during the geotechnical investigation and assuming that the borehole information is representative of the subsoil conditions throughout the site, the following comments and recommendations are provided.

5.1. Serviceability and Ultimate Limit Pressure

Based on the information obtained from the boreholes, the following table provides the estimated geotechnical reaction at the Serviceability Limit States (SLS) and factored geotechnical resistance Ultimate Limit States (ULS) pressures at the various elevations, including soil types:

Borehole No.	Ground Surface Elevation (m)	SLS kPa (psf)	ULS kPa (psf)	Estimated Highest Founding Elevation (m)	Depth to Highest Founding Elevation (m)	Soil Type
1	179.66	150 (3,000)	225 (4,500)	178.90 to 172.04 (termination)	0.76	Clay and Silt/Sand/Sandy Clayey Silt Till
2	179.52	150 (3,000)	225 (4,500)	178.00 to 174.95 (termination)	1.52	Clayey Sandy Silt/Silt Till/Sand
3	180.13	150 (3,000)	225 (4,500)	179.37 to 174.95 (termination)	0.76	Clayey Silt/Silt Till/Sandy Clayey Silt Till
4	182.49	150 (3,000)	225 (4,500)	181.73 to 177.31 (termination)	0.76	Clayey Silt/Sandy Clayey Silt Till/ Silt Till
5	177.84	150 (3,000)	225 (4,500)	177.08 to 171.74 (termination)	0.76	Clayey Silt/Sandy Clayey Silt Till/Silt Till
6	181.68	150 (3,000)	225 (4,500)	180.92 to 174.06 (termination)	0.76	Clayey Silt/Sand/Silt Till/Sandy Clayey Silt Till
7	179.02	150 (3,000)	225 (4,500)	178.26 to 173.84 (termination)	0.76	Clayey Silt/Silt Till

Should footings be designed to be constructed at elevations higher than the elevations indicated in the table above, then structural fill will be required in order to achieve the design grades for the proposed foundations. The serviceability limit pressure for structural fill placed and compacted in accordance with Section 5.4.3 of this report and constructed on approved competent native soils is estimated to be at least 150 kPa (3,000 psf) at SLS and 225 kPa (4,500 psf) at ULS. Alternatively, footings could be stepped down to bear on approved undisturbed founding soils.

Footings may be placed at a higher elevation relative to another footing provided that the slope between the outside face of the footings is separated by a minimum slope of 10 horizontal to 7 vertical (10H:7V) with an imaginary line projected from the underside of the footings. This must be taken into account for any deep structures such as sump pits.

With respect to the Serviceability Limit State (SLS), the total and differential footing settlements are not expected to exceed the generally acceptable limits of 25 mm (1") and 19 mm (3/4") respectively.

All exterior footings must be provided with a minimum of 1.2 m of soil cover or equivalent thermal insulation (sufficient thermal insulation is required to protect all footings and slab-on-grades during construction until such a time that the structure is heated) in order to provide protection from frost action.

It should be noted that the native soils that exist at or below founding elevations may be in a wet/saturated state and may be too wet to provide suitable bearing for foundations without construction of a mud mat or granular drainage layer. It is imperative that the subgrade soils be inspected and approved by competent geotechnical personnel to ensure that the founding soils are suitable for bearing. Dewatering during construction may be required (see Section 5.8 of this report), along with the potential construction of a mud mat or granular drainage layer.

At the time of investigation, the proposed founding elevations were not available. CMT Inc. would be pleased to review design drawings when they become available and provide further recommendations with respect to bearing and foundation elevations.

5.2. Seismic Site Classification

The site classification for seismic response in Table 4.1.8.4 of the 2012 Ontario Building Code relates to the average properties of the upper 30 m of strata. The information obtained in the geotechnical field investigation was gathered from the upper 4.57 m to 7.62 m of strata. Based on the information gathered in the geotechnical field investigation, the site classification for seismic site response would be considered Site Class D (stiff soils) for structures founded on the native soils at the recommended founding elevations provided in Section 5.1 of this report. For foundations constructed on structural fill, placed in accordance with Section 5.4.3 of this report, the site classification for seismic site response would be considered Site Class D (stiff soil). The structural engineer responsible for the design of the structure should review the earthquake loads and effects.

5.3. Soil Design Parameters

The following table provides the estimated soil design parameters for imported granular fill, as well as the native soils encountered on-site.

The estimated soil design parameters can be utilized for the design of perimeter shoring, foundations and retaining walls, as required:

Soil Type	Soil Density (kg/m^3)	Friction Angle (Degree)	Coefficient of Active Pressure (K_a)	Coefficient of Passive Pressure (K_p)	Coefficient of At-Rest Pressure (K_o)	Coefficient of Friction (μ)	Cohesion (kPa)
Imported Gran 'A'/Gran 'B' (OPSS 1010)	2,100	34°	0.28	3.54	0.44	0.45	0
Clayey Silt	1,850	30°	0.33	3.00	0.50	0.38	10
Sand	1,800	33°	0.29	3.39	0.46	0.43	0
Sandy Clayey Silt Till	1,850	32°	0.31	3.25	0.41	0.41	5
Silt Till	1,900	33°	0.29	3.39	0.46	0.43	0

5.4. Site Preparation

The site preparation for the proposed church is anticipated to include topsoil stripping, vegetation grubbing, the subexcavation of all relatively loose/soft native soils deemed not capable of supporting the design bearing capacity, the removal or relocation of any existing services (field tiles), followed by the placement of structural fill (as required) and site grading to achieve proposed grades.

5.4.1. Topsoil Stripping/Vegetation Grubbing

Due to the undulating topography and erosion, it should be expected that the thickness of topsoil may vary significantly throughout the site.

All existing topsoil, vegetation (including tree roots and all loose/disturbed soils associated with tree roots) must be removed from within the proposed building envelopes, driveways and parking lots to expose approved competent subgrade soils. The topsoil may be used in landscaped areas where some settlement can be tolerated; otherwise, it should be properly disposed of off-site.

Swelling and shrinkage factors of topsoil during site grading operations is generally relative to the insitu density and moisture content at the time of construction, as well as the type of equipment utilized and the compactive effort that the topsoil is subjected to during stockpiling and the subsequent placement during the final grading process. When topsoil is stripped and then placed in

stockpiles with heavy earthmoving equipment such as motor scrapers or rock trucks and bulldozers, it tends to compact considerably in the stockpile. As previously indicated, the amount of compaction is generally relative to the weight of the equipment utilized, the number of passes that the equipment makes over the stockpiled topsoil, as well as the moisture content of the topsoil at the time of construction. Therefore, the swelling and shrinkage factors can vary significantly. Determination of swelling and shrinkage factors would require considerable laboratory testing throughout the construction process in order to provide an average that may be considered reasonable for quantity calculations. A frequently used practice to determine stripped quantities of topsoil would be to do a topographic survey prior to and following the stripping process. Due to the typical relatively loose insitu state of the topsoil, it should be expected that compacted volumes (when the topsoil is put back down) will be considerably less (again relative to the type and weight of equipment, the number of passes and the moisture content at the time of construction) than in the insitu state.

The volume of topsoil removed during the stripping process is also relative to the equipment utilized for the stripping process as well as the moisture conditions at the time of stripping. If an excavator with a smooth bucket is utilized for stripping, there would generally be less potential for topsoil to become intermixed with the underlying relatively loose subsoil and therefore less concern of over-excavation to remove all topsoil. If the topsoil is stripped with wheeled equipment or bulldozers, then there is an increased potential for the topsoil and subsoil to become intermixed, subsequently requiring additional excavation to remove all topsoil. This is further influenced by rutting which can occur during wet conditions.

It should also be noted that the clayey silt soils that were encountered directly underlying the topsoil are likely in a soft to firm state and may not be suitable to support foundations in their current state. As such, the upper clayey silt soils may require reworking with further compactive effort; otherwise these soils will require subexcavation to expose competent approved native mineral soils. This material will also be subjected to significant volume changes during the construction process.

5.4.2. Removal/Relocation of Existing Services

Any existing tile drains (field tiles or municipal tile drains) that may be located within the proposed building envelopes, driveways or parking lots must be completely removed to a minimum distance of 15.0 m (50.0 ft) outside of the construction envelopes. All drains that are terminated must be completely sealed with concrete or grout at termination points to prevent the migration of soils into pipe voids which may result in potential settlement. Ideally, depending on flow direction, any existing tile drains (if present) should be redirected and reconnected outside of the building envelopes in order to maintain flow and prevent subsurface

accumulation of water. It may be prudent (if feasible) to incorporate existing field tiles into the storm sewer system or a separate collection system, to assist in systematically draining the subsurface soils in the church building. All existing trench backfill material associated with the drains must be subexcavated and the subsequent excavation must be backfilled with approved soils placed in accordance with Section 5.4.3 of this report. The location of existing field tiles is commonly identified by lines of buried topsoil within the subgrade soils and/or water boiling out of the ground following excavation. The field tiles are historically installed at 15.0 m (50.0 ft) intervals, however this can vary from site to site.

The monitoring wells that have been installed as a part of this investigation can be decommissioned by an MECP licensed well contractor with a Class 1, Class 2 or Class 3 license in accordance with Reg. 903.

5.4.3. Site Grading

Currently, there are no design grades available. However, based on the existing grades and topography, it is expected that significant cut and fill operations will be required to achieve the final design elevations across the site.

Following stripping of the topsoil, the removal of all trees roots (including all relatively loose soils associated with the tree roots), as well as the subexcavation of any relatively soft native soils deemed unsuitable of supporting the design bearing capacity, the exposed subgrade must be proof-rolled, and any soft or unstable areas must be further subexcavated and replaced with approved fill materials. Any fill materials required to achieve the design site grades should be placed according to the following procedures:

- Should the native subgrade soils at the design founding elevation in the proposed building envelope comprise wet or saturated soils, as was observed in some of the boreholes, then a granular drainage layer, constructed in accordance with Section 9.14.4 of the current Ontario Building Code (OBC) may be required. Alternatively, a lean mix concrete mud mat may be poured overlying the subgrade soils to provide a stable base;

- Prior to placement of any structural fill or bulk fill, the subgrade for the proposed buildings, driveways and roads must be prepared large enough to accommodate a 1:1 slope commencing a distance of 1.0 m beyond the outside edge of the proposed foundation and pavement/concrete edge down to the approved competent founding soils;

- Soils approved for use as structural fill must be placed in loose lifts not exceeding 0.3 m (12") in depth for granular soils (recommended fill material) and 0.2 m (8") in depth for silts and clays, or the capacity of the compactor (whichever is less);

- Imported granular fill materials (OPSS 1010 Type III Granular 'B' recommended for this application) can be compacted utilizing adequate heavy vibratory smooth drum compaction equipment;

- Fine-grained silt and clay soils (not recommended) must be compacted utilizing adequate heavy padfoot vibratory compaction equipment;

- Approved fill materials must be at suitable moisture contents to achieve the specified compaction. The wet to saturated soils encountered in the boreholes would generally be considered difficult for use as structural fill as they would require extensive air-drying in order to achieve the specified density. Soil moisture will also be dependent on weather conditions at the time of construction. Granular soils may require the addition of water in order to achieve the specified compaction;

- Approved structural fill materials that will support structures (including foundations, interior slab-on-grades, sidewalks, large expansive exterior slabs) must be compacted to a minimum of 98% standard Proctor maximum dry density (SPMDD);

- Approved bulk fill (exterior foundation wall backfill in landscaped areas, bulk fill for roadway (including sidewalk subgrade) and driveways) must be compacted to a minimum 95% SPMDD;

- Granular 'B' subbase and Granular 'A' base materials for the roads and driveways must be compacted to 100% SPMDD;

- It is recommended that compactive effort be applied to bulk fill in landscaped areas in order to reduce the effects of long-term settlement.

Based on the subsurface conditions observed in the boreholes, wet soils may be encountered, depending on the depth of excavation. As such, for soils excavated from the zone of saturation, significant air-drying along with working of the soils may be required in order to achieve the specified compaction of 98% SPMDD for structural fill and 95% SPMDD for bulk fill for the parking lot and driveways. Utilizing the existing soils during site grading may be more achievable if work is completed during the generally drier summer months. Reuse of excavated soils on-site will be subject to approval from qualified geotechnical personnel.

It should also be noted that the native soils encountered in the lower zone of the boreholes typically became very dense/hard with depth (SPT N-values in excess of 50 blows per 0.3 m) and may prove difficult to excavate with conventional excavating equipment. It is imperative that if the very dense/hard soils are utilized as fill, the material must be broken down (pulverized) to minimize void space and reduce the potential for settlement. Problems associated with compacting very dense/hard soils include the potential for long-term settlement due to excessive void space caused by the generally blocky structure of the excavated soils. As such, the very dense, blocky material must **not** be used as structural fill. The contractor must have equipment on-site that can effectively break down (pulverize) the very dense excavated soil into workable sizes (as required). Backfilling utilizing this material must be performed in thin lifts with considerable compactive effort applied, thereby reducing the void space and minimizing long-term settlement. This process could be difficult and time-consuming.

