Functional Servicing & Stormwater Management Report 500 Salem Road Subdivision City of Barrie

WMI File# 21-652
September 2022

Prepared by

WMI & Associates Limited
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Table of Contents

Appendices

1.0 Background

1.1 General

WMI & Associates Limited has been retained by LSR Salem Inc. (002527943 ON Inc.) to prepare a Functional Servicing and Stormwater Management Report in support of the proposed townhome subdivision development (herein referred to as the 'site') located at 500 Salem Road in the City of Barrie. The site is located within lands that were previously annexed from the Town of Innisfil, and is within the Salem Secondary Plan area.

The Functional Servicing and Stormwater Management Report provided herein has been based on a previously prepared Functional Servicing and Stormwater Management Report prepared by WMI & Associates (June 2021) that had been prepared in support of a conformity review submission to the City of Barrie. The conformity review process had demonstrated that the proposed subdivision is generally in conformance with planning and master servicing policies associated with the Salem Secondary Plan.

This report presents an investigation of existing services and drainage patterns, conceptual designs for proposed watermains, sanitary sewers, and stormwater management controls in support of a re-zoning application. The level of detail presented is sufficient to support planning level approvals and shall serve as the basis for detailed design.

Fundamental servicing and drainage objectives detailed in this report are based on drainage and servicing constraints, pre-consultation information from the City of Barrie, Nottawasaga Valley Conservation Authority (NVCA), as well as design guidelines and best management practices as set out by the Ministry of the Environment, Conservation and Parks (MECP). This report is in accordance with master servicing design work completed, including Subwatershed Impact Study (SIS) Report for the Salem Annexed Lands prepared by Schaeffers Engineering dated December 2017. Various external servicing plans, drainage plans, and plan and profile drawings of the surrounding municipal roads were obtained from the City of Barrie (Essa Road and Salem Road Expansion Drawings prepared by RJ Burnside on behalf of the City of Barrie dated July 7, 2021, (60% submission drawings). As well, specifics for the future development north of the site (Functional Servicing Report for the DiPoce development prepared by Schaeffers Engineering Consultants dated June 2020) were also referenced to determine area-wide drainage patterns and, the extent of and connections to proposed municipal infrastructure.

1.2 Site Description

The property comprises 3.32ha and is located on the north side of Salem Road, east of the intersection of County Road 27 and Salem Road. It is located in a rural area consisting of low-density residential, industrial and undeveloped properties. Specifically, the property is bound to the west by low density residential properties, vacant lands that are slated for future residential and commercial development to the north, undeveloped lands to the east and industrial properties to the south.

The western portion of the property contains a residential dwelling and the central portion comprises undeveloped low lying lands and a tributary of Bear Creek. The proposed townhome site at the east end of the property is currently undeveloped and consists of tall grasses and trees along the east property line. The townhome site, which comprises 0.68ha, is to be severed from the 500 Salem Road property and the adjacent low-lying wet lands are to be dedicated as environmental protection lands.

The proposed development includes six (6) residential townhouse blocks each with 5-6 units for a total of 34 units, and a proposed municipal road herein referred to as “Street A” that will connect Salem Road to the south with the DiPoce subdivision development to the north. A 7.0m wide area across the frontage of the townhouse site is to be dedicated to the City of Barrie for the future road widening of Salem Road.

The property is legally referred to as Part of South Half of Lot 1, Concession 11, Geographic Township of Innisfil, Town of Innisfil, County of Simcoe. This report is based upon a conceptual Site Plan dated July 18, 2022 and Draft Plan of Subdivision dated September 9, 2022 both prepared by Innovative Planning Solutions (IPS). The conceptual Site Plan, Draft Plan and Site Location Plan are contained in **Appendix A** for reference. Also, refer to the Conceptual Site Servicing and Grading Plans contained in **Appendix A** for pertinent conceptual design details which are discussed throughout this report.

2.0 Stormwater Management

2.1 Existing Topography and Pre-Development Drainage

Existing grades within the site are generally sloped in the range of 2-6%; however, a ridge along the south-eastern border of the site has grades in the range of 5:1. The site is predominantly drained via overland sheet flow, with the site drainage split approximately equally, flowing toward the north and west.

The pre-development drainage boundaries are as defined by site topography. The eastern drainage area, herein referred to as Catchment PRE-E, drains north towards the future DiPoce development and comprises 0.39ha. The remaining western portion of the site, herein referred to as Catchment PRE-W, comprises 0.35ha and drains west towards the low-lying lands and tributary of Bear Creek.

The design of the adjacent DiPoce Residential Subdivision as described in the Functional Servicing Report (FSR) prepared by Schaeffers Consulting Engineers details the catchment areas and drainage patterns of Salem Road and the surrounding areas. Since the subject 500 Salem Road site drains into the DiPoce subdivision in the pre-development condition, their drainage and stormwater management design accounts for this drainage; specifically a 0.68ha drainage area (with runoff coefficient 'C' of 0.55) from the site, of the total 0.93ha Catchment 209E drainage area as referenced from Figure 2-2 of their FSR.

Refer to the Pre-development Drainage Areas, **Figure 2**, included in **Appendix A**. A copy of the Post-Development Drainage Plan for the DiPoce development (Figure 2-2) contained in **Appendix A** for reference.

2.2 Subsurface Conditions

Based on data from the Soils Map of Simcoe County, published by the Canada Department of Agriculture (1959), the predominant soil deposit in the area is identified as Sargent Gravelly Sandy Loam. These soils are considered to have good drainage characteristics, and are classified within Hydrologic Soils Group 'AB'.

A Geotechnical Investigation Report (dated July 2022) was completed for the subject site by Soil Engineers Ltd. This investigation consisted of 3 boreholes drilled to depths of 6.6m to 8.1m below ground surface, and each of the boreholes was outfitted with a monitoring well. Below the surficial topsoil, the soils generally consist of native sand and silty sand till. This Report reveals that the surficial soils exhibit a percolation rate of 12min/cm (50mm/hr). Groundwater was encountered at the time of borehole drilling with levels at 2.1m to 3.4m below ground surface.

A Hydrogeological Study and Water Balance Analysis (dated September 14, 2022) was completed by Ian D. Wilson Associates Ltd. Groundwater table depths were found to be 1.5m-2.6m below grade as observed on July 8, 2022, however, based on the setting of the site shallow water table conditions are presumed during the spring months. The Water Balance Assessment contained in the report indicates that 65% of the runoff from the building rooftops (848m^3/year) will be required to be infiltrated to restore water balance to pre-development levels.

Wilson's review of Source Protection and Risk Management states that the subject site is located within Well Head Protection Area WHPA-Q2, within a significant groundwater recharge area and within a highly vulnerable aquifer. Infiltration will be provided in accordance with the water balance recommendations.

The Preliminary Geotechnical Investigation Report (by Soil Engineers Ltd.) and Hydrogeological Report (by Wilson Associates) are included in **Appendix D**.

2.3 Design Criteria Guidelines

The stormwater management design principles for the proposed development are to incorporate the policies and criteria of The Ministry of the Environment, Conservation, and Parks (MECP), the Nottawasaga Valley Conservation Authority (NVCA), and the City of Barrie, and are to incorporate low impact development (LID) features as a part of the stormwater management system. The proposed development is also in conformance with the requirements of the Subwatershed Impact Study (SIS) for Salem Annexed Lands. Stormwater management design criteria are summarized below:

- The City of Barrie rainfall intensity-duration-frequency (IDF) curves will be used to determine the peak design flows and runoff volumes for each of the design storm events analyzed.

- Quantity controls are to be provided to attenuate peak flows to pre-development and/or allowable levels for all storm events.

- Quality control will be provided at an Enhanced Level as defined by The Ministry of the Environment's (MOE) Stormwater Management Planning and Design Manual (March 2003).

- Phosphorus reduction, water balance controls, and runoff volume control will be achieved to the greatest extent possible as per NVCA guidelines and SIS requirements.

- Erosion and sediment control measures will be implemented prior to, and during, construction and maintained until the site is stabilized.

Through review of the stormwater management design for the DiPoce Development, it is confirmed that their SWM controls have largely accounted for the subject site in its proposed post-development form. The following sections of the report describe how the above-noted criteria are satisfied.

2.4 Post-Development Drainage

Post-development drainage conditions will generally strive to match the pre-development conditions as closely as possible, while adhering to the overall drainage plans as established via the adjacent DiPoce subdivision and the Salem Road reconstruction plans. Once developed, most of the drainage from the site will be directed to the DiPoce development to the north which has been accounted for in the DiPoce stormwater analysis. The Salem Road reconstruction design also depicts a storm sewer connection through the subject lands and through to the DiPoce lands to the north.

2.4.1 External Drainage

Based on the location and proposed built form of the subject development, it is dependent on the stormwater management system of the development (DiPoce) to the north (downstream) for its stormwater drainage objectives. Consideration of drainage from Salem Road to the south (upstream) of the site is also required for the determination of peak flows and sizing the proposed storm sewer through the site.

The Storm Drainage Area Plan (STM-1) from the City of Barrie Infrastructure Department dated July 7, 2021 details the external drainage areas to outlet through the site, and which are accounted for in the design.

Should the Salem Road reconstruction project not be constructed before the development of the subject site, a road crossing culvert will need to be installed within the north ditch where Street ‘A’ intersects Salem Road to divert the external drainage west of the site where it ultimately outlets to the existing Bear Creek tributary.

Refer to **Appendix A** for the Storm Drainage Area Plan (STM-1) and the DiPoce Post-Development Drainage Plan (Figure 2-2). Also refer to the storm sewer design sheet contained in **Appendix B**.

2.4.2 Internal Drainage

The proposed internal drainage patterns will be such that the entire roadway, the front yards of all of the townhouses and the rear yards of the townhomes along the eastern portion of the site will drain towards Street ‘A’ and then be conveyed north towards the DiPoce development.

This drainage area that discharges to Street 'A' comprises 0.54ha and is referred herein as Catchment A1. These flows will be conveyed by a proposed storm sewer connecting to the DiPoce storm sewer, with the Street 'A' right-of-way to provide conveyance of flows during major storm events.

The western portion of the site consists of the rear half of the western townhome blocks and associated rear yards, is herein referred to as Catchment A2 and comprises 0.14ha. Catchment A2 cannot flow to Street 'A' based on topographical constraints and will drain by overland flow west to the existing low-lying area and Bear Creek tributary, similar to the pre-development condition.

Table 1 below summarizes the uncontrolled pre-development and allowable peak flows for various return period design storms.

Table 1: Pre- Development and Allowable Uncontrolled Peak Flows

Catchment I.D.	A (ha)	T_C (min.)	C	Q_2 (m^3/s)	Q_5 (m^3/s)	Q_{10} (m^3/s)	Q_{25} (m^3/s)	Q_{50} (m^3/s)	Q_{100} (m^3/s)
PRE-E	0.39	18.8	0.15	0.009	0.012	0.014	0.019	0.023	0.026
PRE-W	0.35	18.9	0.15	0.008	0.011	0.013	0.017	0.020	0.023
Allowable Site Area to DiPoce	**0.68**	**10.0**	**0.55**	**0.086**	**0.113**	**0.131**	**0.169**	**0.205**	**0.234**

Table 2 below summarizes the uncontrolled post-development and external peak flows for various return period design storms.

Table 2: Post-Development and External Uncontrolled Peak Flows

Catchment I.D.	A (ha)	T_C (min.)	C	Q_2 (m^3/s)	Q_5 (m^3/s)	Q_{10} (m^3/s)	Q_{25} (m^3/s)	Q_{50} (m^3/s)	Q_{100} (m^3/s)
A1	0.54	10.0	0.65	0.081	0.106	0.123	0.159	0.192	0.220
A2	0.14	10.0	0.31	0.010	0.013	0.015	0.020	0.024	0.027
EXT	0.48	10.0	0.58	0.064	0.084	0.097	0.125	0.152	0.173

Since the Catchment A2 flows are comparable to the PRE-W flows, quantity controls are not proposed for this catchment. The peak flows from Catchment A1 are less than the allowable peak flows from the allowable site area draining to DiPoce for all storm events; therefore, no peak flow attenuation is required.

Refer to **Figure 3** for the Post-Development Drainage Plan, contained in **Appendix A**. Also refer to the storm drainage calculations contained in **Appendix B.**

2.5 Quantity Control

As detailed in **Section 2.4,** the peak flows generated by the subject site within Catchment A1, for the post-development condition, are within the allowable limits as prescribed by the DiPoce SWM analysis. Based on this, no on-site quantity control measures are proposed, as all of the quantity controls will be provided within the DiPoce Development SWM Pond H which has sufficient capacity to accommodate peak flows from the subject site.

2.6 Quality Control

Stormwater quality treatment must be provided to an Enhanced Level (80% TSS removal), as per MECP requirements. Quality controls are to be provided predominantly within the DiPoce Development by means of a treatment train. The treatment train for Catchments 200, 206 and 209E (which includes the subject site) includes Jellyfish filtration units with Environmental Technology Verification (ETV) capabilities, and the permanent pool and infiltration bed within SWM Pond H. This treatment train was found to have an overall TSS removal efficiency of 98%, which is in excess of the Enhanced Level requirements.

Within the subject site, pre-treatment BMPs will be incorporated into the proposed storm sewer system by providing deep sumps within the catchbasins to allow for increased sediment capture. This contaminate removal will provide pre-treatment of runoff generated on the site and increase the effectiveness of the downstream treatment train within the DiPoce Development to ensure an Enhanced Level of quality control is achieved.

For supporting information pertaining to quality controls, refer to excerpts from Section 2.7 of the DiPoce FSR contained in **Appendix B**.

2.7 Water Balance Controls

Water balance measures for the subject site are provided within the DiPoce development via the infiltration bed located within SWM Pond H. The water balance mitigation calculations from the DiPoce FSR identifies that there is a net deficit of 22,882m^3 of infiltration annually for the development and surrounding areas.

The calculated water balance mitigation proposed for the DiPoce development is 25,015m^3/yr for the SWM Pond H infiltration bed. The proposed infiltration for the entire DiPoce development is 34,006m^3/yr, which is 11,124m^3/yr greater than the targeted volume of 22,882m^3.

The Water Balance Analysis conducted by Wilson Associates for the subject site details that 848m^3/year is required to be infiltrated into LIDs to mitigate this water balance deficit. The majority of the subject site runoff drains into the proposed DiPoce development, specifically into SWM Pond H. Based on this, the required volume of 848m^3/yr for water balance of the subject site is accommodated by the DiPoce development's infiltration bed, which provides an excess capacity of 11,124m^3/yr.