5.5. Foundation Subgrade Preparation

The native soils encountered in the boreholes are sensitive to changes in moisture content and can become loose/soft if the soils are subjected to additional water or precipitation, as well as severe drying conditions. The native subgrade soils could also be easily disturbed if traveled on during construction. Once they become disturbed, they are no longer considered adequate for the support of shallow foundations. To ensure and protect the integrity of the founding soils during construction operations, the following is recommended:

- During construction, the subgrade should be sloped or ditched to a sump located outside the building footprint in the excavation to promote surface drainage of rainwater or seepage and the collected water should be pumped out of the excavation. The environmental consultant must be consulted prior to any on-site water being pumped and/or discharged to municipal outlets to ensure that proper procedures are followed. It is critical that all water be controlled (not allowed to pond) and that the subgrade and foundation preparation commence in dry conditions;

- Should the native subgrade soils at the design founding elevation in the proposed building envelope(s) comprise saturated soils, as was observed in some of the boreholes, then a granular drainage layer, constructed in accordance with Section 9.14.4 of the current Ontario Building Code (OBC) may be required;

- Construction equipment travel and foot traffic on the founding soils should be minimized;

- If construction is to be undertaken during subzero weather conditions, the founding native soils and any potential fill materials must be maintained above freezing;

- Prior to pouring concrete for the foundations, the founding soils must be cleaned of all disturbed or caved materials;

- The foundation formwork and concrete should be installed as soon as practical following the excavation, inspection and approval of the founding soils. The longer that the excavated soils remain open to weather conditions and groundwater seepage, the greater the potential for construction problems to occur;

- If it is expected that the founding soils will be left open to exposure for an extended period of time, it is recommended that a 75 mm concrete mud slab be poured in order to protect the structural integrity of the founding soils.

5.6. Slab-on-Grade/Modulus of Subgrade Reaction

Prior to the placement of the granular base for the slab-on-grade construction, the subgrade soils should be proof-rolled. Any soft or weak zones, as well as any potential unsuitable fill in the subgrade (field tile trenches), should be subexcavated and backfilled with approved fill materials (see Section 5.4.3 of this report).

The following table provides the estimated modulus of subgrade reaction (k) for imported granular fill, as well as the native soils encountered on-site:

Soil Type	Modulus of Subgrade Reaction (k)
Imported Sand and Gravel (OPSS 1010)	81,000 kN/m^3 (300 lb/in^3)
Clayey silt	40,000 kN/m^3 (150 lb/in^3)
Sand	40,000 kN/m^3 (150 lb/in^3)
Sandy Clayey Silt Till	47,000 kN/m^3 (175 lb/in^3)
Silt Till	47,000 kN/m^3 (175 lb/in^3)

In dry conditions, the floor slab can be founded on a minimum thickness of 150 mm (6") of Granular 'A' (OPSS 1010) and compacted to 100% SPMDD. Alternatively (particularly in wet conditions), 150 mm (6") of 19 mm clear crushed stone (OPSS 1004) should be used instead of Granular 'A'. Compactive effort should be utilized to consolidate the clear stone.

It is recommended that areas of extensive exterior slab-on-grade (sidewalks, accessibility ramps and exterior stairs) be constructed with a Granular 'B' subbase (450 mm) and a Granular 'A' base (150 mm), as well as incorporating subdrains, to provide rapid drainage and reduce the effects of frost heaving. This is particularly critical at barrier-free access points. Alternatively, a structural frost slab or thermal insulation could be designed and constructed at door entrances.

5.7. Excavations

All excavations must be carried out in accordance with Ontario Regulation 213/91 (Reg 213/91) of the Occupational Health and Safety Act and Regulations for Construction Projects.

Type 2 Soils - In general, the hard or very dense native clayey silt, silt till, and sandy clayey silt till encountered in a drained state (not wet or saturated), would be classified as Type 2 soils under Reg 213/91. The Type 2 soils must be sloped to within 1.2 m of its bottom with a slope having a minimum gradient of 1 horizontal to 1 vertical. Soils underlain by Type 3 or Type 4 soils that are exposed in the excavation must be treated accordingly as Type 3 or Type 4 soils (see below). Soils in a saturated condition (if encountered) must be treated as Type 4 soils, addressed below.

Type 3 Soils - In general, the native sand, and any fill soils encountered in a drained state (not wet or saturated), would be classified as Type 3 soils under Reg 213/91. The Type 3 soils must be sloped from the bottom of the excavation at a minimum gradient of 1 horizontal to 1 vertical. All saturated soils encountered must be treated as Type 4 soils, as described below.

Type 4 Soils - In general, any wet to saturated soils would be classified as Type 4 soils under Reg 213/91. Type 4 soils must be sloped from the bottom of the excavation at a minimum gradient of 3 horizontal to 1 vertical.

If it is not practical to excavate according to the above requirements, then a trench support system (designed in accordance with the Ontario Health and Safety Act Regulations) may be utilized. When using a temporary trench support system consisting of trench boxes to reduce the lateral extent of the excavations, it should be noted that the support system is intended primarily to protect workers as opposed to controlling lateral soil movement. Any voids between the excavation walls and the support system should be immediately filled to reduce the potential for loss of ground and to provide support to existing adjacent utilities and roadways, and it is recommended that the excavation be carried out in short sections, with the support system installed immediately upon excavation completion.

As previously noted, the native clayey silt, silt and clay/clay and silt, and silt soils encountered in the lower zone of Boreholes 4, 5 and 6 became very dense/hard with depth (SPT N-values in excess of 50 blows per 0.3 m) and may prove difficult to

excavate with conventional excavating equipment, impacting the production schedule. It is imperative that when the very dense/hard soils are utilized as fill, the material must be broken down (pulverized) to minimize void space and reduce the potential for settlement.

5.8. Construction Dewatering Considerations

Wet to saturated soils were encountered in Boreholes 1 to 6, as described in Section 4.6 of this report. The relatively impermeable fine-grained, hard/very dense, clayey silt, silt till, as well as the sandy clayey silt till observed in the lower zone of the boreholes, may have the potential to create perched water conditions.

Seepage control requirements and groundwater conditions during construction are generally dependent on the amount of precipitation, control of surface water, the time of year, the area of work on the site, the depth of the excavations, and can fluctuate significantly in elevation and volume. As such, it is critical that provisions for site dewatering be part of the site development and construction process. As required, seepage should generally be adequately controlled using conventional construction dewatering techniques such as pumping from sump pits. However, if heavy seepage occurs, it may be necessary to increase the number of pumps during construction.

Dewatering should be performed in accordance with OPSS 517 and the control of water must be in accordance with OPSS 518. It is the responsibility of the contractor to propose a suitable dewatering system based on the groundwater elevation at the time of construction. Collected water should discharge a sufficient distance away from the excavation to prevent re-entry. Sediment control measures must be installed at the discharge point of the dewatering system to avoid any potential adverse impacts on the environment.

It is recommended that R.J. Burnside & Associates Limited be consulted prior to any on-site water being discharged to municipal outlets to ensure that proper procedures are followed.

5.9. Service Pipe Bedding

It is expected that the native soils encountered in the geotechnical investigation will be in a saturated state and therefore it is expected that it will be necessary to increase the thickness of the granular base and utilize 19 mm clear stone to create an adequate supporting base for the service pipes and/or manholes and catch basin structures. As such, it is recommended that provisions for extra pipe bedding and clear stone be part of the project tendering and construction process. The general contractor is responsible to protect service piping from damage by heavy equipment. Pipe embedment, cover and backfill for both flexible and rigid pipes should be in accordance with all current and applicable OPSS, OPSD, and OBC standards and guidelines, and as follows:

Flexible Pipes – The pipe bedding should be shaped to receive the bottom of the pipe. If necessary, pipe culvert frost treatment should be undertaken in accordance with OPSD-803.030 and OPSD-803.031. The trench excavations should be symmetrical with respect to the centreline of the pipe. The granular material placed under the haunches of the pipe must be compacted to 95% SPMDD prior to the continued placement and compaction of the embedment material. The homogeneous granular material used for embedment should be placed and compacted uniformly around the pipe. Should wet conditions be encountered at the base of the trench, the pipe bedding should consist of 19 mm clear crushed stone (meeting OPSS 1004 specifications). Normally, it would be recommended to wrap the clear crushed stone with geotextile to prevent fine soils from entering the clear stone and thereby creating voids around the pipe. However, in the saturated conditions expected, it is not typically feasible to wrap the clear stone, nor is it necessary, as the void space is quickly filled with fine soils as water (with suspended fine soils) rapidly enters the excavation.

Rigid Pipes - In general, the pipe installation recommendations for rigid pipes are the same as those for flexible pipes, except that the minimum bedding depth below a rigid pipe should be $0.15D$ (where D is the pipe diameter). In no case should this dimension be less than 150 mm or greater than 300 mm.

5.10. Perimeter Building Drainage, Foundation Wall Backfill and Trench Backfill

In order to assist in maintaining a dry building with respect to surface water seepage, it is recommended that exterior grades around the buildings be sloped down and away at a 2% gradient or more, for a distance of at least 1.5 m to 2.0 m (depending on side yard setbacks). Any surface discharge rainwater leaders must be constructed with solid piping that discharges with positive drainage at least 1.5 m away from building foundations and/or beyond sidewalks to a drainage swale or appropriate storm drainage system.

The founding elevations for the proposed structures were not available at the time of preparation of this report. CMT Inc. can provide further recommendations for building drainage once the design drawings are completed and the founding elevations have been confirmed.

It should be noted that based on the observations in the boreholes, there is potential for perched water conditions. The construction of foundations, slabs-on-grade, and deep structures such as sump pits within or below zones of saturation will require design of site-specific waterproofing systems constructed in accordance with the 2012 OBC. If required, it would be recommended that a waterproofing supplier/specialist be consulted to recommend an appropriate product and installation requirements that would be suited to this site. It is recommended that a good quality sump pump be utilized, and that the system be equipped with a battery backup in the event of power failure, (keeping in mind that a battery backup system does not typically have a long run time).

It is anticipated that the new building will have a basement level. An exterior perimeter weeping tile system comprising perforated drainage pipe with a factory installed filter sock, bedded in 19 mm clear crushed stone and wrapped in geotextile filter fabric such as Terrafix 270R (or equivalent), must be installed at an elevation that is below the proposed basement slab-on-grade elevation and provided with positive drainage into a sump pit. The portion of the piping that connects the exterior weeping tile system into the sump pit must comprise solid piping to prevent exterior water from being introduced into the interior subslab stone. It may be prudent to install perforated drainage pipe in the interior basement as well to provide an outlet for any water that may collect in the subslab stone. It is also recommended that a capped cleanout port(s) be extended up to the ground surface elevation to provide future access (if required). The rainwater leaders must not be connected to the perimeter weeping tile system.

In order to reduce the effects of surficial frost heave in areas that will be hard surfaced, it is recommended that the exterior foundation backfill consist of free-draining granular material such as approved on-site sand and gravel or imported Granular 'B' Type I or Type III (OPSS 1010), with a maximum aggregate size not exceeding 100 mm, and that it extend a minimum lateral distance of 600 mm out from the foundation walls and/or beyond perimeter sidewalks and entranceway slabs. It is critical that particles greater than 100 mm in diameter are not in contact with the foundation wall to prevent point loading and overstressing. The backfill material used against the foundation walls must be placed so that the allowable lateral capacities of the foundation walls are not exceeded. Where only one side of a foundation wall will be backfilled, and the height of the wall is such that lateral support is required, or where the concrete strength has not been achieved, the wall must be braced or laterally supported prior to backfilling. In situations where both sides of the wall are backfilled, the backfill should be placed in equal lifts, not exceeding 200 mm differential on each side during backfill operations and the backfill should be compacted to a minimum of 98% SPMDD.

The native mineral soils (non-organic) are generally considered suitable for reuse as trench backfill and bulk fill in the driveways and parking lots; however, the wet soils may require air-drying in order to achieve the specified compaction. Air-drying cannot typically be achieved during winter construction; therefore, depending on the time of year that construction takes place, it may be more feasible to utilize an imported granular fill for this project.

Backfilling operations should be carried out with the following minimum requirements:

- Adequate heavy smooth drum or padfoot vibratory compaction equipment (suited to soil type) should be used for the compaction and to break down any large blocky pieces of soil;

- Loose lift thicknesses should not exceed 0.3 m (12") for granular soils or 0.2 m (8") for silt soils or the capacity of the compactor (whichever is less);

- The soils must be at suitable moisture contents to achieve compaction to a minimum 95% SPMDD in non-structural bulk fill areas. Service trenches excavated the zone of influence of footings for structures must be compacted to a minimum of 98% SPMDD;

- It is recommended that inspection and testing be carried out during construction to confirm backfill quality, thickness and to ensure that compaction requirements are achieved;

- Service trench backfill materials may consist of approved excavated soils with no particles greater than 100 mm and no topsoil or other deleterious materials;

- If construction operations are undertaken in the winter, strict consideration should be given to the condition of the backfill material to make certain that frozen material is not used.