For supporting information pertaining to water balance controls, refer to excerpts from Section 2.9 of the DiPoce FSR contained in **Appendix B**. Also refer to **Appendix D** for the Hydrogeological Assessment and Water Balance Budget analysis of the proposed townhome development.

2.8 Phosphorus Removal Initiatives

Phosphorus removal initiatives are required to meet the NVCA guidelines which are to match pre-development phosphorus loading, with a best effort to achieve an additional 20% reduction from pre-development loads. From the DiPoce development, phosphorus reduction measures are proposed through a number of Best Management Practices (BMP).

The BMPs used in the DiPoce development, which the subject development drains into, includes Jellyfish filtration units (with ETV treatment capabilities), the SWM Pond H, and an infiltration bed within SWM Pond H. The total pre-development phosphorus export is **2.52kg/yr**. Based on the efficiencies of the proposed treatment train, the total post-development phosphorus export is **0.85kg/yr** with BMPs and the phosphorus export without BMPs is **6.05kg/yr**. This represents a **66%** TP load reduction with the implementation of the BMPs from the pre-development phosphorus loading levels.

For supporting information pertaining to phosphorus controls, refer to excerpts from Section 2.10 of the DiPoce FSR contained in **Appendix B**.

2.9 Runoff Volume Controls

The NVCA does not have a requirement for runoff volume control but to meet the requirements of the SIS study, the requirements for volumetric control as described by the Lake Simcoe Region Conservation Authority (LSRCA) are to be followed to the greatest extent possible.

The objective of runoff volume control is to provide runoff volume reduction through stormwater retention (via practices such as infiltration, evapotranspiration), runoff filtration, and through the application rate control BMPs; in this order of priority.

The proposed SWM system within the DiPoce development, which accommodates the subject site, incorporates infiltration through a centralized treatment system. Based on land use constraints and the requirement for a centralized runoff control system as outlined in the SIS, it is determined that 6.5mm of runoff retention from impervious

areas is the achievable target. The drainage area used for the Runoff Volume control calculations as detailed in the DiPoce FSR, encompasses an area of 24.49ha which includes Catchment 209E, and therefore the subject site. The calculated infiltration volume, using the 6.5mm rainfall depth target is 785m^3, which is greater than the targeted volume of 669m^3.

Based on the above, there is sufficient runoff volume control provided within the DiPoce Development to accommodate the subject site.

For supporting information pertaining to runoff volume controls, refer to excerpts from Section 2.8 of the DiPoce FSR contained in **Appendix B**.

3.0 Site Grading

The proposed grading for the residential development is based on site constraints, built form and stormwater management strategy. Specifics of proposed grading features are as follows:

- The Street ‘A’ road grades at the intersection of Salem Road are such that they will facilitate both the existing and future grading conditions for the site entrance.

- Street ‘A’ road grades from the Salem Road intersection to the DiPoce subdivision limit range from 2.0-3.2% to facilitate drainage to catchbasins and via overland flow within Street ‘A’. Driveway slopes for the individual units will be in the order of 2.0% to 6.0%.

- Earth cut is required for the ridge along the south and eastern boundary to facilitate drainage towards Street ‘A’. Perimeter grades within landscaped areas and around the proposed buildings will generally be from 2.0% to 5.0% with some areas having 3:1 slopes as required to match onto adjacent properties.

- The site is to be graded relatively high in order to permit servicing and townhome construction that will not be adversely impacted by the high groundwater table. It is noted that engineered fill may be required to construct servicing works. The grading scheme is consistent with that of the adjacent DiPoce subdivision to the north.

- A mixture of split drainage with rear walk-outs and rear-to-front grading designs are proposed to accommodate existing property line grades, and minimize impacts to adjacent properties.

Refer to **Figure 5** for the Conceptual Grading Plan, contained in **Appendix A**.

4.0 Sanitary Servicing

There are no existing sanitary sewers along Salem Road and the site is not currently serviced.

It is proposed that the 34 Townhome subdivision be serviced by a new 200mm diameter sanitary sewer. Each townhome will be serviced by individual sanitary service connections to the proposed sewer.

The proposed 200mm diameter sanitary sewer will connect to the proposed DiPoce 200mm diameter sanitary sewer at the north limit of the site, and will terminate near the south limit of the site, since a connection to Salem Road is not required based on the RJ Burnside drawings. It is confirmed that the elevation of the sewer at the DiPoce property line is sufficient to accommodate a sewer connection and service the townhomes of the subject site.

In order to confirm that the proposed sanitary sewer system within the DiPoce development is able to accommodate sewage flows from the site, an analysis was completed based on sanitary pipe capacities. The analysis utilized the plan and profile drawings for the DiPoce subdivision (dated June 2021) and servicing drawings and calculations from the DiPoce FSR (June, 2020).

From the review of the DiPoce site servicing drawings the governing sanitary sewer was determined to have 200mm diameter with 0.7% slope which is estimated to be the critical section of sewer with the lowest capacity. The peak sanitary flows for the DiPoce development was calculated to be 40.1% of the critical sanitary sewer capacity. Including the peak flows from the subject site results in peak flows of 43.6% of the critical sanitary sewer capacity. The 3.5% increase is considered negligible and therefore the downstream DiPoce sanitary sewer system is adequate to convey flows from the subject development.

Refer to **Appendix C** for supporting sanitary sewage flow calculations and information from the DiPoce FSR and Figure 4 in **Appendix A** for the Conceptual Site Servicing Plan and the plan and profile drawings / servicing plans for DiPoce.

5.0 Water Servicing

There are no existing municipal watermains along Salem Road and the site does not contain any existing water services or wells. There are also no fire hydrants in the vicinity of the site.

The proposed 300mm diameter watermain from the DiPoce development north of the site will be extended to the proposed Salem Road right-of-way at the south and tie into the proposed 300mm diameter watermain along Salem Road (to be completed as part of the reconstruction works) to loop the water distribution system and to facilitate service connections for the subject site. The Maximum Day Demand (MDD) for the site is calculated to be 1.66L/s.

5.1 Fire Protection

Two fire hydrants are proposed for the development with the first hydrant located immediately south of the DiPoce development near the north boundary and the second fire hydrant near the Salem Road right-of-way, both of which are located along the western side of the Street ‘A’ right-of-way.

The results of the water modeling from the DiPoce development was used to determine that there is sufficient capacity within this watermain system to account for the proposed site. The pressure used from the DiPoce Development was Node J-119, which is located immediately north of the subject site, under the maximum day and fire flow demand scenario.

The building specific water demand for the subject site was calculated to be 95.2L/s based on Fire Underwriters Survey (FUS) criteria, and the minimum required fire flow for Townhomes is 155L/s as per the City of Barrie land-use requirements. The DiPoce water model utilizes a fire flow of 155L/s in conjunction with the maximum day demand to confirm that the proposed water system is appropriately sized. Since the proposed built form of the subject site is similar to that of the DiPoce site and generates minimal additional maximum day demands, the water system can accommodate the additional 34 townhome units.

Refer to **Appendix C** for water servicing calculations and supporting information, and Figure 4 in **Appendix A** for the Conceptual Site Servicing Plan.

6.0 Utilities

Based on the proposed DiPoce plan of subdivision and Salem Road reconstruction works, it is anticipated that gas, hydro and telecom infrastructure will be available to service the subject site. In order to confirm that each of these services are available to service the proposed subdivision, the following utilities have been circulated a copy of the Draft Plan:

- Bell
- Rogers
- Hydro
- Enbridge
- Canada Post

It is anticipated that there will be no issues with providing utility servicing for the site. Specific utility servicing requirements will be confirmed at the detailed design stage.

7.0 Sediment and Erosion Controls

Effective erosion and sediment control must be established prior to construction commencement and maintained until the site has been stabilized. Pro-active measures will be required to limit the amount of sediment travelling downstream. Where site grading is required, exposure of the soil during construction should be minimized to avoid erosion and sedimentation.

Silt Fence: Silt fence to be placed on the down slope of all excavated material to prevent sediment transport onto adjacent properties and municipal roadways. Periodic inspections and repairs to the silt fence should be performed regularly, as well as after every rainfall event.

Storm Sewer Inlets: Filter cloth complete with clear stone cover at storm sewer inlet structures (i.e. catchbasins) will ensure any construction related sediment laden overland runoff is treated before entering the municipal storm sewer system.

Mud Mat: Mud tracking from construction traffic to be controlled through the use of a construction site access mud-mat (consisting of large diameter rip-rap).

Vegetated Buffers: Existing treed and lawn areas along the development limits are to be maintained wherever possible. These areas provide a natural barrier to filter potentially sediment-laden overland flow.

Monitoring and Inspection: Erosion monitoring and sediment removal should be undertaken weekly and after every rainfall event. All damaged or clogged control devices to be repaired immediately.

8.0 Summary and Conclusions

This Functional Servicing and Stormwater Management Report demonstrates how the proposed 500 Salem Road townhome development can be serviced by the adjacent municipal services and how storm runoff can be controlled without imposing negative or adverse impacts to the surrounding lands.

Specifically:

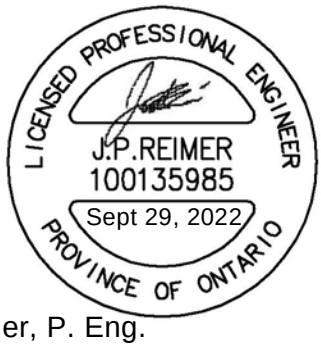
- Storm drainage for the site will be provided by connecting to the proposed storm sewer and conveying overland flows to the adjacent DiPoce development to the north.
- An enhanced level of quality (80% TSS Removal) will be provided through pre-treatment on-site and by the treatment train within the downstream DiPoce development.
- Water balance, runoff volume and phosphorus controls for the subject site are accounted for in the stormwater management measures of the DiPoce site.
- Sanitary servicing will be provided by extending a new sanitary sewer from the DiPoce sanitary sewer and providing individual service connections. The DiPoce sanitary sewer system has sufficient capacity to accommodate the subject development requirements.
- Fire and potable water servicing will be provided by a new watermain extended from the DiPoce development watermain and providing individual service connections. The DiPoce water distribution system has sufficient capacity to accommodate the subject development requirements.
- The use of silt fence, clear stone and filter cloth inlet protection, vegetated buffer strips and a construction mud mat, will provide adequate sediment and erosion controls during construction and until the site is fully stabilized.

Based on the above, we recommend that this report be accepted in support of planning level approvals.

Should you have any questions, or require additional information, please contact the undersigned.

Prepared by:

WMI & Associates Limited



Chris Jungkunz, EIT

Jonathan Reimer, P. Eng.

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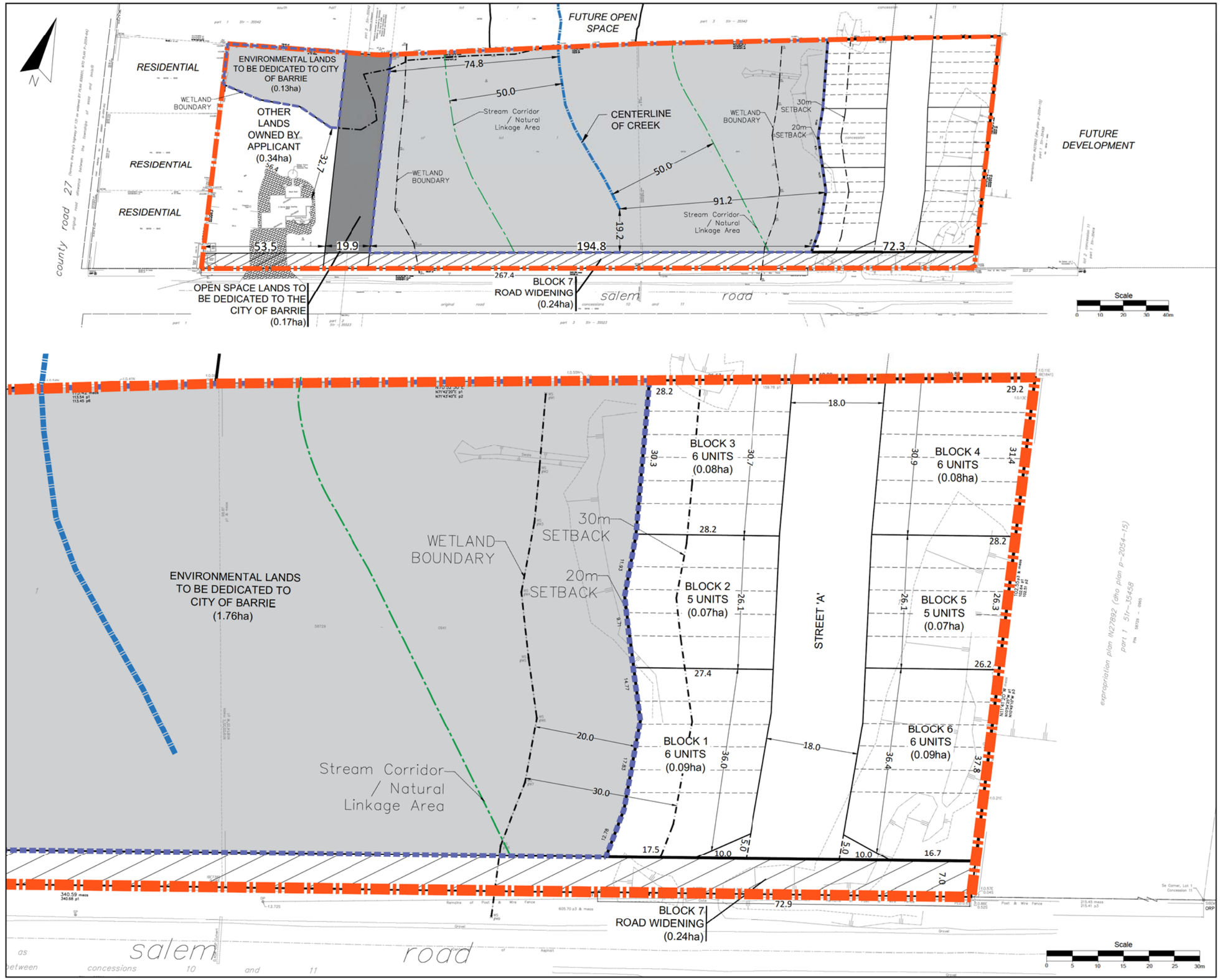
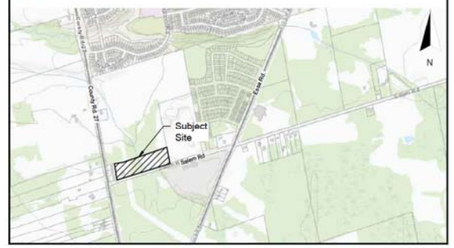
APPENDIX A

FIGURES/DRAWINGS



KEY MAP



DRAFT PLAN OF SUBDIVISION

PART OF SOUTH HALF OF LOT 1, CONCESSION 11,
GEOGRAPHIC TOWNSHIP OF INNISFIL,
TOWN OF INNISFIL,
COUNTY OF SIMCOE

LEGEND

- SUBJECT LANDS
  - AREA: 3.32ha
  - FRONTAGE: 340.5m (incl. develop. limit)
- DEVELOPMENT LIMIT (AREA:0.68ha excluding road widening)
- WETLAND BOUNDARY
- WETLAND SETBACK
- STREAM CORRIDOR / NATURAL LINKAGE AREA
- ENVIRONMENTAL LANDS TO BE DEDICATED TO THE CITY OF BARRIE
- OPEN SPACE LANDS TO BE DEDICATED TO THE CITY OF BARRIE

OWNER'S CERTIFICATE

I HEREBY AUTHORIZE INNOVATIVE PLANNING SOLUTIONS TO PREPARE THIS DRAFT PLAN OF SUBDIVISION AND SUBMIT THIS DRAFT PLAN OF SUBDIVISION FOR APPROVAL.