5.11. Pavement Design/Drainage

All topsoil and vegetation (including tree roots and all loose/disturbed soils containing roots or organics material), and any loose/soft native soils, must be subexcavated from within the proposed driveways and parking lot areas. It is recommended to either subexcavate any existing soft subgrade materials or provide further consolidation with vibratory compaction equipment in order to prepare a proper, stable subgrade.

Prior to placement of the granular base, the subgrade must be proof-rolled, and any soft or unstable areas should be subexcavated and replaced with suitable drier materials. The subgrade should be graded smooth (free of depressions) and properly crowned to ensure positive drainage, with a minimum grade of 3% toward the catch basins or to the parking lot/driveway edge (provided that collection and proper gravity drainage to a suitable outlet is provided). When service pipes are installed, pipe bedding and backfilling should be undertaken as indicated in Sections 5.9 and 5.10 of this report.

Rapid drainage of the pavement structure is critical to ensure long-term performance and to help minimize frost heave. The requirement for subdrains will be dependent on the composition of the prepared pavement subgrade soils. Some of the native soils encountered in the boreholes are frost-susceptible soils and, as such, it is recommended to install subdrains (provided gravity drainage to a suitable outlet can be provided). It is recommended to install minimum 100 mm diameter perforated subdrains to collect and redirect water beneath the pavement surface. Subdrains should be designed and installed in accordance with OPSS 405 and OPSD 216.021. If Granular 'A' bedding (OPSS 1010) is utilized, the subdrains should be equipped with a factory installed filter sock. If 19 mm clear stone (OPSS 1004) is utilized as bedding for the subdrain, then the bedding must be wrapped completely with geotextile filter fabric such as Terrafix 270R (or equivalent) and a factory installed filter sock is not required. Installation of rigid subdrains allows for better grade control and less potential for damage during installation; however, it would

be expected that there would be higher cost implications associated with the installation of rigid subdrains over flexible subdrains. Positive drainage through grade control of subdrains is critical, as improperly installed subdrains can turn drainage systems into reservoirs, which can fuel frost action. The subdrains will hasten the removal of water, thereby reducing the risk and effects of frost heaving and load transfer in saturated conditions. It is suggested that, at a minimum, subdrains be installed through all low areas in the parking lot and driveways, and ideally along the curb lines as well to prevent water from entering the granular subbase. The subdrains should be installed in a 0.3 m (1.0 ft) by 0.3 m (1.0 ft) trench in the subgrade and bedded approximately 50 mm (2") above the bottom of the trench. The subgrade must be prepared with positive drainage to the subdrains and the subdrains must be installed with positive drainage into a catch basin structure or other suitable outlet.

Should the subgrade soils comprise free-draining granular soils (minimum 1.0 m thick with positive drainage at the interface with any relatively impermeable soils), then the installation of subdrains may not be required.

The native subgrade soils are sensitive to change in moisture content and can become loose or soft if the soils are subject to inclement weather and seepage or severe drying. Furthermore, the subgrade soils could be easily disturbed if traveled on during construction. As such, where this material will be exposed, it is recommended that the granular subbase be placed immediately upon completion of the subgrade preparation to protect the integrity of the subgrade soils.

It is expected that the driveways and parking lots will experience light traffic (personal vehicles) and some heavy traffic (delivery trucks, as well as maintenance and emergency vehicles). Based on the anticipated vehicle loading and frost-susceptibility of the subgrade soils, the following pavement design is provided:

Material	**Recommended Thickness For New Pavement**	
	Light Traffic	Heavy Traffic
Asphaltic Concrete	HL3-40 mm (1.5") HL4 or HL8-50 mm (2.0")	HL3-50 mm (2.0") HL4 or HL8-60 mm (2.5")
Granular 'A' Base	150 mm (6.0")	150 mm (6.0")
Granular 'B' Subbase	400 mm (16.0")	450 mm (18.0")

Given the potential for wet subgrade conditions, it is recommended that the driveways and parking lot subgrade soils be assessed at the time of excavation by qualified personnel. Depending on conditions encountered at the time of construction, different options may need to be undertaken to construct a stable driveway and parking lot base. These options may include subexcavation and increasing the thickness of the Granular 'B' subbase, the use of reinforcing geotextile and/or geogrid, or a combination of all. As such, it is recommended that provisions for subexcavation and disposal of wet soils, importing and placing additional Granular 'B' (OPSS 1010), as well as supply and

placement of a reinforcing geotextile (Terrafix 270R or equivalent) and geogrid (Tensar BX1200 or equivalent) should be included in the tender documents.

The granular base and subbase materials must conform to the physical property and gradation requirements of OPSS 1010 and must be compacted to 100% SPMDD. Asphaltic concrete should be supplied, placed and compacted to a minimum 92.0% Marshall maximum relative density, in accordance with OPSS 1150 and OPSS 310.

Construction joints in the surface asphalt must be offset a minimum of 150 mm to 300 mm (6" to 12") from construction joints in the binder asphalt so that longitudinal joints do not coincide.

Frost tapers must be constructed at any changes from light traffic to heavy traffic areas within the driveways and parking lots. If heavy traffic routes are not delineated by barriers or if it is anticipated that heavy equipment (such as loader and dump trucks) will be utilized for snow removal, it would be recommended that the heavy traffic pavement structure be utilized throughout the driveways and parking lots.

Where new asphalt is joined into existing asphalt, it is recommended that the existing asphalt be sawcut in a straight line prior to being milled to a depth of 40 mm and a width of 150 mm as per OPSD 509.010. It is recommended that a tackcoat be applied to the edge and surface of all milled asphalt prior to placement of new asphalt in conformance with OPSS 308.

The pavement should be designed to ensure that water will not pond on the pavement surface. If the surface asphalt is not placed within a reasonable time following placement of the binder asphalt, it is recommended that the catch basin lids are set at a lower elevation or apertures provided to allow surface water to drain into the catch basins and not accumulate around the catch basins. The strength of the pavement structure relies on all of the components to be in place in order to provide the design strength; therefore, it is strongly recommended that the surface asphalt be placed shortly after placement of the binder asphalt so as to avoid undue stress on the binder asphalt by not having the complete pavement structure in place.

It should be noted that, currently, asphalt mixes tend to be more flexible and, as such, there is a tendency for damage to occur from vehicles turning their steering wheels or applying excessive brake pressure. The damage can occur from both passenger vehicles as well as large vehicles. The condition is further intensified during hot weather. In high traffic/tight turning areas, it is recommended that rigid Portland cement pavement be considered.

5.12. Excess Soil Management

5.12.1 Chemical Testing was NOT Undertaken

Generally, if surplus soils are to be exported off-site, it will be necessary to perform chemical analysis of the soils. Chemical analysis was not undertaken as part of this geotechnical investigation. Should chemical analysis tests be required, the required tests vary and will be dependent on the disposal site utilized by the general contractor.

Most commonly, the soils are tested for the following:

- F1-F4, VOC's, BTEX as per O. Reg. 153/04 as amended by R511
- SVOC as per O. Reg. 153/04 as amended by R511
- Metals/Inorganics as per O. Reg. 153/04 amended by R511

The chemical analysis results are then compared to Ontario Regulation 153/04 - as amended by O.Reg. 511 – April 15, 2011 Standards = [Suite] – ON-511-T1/T2-SOIL-RPI.

5.12.2 TCLP Requirement

If soils are transported to a landfill facility, additional chemical testing in accordance with Ontario Regulation 347, Schedule 4, as amended to Ontario Regulation 558/00, dated March 2001, Toxicity Characteristic Leaching Procedure (TCLP) will be required.

When transporting soils off-site, the following is recommended:

- All chemical analyses and environmental assessment reports must be fully disclosed to the receiving site owners/authorities, who must agree to receive the material.
- An environmental consultant must confirm the land use at the receiving site is compatible to receive the material.
- An environmental consultant must monitor the transportation and placement of the materials to ensure that the material is placed appropriately at the pre-approved site.
- The excess materials may not be transported to a site that has previously had a Record of Site Condition (RSC) filed, unless the material meets the criteria outlined in the RSC.

It should be noted that landfill sites will generally only accept laboratory test results that have been completed within 30 days of exporting. Therefore, it is recommended that provisions for chemical analysis be included in the tender documents. It should also be noted that the laboratory testing generally takes five (5) working days to process with a regular turnaround time.

5.13. Coefficient of Permeability/T-time

As part of the geotechnical investigation, gradation analyses were performed on samples of the native clayey silt, the silt and clay/clay and silt, as well as the silt soils. The following table provides the sample location (monitoring well/borehole number), sample depth, corresponding estimated coefficient of permeability (k) and T-time, as well as soil type:

Borehole No.	Depth (m)	Estimated Coefficient of Permeability (k) cm/s	Estimated T-time (T) min/cm	Soil Type
1	0.76 – 1.37	$< 1.0 \times 10^{-6}$	> 50	Clay and silt, some sand, trace gravel (ML)
2	1.52 – 2.13	$< 1.0 \times 10^{-6}$	50	Clayey, sandy silt trace gravel (ML)

5.14. Radon

According to information provided by Health Canada, radon is a radioactive gas that is naturally formed through the breakdown of uranium in soil, rock and water. When radon escapes the earth in the outdoors, it mixes with fresh air, resulting in concentrations that are too low to be of concern. However, when radon enters an enclosed space, such as a building, high concentration of radon can accumulate and become a health concern. Health Canada indicates that most buildings have some level of radon in them. Unfortunately, it is not possible to predict before construction whether or not a new building will have high radon levels as radon can only be detected by radon measurement devices, which would be installed in a home, post construction. Section 9.13.4.1 Soil Gas Control of the current 2012 Ontario Building Code (OBC) states that "*Where methane or radon gases are known to be a problem, construction shall comply with the requirements for soil gas control in MMAH Supplementary Standard SB-9, Requirements for Soil Gas Control*".

6.0 SITE INSPECTIONS

Qualified geotechnical personnel should supervise excavation inspections as well as compaction testing for structural filling, site grading and site servicing. This will ensure that footings are founded in the proper strata and that proper material and techniques are used and the specified compaction is achieved. CMT Engineering Inc. would be pleased to review the design drawings and provide an inspection and testing program for the construction of the proposed development.

7.0 LIMITATIONS OF THE INVESTIGATION

This report is intended for the Client named herein and for their Client. The report should be read in its entirety, and no portion of this report may be used as a separate entity. 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.

The recommendations made in this report are in accordance with our present understanding of the project. We request that we be permitted to review our recommendations when the drawings and specifications are complete, or if the proposed construction should differ from that mentioned in this report.

It is important to emphasize that a soil investigation is, in fact, a random sampling of a site and the comments are based on the results obtained at the test locations only. It is therefore assumed that these results are representative of the subsoil conditions across the site. Should any conditions at the site be encountered which differ from those found at the test locations, we request that we be notified immediately in order to permit a reassessment of our recommendations.

It should be noted that this report specifically addresses geotechnical aspects of the project and does not include any investigations or assessments relating to potential subsurface contamination. As such, there should be no assumptions or conclusions derived from this report with respect to potential soil or water contamination. Soil or water contamination is generally caused by the presence of xenobiotic (human-made) chemicals or other alteration processes in the natural soil and groundwater environment. If necessary, the investigation, assessment and rehabilitation of soil and water contaminants should be undertaken by qualified environmental specialists.

The samples obtained during the geotechnical investigation will be stored for a period of three months, after which time they will be disposed of unless alternative arrangements are made.

We trust that this report meets with your present requirements. Should you have any questions, please do not hesitate to contact our office.

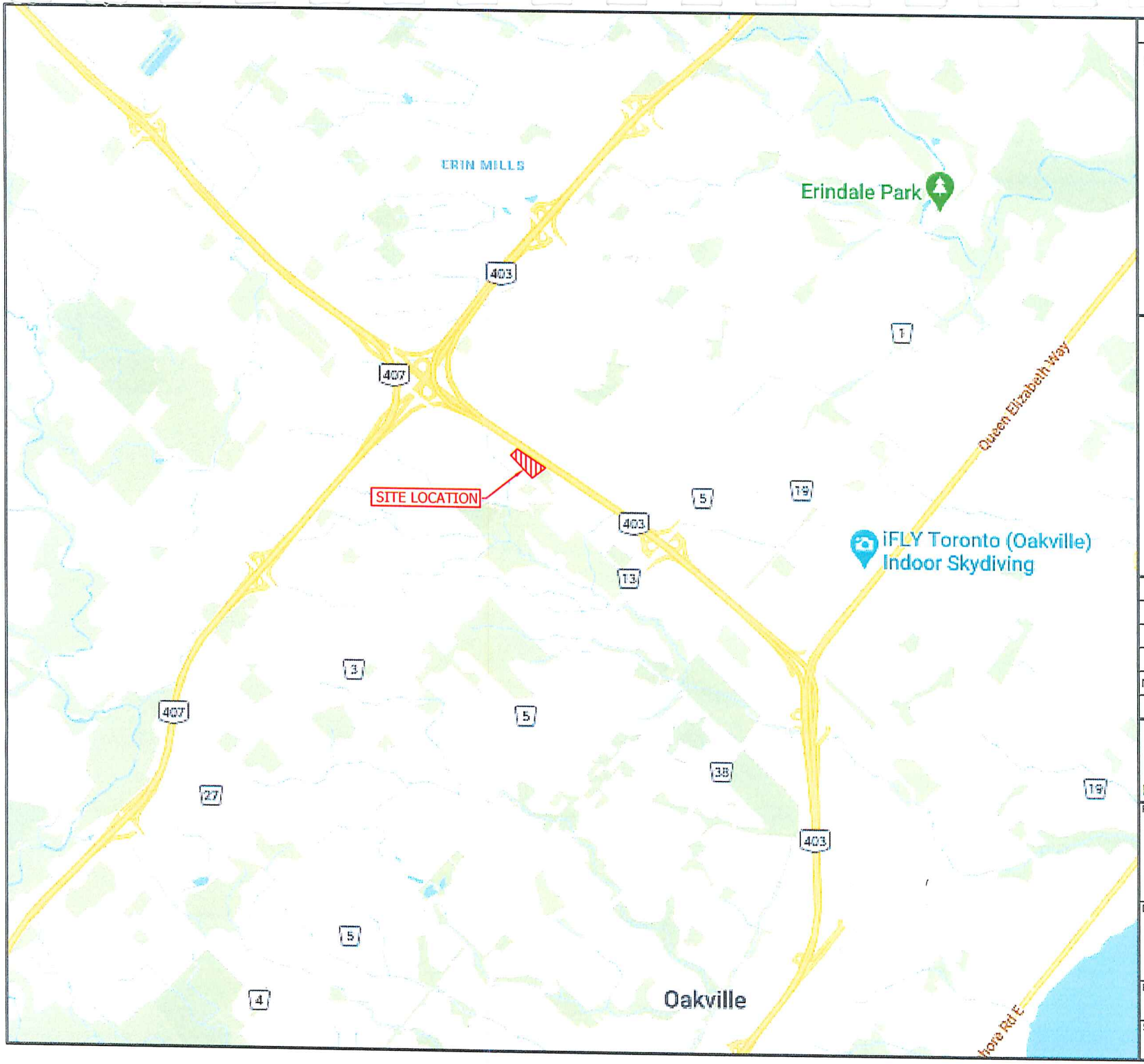
Prepared by:

Reviewed by:

Shawn Wheatley, M.Eng.

Nathan Chortos, P.Eng.

ks



NOTES:

Base map provided by Google Maps

NO.	DESCRIPTION	DATE

REVISIONS

CMT ENGINEERING INC.
1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
Tel.: 519-699-5775
Fax: 519-699-4664
www.cmtinc.net

PROJECT:

Geotechnical Investigation
Ninth Line,
Mississauga, Ontario

DRAWING TITLE:

SITE LOCATION MAP

PROJECT NO.:	DATE:
20-026	February 19, 2020
SCALE:	DRAWING NO.
N.T.S.	1

NOTES:

1. This drawing is for information purposes only. Locations and sizes of existing and proposed structures are approximate only, and should not be used for construction.
2. Base drawing provided by Google Maps
3. Benchmark: Geodetic Monument Station 00119643010 Reported Elevation = 181.090 m

LEGEND

- CMT Borehole (2020)
- Benchmark

N

NO.	DESCRIPTION	DATE

REVISIONS

CMT ENGINEERING INC.
1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
Tel.: 519-699-5775
Fax: 519-699-4664
www.cmtinc.net

PROJECT:

Geotechnical Investigation
Ninth Line,
Mississauga, Ontario

DRAWING TITLE:

SITE PLAN SHOWING
BOREHOLE LOCATIONS

PROJECT NO.:	DATE:
20-026	February 19, 2020
SCALE:	DRAWING NO.
N.T.S.	2

APPENDIX A

BOREHOLE LOGS

BOREHOLE 1

Date Drilled: February 10, 2020
Rig: Geoprobe 7822DT
Contractor: CMT Drilling Inc.
Drilling Method: SPT

Elevation: 179.66 m
Logged by: SW

Project No.: 20-026
Project: Geotech - Proposed Church
Location: Ninth Line, Mississauga, ON

Depth (ft/m)	Sample Type	Recovery (%)	Sample Number	Symbols	SOIL DESCRIPTION	Elevation / Depth	Well Installation	Moisture Content % Wp [----X----] Wl (10 20 30 40)	Pocket Penetrometer kPa (100 200 300 400) / SPT (N) Blows/0.3 m (20 40 60 80)
					Ground Surface (m)	179.66 / 0.00			
0	SS		1		**TOPSOIL** Loose, dark brown, silty organic topsoil, moist (100mm)	178.90 / 0.76		15.6	6
1	SS		2		**CLAY AND SILT** Firm, brown, red and grey mottled clay and silt, some sand, trace gravel, moist	178.14 / 1.52		12.9	26
2	SS		3		Becoming very stiff, brown Becoming hard			14.0	37
3	SS		4		Becoming grey	177.07 / 2.59		11.1	62
4	SS		5					11.7	41
	MC5		6					10.4	
5	SS		7		**SAND** Dense, grey sand, some gravel, trace silt, wet	175.09 / 4.57		20.9	
	MC5		8		**SANDY CLAYEY SILT TILL** Dense, grey sandy clayey silt till, trace gravel, wet	173.87 / 5.79		10.2	36
6	MC5		9		**SAND** Dense, grey sand, some silt, trace clay and gravel, wet			13.8	
7								16.9	
8					End of Borehole	172.04 / 7.62			
9									

Groundwater measured at approximately 1.74 m below ground surface (elev. 177.92 m) on Feb. 12, 2020

Well Installation: Bentonite; WL: 1.74 m; 1" Steel Casing; #2 Silica Sand; 50mm Slot 10 Screen

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BOREHOLE 2

Date Drilled: February 12, 2020
Rig: Geoprobe 7822DT
Contractor: CMT Drilling Inc.
Drilling Method: SPT

Elevation: 179.52 m
Logged by: SW

Project No.: 20-026
Project: Geotech - Proposed Church
Location: Ninth Line, Mississauga, ON

Depth (ft/m)	Sample Type	Recovery (%)	Sample Number	Symbols	SOIL DESCRIPTION	Elevation / Depth	Well Installation	Moisture Content % Wp [----X----] Wl 10 20 30 40	Pocket Penetrometer kPa 100 200 300 400 / SPT (N) Blows/0.3 m 20 40 60 80
					Ground Surface (m)	179.52			
0	SS		1		**TOPSOIL** Loose, dark brown, silty organic topsoil, moist (100mm)	0.00		29.9	1
1	SS		2		**CLAYEY SANDY SILT** Very soft, dark brown clayey, sandy silt, trace gravel, with trace organics and rootlets, moist	178.76 0.76		18.3	11
2	SS		3		Becoming stiff, brown, with no organics and rootlets	178.00 1.52		11.0	36
	SS		4		Becoming hard			11.3	50(3")
3	SS		5		**SILT TILL** Very dense, grey silt till, some sand and clay, moist	176.93 2.59		7.7	
4	MC	5	6		**SAND** Very dense, grey sand, some silt, trace clay and gravel, wet	175.61 3.91		8.5	50(4")
5					End of Borehole	174.95 4.57		10.6	
								20.2	
6									
7									
8									

Borehole caved at about 3.05 m below ground surface.

Accumulated groundwater encountered at approximately 2.74 m below ground surface in open borehole.

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BOREHOLE 3

Date Drilled: February 12, 2020
Rig: Geoprobe 7822DT
Contractor: CMT Drilling Inc.
Drilling Method: SPT

Elevation: 180.13 m
Logged by: SW

Project No.: 20-026
Project: Geotech - Proposed Church
Location: Ninth Line, Mississauga, ON

Depth (ft/m)	Sample Type	Recovery (%)	Sample Number	Symbols	SOIL DESCRIPTION	Elevation	Depth	Well Installation	Moisture Content % Wp [----X----] Wl 10 20 30 40	Pocket Penetrometer kPa 100 200 300 400 / SPT (N) Blows/0.3 m 20 40 60 80
					Ground Surface (m)	180.13	0.00			
0	SS		1		**TOPSOIL** Loose, dark brown, silty organic topsoil, moist (90mm)				26.1	3
1	SS		2		**CLAYEY SILT** Soft, brown and dark brown mottled clayey silt, some sand, trace gravel, organics and rootlets, moist	179.37	0.76		13.3	30
2	SS		3		Becoming very stiff, brown, no organics and rootlets	178.61	1.52		13.7	35
	SS		4		Becoming hard				10.8	54
3	SS		5						12.8	50(6")
4	MC		6		**SILT TILL** Very dense, light brown silt till, some clay and sand, moist	176.52	3.61		14.5	
									12.9	
5	SS		7		**SANDY CLAYEY SILT TILL** Hard, grey sandy clayey silt till, trace gravel, moist	175.46	4.67		10.2	36
6					End of Borehole	174.95	5.18			
7										
8										

Borehole caved at about 5.03 m below ground surface.

Accumulated groundwater encountered at approximately 4.72 m below ground surface in open borehole.

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BOREHOLE 4

Date Drilled: February 12, 2020
Rig: Geoprobe 7822DT
Contractor: CMT Drilling Inc.
Drilling Method: SPT

Elevation: 182.49 m
Logged by: SW

Project No.: 20-026
Project: Geotech - Proposed Church
Location: Ninth Line, Mississauga, ON

Depth (ft/m)	Sample Type	Recovery (%)	Sample Number	Symbols	SOIL DESCRIPTION	Elevation	Depth	Well Installation	Moisture Content % Wp [----X----] Wl	Pocket Penetrometer kPa	SPT (N) Blows/0.3 m
					Ground Surface (m)	182.49	0.00				
0	SS		1		**TOPSOIL** Loose, dark brown, silty organic topsoil, moist (100mm)				23.9	3	
1	SS		2		**CLAYEY SILT** Soft, brown and dark brown mottled clayey silt, some sand, trace gravel, organics and rootlets, moist	181.73	0.76		14.4		30
2	SS		3		Becoming very stiff, brown, no organics and rootlets				13.3		28
	SS		4		Becoming hard	180.20	2.29		12.3		45
3	SS		5		**SANDY CLAYEY SILT TILL** Very dense, brown sandy clayey silt till, trace gravel, moist	179.29	3.20		11.0		50(4")
4	MC5		6		Becoming grey	178.68	3.81		12.0		
									10.0		
	SS		7		**SILT TILL** Dense, grey silt till, some sand and clay, moist	177.77	4.72		13.3		41
5					End of Borehole	177.31	5.18				
6											
7											
8											

Borehole caved at about 4.67 m below ground surface.

No accumulated groundwater encountered in open borehole.

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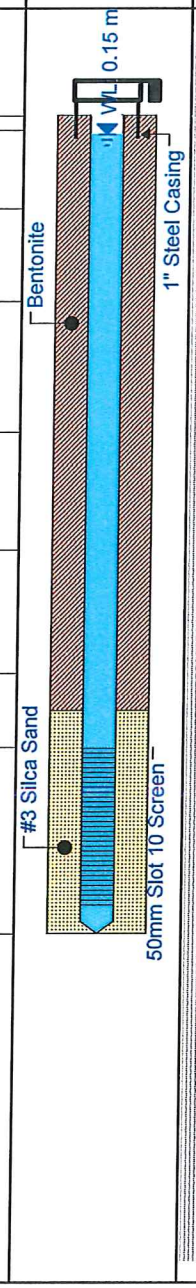
BOREHOLE 5

Date Drilled: February 10, 2020
Rig: Geoprobe 7822DT
Contractor: CMT Drilling Inc.
Drilling Method: SPT

Elevation: 177.84 m
Logged by: SW

Project No.: 20-026
Project: Geotech - Proposed Church
Location: Ninth Line, Mississauga, ON

Depth (ft/m)	Sample Type	Recovery (%)	Sample Number	Symbols	SOIL DESCRIPTION	Elevation / Depth	Well Installation	Moisture Content % Wp [----X----] Wl 10 20 30 40	Pocket Penetrometer kPa 100 200 300 400 / SPT (N) Blows/0.3 m 20 40 60 80
					Ground Surface (m)	177.84			
0	SS		1		**TOPSOIL** Loose, dark brown, silty organic topsoil, moist (120mm)	0.00		25.3	3
						177.08			
1	SS		2		**CLAYEY SILT** Firm, brown, red, and grey mottled clayey silt, some sand and gravel, moist	0.76		12.3	28
						176.32			
2	SS		3		Becoming very stiff, brown Becoming hard	1.52		11.0	50(3")
	SS		4		Becoming grey	175.25 2.59		8.5	57
3	SS		5					10.5	59
					SANDY CLAYEY SILT TILL Very dense, grey sandy clayey silt till, some gravel, wet	174.28 3.56		12.9	
4	MC5		6					12.1	
					SILT TILL Very dense, grey silt till, some sand and clay, trace gravel, moist becoming wet	173.27 4.57			
	SS		7					7.6	50(5")
5						172.66 5.18			
6	MC5		8					24.4	
					End of Borehole	171.13 6.71			
7									
8									
9									



Groundwater measured at approximately 0.15 m below ground surface (elev. 177.69 m) on Feb. 12, 2020.