DATE OWNER'S NAME:

SURVEYOR'S CERTIFICATE

I CERTIFY THAT THE BOUNDARIES OF THE LAND TO BE SUBDIVIDED AND THEIR RELATIONSHIP TO ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN.

DATE NEIL A. LEGROW, O.L.S.

ADDITIONAL INFORMATION REQUIRED UNDER SECTION 51(17) OF THE PLANNING ACT

a) SHOWN ON PLAN
b) SHOWN ON PLAN
c) SEE KEY PLAN
d) RESIDENTIAL
e) SHOWN ON PLAN
f) SHOWN ON PLAN
g) SHOWN ON PLAN
h) MUNICIPAL WATER
i) SAND, SILT, CLAY
j) SHOWN ON PLAN
k) MUNICIPAL WATER & SEWAGE
l) NONE

LAND USE STATISTICS

LAND USE	LOT / BLK No.	UNITS	AREA (ha)
Residential - Townhouse	1 - 6	34	0.48
Street 'A'			0.20
TOTAL	7	34	0.68ha

IPS INNOVATIVE PLANNING SOLUTIONS
PLANNERS • PROJECT MANAGERS • LAND DEVELOPERS
647 WELHAM ROAD, UNIT 9, BARRIE, ON, L4N 0B7
tel: 705 • 812 • 3281 fax: 705 • 812 • 3438 e: info@ipsconsultinginc.com www.ipsconsultinginc.com

Date:	Sept. 9, 2022	Drawn By:	A.S.
File:	20-992	Checked:	T.K.

Key Map

LEGAL DESCRIP. PART OF SOUTH HALF OF LOT 1, CONCESSION 11, GEOGRAPHIC TOWNSHIP OF INNISFIL, TOWN OF INNISFIL, COUNTY OF SIMCOE

LEGEND

- Subject Lands (33,377.5m²/3.33ha)
- Developable Area (6,849.1m²/0.68ha)
- 3-Storey Street Townhouse Units (56.3m²)
- 7.0m Road Widening

NEIGHBOURHOOD RESIDENTIAL (R5) ZONE (SALEM AND HEWITT'S COMMUNITIES PROVISIONS)

Provisions	Required	Provided
Lot Frontage (min.)	4.5m	4.5m
Front Yard Setback (min.)	3.0m (5.5m Driveway Length)	5.5m
Exterior Side Yard Setback (min.)	2.0m	5.3m
Interior Side Yard Setback (min.) one side	0.0m	0.0m
Interior Side Yard Setback (min.) Opposite Side	0.0m	0.0m
Rear Yard (min.)	5.0m	5.0m
End Unit Interior Side Yard Setback (min.)	1.2m	1.7m
Landscaped Open Space (min.% of lot area)	--	35%
Lot Coverage (max. % of lot area)	70%	49%
Dwelling Unit Floor Area (min.)	--	56.8m²
Gross Floor Area (max.% of lot area)	--	148.1%
Maximum Height Number of Storeys	3 Storeys	3 Storeys
Maximum number of contiguous units in a row	8 Units	6 Units
Parking	1.5 Spaces per Dwelling Unit	2 Spaces per Dwelling Unit (1 Driveway Space & 1 Garage Space)

Note: This drawing is for discussion purposes only.
The information shown is approximate and subject to change.

0 5 10 15 20m

N

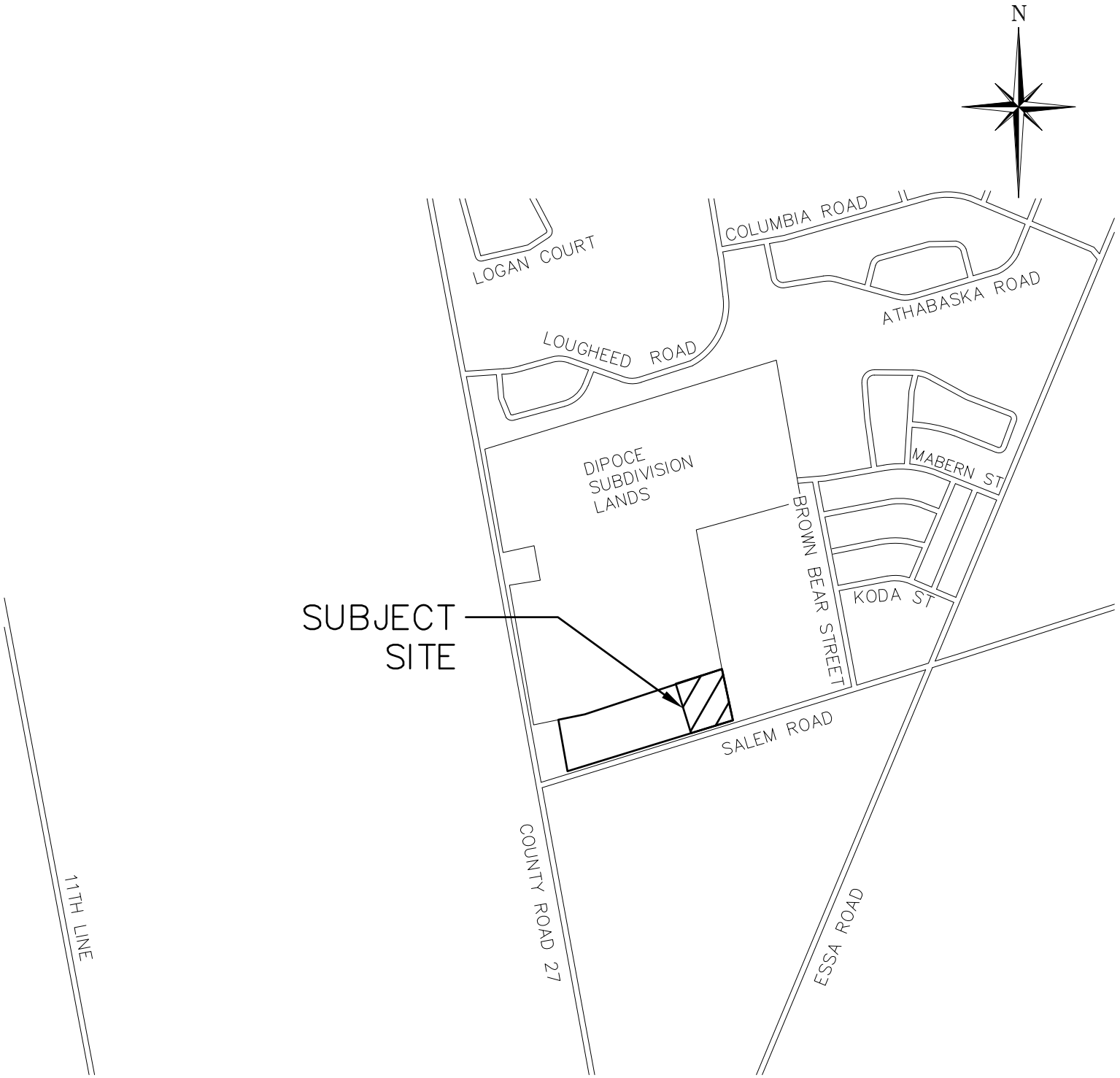
Date:	July 18, 2022	Drawn By:	JV
File:	20-992	Checked By:	TK

CONCEPTUAL SITE PLAN - 34 STREET TOWNHOUSE UNITS
500 SALEM ROAD, BARRIE, ON

SCHEDULE OF REVISIONS

No.	Date	Description	By

IPS
INNOVATIVE PLANNING SOLUTIONS
PLANNERS • PROJECT MANAGERS • LAND DEVELOPERS
647 WELHAM RD., UNIT 9, BARRIE, ONTARIO, L4N 0B7
tel: 705 • 812 • 3281 fax: 705 • 812 • 3434 e: info@ipsconsultinginc.com www.ipsconsultinginc.com



Drawing Title

SITE LOCATION PLAN

Project Title

500 SALEM ROAD

WMI & Associates Limited
119 Collier Street
Barrie, Ontario
L4M 1H5
705-797-2027
www.wmiengineering.ca

Drawn By	Checked By	Figure No.
JB	JR	FIG1
Scale: N.T.S.	Project No.: 21-652	

PR. DIPOCHE SUBDIVISION

SITE BENCHMARK:
TOP OF IB
ELEV: 306.72

WETLAND BOUNDARY

20m SETBACK

20.00

20.00

20.00

PRE-W
0.35

PRE-E
0.39

CATCHMENT 209E FROM DIPOCE A1= 0.93ha
AREA WITHIN SUBJECT SITE = 0.68ha

AREA EXTERNAL TO SUBJECT SITE = 0.25ha

PIN 58729 - 0965

SALEM ROAD

N

Legend:

- 0 / 0.00 — CATCHMENT IDENTIFICATION / CATCHMENT AREA (HA)
- LIMITS OF CATCHMENT AREA
- OVERLAND FLOW DIRECTION
- LIMITS OF ALLOWABLE CATCHMENT AREA

NOTE:

LOCATION OF EXISTING & PROPOSED MUNICIPAL INFRASTRUCTURE IS APPROXIMATE.

Drawing Title

PRE-DEVELOPMENT DRAINAGE PLAN

Project Title

500 SALEM ROAD

WMI & Associates Limited
119 Collier Street
Barrie, Ontario
L4M 1H5
705-797-2027
www.wmiengineering.ca

Drawn By	Checked By	Figure No.
CJ	JR	FIG 2
Scale: 1:500	Project No.: 21-652	

Z:\Projects\2021\21-652\CAD\WMI\FSR\Issue_No1\21-652_SWM-Figures.dwg, FIG2, 1:1

PR. DIPOCHE SUBDIVISION

DIPOCE STM MH7
T/G 307.60
N INV. 305.77
S INV. 305.76

3.00m DRAINAGE EASEMENT

133.5m 200mmø STM @ 1.0%

SITE BENCHMARK:
TOP OF IB
ELEV: 306.72

CB
T/G 307.53
E INV. 305.88
W INV. 305.85

RLCB
T/G 306.80
W INV. 306.20

BLOCK 3
6 UNITS

BLOCK 4
6 UNITS

BLOCK 2
5 UNITS

BLOCK 5
5 UNITS

BLOCK 1
6 UNITS

BLOCK 6
6 UNITS

STREET A

70.4m 450mmø STM @ 2.0%

21.0m 375mmø STM @ 2.0%

STM MH 2
T/G 309.61
N INV. 307.16
S INV. 307.24

STM MH 1
T/G 310.08
N INV. 307.66
S INV. 307.74

BH1
BH2
BH3

A1
0.54

A2
0.14

WETLAND BOUNDARY

Trees

Swale

Drip Line

Fence

Post & Wire Fence

Gate

Chain Link Fence

EX GRAVEL

EX GRAVEL SHOULDER

EX EDGE OF PAVEMENT

EX CENTRELINE

FUT. CONCRETE CURB & GUTTER

FUT. STORMTANK UNITS OR APPROVED EQUIVALENT

FUT. STM MH 205
T/G 309.75
N INV. 307.88
S INV. 308.03
E INV. 308.03

FUT. 27.5m 375mmø STM @ 0.5%

FUT. 9.45m 250mmø STM @ 2.0%

FUT. 80.7m 300mmø STM @ 3.46%

EXT
0.48

SALEM ROAD

south half of lot 1 concession 11

known as salem road allowance between concessions 10 and 11

Se Corner, Lot 1 Concession

Part 1 51r-35458 expropriation plan IN27892 (dho plan p-2054-15)

PIN 58729 - 0965

N

Legend:

- 0 / 0.00 — CATCHMENT IDENTIFICATION / CATCHMENT AREA (HA)
- LIMITS OF CATCHMENT AREA
- OVERLAND FLOW DIRECTION

NOTE:

LOCATION OF EXISTING & PROPOSED MUNICIPAL INFRASTRUCTURE IS APPROXIMATE.