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BOREHOLE 6

Date Drilled: February 10, 2020
Rig: Geoprobe 7822DT
Contractor: CMT Drilling Inc.
Drilling Method: SPT

Elevation: 181.68 m
Logged by: SW

Project No.: 20-026
Project: Geotech - Proposed Church
Location: Ninth Line, Mississauga, ON

Depth (ft/m)	Sample Type	Recovery (%)	Sample Number	Symbols	SOIL DESCRIPTION	Elevation	Depth	Well Installation	Moisture Content % Wp [----X----] Wl 10 20 30 40	Pocket Penetrometer kPa 100 200 300 400 / SPT (N) Blows/0.3 m 20 40 60 80
					Ground Surface (m)	181.68	0.00			
0	SS		1		**TOPSOIL** Loose, dark brown, silty organic topsoil, moist (80mm)	180.92	0.76		15.7	4
1	SS		2		**CLAYEY SILT** Firm, brown, red, and grey mottled clayey silt, some sand and gravel, moist	179.98	1.70		12.5	32
2	SS		3		Becoming hard, brown	179.39	2.29		10.0	50(5")
3	SS		4		**SAND** Very dense, brown sand, trace silt and gravel, moist	178.94	2.74		19.0	44
4	SS		5		Becoming wet, some silt **SILT TILL** Dense, brown silt till, some sand and clay, wet				18.5	54
5	MC5		6						19.5	
6	SS		7			176.96	4.72		10.6	
7	MC5		8		**SANDY CLAYEY SILT TILL** Hard, grey sandy clayey silt till, trace gravel, moist				9.4	50(5")
8	MC5		9		**SAND** Very dense, grey sand, some silt, trace clay and gravel, wet	175.58	6.10		9.4	
9						174.06	7.62		19.3	
					End of Borehole					

Groundwater measured at approximately 4.27 m below ground surface (elev. 177.41 m) on Feb. 12, 2020.

Well Installation: Bentonite; 1" Steel Casing; WL: 4.27 m; #2 Silica Sand; 50mm Slot 10 Screen

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1011 Industrial Crescent, Unit 1
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BOREHOLE 7

Date Drilled: February 12, 2020
Rig: Geoprobe 7822DT
Contractor: CMT Drilling Inc.
Drilling Method: SPT

Elevation: 179.02 m
Logged by: SW

Project No.: 20-026
Project: Geotech - Proposed Church
Location: Ninth Line, Mississauga, ON

Depth (ft/m)	Sample Type	Recovery (%)	Sample Number	Symbols	SOIL DESCRIPTION	Elevation	Depth	Well Installation	Moisture Content % Wp [----X----] Wl 10 20 30 40	Pocket Penetrometer kPa 100 200 300 400 / SPT (N) Blows/0.3 m 20 40 60 80
					Ground Surface (m)	179.02	0.00			
0	SS		1		**TOPSOIL** Loose, dark brown, silty organic topsoil, moist (50mm)				16.4	7
1	SS		2		**CLAYEY SILT** Soft to firm, brown and dark brown mottled clayey silt, some sand, trace gravel, organics and rootlets, moist	178.26	0.76		12.8	26
2	SS		3		Becoming very stiff, brown, no organics and rootlets	177.29	1.73		11.6	36
	SS		4		Becoming hard, red				11.1	56
3	SS		5		**SILT TILL** Dense, grey silt till, some sand and clay, moist	175.97	3.05		8.4	48
4	MC		6						8.8	
5	SS		7			173.84	5.18		9.0	28
					End of Borehole					
6										
7					Borehole open to termination.					
8					No accumulated groundwater encountered in open borehole.					

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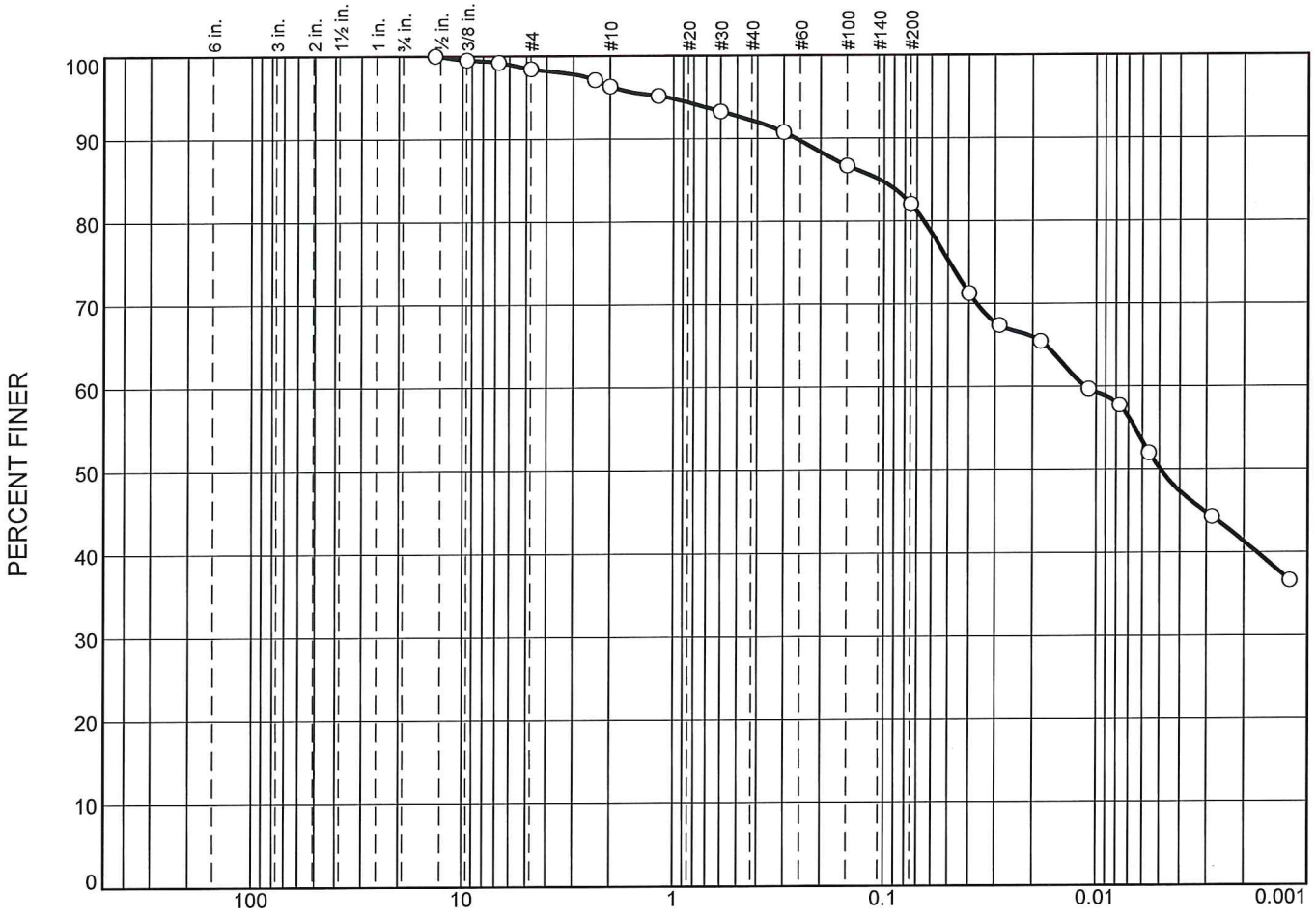
APPENDIX B

GRAIN SIZE ANALYSES

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	1.6	2.1	4.1	10.1	40.8	41.3

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH1	2	0.76-1.37m	clay and silt, some sand, trace gravel	ML
				Sampled by SW of CMT Engineering Inc., February 12, 2020	
				Tested by JM of CMT Engineering Inc., February 14, 2020	

CMT Engineering Inc.

St. Clements, ON

Client: St. Mark and St. Demiana Coptic Orthodox Church

Project: Ninth Line
Mississauga, Ontario

Project No.: 20-026

Figure 1

Particle Size Distribution Report

	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	2.9	3.9	8.0	13.6	45.2	26.4

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH2	3	1.52-2.13m	clayey, sandy silt, trace gravel	ML
				Sampled by SW of CMT Engineering Inc., February 12, 2020	
				Tested by JM of CMT Engineering Inc., February 14, 2020	

CMT Engineering Inc.

St. Clements, ON

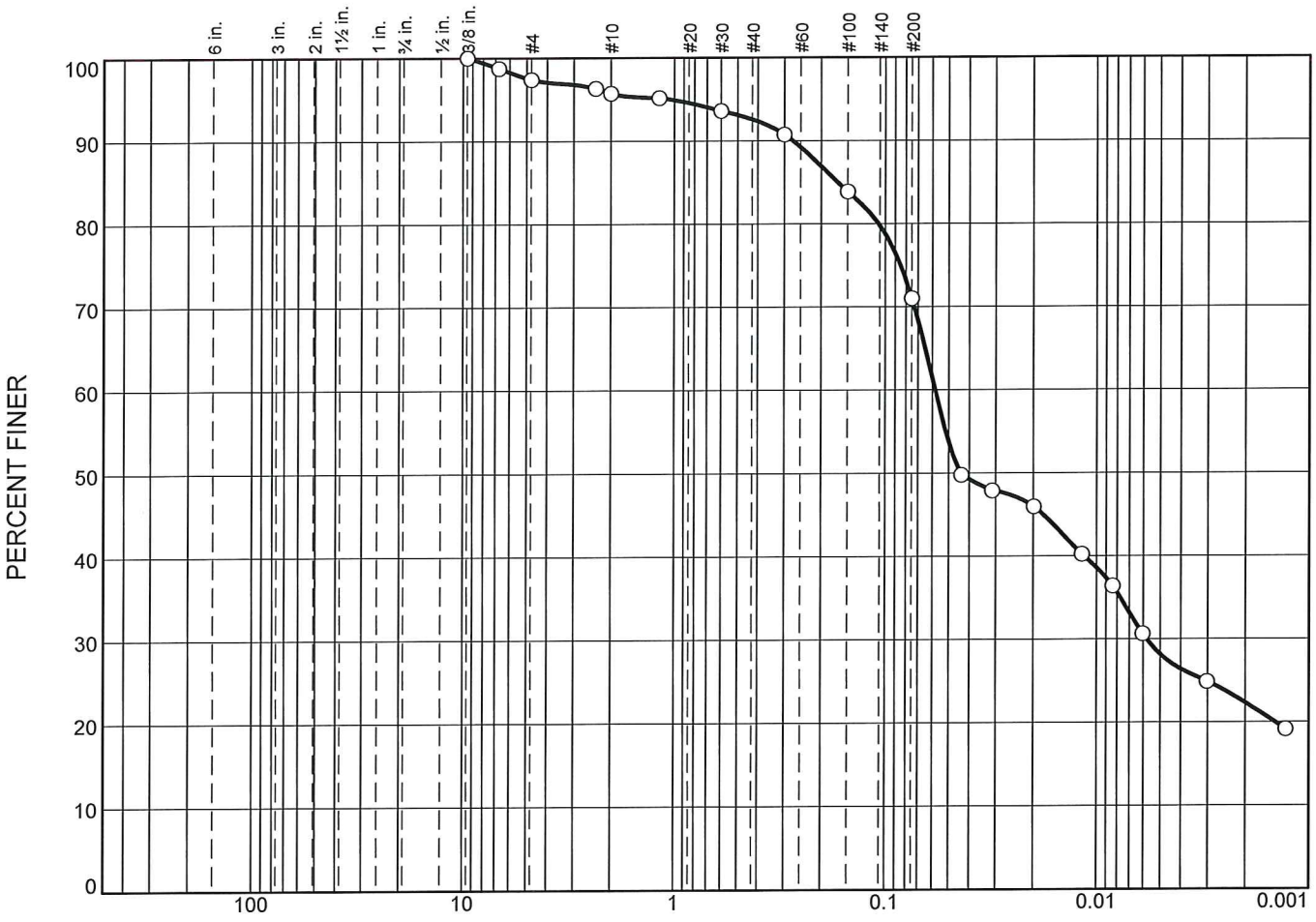
Client: St. Mark and St. Demiana Coptic Orthodox Church

Project: Ninth Line
Mississauga, Ontario

Project No.: 20-026

Figure 2

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	2.6	1.7	3.1	21.6	48.7	22.3

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH4	6	3.66-4.57m	sandy, clayey silt, trace gravel	ML
				Sampled by SW of CMT Engineering Inc., February 12, 2020	
				Tested by JM of CMT Engineering Inc., February 14, 2020	

CMT Engineering Inc.

St. Clements, ON

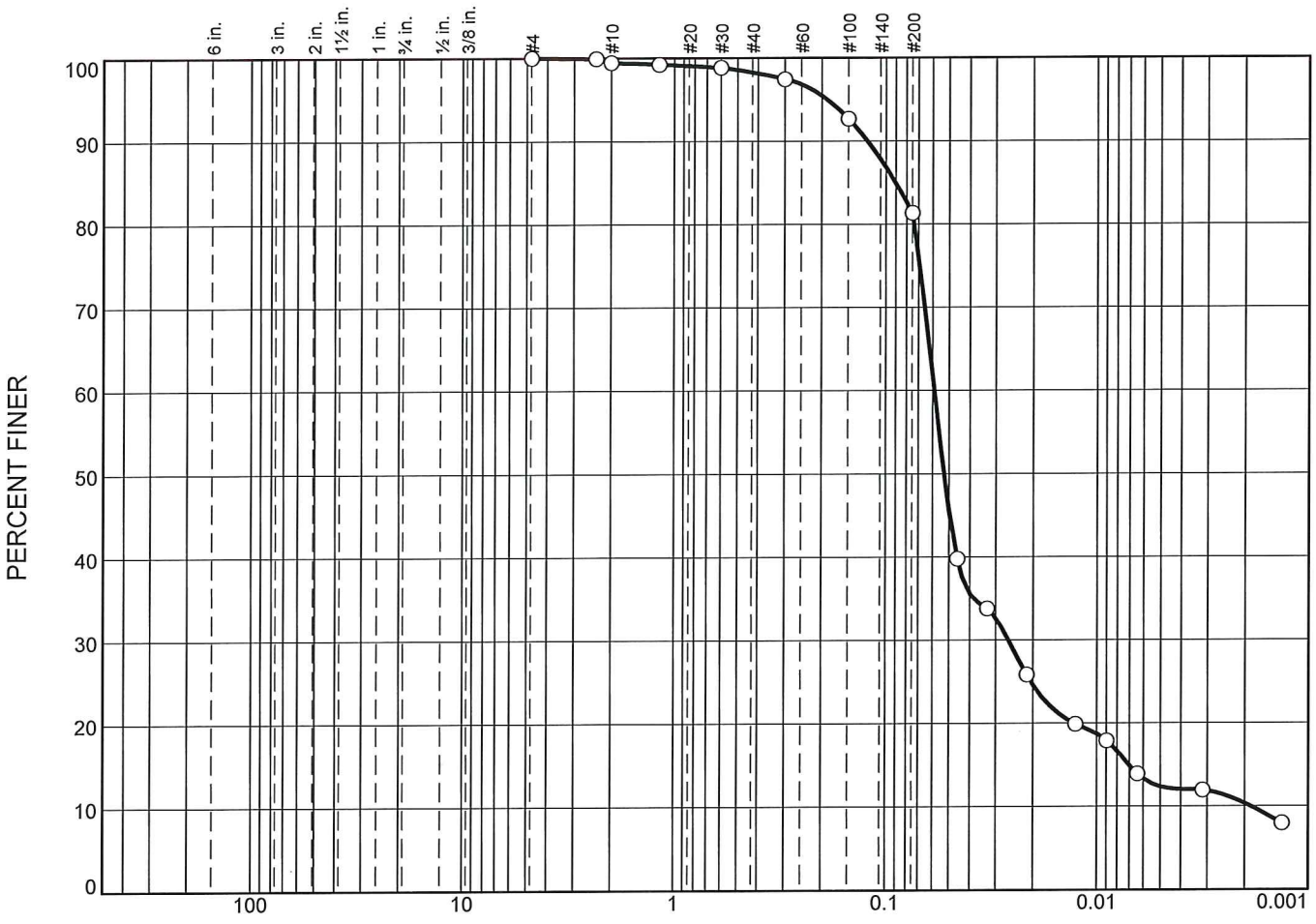
Client: St. Mark and St. Demiana Coptic Orthodox Church

Project: Ninth Line
Mississauga, Ontario

Project No.: 20-026

Figure 3

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.6	1.1	17.0	70.9	10.4

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH6	5	3.05-3.66m	silt, some sand and clay	ML
				Sampled by SW of CMT Engineering Inc., February 12, 2020	
				Tested by JM of CMT Engineering Inc., February 14, 2020	

CMT Engineering Inc.

St. Clements, ON

Client: St. Mark and St. Demiana Coptic Orthodox Church

Project: Ninth Line
Mississauga, Ontario

Project No.: 20-026

Figure 4

APPENDIX C

WELL RECORDS

Ontario — Ministry of the Environment, Conservation and Parks

Well Tag No. *(Place Sticker and/or Print Below)*: A282604

Measurements recorded in: ☑ Metric ☐ Imperial

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
	THE DIOCESE OF MISSISSAUGA, VANCOUVER AND WESTERN	CANADA ATTN: MOHER MICHAEL	

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. *(inc. area code)*
2188 ROBINWOOD COURT	MISSISSAUGA	ON	L5M5B9	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
NINTH LINE (500m SE OF BURNHAMTHORPE RDE)			

County/District/Municipality	City/Town/Village	Province	Postal Code
	OAKVILLE	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	603971	4819466		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
BLACK	TOPSOIL			0	0.3
BROWN	SILT	CLAY	HARD	0.3	4.5
GREY	SILT	CLAY	DENSE	4.5	6.0
GREY	SAND	SILT	DENSE	6.0	7.6

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used *(Material and Type)*	Volume Placed (m³/ft³)
0	5.4	3/8 HOLEPLUG	L1
5.4	7.6	#2 SAND	L1

Method of Construction

☐ Cable Tool ☐ Diamond
☑ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, *specify*

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☑ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, *specify*

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
5.08	PLASTIC		0	6.1

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To
5.3	PLASTIC	10	6.1	7.6

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☑ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, *specify*
☐ Other, *specify*

Water Details

Water found at Depth (m/ft)	☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*
0		☐ Fresh ☐ Untested
(m/ft)	☐ Gas	☐ Other, *specify*
		☐ Fresh ☐ Untested
(m/ft)	☐ Gas	☐ Other, *specify*

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	7.6	12

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, *specify*

If pumping discontinued, give reason:

Pump intake set at *(m/ft)*

Pumping rate *(l/min / GPM)*

Duration of pumping _____ hrs + _____ min

Final water level end of pumping *(m/ft)*

If flowing give rate *(l/min / GPM)*

Recommended pump depth *(m/ft)*

Recommended pump rate *(l/min / GPM)*

Well production *(l/min / GPM)*

Disinfected? ☐ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Map of Well Location

Please provide a map below following instructions on the back.

SEE ATTACHED MAP

Comments:

CMT Drilling Inc. License No. 7366
1011 Industrial Cres, Unit 1, St. Clements
Ontario, N0B 2M0 cblack@cmtinc.net
519-699-5775 Black, Chris
3711 _____ 2020/02/25
Tech License No. Signature of Contractor Date Submitted

Well owner's information package delivered ☐ Yes ☐ No

Date Package Delivered: Y Y Y Y M M D D

Date Work Completed: 2020/02/24

Ministry Use Only
Audit No. Z324519
Received

Ontario — Ministry of the Environment, Conservation and Parks

Well Tag No. *(Place Sticker and/or Print Below)*: A282605

Well Record

Regulation 903 Ontario Water Resources Act

Measurements recorded in: ☑ Metric ☐ Imperial

Page 1 of 1

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
	THE DIOCESE OF MISSISSAUGA, VANCOUVER AND WESTERN CANADA ATTN: MOHEB MICHAEL		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. *(inc. area code)*
2188 ROBINWOOD COURT	MISSISSAUGA	ON	L5M5B9	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
NINTH LINE (500m SE OF BURHAMTHORPE RD E)			

County/District/Municipality	City/Town/Village	Province	Postal Code
	OAKVILLE	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	600411	4811318		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
BLACK	TOPSOIL			0	0.3
BROWN	CLAY	SILT	DENSE	0.3	1.5
GREY	SILT	CLAY	DENSE	1.5	4.5
GREY	SILT		DENSE	4.5	6.7

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used *(Material and Type)*	Volume Placed (m³/ft³)
0	4.5	3/8 HOLEPLUG	1
4.5	6.7	#2 SAND	1

Method of Construction

☐ Cable Tool ☐ Diamond
☑ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, *specify*

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☑ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, *specify*

Construction Record - Casing

Inside Diameter *(cm/in)*	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness *(cm/in)*	Depth (m/ft) From	Depth (m/ft) To
5.08	PLASTIC		0	5.1

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
5.3	PLASTIC	10	5.1	6.7

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☑ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, *specify*
☐ Other, *specify*

Water Details

Water found at Depth (m/ft)	Kind of Water	Hole Diameter Depth (m/ft) From	Hole Diameter Depth (m/ft) To	Diameter (cm/in)
☐ Gas	☐ Fresh ☐ Untested ☐ Other, *specify*			
☐ Gas	☐ Fresh ☐ Untested ☐ Other, *specify*	0	6.7	12
☐ Gas	☐ Fresh ☐ Untested ☐ Other, *specify*			

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, *specify*

If pumping discontinued, give reason:

Pump intake set at *(m/ft)*

Pumping rate *(l/min / GPM)*

Duration of pumping _____ hrs + _____ min

Final water level end of pumping *(m/ft)*

If flowing give rate *(l/min / GPM)*

Recommended pump depth *(m/ft)*

Recommended pump rate *(l/min / GPM)*

Well production *(l/min / GPM)*

Disinfected? ☐ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Map of Well Location

Please provide a map below following instructions on the back.

SEE ATTACHED MAP

Comments:

Licence No.

CMT Drilling Inc. License No. 7366
1011 Industrial Cres, Unit 1, St. Clements
Ontario, N0B 2M0 cblack@cmtinc.net
519-699-5775 Black, Chris
3711 CG BQ 2020/02/25
Tech License No. Signature of Contractor Date Submitted

Y/Y/Y/Y/M/M/D/D

Well owner's information package delivered ☐ Yes ☐ No

Date Package Delivered

Date Work Completed 2020/02/26

Ministry Use Only

Audit No. Z324520

Received

y's Copy

Ontario — Ministry of the Environment, Conservation and Parks

Measurements recorded in: ☑ Metric ☐ Imperial

Well Tag No. *(Place Sticker and/or Print Below)*: A282606

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
	THE DIOCESE OF MISSISSAUGA, VANCOUVER AND WESTERN CANADA ATTN: MOHEB MICHAEL		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. *(inc. area code)*
2188 ROBINWOOD COURT	MISSISSAUGA	ON	L5M5B9	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
(500M SE OF BURNHAM THORPE RD) NINTH LINE			

County/District/Municipality	City/Town/Village	Province	Postal Code
	OAKVILLE	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	604180	4819363		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
BROWN	TOPSOIL			0	0.3
BROWN	CLAY	SILT	DENSE	0.3	2.3
GREY	CLAY	SILT	DENSE	2.3	4.5
GREY	SAND	SILT	DENSE	4.5	7.6

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used *(Material and Type)*	Volume Placed (m³/ft³)
0	5.1	3/8 HOLEPLUG	L1
5.1	7.6	#2 SAND	L1

Method of Construction

☐ Cable Tool ☐ Diamond
☑ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, *specify*

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☑ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, *specify*

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
5.08	PLASTIC		0	6.1

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☑ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, *specify*
☐ Other, *specify*

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To
5.3	PLASTIC	10	6.1	7.6

Water Details

Water found at Depth (m/ft)	Kind of Water: ☐ Fresh ☐ Untested ☐ Gas ☐ Other, *specify*

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	7.6	12

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, *specify*

If pumping discontinued, give reason:

Pump intake set at *(m/ft)*

Pumping rate *(l/min / GPM)*

Duration of pumping ____ hrs + ____ min

Final water level end of pumping *(m/ft)*

If flowing give rate *(l/min / GPM)*

Recommended pump depth *(m/ft)*

Recommended pump rate *(l/min / GPM)*

Well production *(l/min / GPM)*

Disinfected? ☐ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Map of Well Location

Please provide a map below following instructions on the back.

SEE ATTACHED MAP

Comments:

Licence No.