Drawing Title

POST-DEVELOPMENT DRAINAGE PLAN

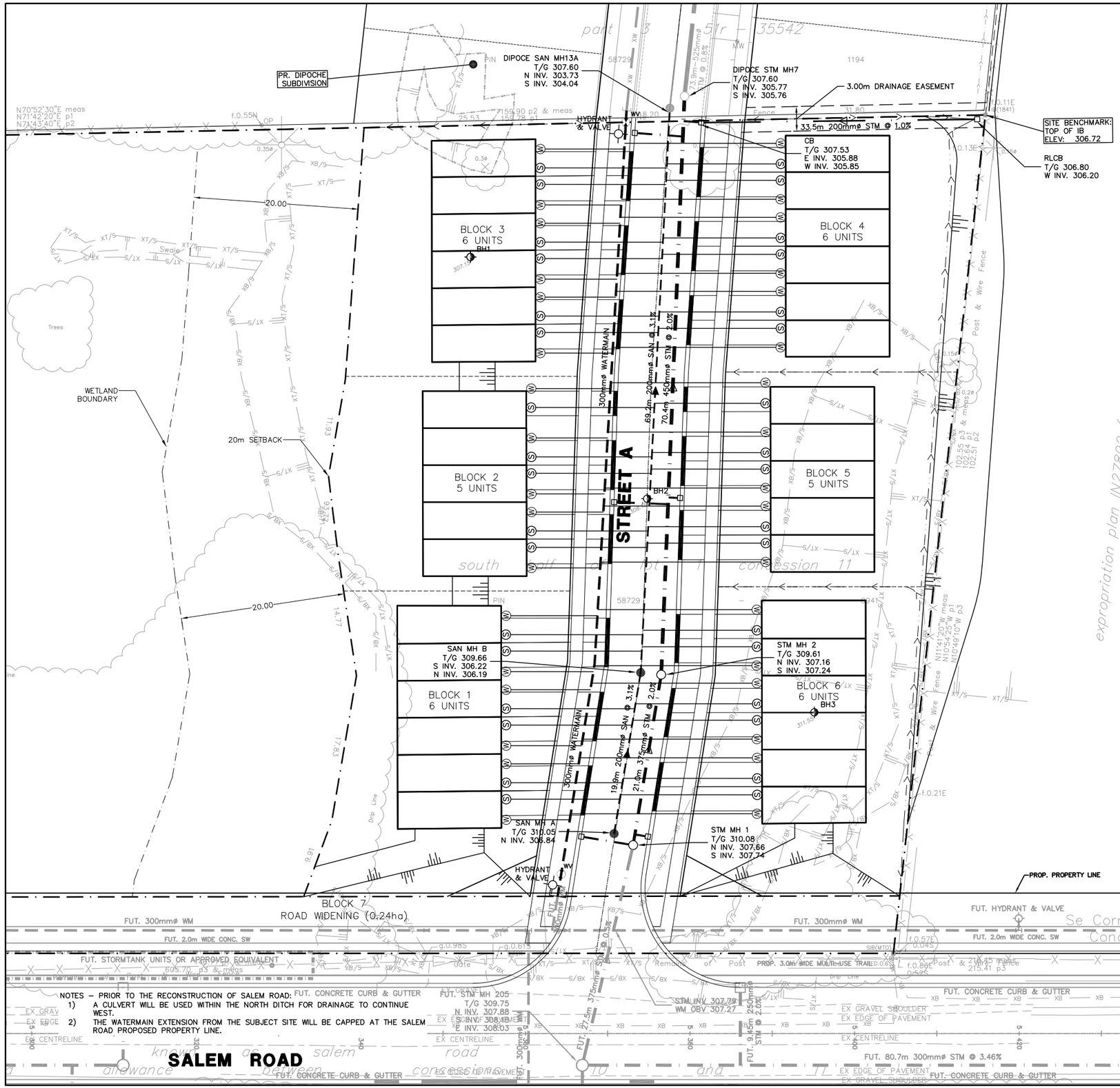
Project Title

500 SALEM ROAD

WMI & Associates Limited
119 Collier Street
Barrie, Ontario
L4M 1H5
705-797-2027
www.wmiengineering.ca

Drawn By	Checked By	Figure No.
CJ	JR	FIG 3
Scale: 1:500	Project No.: 21-652	

Z:\Projects\2021\21-652\CAD\WMI\FSR\Issue_No1\21-652_SWM-Figures.dwg, FIG3, 1:1



NOTES – PRIOR TO THE RECONSTRUCTION OF SALEM ROAD:

1) A CULVERT WILL BE USED WITHIN THE NORTH DITCH FOR DRAINAGE TO CONTINUE WEST.
2) THE WATERMAIN EXTENSION FROM THE SUBJECT SITE WILL BE CAPPED AT THE SALEM ROAD PROPOSED PROPERTY LINE.

Legend:

EXISTING FEATURES (EX)

- EX WATER SERVICE
- EX FIRE HYD.
- EX ST NAME SIGN
- EX STOP SIGN
- EX ELEVATION
- EX FENCE
- EX U/G GASMAIN
- EX U/G BELL
- EX U/G HYDRO
- EX WATERMAIN & VALVE
- EX SAN SEWER & MH
- EX STM SEWER & MH
- EX BOREHOLE LOCATION

PROPOSED FEATURES (PR)

- PR WATER SERVICE
- PR SANITARY SERVICE
- PR STORM SERVICE
- PR WATERMAIN
- PR FIRE HYDRANT
- PR WATER VALVE
- PR SANITARY SEWER
- PR SANITARY MANHOLE
- PR STORM SEWER
- PR CATCHBASIN MANHOLE
- PR MANHOLE
- PR CATCHBASIN
- PR SWALE
- PR INFILTRATION TRENCH
- PR RETAINING WALL
- PR ELEVATION
- PR MATCH EXISTING ELEVATION
- PR ELEVATION BY OTHERS
- PR STEEP SLOPE

NOTE:

LOCATION OF EXISTING & PROPOSED MUNICIPAL INFRASTRUCTURE IS APPROXIMATE.

Drawing Title

CONCEPTUAL SITE SERVICING PLAN

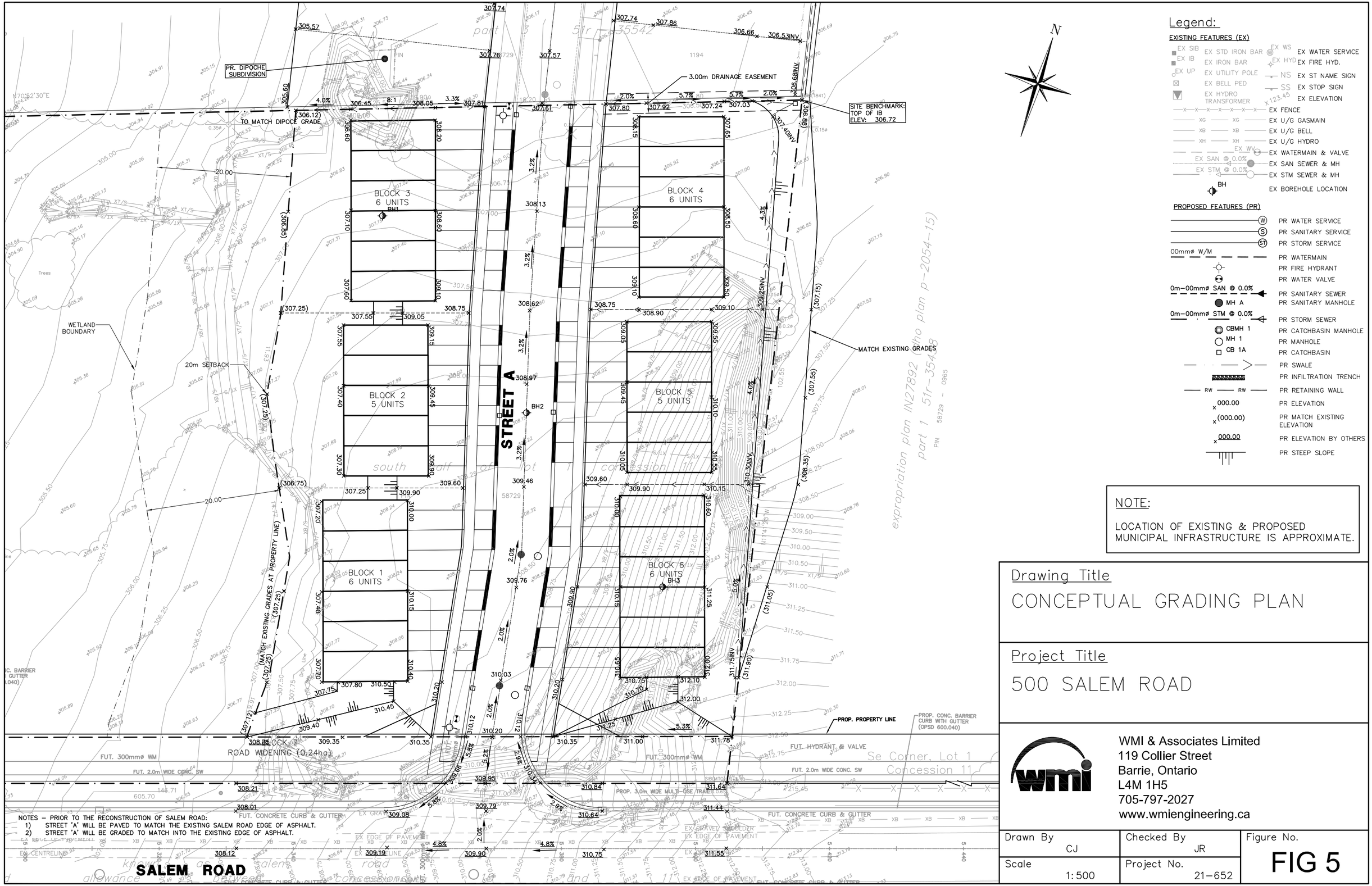
Project Title

500 SALEM ROAD

WMI & Associates Limited
119 Collier Street
Barrie, Ontario
L4M 1H5
705-797-2027
www.wmiengineering.ca

Drawn By	Checked By	Figure No.
CJ	JR	FIG 4
Scale: 1:500	Project No.: 21-652	

Z:\Projects\2021\21-652\CAD\WMI\FSR\Issue_No1\21-652-SS+GR.dwg, FIG4-SS, 1:1



Legend:

EXISTING FEATURES (EX)

- EX SIB / EX IB — EX STD IRON BAR / EX IRON BAR
- EX UP — EX UTILITY POLE
- EX BELL PED
- EX HYDRO TRANSFORMER
- EX WS — EX WATER SERVICE
- EX HYD — EX FIRE HYD.
- NS — EX ST NAME SIGN
- SS — EX STOP SIGN
- X123.45 — EX ELEVATION
- EX FENCE
- XG — EX U/G GASMAIN
- XB — EX U/G BELL
- XH — EX U/G HYDRO
- EX WV — EX WATERMAIN & VALVE
- EX SAN @ 0.0% — EX SAN SEWER & MH
- EX STM @ 0.0% — EX STM SEWER & MH
- BH — EX BOREHOLE LOCATION

PROPOSED FEATURES (PR)

- W — PR WATER SERVICE
- S — PR SANITARY SERVICE
- ST — PR STORM SERVICE
- 00mmø W/M — PR WATERMAIN
- PR FIRE HYDRANT
- PR WATER VALVE
- 0m–00mmø SAN @ 0.0% — PR SANITARY SEWER
- MH A — PR SANITARY MANHOLE
- 0m–00mmø STM @ 0.0% — PR STORM SEWER
- CBMH 1 — PR CATCHBASIN MANHOLE
- MH 1 — PR MANHOLE
- CB 1A — PR CATCHBASIN
- PR SWALE
- PR INFILTRATION TRENCH
- RW — RW — PR RETAINING WALL
- 000.00 — PR ELEVATION
- (000.00) — PR MATCH EXISTING ELEVATION
- 000.00 — PR ELEVATION BY OTHERS
- PR STEEP SLOPE

NOTE:

LOCATION OF EXISTING & PROPOSED MUNICIPAL INFRASTRUCTURE IS APPROXIMATE.