CMT Drilling Inc. License No. 7366
1011 Industrial Cres, Unit 1, St. Clements
Ontario, N0B 2M0 cblack@cmtinc.net
519-699-5775 Black, Chris

3711 _____ FEB/25/2020
Tech License No. Signature of Contractor Date Submitted

Well owner's information package delivered ☐ Yes ☐ No

Date Package Delivered: Y Y Y Y M M D D

Date Work Completed: 2020/02/24

Ministry Use Only

Audit No. Z324521

Received

y's Copy


Ninth Line, Oakville
Legend
Monitoring Well
A282606
A282604
A282605
403
Burnhamthorpe Road West
Ninth Line
13
27
Google Earth
100 m

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix B

Stormwater Management Calculations

BURNSIDE

Project: **Ninth Line**

Task: **CN Number Summary**

Date: **10-May-23**

Prepared by: **T.R.**

Project no.: **3000044049**

	Land Cover	Crops	Gravel	Lawn	Paved	SWM Pond	
	Soil Group	C / D	C / D	C / D	C / D	C / D	
	CN Number	89.0	96	81.5	98.0	98.0	
Catchment	**Total Area**	**Crops**	**Gravel**	**Lawn**	**Paved**	**SWM Pond**	**CN Number**
101	3.72	3.72	0.00	0.00	0.00	0.00	89.0
102	0.21	0.21	0.00	0.00	0.00	0.00	89.0
201	0.42	0.00	0.00	0.33	0.09	0.00	85.0
202	3.50	0.00	0.06	1.35	1.85	0.24	91.6

Project: **Ninth Line**
Project #: 300044049
Designed By: T. Rosborough
Date: 10-May-2023

Airport Method for Time to Peak Calculations

Natural Area Watershed Information

WS	Area (ha)	Length (m)	C	Slope (%)	Calculated Time of Concentration (min) *	Time of Concentration Used in Modelling* (min) *	Time to Peak (hrs)
EXISTING							
101	3.72	137	0.25	4.90	19.20	19.20	0.19
102	0.21	9.3	0.25	28.00	2.81	15.00	0.15
POST-DEVELOPMENT							
201	0.42	10	0.32	25.00	2.78	15.00	0.15

* Minimum Tc = 15 min as per City standards

NOTE: Time to Peak = 0.60Tc

NOTE: Airport method was selected to calculate the watershed time of concentration as per the MOE Drainage Management Manual (for RC less than 0.4) - see below

Airport Formula

For watersheds where the runoff coefficient, C, is less than 0.40, the Airport formula gives a better estimate of t_c. This method was developed for airfields and is expressed as follows:

$$t_c = \frac{3.26 * (1.1 - C) * L^{0.5}}{S_w^{0.33}} \qquad (8.16)$$

where:

t_c = time of concentration, min
C = runoff coefficient
S_w = watershed slope, %
L = watershed length, m

When a watershed length is made up of widely differing surfaces (e.g. grass and concrete), t_c, can be calculated for each surface, and the individual values summed to give the overall value.

Project: Ninth Line
File: 300044049
Designed by: T.Rosborough
Checked by: S.Roorda
Date: 10-May-23

BURNSIDE

IMPERVIOUS CALCULATIONS - Pre-Development (Catchment 101)

Drainage Area = **37200** **m2** **or** **3.72** **ha**

Impervious (m2)		**Landscaped Areas (m2)**	
5995	Gravel	31205	Landscape

Total Area= 0.60 ha

		Area
TIMP	90%	0.54 ha
XIMP	70%	0.42 ha

Total Area= 3.12 ha

		Area
TIMP	10%	0.31 ha
XIMP	5%	0.16 ha

IMPERVIOUSNESS			
TOTAL Modelled Area=	**3.72 ha**	**TOTAL Pervious Area=**	**2.87 ha**
OVERALL TIMP	**0.229**	**OVERALL Runoff Coefficient**	**0.26**
OVERALL XIMP	**0.155**		

IMPERVIOUS CALCULATIONS - Pre-Development (Catchment 102)

Drainage Area = **2100** **m2** **or** **0.21** **ha**

Impervious (m2)		**Landscaped Areas (m2)**	
0	Gravel	2100	Landscape

Total Area = 0.00 ha

		Area
TIMP	90%	0.00 ha
XIMP	70%	0.00 ha

Total Area = 0.21 ha

		Area
TIMP	10%	0.00 ha
XIMP	5%	0.00 ha

IMPERVIOUSNESS			
TOTAL Modelled Area=	**0.21 ha**	**TOTAL Pervious Area=**	**0.19 ha**
OVERALL TIMP	**0.100**	**OVERALL Runoff Coefficient**	**0.14**
OVERALL XIMP	**0.050**		

Project: Ninth Line
File: 300044049
Designed by: T.Rosborough
Checked by: S.Roorda
Date: 10-May-23

BURNSIDE

IMPERVIOUS CALCULATIONS - Post Development Uncontrolled to Ninth Line ROW (Catchment 201)

Drainage Area = **4247** **m2** **or** **0.42** **ha**

Impervious (m2)		**Landscaped Areas (m2)**	
958	Asphalt	3289	Landscape

Total Area=	0.10 ha		Total Area=	0.3289 ha	
		Area			Area
TIMP	90%	0.09 ha	TIMP	10%	0.03 ha
XIMP	70%	0.07 ha	XIMP	5%	0.02 ha

IMPERVIOUSNESS			
TOTAL Modelled Area=	**0.42 ha**	**TOTAL Pervious Area=**	**0.31 ha**
OVERALL TIMP	**0.280**	**OVERALL Runoff Coefficient**	**0.30**
OVERALL XIMP	**0.197**		

Project: Ninth Line
File: 300044049
Designed by: T.Rosborough
Checked by: S.Roorda
Date: 10-May-23

BURNSIDE

IMPERVIOUS CALCULATIONS - Post Development (Catchment 202)

Pond Drainage Area = **35022** **m2** **or** **3.50** **ha**

Impervious (m2)

19083	Roof / Roads / Walkways

Total Area= 1.91 ha

		Area
TIMP	90%	1.72 ha
XIMP	70%	1.34 ha

Landscaped Areas (m2)

4633	Septic Area
8908	Landscape

Total Area= 1.35 ha

		Area
TIMP	10%	0.14 ha
XIMP	5%	0.07 ha

z

SWM Block (m2)

2399	Pond

Total Area = 0.24 ha

		Area
TIMP	50%	0.12 ha
XIMP	50%	0.12 ha

Total Area = 0.00 ha

		Area
TIMP	80%	0.19 ha
XIMP	60%	0.14 ha

IMPERVIOUSNESS

TOTAL Modelled Area=	**3.50 ha**	**TOTAL Pervious Area=**	**1.53 ha**
OVERALL TIMP	**0.563**	**OVERALL Runoff Coefficient**	**0.56**
OVERALL XIMP	**0.435**		

Water Quality Design Sheet:

Project Name: Ninth Line
Project Number: 300044049
Date: 5/10/2023
Completed by: T.Rosborough

BURNSIDE

Water Quality and Extended Detention Storage - Catchment 202

Summary of Land Uses	Area =		Imperviousness =
Roof / Road / Walkways	1.91	ha	90%
Landscaped Areas	1.35	ha	10%
SWM Pond	0.24	ha	50%
TOTAL	3.50	ha	56.3%

Protection Level	1	Type "1" for Enhanced, "2" for Normal, "3" for Basic	Table 3.2 Code
Pond Type	Wetpond	Choose Infiltration, Wetpond, Wetland, or Hybrid	3
Imperviousness %	56.3		
MOE 2003 Table 3.2 Volume	154.6	m^3/ha	

Type of SWM Facility	Protection Level	Water Quality Volume (m^3)	Extended Detention Volume *		Estimated Peak Release Rate (m^3/s)
			MOE Guideline (40m^3/ha) (m^3)	25mm Storm Runoff (m^3)	
Wetpond	1	541	140	493	0.0086

NOTE: - * The greater of the MOE Guideline (40m^3/ha) and the 25mm Storm Runoff Volume is used as the Extended Detention Volume.
- The Estimated Peak Release Rate is based on the Extended Detention Volume divided by 24hrs divided by 3600sec multiplied by 1.5.
- The constant of 1.5 is used to determine the approx. peak release rate from the average release rate.

5mm On-Site Retention Volume

PROJECT: Ninth Line
PROJECT #: 300044049
DATE: 10-May-23
MUNICIPALITY: City of Mississauga

Catchment	Area (ha)	Impervious Level	Runoff Volume (mm)	Drawdown Time (hrs)	Required Detention Volume (m^3)
201*	0.24	0.28	5.00	24	3.4
202	3.50	0.56	5.00	24	98.0
Total	**3.75**	**0.54**			**101.4**

**Uncontrolled Area of 0.44 ha minus 0.18 ha conveyed to the City.*

SWM Facility Storage Design Sheet:

Project Name: Ninth Line
Project Number: 300044049
Date: 5/10/2023
Completed by: T.R.

BURNSIDE

SWM Pond - Storage Calculations

INPUT AREA

Base:	178.00	
NWL	179.20	
Required Water Quality Volume:	564	m^3
Provided Water Quality Volume:	676	m^3
Required 100-Year Storage Volume	1704	m^3
100-Year Storage Volume Provided	2218	m^3

ELEVATION / STORAGE INFORMATION

	Elevation	Stage	Area 1	Area 2	Total Area	Avg. Area	Incremental Storage	Cumulative Storage	Cumulative Storage above Permanent Pool
	(m)	(m)	(m2)	(m2)	(m2)	(m2)	(m3)	(m3)	(m3)
Base	178.00	0.00	200	0	200				
	178.50	0.50	376	178	554	377	189	**189**	**0**
	179.00	1.00	591	143	734	644	322	**511**	**0**
NWL	179.20	1.20	922		922	828	166	**676**	**0**
	179.50	1.50	1,153		1,153	1,038	311	**987**	**311**
	180.00	2.00	1,528		1,528	1,341	670	**1,658**	**982**
	180.50	2.50	1,867		1,867	1,698	849	**2,506**	**1,830**
Freeboard	180.70	2.70	2,009		2,009	1,938	388	**2,894**	**2,218**
	181.00	3.00	2,231		2,231	2,120	636	**3,530**	**2,854**

Stage-Discharge-Storage Operation

Wet-Pond Facility

Ninth Line

Project # 300044049

Input:

Control used	Control	Inv. Elev. (m)	D or L (mm or m)	Lip Elev. (m)	Description	
Y	Orifice 1	179.20	80	179.20	ED	
Y	Orifice 2	179.20	170	179.80	100-Year	
N	Orifice X	500	500	500.00		not used
Y	Weir A	180.70	10.0	180.70	Emergency	

Orifice: $Q=CA(2gH)^{0.5}$

Weir: $Q=Cd*(L-0.06h)*H^{3/2}$

Pond WS Elev (m)	Orifice 1 Head (m)	Orifice 1 Outflow (m^3/s)	Orifice 2 Head (m)	Orifice 2 Outflow (m^3/s)	Orifice 3 Head (m)	Orifice 3 Outflow (m^3/s)	Weir "A" Head (m)	Weir "A" Discharge Coefficient	Weir "A" Outflow (m^3/s)	**Total Controlled Outflow (m^3/s)**	**Pond Storage (m^3)**	Tailwater Elev (m)	Design Storm
									0				
179.20	na	0.000	na	0.000	na	0.00	0.00	1.84	0.00	**0.000**	-	0.00	
179.30	0.06	0.003	na	0.000	na	0.00	0.00	1.84	0.00	**0.003**	**104**	0.00	
179.40	0.16	0.006	na	0.000	na	0.00	0.00	1.84	0.00	**0.006**	**208**	0.00	
179.50	0.26	0.007	na	0.000	na	0.00	0.00	1.84	0.00	**0.007**	**311**	0.00	
179.60	0.36	0.008	na	0.000	na	0.00	0.00	1.84	0.00	**0.008**	**445**	0.00	
179.70	0.46	0.009	na	0.000	na	0.00	0.00	1.84	0.00	**0.009**	**579**	0.00	
179.80	0.56	0.010	na	0.000	na	0.00	0.00	1.84	0.00	**0.010**	**713**	0.00	ED
179.90	0.66	0.011	0.61	0.049	na	0.00	0.00	1.84	0.00	**0.060**	**847**	0.00	
180.00	0.76	0.012	0.71	0.053	na	0.00	0.00	1.84	0.00	**0.065**	**982**	0.00	
180.10	0.86	0.013	0.81	0.056	na	0.00	0.00	1.84	0.00	**0.069**	**1,151**	0.00	
180.20	0.96	0.014	0.91	0.060	na	0.00	0.00	1.84	0.00	**0.073**	**1,321**	0.00	
180.30	1.06	0.014	1.01	0.063	na	0.00	0.00	1.84	0.00	**0.077**	**1,491**	0.00	
180.40	1.16	0.015	1.11	0.066	na	0.00	0.00	1.84	0.00	**0.081**	**1,660**	0.00	
180.50	1.26	0.015	1.21	0.069	na	0.00	0.00	1.84	0.00	**0.084**	**1,830**	0.00	
180.60	1.36	0.016	1.31	0.071	na	0.00	0.00	1.84	0.00	**0.088**	**2,024**	0.00	
180.70	1.46	0.017	1.41	0.074	na	0.00	0.00	1.84	0.00	**0.091**	**2,218**	0.00	100-Year
180.80	1.56	0.017	1.51	0.077	na	0.00	0.10	1.84	0.58	**0.675**	**2,430**	0.00	
180.90	1.66	0.018	1.61	0.079	na	0.00	0.20	1.84	1.64	**1.738**	**2,642**	0.00	
181.00	1.76	0.018	1.71	0.082	na	0.00	0.30	1.84	3.01	**3.113**	**2,854**	0.00	

STORM SEWER DESIGN SHEET: (10 Year Storm)

PROPOSED SEWER SYSTEM
NINTH LINE, CITY OF MISSISSAUGA

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Project #: 300044049.0000
Date: 10-May-23
Designed: TR
Checked: SR

Min. Diameter = 250 mm
Mannings 'n'= 0.013
Starting Tc = 15 min
Factor of Safety = 10 %

Rainfall Intensity = $\frac{A}{(Tc+B)^c}$ *where Tc is in minutes*

A = 820
B = 4.6
C = 0.78
(10 Yr)

NOMINAL PIPE SIZE USED

DESCRIPTION	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 (%)
	DCBMH11	MH10	0.26	0.81	0.22	0.22	80.5	0.048			0.048	23.2	0.40	300	0.061	0.87	15.00	0.45	15.45	79%
	MH10	CBMH09				0.22	79.1	0.047			0.047	54.8	0.40	300	0.061	0.87	15.45	1.06	16.50	77%
	RD01	CBMH09	0.50	0.90	0.45	0.45	80.5	0.101			0.101	30.0	2.00	300	0.137	1.93	15.00	0.26	15.26	74%
	CBMH09	DCBMH07	0.24	0.73	0.17	0.84	76.0	0.177			0.177	76.3	0.40	525	0.272	1.26	16.50	1.01	17.51	65%
	DCBMH07	DCBMH06	0.25	0.69	0.17	1.01	73.3	0.206			0.206	20.5	0.30	525	0.236	1.09	17.51	0.31	17.83	87%
	DCBMH06	DCBMH03	0.16	0.80	0.13	1.14	72.5	0.230			0.230	40.6	0.30	600	0.336	1.19	17.83	0.57	18.40	68%
	DCBMH05	CBMH04	0.32	0.85	0.27	0.27	80.5	0.060			0.060	23.7	0.30	375	0.096	0.87	15.00	0.45	15.45	62%
	CBMH04	DCBMH03	0.22	0.81	0.18	0.45	79.1	0.099			0.099	47.4	0.30	450	0.156	0.98	15.45	0.80	16.26	63%
	DCBMH03	DCBMH02	0.18	0.87	0.16	1.75	71.1	0.345			0.345	17.4	0.30	675	0.460	1.29	18.40	0.23	18.62	75%
	DICB03	MH12	0.35	0.25	0.09	0.09	80.5	0.019			0.019	20.1	0.40	250	0.038	0.77	15.00	0.44	15.44	52%
	MH12	DCBMH02				0.09	79.1	0.019			0.019	59.2	0.40	250	0.038	0.77	15.44	1.29	16.72	51%
	DCBMH02	CHAMBER	0.19	0.76	0.14	1.98	70.5	0.387			0.387	3.5	0.30	675	0.460	1.29	18.62	0.05	18.67	84%
	CHAMBER	MH35				1.98	70.4	0.386			0.386	5.2	0.30	675	0.460	1.29	18.67	0.07	18.74	84%
	MH35	MH34				1.98	70.3	0.386			0.386	26.7	0.30	675	0.460	1.29	18.74	0.35	19.08	84%
	MH34	MH33				1.98	69.5	0.381			0.381	31.9	0.30	675	0.460	1.29	19.08	0.41	19.49	83%
	DICB02	MH33	0.29	0.25	0.07	0.07	80.5	0.016			0.016	20.2	0.50	250	0.042	0.86	15.00	0.39	15.39	38%
	MH33	HW01				2.05	68.5	0.390			0.390	9.2	0.30	675	0.460	1.29	19.49	0.12	19.61	85%

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Appendix C

Watermain Calculations

Connection Single Use Demand Table

WATER CONNECTION

Connection point [3]			
Ninth Line, ~400m south of Burnhamthorpe Road			
Pressure zone of connection point		Zone 4	
Total equivalent population to be serviced [1]		1104	Persons
Total lands to be serviced		3.93	Hectares
Hydrant flow Test			
Hydrant flow test location			
	Pressure (kPa)	Flow (in l/s)	Time
Minimum Water Pressure			
Maximum Water Pressure			

No.	**Water demands**		
	Demand type	**Demand**	**Units**
1	Average day flow	1.79	l/s
2	Maximum day flow	2.50	l/s
3	Peak hour flow	5.37	l/s
4	Fire flow [2]	178.50	l/s
Analysis			
5	Maximum day plus fire flow	181.00	l/s

WASTEWATER CONNECTION

Connection point [4]		Septic
Total equivalent population to be serviced [1]		1104
Total lands to be serviced		3.93 ha.
6	Wastewater sewer effluent (in l/s)	N/A

[1] The calculations should be based on the development estimated population (employment or residential).
[2] Please reference the Fire Underwriters Survey Document
[3] Please specify the connection point ID
[4] Please specify the connection point (wastewater line or manhole ID)
Also, the "total equivalent population to be serviced" and the "total lands to be serviced" should reference the connection point. (The FSR should contain one copy of Site Servicing Plan)

Please include the graphs associated with the hydrant flow test information table
Please provide Professional Engineer's signature and stamp on the demand table
All required calculations must be submitted with the demand table submission.

Connection Single Use Demand Table

WATER CONNECTION

Connection point [3]			
Ninth Line, ~400m south of Burnhamthorpe Road			
Pressure zone of connection point		Zone 4	
Total equivalent population to be serviced [1]		2371	Persons
Total lands to be serviced		3.93	Hectares
Hydrant flow Test			
Hydrant flow test location			
	Pressure (kPa)	Flow (in l/s)	Time
Minimum Water Pressure			
Maximum Water Pressure			

No.	Water demands		
	Demand type	**Demand**	**Units**
1	Average day flow	3.84	l/s
2	Maximum day flow	5.38	l/s
3	Peak hour flow	11.53	l/s
4	Fire flow [2]	255.71	l/s
Analysis			
5	Maximum day plus fire flow	261.09	l/s

WASTEWATER CONNECTION

Connection point [4]	Septic
Total equivalent population to be serviced [1]	N/A
Total lands to be serviced	3.93 ha.
6 Wastewater sewer effluent (in l/s)	N/A

[1] The calculations should be based on the development estimated population (employment or residential).
[2] Please reference the Fire Underwriters Survey Document
[3] Please specify the connection point ID
[4] Please specify the connection point (wastewater line or manhole ID)
Also, the "total equivalent population to be serviced" and the "total lands to be serviced" should reference the connection point. (The FSR should contain one copy of Site Servicing Plan)

Please include the graphs associated with the hydrant flow test information table
Please provide Professional Engineer's signature and stamp on the demand table
All required calculations must be submitted with the demand table submission.

From: Sniatenchuk, Bernadette <bernadette.sniatenchuk@peelregion.ca>
Sent: Monday, April 22, 2019 10:36 AM
To: Daniel Nagel
Cc: Steven Roorda; Ambrico, Angelo
Subject: RE: East Side of Ninth Line, Mississauga - Attached Water Demand Tables for two possible scenarios

Hi Daniel, the modeling indicated that the existing watermain cannot meet the maximum day demand and fire flow for phase 1, which is the Church only.

Let me know if you have any other questions.

Bernadette Sniatenchuk, B.Sc.
Facilitator – Development Engineering

Development Services, Public Works, Region of Peel
10 Peel Centre Drive, Suite B, 4th Floor
Brampton, On L6T 4B9
e-mail: bernadette.sniatenchuk@peelregion.ca
Phone: 905-791-7800, ext.8589
Fax: 905-791-1442

From: Daniel Nagel <Daniel.Nagel@rjburnside.com>
Sent: April 8, 2019 1:54 PM
To: Sniatenchuk, Bernadette <bernadette.sniatenchuk@peelregion.ca>
Cc: Steven Roorda <Steven.Roorda@rjburnside.com>; Ambrico, Angelo <angelo.ambrico@peelregion.ca>
Subject: RE: East Side of Ninth Line, Mississauga - Attached Water Demand Tables for two possible scenarios

Hey Bernadette,
Thanks for the analysis, I just wanted to confirm one more thing concerning the analysis results. Is the existing 200mm inadequate for both Phases (Phase #1 and/or #2)? It would be great if could confirm this for us! Thanks again for your help!

Cheers,
Daniel

Daniel Nagel, P.Eng.
Senior Project Engineer
R.J. Burnside & Associates Limited | www.rjburnside.com
Office: +1 800-265-9662 Direct: +1 226-486-1544

From: Sniatenchuk, Bernadette <bernadette.sniatenchuk@peelregion.ca>
Sent: Monday, April 08, 2019 7:46 AM
To: Daniel Nagel <Daniel.Nagel@rjburnside.com>
Cc: Steven Roorda <Steven.Roorda@rjburnside.com>; Ambrico, Angelo <angelo.ambrico@peelregion.ca>

Subject: RE: East Side of Ninth Line, Mississauga - Attached Water Demand Tables for two possible scenarios

Hi Daniel, The results of the analysis showed that the existing 200mm watermain on Ninth line cannot adequately meet your fire flow requirements and there may be a negative impact to existing customers using this watermain. In order for your proposal to have adequate water for fire protection the 200mm watermain will require an upgrade to a minimum 300mm watermain.

If you have any more questions, let me know.
Thanks,

Bernadette Sniatenchuk, B.Sc.
Facilitator – Development Engineering

Development Services, Public Works, Region of Peel
10 Peel Centre Drive, Suite B, 4th Floor
Brampton, On L6T 4B9
e-mail: bernadette.sniatenchuk@peelregion.ca
Phone: 905-791-7800, ext.8589
Fax: 905-791-1442

From: Sniatenchuk, Bernadette
Sent: April 4, 2019 5:19 PM
To: 'Daniel Nagel' <Daniel.Nagel@rjburnside.com>
Cc: Steven Roorda <Steven.Roorda@rjburnside.com>; Ambrico, Angelo <angelo.ambrico@peelregion.ca>
Subject: RE: East Side of Ninth Line, Mississauga - Attached Water Demand Tables for two possible scenarios

Hi Daniel, I just got your voicemail. I actually just received the modeling results today. One point that was raised was the proposed population growth. I recommend that you speak with Planning at the City of Mississauga as the proposed population is higher than the projected growth for this area. The City will be able to provide guidance on the Planning data and population forecasts.

I reviewed the analysis and I had some questions for the modeller before I forward you the information. I'm just waiting to hear back.
Thanks,

Bernadette Sniatenchuk, B.Sc.
Facilitator – Development Engineering

Development Services, Public Works, Region of Peel
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Brampton, On L6T 4B9
e-mail: bernadette.sniatenchuk@peelregion.ca
Phone: 905-791-7800, ext.8589
Fax: 905-791-1442

From: Daniel Nagel <Daniel.Nagel@rjburnside.com>
Sent: March 19, 2019 12:36 PM
To: Sniatenchuk, Bernadette <bernadette.sniatenchuk@peelregion.ca>
Cc: Steven Roorda <Steven.Roorda@rjburnside.com>
Subject: RE: East Side of Ninth Line, Mississauga - Attached Water Demand Tables for two possible scenarios

Hey Bernadette,
I attached a Scenario Plan to this email, showing the usage for the church only representing Scenario #1 (excluding Red Hatched Areas), as well as the additional services required within Scenario #2 (including Red Hatch Areas). Please let me know if there are any additional questions from your end.

Cheers,
Daniel

Daniel Nagel, P.Eng.
Senior Project Engineer
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From: Sniatenchuk, Bernadette <bernadette.sniatenchuk@peelregion.ca>
Sent: Monday, March 18, 2019 11:31 AM
To: Daniel Nagel <Daniel.Nagel@rjburnside.com>
Cc: Steven Roorda <Steven.Roorda@rjburnside.com>
Subject: RE: East Side of Ninth Line, Mississauga - Attached Water Demand Tables for two possible scenarios

Hi Daniel,

For Scenario #2 what would the other uses be on the site besides the Church?

Thanks,
Bernadette Sniatenchuk, B.Sc.
Facilitator – Development Engineering

Development Services, Public Works, Region of Peel
10 Peel Centre Drive, Suite B, 4th Floor
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Fax: 905-791-1442

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From: Daniel Nagel <Daniel.Nagel@rjburnside.com>
Sent: March 4, 2019 3:00 PM
To: Sniatenchuk, Bernadette <bernadette.sniatenchuk@peelregion.ca>
Cc: Steven Roorda <Steven.Roorda@rjburnside.com>
Subject: East Side of Ninth Line, Mississauga - Attached Water Demand Tables for two possible scenarios

Hey Bernadette,
It was great talking to you over the phone today, concerning the water modeling for our project on Ninth Line, Mississauga. As discussed we did a two scenario approach for the water demand, which are attached to this email. Scenario #1 only includes the church, where as Scenario #2 would be the entire site. We hope that the attached demand tables are useful to complete the water modeling from your end. In the case of any possible questions, please feel free to get in contact with me at any time. Thanks again for everything and I am looking forward to hear from you soon.

Cheers,
Daniel

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Daniel Nagel, P.Eng.
Senior Project Engineer

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