Drawing Title

CONCEPTUAL GRADING PLAN

Project Title

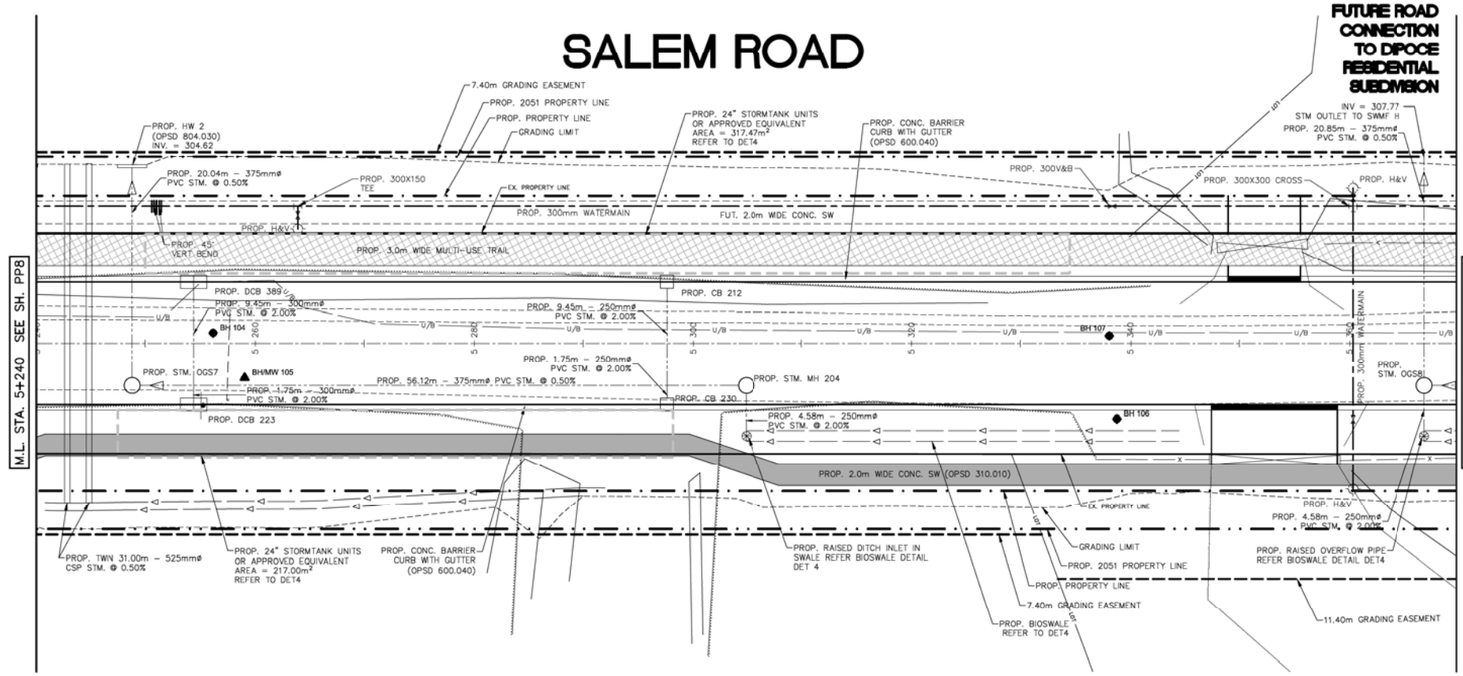
500 SALEM ROAD

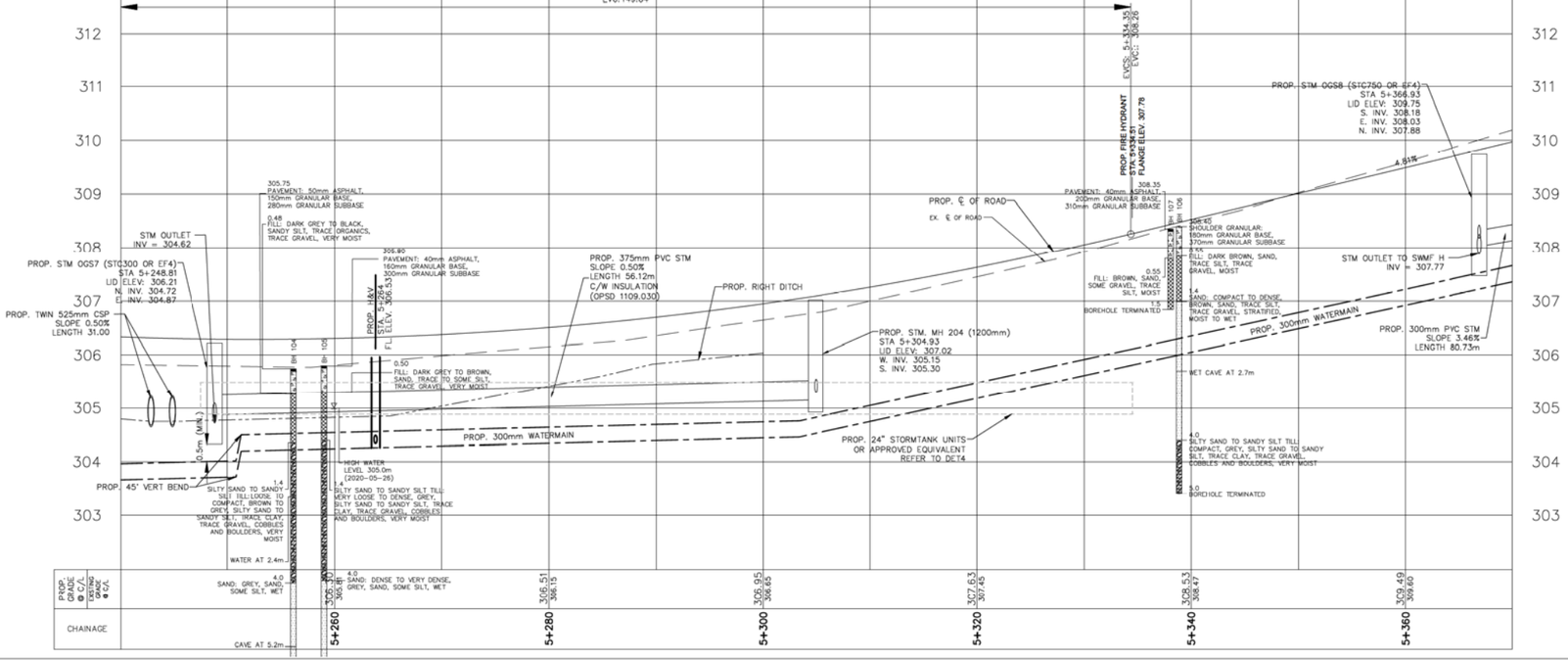
WMI & Associates Limited
119 Collier Street
Barrie, Ontario
L4M 1H5
705-797-2027
www.wmiengineering.ca

Drawn By	Checked By	Figure No.
CJ	JR	FIG 5
Scale: 1:500	Project No.: 21–652	

Z:\Projects\2021\21-652\CAD\WMI\FSR\Issue_No1\21-652-SS+GR.dwg, FIG5-LGR, 1:1

SALEM ROAD





GENERAL NOTES

REFER TO CURRENT CITY OF BARRIE STANDARDS FOR APPLICABLE GENERAL NOTES.

BENCH MARKS

DISTANCE NOTE

DISTANCES SHOWN HEREON ARE GRID DISTANCES AND CAN BE CONVERTED TO GROUND DISTANCES BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 1.00003.

BEARING NOTE

BEARINGS HEREIN ARE GRID BEARINGS AND ARE DERIVED FROM CONTROL MONUMENTS 03120080052 (N=4908701.308, E=602294.042)AND 03119950001 (N=4908133.715, E=602057.389), AND ARE REFERRED TO THE CENTRAL MERIDIAN (81 DEGREES OF LONGITUDE) IN ZONE, 17 AND ARE BASED ON NAD27 (76 ADJUSTMENT).

BENCH MARK 03120110001

270.491 – LOCATED BEHIND THE CURB OF ESSA ROAD AT THE NORTH-WEST CORNER OF THE INTERSECTION OF SALEM ROAD, APPROXIMATELY 775m EAST OF THE COUNTY ROAD #27 AND SALEM ROAD INTERSECTION.
NOTE: A PROTECTIVE WATER VALVE COVER HAS BEEN PLACED OVER MONUMENT CAP.

BENCH MARKS WILL BE FROM CITY OF BARRIE VERTICAL CONTROL NETWORK. INITIAL BENCH MARK TO BE OF 2nd ORDER ACCURACY

NO.	REVISIONS	DATE	APPROVED
1	ISSUED FOR 30% SUBMISSION	191129	DD
2	ISSUED FOR 60% SUBMISSION	2'XXXX	DD

CITY OF BARRIE
ACCEPTED
DATE. . . . . .
. . . . . DIRECTOR OF INFRASTRUCTURE

ESSA ROAD AND SALEM ROAD WIDENING
EN1276

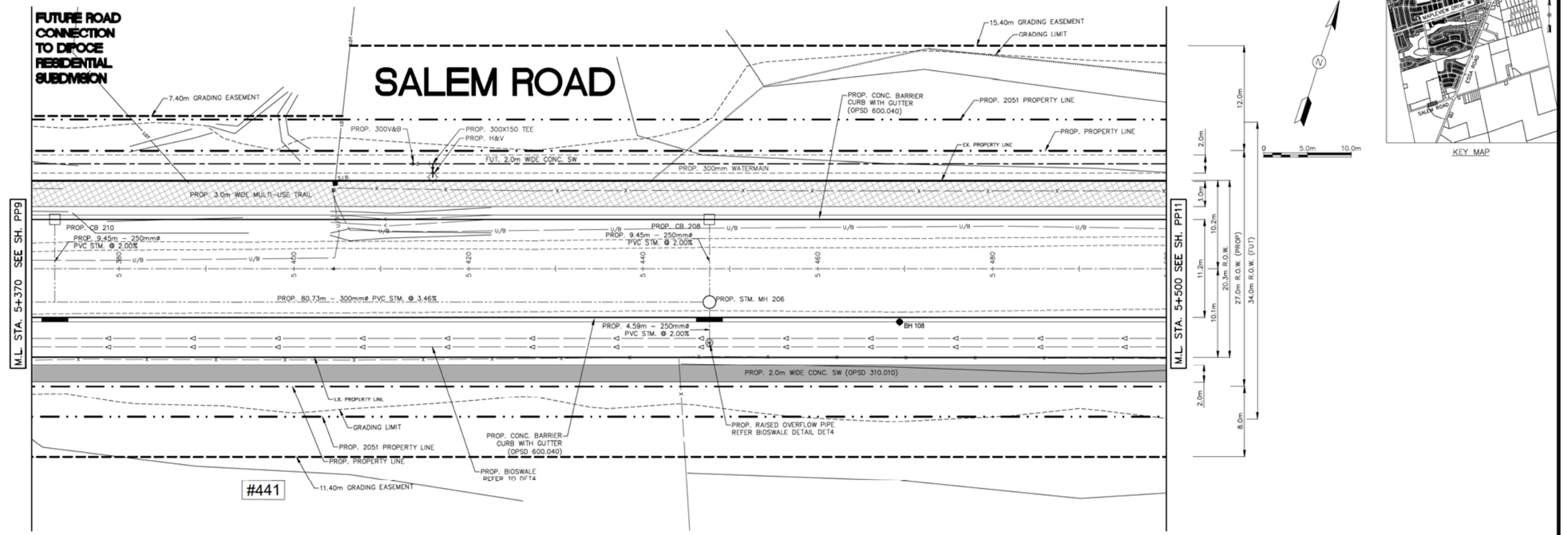
PLAN & PROFILE
STA. 5+240 TO STA. 5+370

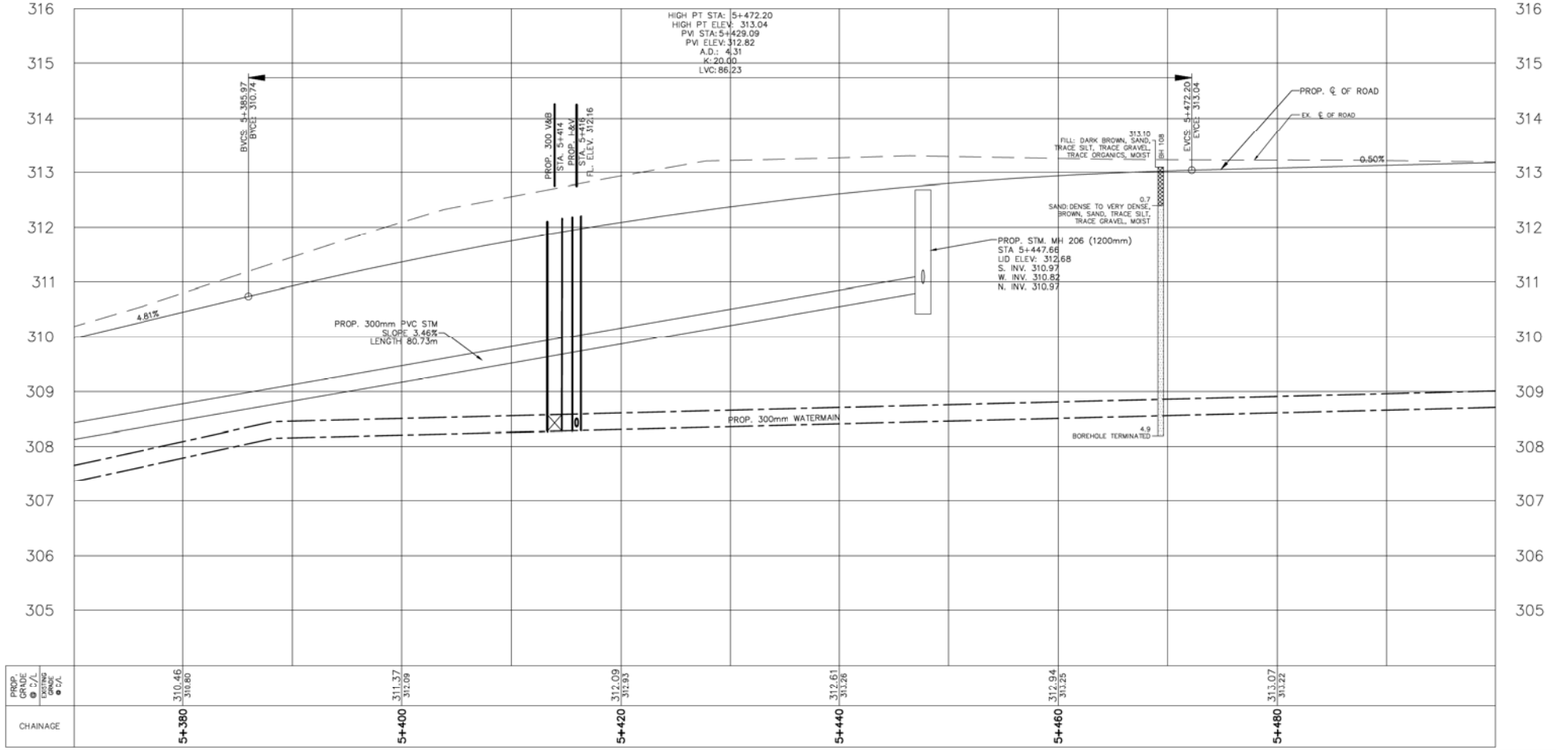
Barrie
INFRASTRUCTURE DEPARTMENT

SCALE HOR.	1:250	SCALE VER.	1:50
DESIGN	ML	DRAWN	MH
REVIEWED	DD	DATE	2020/07/02

CONTRACT NO. 2020-XXXX
SHEET NO. PP9

5/7/2021 9:50 AM MIKE LEE 044205_PP09.DWG





GENERAL NOTES

REFER TO CURRENT CITY OF BARRIE STANDARDS FOR APPLICABLE GENERAL NOTES.

BENCH MARKS

DISTANCE NOTE
DISTANCES SHOWN HEREON ARE GRID DISTANCES AND CAN BE CONVERTED TO GROUND DISTANCES BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 1.0003.

BEARING NOTE
BEARINGS HEREIN ARE GRID BEARINGS AND ARE DERIVED FROM CONTROL MONUMENTS 03120080052 (N=4908701.308, E=602294.042)AND 03119950001 (N=4908133.715, E=602057.389). AND ARE REFERRED TO THE CENTRAL MERIDIAN (81 DEGREES OF LONGITUDE) IN ZONE, 17 AND ARE BASED ON NAD27 (76 ADJUSTMENT).

BENCH MARK 03120110001
270.491 – LOCATED BEHIND THE CURB OF ESSA ROAD AT THE NORTH-WEST CORNER OF THE INTERSECTION OF SALEM ROAD, APPROXIMATELY 775m EAST OF THE COUNTY ROAD #27 AND SALEM ROAD INTERSECTION.
NOTE: A PROTECTIVE WATER VALVE COVER HAS BEEN PLACED OVER MONUMENT CAP.

BENCH MARKS WILL BE FROM CITY OF BARRIE VERTICAL CONTROL NETWORK. INITIAL BENCH MARK TO BE OF 2nd ORDER ACCURACY

NO.	REVISIONS	DATE	APPROVED
1	ISSUED FOR 30% SUBMISSION	191129	DD
2	ISSUED FOR 60% SUBMISSION	2'XXXX	DD

CITY OF BARRIE
ACCEPTED
DATE. . . . . .
. . . . . .
DIRECTOR OF INFRASTRUCTURE

ESSA ROAD AND SALEM ROAD WIDENING
EN1276

PLAN & PROFILE
STA. 5+370 TO STA. 5+500

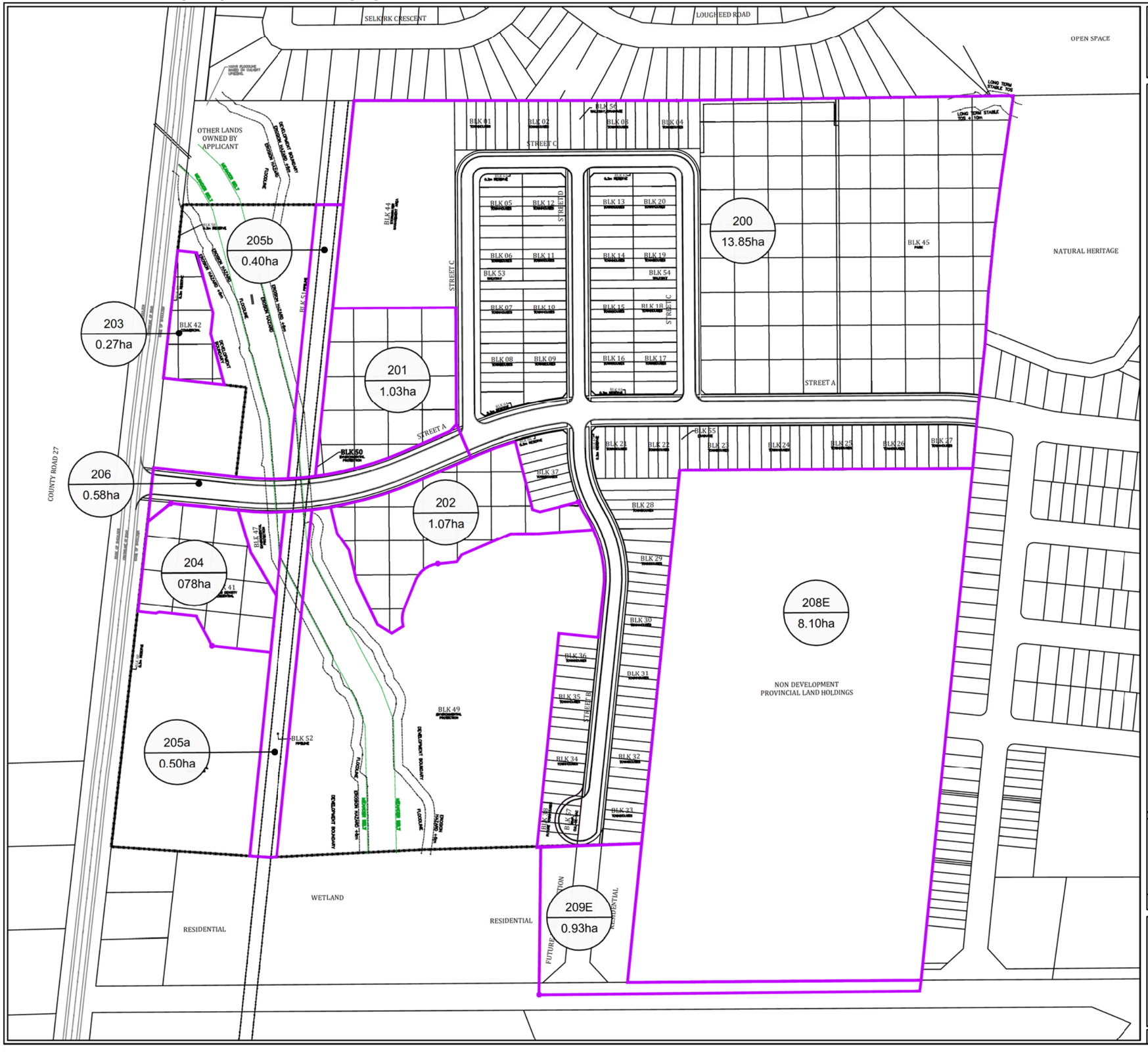
Barrie
INFRASTRUCTURE DEPARTMENT

SCALE HOR.	1:250	SCALE VER.	1:50	CONTRACT NO. 2020-XXXX
DESIGN	ML	DRAWN	MH	SHEET NO. PP10
REVIEWED	DD	DATE	2020/07/02	

5/19/2021 11:42 AM MIKE.LEE 044205_PP02.DWG

W:\4500's\4560 DIPoce - Barrie\Drawings\Drainage\2019-10-26-4560-Post Drainage.dwg

Sadman Soumik



DI POCE (INNISFIL) INC.
CITY OF BARRIE

LEGEND

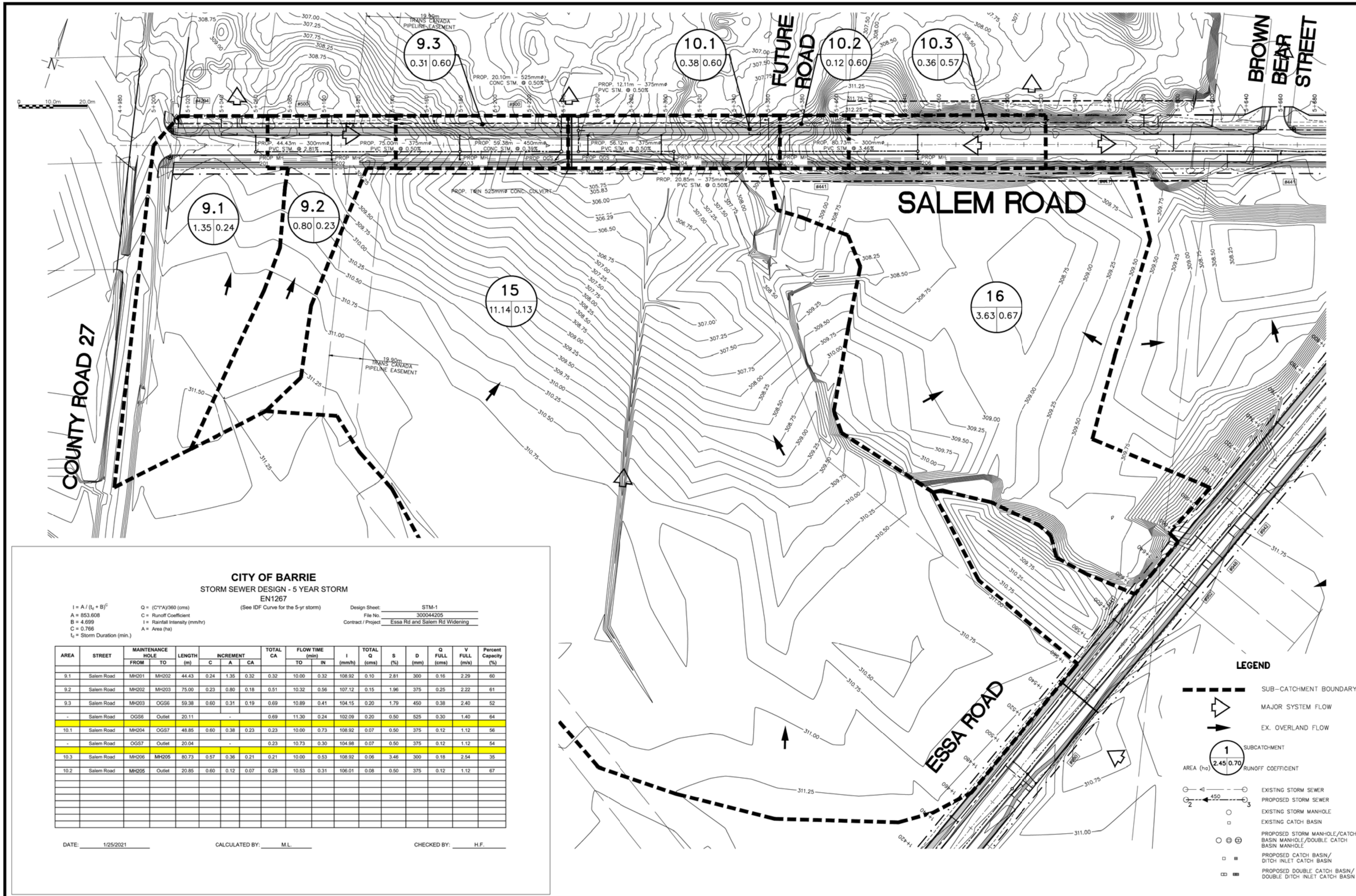
DRAINAGE AREAS

208E / 8.10ha — ID / AREA IN HECTARES

SCHAEFFERS
CONSULTING ENGINEERS
6 Ronrose Drive, Concord, Ontario L4K 4R3
Tel: (905) 738-6100 Email: general@schaeffers.com
www.schaeffers.com

FIGURE 2-2
POST-DEVELOPMENT
DRAINAGE AREAS

2017-4560	JUNE 2020	SCALE: N.T.S.



CITY OF BARRIE

STORM SEWER DESIGN - 5 YEAR STORM

EN1267

$I = A / (t_d + B)^C$
A = 853.608
B = 4.699
C = 0.766
t_d = Storm Duration (min.)

Q = (C*I*A)/360 (cms)
C = Runoff Coefficient
I = Rainfall Intensity (mm/hr)
A = Area (ha)

(See IDF Curve for the 5-yr storm)

Design Sheet: STM-1
File No. 300044205
Contract / Project: Essa Rd and Salem Rd Widening

AREA	STREET	MAINTENANCE HOLE		LENGTH	INCREMENT			TOTAL CA	FLOW TIME (min)		I	TOTAL Q	S	D	Q FULL	V FULL	Percent Capacity
		FROM	TO	(m)	C	A	CA		TO	IN	(mm/h)	(cms)	(%)	(mm)	(cms)	(m/s)	(%)
9.1	Salem Road	MH201	MH202	44.43	0.24	1.35	0.32	0.32	10.00	0.32	108.92	0.10	2.81	300	0.16	2.29	60
9.2	Salem Road	MH202	MH203	75.00	0.23	0.80	0.18	0.51	10.32	0.56	107.12	0.15	1.96	375	0.25	2.22	61
9.3	Salem Road	MH203	OGS6	59.38	0.60	0.31	0.19	0.69	10.89	0.41	104.15	0.20	1.79	450	0.38	2.40	52
-	Salem Road	OGS6	Outlet	20.11		-		0.69	11.30	0.24	102.09	0.20	0.50	525	0.30	1.40	64
10.1	Salem Road	MH204	OGS7	48.85	0.60	0.38	0.23	0.23	10.00	0.73	108.92	0.07	0.50	375	0.12	1.12	56
-	Salem Road	OGS7	Outlet	20.04		-		0.23	10.73	0.30	104.98	0.07	0.50	375	0.12	1.12	54
10.3	Salem Road	MH206	MH205	80.73	0.57	0.36	0.21	0.21	10.00	0.53	108.92	0.06	3.46	300	0.18	2.54	35
10.2	Salem Road	MH205	Outlet	20.85	0.60	0.12	0.07	0.28	10.53	0.31	106.01	0.08	0.50	375	0.12	1.12	67

DATE: 1/25/2021 CALCULATED BY: M.L. CHECKED BY: H.F.

GENERAL NOTES

REFER TO CURRENT CITY OF BARRIE STANDARDS FOR APPLICABLE GENERAL NOTES.

BENCH MARKS

DISTANCE NOTE

DISTANCES SHOWN HEREON ARE GRID DISTANCES AND CAN BE CONVERTED TO GROUND DISTANCES BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 1.0003.

BEARING NOTE

BEARINGS HEREIN ARE GRID BEARINGS AND ARE DERIVED FROM CONTROL MONUMENTS 031910009 (N=4914801.348, E=601584.468)AND 010860410 (N=4913103.464, E=606668.620). AND ARE REFERRED TO THE CENTRAL MERIDIAN (81 DEGREES OF LONGITUDE) IN ZONE, 17 AND ARE BASED ON NAD27 (76 ADJUSTMENT).

BENCH MARK V010865470

269.751 – BRASS TABLET SET IN CONCRETE HEADWALL OF UNDERGROUND STORM SEWER ENTRANCE ON WEST SIDE OF FERNDALE DRIVE NORTH, 1.0KM NORTH OF EDGEHILL DRIVE. TABLET IS SET HORIZONTALLY IN EAST FACE OF WESTERLY WALL, 15.0m WEST OF CENTRELINE OF FERNDALE DRIVE NORTH, 44CM SOUTH OF NORTHWEST END AND 37CM BELOW TOP OF CONCRETE WALL.

BENCH MARKS WILL BE FROM CITY OF BARRIE VERTICAL CONTROL NETWORK. INITIAL BENCH MARK TO BE OF 2nd ORDER ACCURACY

NO.	REVISIONS	DATE	APPROVED
1	ISSUED FOR 30% SUBMISSION	191129	DD
2	ISSUED FOR 60% SUBMISSION	210707	DD

CITY OF BARRIE ACCEPTED

DATE. . . . .

DIRECTOR OF INFRASTRUCTURE

ESSA ROAD AND SALEM ROAD EXPANSION

EN1276

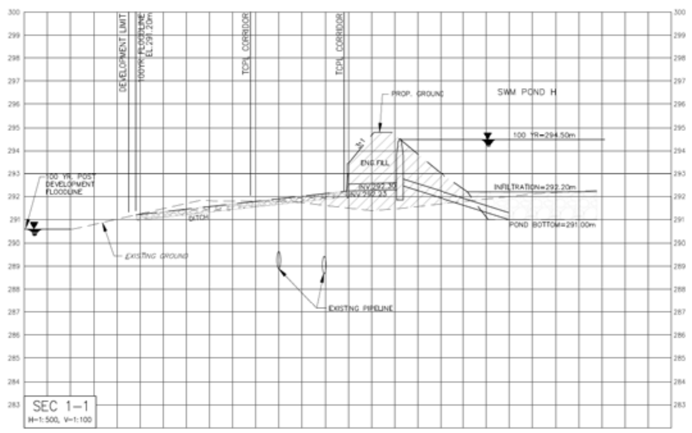
STORM DRAINAGE AREA PLAN

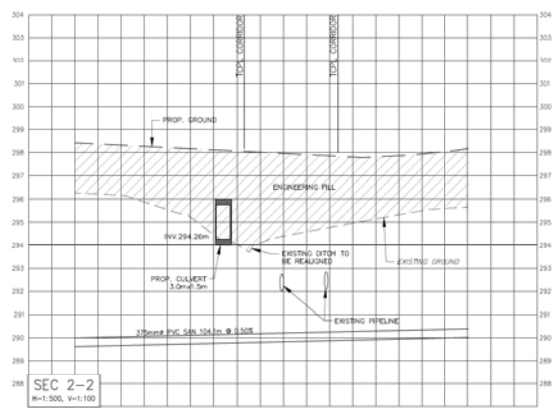
Barrie INFRASTRUCTURE DEPARTMENT

SCALE HOR.	H 1:250	V 1:50	
DESIGN	ML	DRAWN	MH
REVIEWED	DD	DATE	2020/07/02

CONTRACT NO. 300044205

SHEET NO. STM1



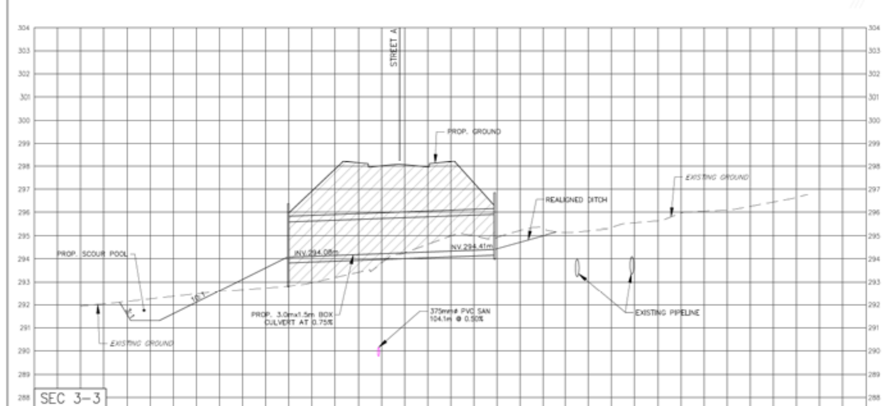


SWM POND VOLUMES			
DESCRIPTION		PROVIDED	REQUIRED
PP	291.00 - 292.50	2,755	2,412
2 YR	292.65 - 293.60	4,703	4,619
5 YR	292.65 - 293.85	6,203	5,691
10 YR	292.65 - 293.95	6,834	6,605
25 YR	292.65 - 294.15	8,146	8,028
50 YR	292.65 - 294.25	8,829	8,810
100 YR	292.65 - 294.50	10,613	9,939
INFILTRATION	292.20 - 292.50	200	344
INFILTRATION	292.50 - 292.65	585	

LEGEND

- PROPOSED STORM MANHOLE
- PROPOSED SANITARY MANHOLE
- PROPOSED STORM SEWER
- PROPOSED SANITARY SEWER
- PROPOSED WATERMAIN
- EXISTING CONTOUR AND ELEVATION
- PROPERTY LIMIT
- OVERLAND FLOW ROUTE
- EXISTING ELEVATION
- PROPOSED ELEVATION
- SANITARY SEWER OBVERT
- STORM SEWER OBVERT
- ROAD HIGH POINT
- ROAD LOW POINT
- TREES TO BE PRESERVED
- TREE REMOVAL REQUIRED
- TREE REMOVAL RECOMMENDED
- TREE PROTECTION FENCE

REFER TO COUNTY ROAD 27 AND MABERN STREET SANITARY TRUNK AND WATERMAIN DESIGN BY R.J. BURNSIDE & ASSOCIATES LIMITED. BURNSIDE PROJECT NO. 032868.2000 FOR INFORMATION REGARDING SANITARY AND WATERMAIN ALONG STREET A AND COUNTY ROAD 27.



DISTANCE NOTE
DISTANCES SHOWN HEREON ARE GROUND DISTANCES AND CAN BE CONVERTED TO GRID DISTANCES BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.9996684

BEARING NOTE
BEARINGS HEREIN ARE GRID BEARINGS AND ARE DERIVED FROM CONTROL MONUMENTS 031910009 (N=4914801.348, E=601584.468) AND 010860410 (N=4913103.464, E=606668.620), AND ARE REFERRED TO THE CENTRAL MERIDIAN (81 DEGREES OF LONGITUDE) IN ZONE 17 AND ARE BASED ON NAD27 (76 ADJUSTMENT).

BENCH MARK No. 03120110008
ELEVATIONS SHOWN ON THIS PLAN ARE RELATED TO GEODETIC DATUM AND ARE DERIVED FROM THE CITY OF BARRIE BENCH MARK No 03120110008 HAVING A PUBLISHED ELEVATION OF 311.503 METRES.

BENCH MARK V01086547O
269.751 – BRASS TABLET SET IN CONCRETE HEADWALL OF UNDERGROUND STORM SEWER ENTRANCE ON WEST SIDE OF FERNDALE DRIVE NORTH, 1.0KM NORTH OF EDGEHILL DRIVE. TABLET IS SET HORIZONTALLY IN EAST FACE OF WESTERLY WALL, 15.0m WEST OF CENTRELINE OF FERNDALE DRIVE NORTH, 44CM SOUTH OF NORTHWEST END AND 37CM BELOW TOP OF CONCRETE WALL. BENCH MARKS WILL BE FROM CITY OF BARRIE VERTICAL CONTROL NETWORK.
INITIAL BENCH MARK TO BE OF 2nd ORDER ACCURACY

NO.	REVISIONS	DATE	APPROVED

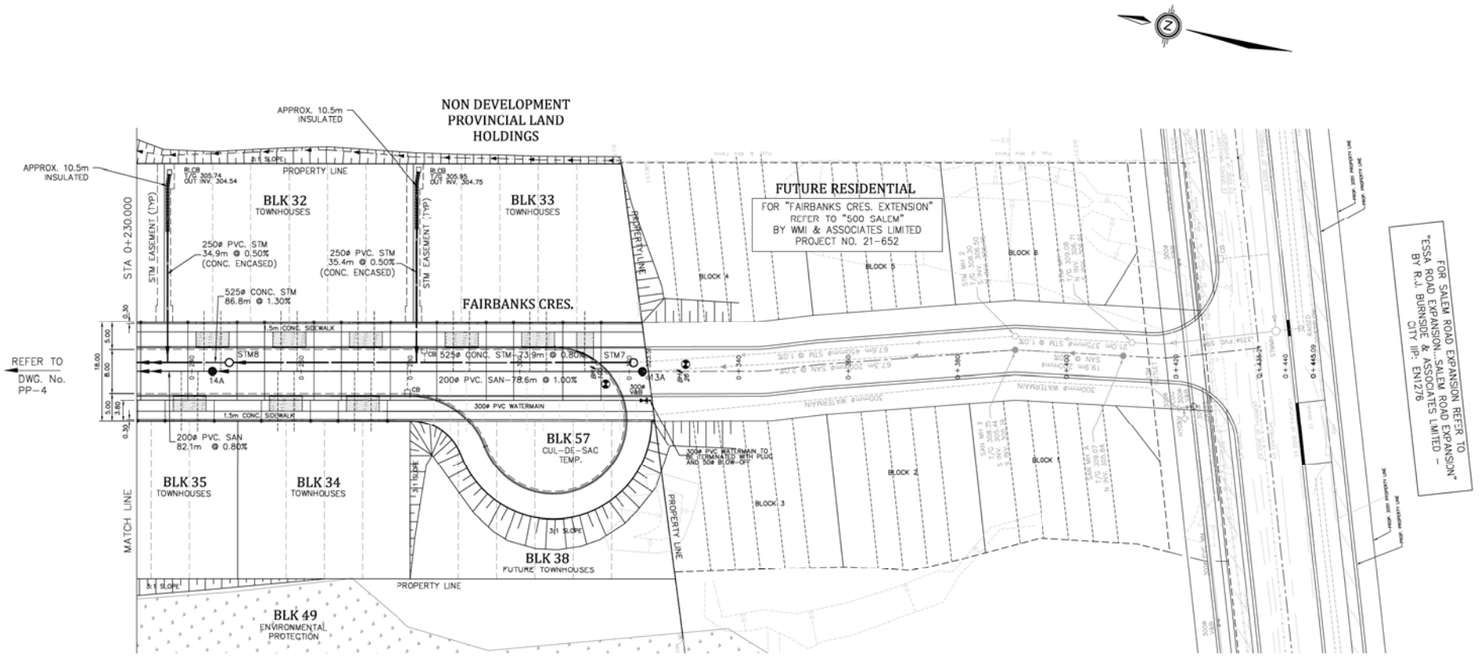
SCHAEFFERS
CONSULTING ENGINEERS
SCHAEFFER & ASSOCIATES LTD.
6 Ronrose Drive, Concord, Ontario L4K 4R3
Tel: (905) 738-6100
Fax: (905) 738-6875
E-mail: design@schaeffers.com

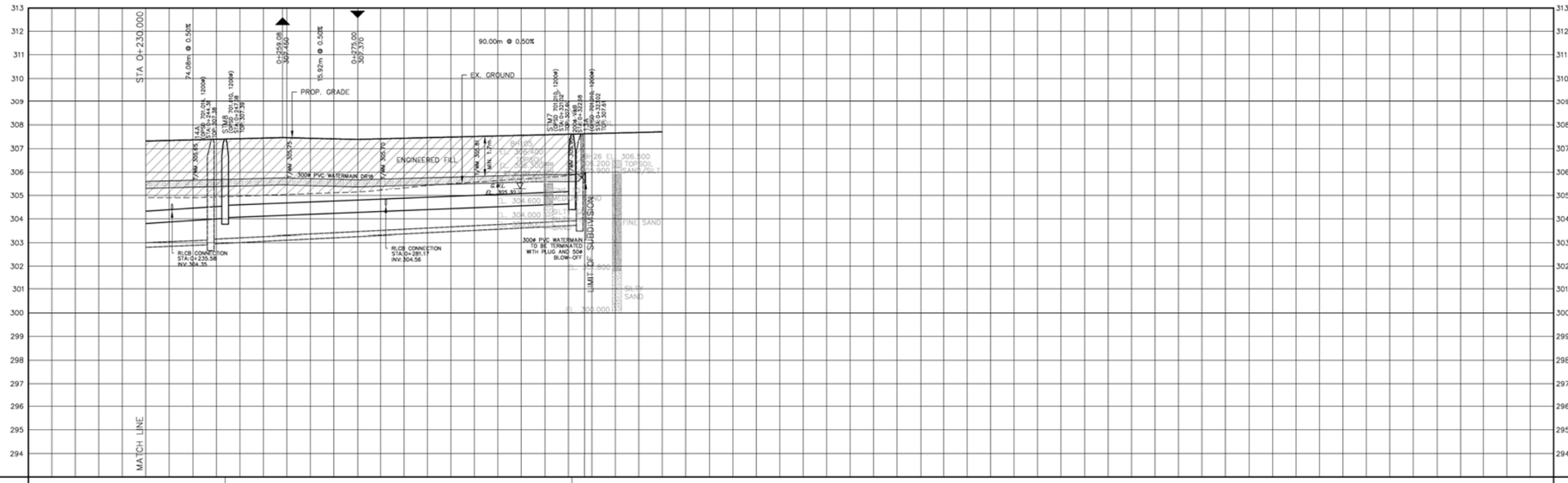
CITY OF BARRIE
ACCEPTED
DATE ....
DIRECTOR OF ENGINEERING

DiPoce RESIDENTIAL SUBDIVISION
GRADING & SERVICING PLAN

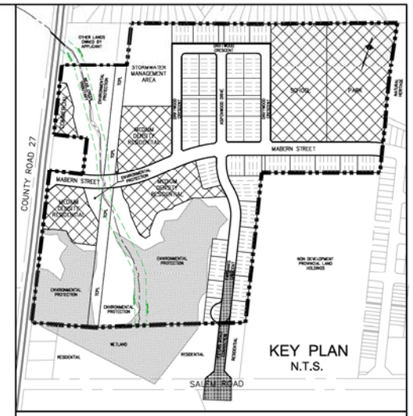
The City of BARRIE
ENGINEERING DEPARTMENT

SCALE HOR. 1:1000	VERT. n/a	PROJECT NO. 4560
DESIGN A.C.	DRAWN A.C.	SHEET NO. GR-SS
REVIEWED Z.L.	DATE JUNE 2020	





STORM SEWER	06.8m–525ø CONC STM @ 1.30% CL–650					73.9m–525ø CONC STM @ 0.80% CL–650				
SANITARY LOCAL SEWER	82.1m–200ø PVC SAN @ 0.80% DR35					78.6m–200ø PVC SAN @ 1.00% DR35				
EX./PROP. ELEVATION	304.600 / 304.90	304.600 / 304.90	304.864 / 304.96	305.036 / 305.04	305.108 / 305.11	305.221 / 305.22	305.423 / 305.42	305.570 / 305.57	305.701 / 305.70	305.858 / 305.86
CHAINAGE	0+230.00	0+240.00	0+250.00	0+260.00	0+270.00	0+280.00	0+290.00	0+300.00	0+310.00	0+320.00	0+330.00



NOTES:

1. FOR GENERAL AND SPECIAL NOTES REFER TO DWG. No. GN–1.
2. ANY REQUIRED DEWATERING OF SEWER TRENCHES SHALL BE AS PER SOILS REPORT.
3. ALL VERTICAL AND HORIZONTAL WATERMAIN'S BENDS LESS THAN 3.8 DEGREES SHALL BE ACHIEVED BY DEFLECTION (NOT TO EXCEED THE MANUFACTURER'S RECOMMENDED ANGLE) OF ONE OR MORE JOINTS OF THE PIPE. FOR LARGER BENDS STANDARD PREMANUFACTURED BENDS OF 5°, 11.25°, 22.50°, ETC. WILL BE USED. DEFLECTION OF PIPE IS NOT ALLOWED.
4. ALL STORM AND SANITARY SEWERS AND MANHOLE JOINTS SHOULD BE ADEQUATELY SEALED USING A WATERTIGHT RUBBERIZED ADHESIVE MEMBRANE (OR EQUIVALENT).
5. ALL MAINTENANCE HOLES SHOULD HAVE SELF LEVELING LIDS AS PER BSD–41. REFER TO D–4 FOR DETAIL.
6. WATERMAIN STUBS FOR PHASE2 & SITE PLAN BLOCK CONNECTIONS TO BE INSTALLED WITH RESTRAINED JOINTS.
7. FOR SAND FILTRATION BED DETAILS REFER TO DWGS SFB–D1 & SFB–D2.
8. THE CONTRACTOR SHOULD VERIFY AS BUILT INVERTS OF EX. SAN MH SAHOB044 PRIOR TO START WORKS. ANY DISCREPANCIES AND/OR VARIATIONS FROM WHAT ARE SHOWN ON THE DRAWING SHALL BE REPORTED TO THE ENGINEER.

LEGEND

- DENOTES VALVE AND BOX
- DENOTES HYDRANTS
- DENOTES SINGLE OR DOUBLE CATCHBASIN
- DENOTES SINGLE OR DOUBLE CATCHBASIN WITH HEAVY DUTY HONEYCOMB GRATING BOLTED DOWN
- DENOTES SANITARY MANHOLE
- DENOTES STORM MANHOLE
- DENOTES CATCHBASIN MANHOLE
- DENOTES SINGLE SAN. HOUSE CONNECTIONS
- DENOTES SINGLE WATERMAIN HOUSE CONNECTIONS
- DENOTES CHAIN LINK FENCE
- DENOTES WOOD PRIVACY FENCE
- DENOTES TRENCH PLUG
- DENOTES BOREHOLE LOCATION

SPECIAL NOTES:

MABERN STREET
FOR LAYOUT AND OBV. OF EXISTING WATERMAIN AND LAYOUT AND INVERTS OF EXISTING SANITARY SEWERS REFER TO "RECORD DRAWINGS" DATED 21/03/10 – PROJECT No. 032868.200 PREPARED BY R.J. BURNSIDE & ASSOCIATES LIMITED.

COUNTY ROAD 27
FOR LAYOUT AND OBV. OF EXISTING WATERMAIN AND LAYOUT AND INVERTS OF EXISTING SANITARY SEWERS REFER TO "AS–RECORDED DRAWINGS" DATED 20/06/22 – PROJECT No. 032868.200 PREPARED BY R.J. BURNSIDE & ASSOCIATES LIMITED.

ROAD PAVEMENT STRUCTURE		
COURSE	*THICKNESS*	*OPS SPECIFICATIONS*
ASPHALT SURFACE	40mm	HL3 SURFACE COURSE ASPHALT
ASPHALT BINDER	70mm	HL8 BINDING COURSE ASPHALT
GRANULAR BASE	150mm	19mm CRUSHER–RUN LIMESTONE BASE
GRANULAR SUB–BASE	450mm	50mm CRUSHER–RUN LIMESTONE SUB–BASE

BENCH MARKS U.T.M. COORDINATES: ZONE 17 NAD 83

DISTANCE NOTE
DISTANCES SHOWN HEREON ARE GROUND DISTANCES AND CAN BE CONVERTED TO GRID DISTANCES BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.9997265 AS PER RODNEY GEYER ONTARIO LAND SURVEYOR.

MNR No: 01019860437 – BENCH MARK No: 010860437 – HORIZONTAL CONTROL MONUMENT RECORD
THE HORIZONTAL MONUMENT IS LOCATED ON THE NORTH–WEST SIDE OF THE INTERSECTION OF COUNTY ROAD No 27 (TOWN LINE), AT SALEM ROAD IN SHOULDER OF ROAD AT DRIVEWAY ENTRANCE.
SCALE FACTOR: 0.999826

MNR No: 03120110001 – BENCH MARK No: 03120110001 – COMBINED CONTROL MONUMENT RECORD
LOCATED BEHIND THE CURB OF ESSA ROAD AT THE NORTH–WEST CORNER OF THE INTERSECTION OF SALEM ROAD, APPROXIMATELY 775m EAST OF THE COUNTY ROAD #27 AND SALEM ROAD INTERSECTION.
NOTE: A PROTECTIVE WATER VALVE COVER HAS BEEN PLACED OVER MONUMENT CAP.

MNR No: 03120080011 – BENCH MARK No: 03120080011 – HORIZONTAL & VERTICAL CONTROL MONUMENT RECORD
LOCATED ON COUNTY ROAD No27 (TOWN LINE ROAD), APPROXIMATELY 4.6m'S SOUTH OF DUNLOP STREET WEST (COUNTY ROAD No. 90), APPROXIMATELY 306m SOUTH OF MAPLEVIEW DRIVE WEST AND APPROXIMATELY 33.0m EAST OF COUNTY ROAD No. 27.
NOTE: A PROTECTIVE WATER VALVE COVER HAS BEEN PLACED OVER MONUMENT CAP.
SCALE FACTOR: 0.99968543

NO.	REVISIONS	DATE	APPROVED

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E-mail: design@schaeffers.com

REGISTERED PROFESSIONAL ENGINEER
H. O. TOZCU
JUNE 2022
PROVINCE OF ONTARIO

CITY OF BARRIE
ACCEPTED
DATE. . . . . .
. . . . . .
DIRECTOR OF ENGINEERING

SALEM AND HIGHWAY 27 RESIDENTIAL SUBDIVISION
PLAN AND PROFILE
FAIRBANK CRES. & FUT. ROAD
FROM STA. 0+230.000 TO STA. 0+323.650

Barrie
ENGINEERING DEPARTMENT

SCALE HOR. 1:500	VERT. 1:100	PROJECT NO.	5067
DESIGN M.K.	DRAWN G.B.	SHEET NO.	PP - 5
REVIEWED H.T	DATE JUNE 2021		

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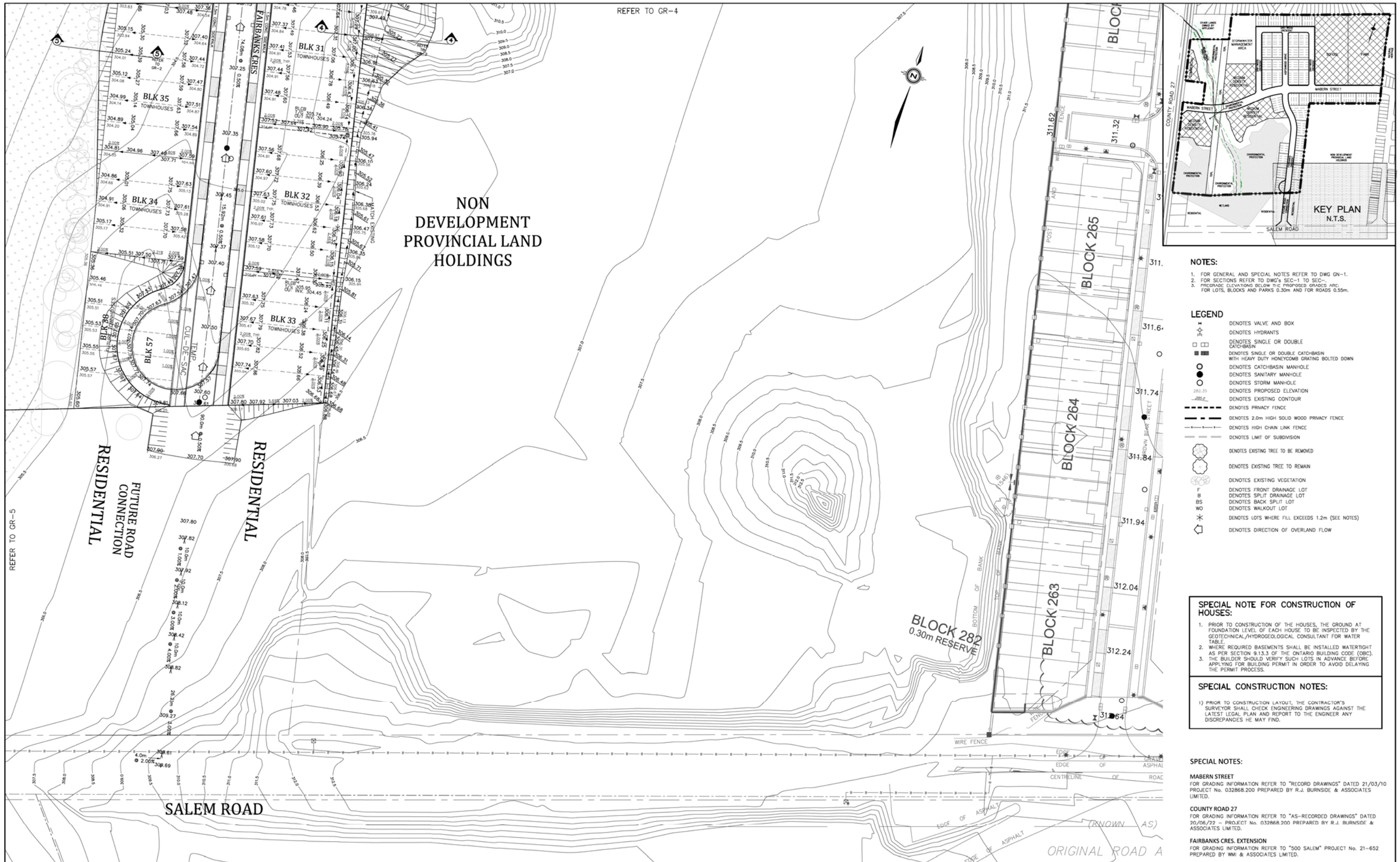

NOTES:

1. FOR GENERAL AND SPECIAL NOTES REFER TO DWG GN-1.
2. FOR SECTIONS REFER TO DWG's SEC-1 TO SEC-.
3. PREGRADE ELEVATIONS BELOW THE PROPOSED GRADES ARE: FOR LOTS, BLOCKS AND PARKS 0.30m AND FOR ROADS 0.55m.

LEGEND

- DENOTES VALVE AND BOX
- DENOTES HYDRANTS
- DENOTES SINGLE OR DOUBLE CATCHBASIN
- DENOTES SINGLE OR DOUBLE CATCHBASIN WITH HEAVY DUTY HONEYCOMB GRATING BOLTED DOWN
- DENOTES CATCHBASIN MANHOLE
- DENOTES SANITARY MANHOLE
- DENOTES STORM MANHOLE
- DENOTES PROPOSED ELEVATION
- DENOTES EXISTING CONTOUR
- DENOTES PRIVACY FENCE
- DENOTES 2.0m HIGH SOLID WOOD PRIVACY FENCE
- DENOTES HIGH CHAIN LINK FENCE
- DENOTES LIMIT OF SUBDIVISION
- DENOTES EXISTING TREE TO BE REMOVED
- DENOTES EXISTING TREE TO REMAIN
- DENOTES EXISTING VEGETATION
- F DENOTES FRONT DRAINAGE LOT
- B DENOTES SPLIT DRAINAGE LOT
- BS DENOTES BACK SPLIT LOT
- WO DENOTES WALKOUT LOT
- DENOTES LOTS WHERE FILL EXCEEDS 1.2m (SEE NOTES)
- DENOTES DIRECTION OF OVERLAND FLOW

SPECIAL NOTE FOR CONSTRUCTION OF HOUSES:

1. PRIOR TO CONSTRUCTION OF THE HOUSES, THE GROUND AT FOUNDATION LEVEL OF EACH HOUSE TO BE INSPECTED BY THE GEOTECHNICAL/HYDROGEOLOGICAL CONSULTANT FOR WATER TABLE.
2. WHERE REQUIRED BASEMENTS SHALL BE INSTALLED WATERTIGHT AS PER SECTION 9.13.3 OF THE ONTARIO BUILDING CODE (OBC).
3. THE BUILDER SHOULD VERIFY SUCH LOTS IN ADVANCE BEFORE APPLYING FOR BUILDING PERMIT IN ORDER TO AVOID DELAYING THE PERMIT PROCESS.

SPECIAL CONSTRUCTION NOTES:

1) PRIOR TO CONSTRUCTION LAYOUT, THE CONTRACTOR'S SURVEYOR SHALL CHECK ENGINEERING DRAWINGS AGAINST THE LATEST LEGAL PLAN AND REPORT TO THE ENGINEER ANY DISCREPANCIES HE MAY FIND.

SPECIAL NOTES:

MABERN STREET
FOR GRADING INFORMATION REFER TO "RECORD DRAWINGS" DATED 21/03/10 PROJECT No. 032868.200 PREPARED BY R.J. BURNSIDE & ASSOCIATES LIMITED.

COUNTY ROAD 27
FOR GRADING INFORMATION REFER TO "AS-RECORDED DRAWINGS" DATED 20/06/22 - PROJECT No. 032868.200 PREPARED BY R.J. BURNSIDE & ASSOCIATES LIMITED.

FAIRBANKS CRES. EXTENSION
FOR GRADING INFORMATION REFER TO "500 SALEM" PROJECT No. 21-652 PREPARED BY WMI & ASSOCIATES LIMITED.

BENCH MARKS U.T.M. COORDINATES: ZONE 17 NAD 83

DISTANCE NOTE
DISTANCES SHOWN HEREON ARE GROUND DISTANCES AND CAN BE CONVERTED TO GRID DISTANCES BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.9997265 AS PER RODNEY DEVER ONTARIO LAND SURVEYOR.

MNR No: 01019860437 - BENCH MARK No: 01080860437 - HORIZONTAL CONTROL MONUMENT RECORD
THE HORIZONTAL MONUMENT IS LOCATED ON THE NORTH-WEST SIDE OF THE INTERSECTION OF COUNTY ROAD No 27 (TOWN LINE), AT SALEM ROAD IN SHOULDER OF ROAD AT DRIVEWAY ENTRANCE.
SCALE FACTOR: 0.9996826

MNR No: 03120110001 - BENCH MARK No: 03120110001 - COMBINED CONTROL MONUMENT RECORD
LOCATED BEHIND THE CURB OF ESSA ROAD AT THE NORTH-WEST CORNER OF THE INTERSECTION OF SALEM ROAD, APPROXIMATELY 775m EAST OF THE COUNTY ROAD #27 AND SALEM ROAD INTERSECTION.
NOTE: A PROTECTIVE WATER VALVE COVER HAS BEEN PLACED OVER MONUMENT CAP.

MNR No: 03120080011 - BENCH MARK No: 03120080011 - HORIZONTAL & VERTICAL CONTROL MONUMENT RECORD
LOCATED ON COUNTY ROAD No27 (TOWN LINE ROAD), APPROXIMATELY 4.6m'S SOUTH OF DUNLOP STREET WEST (COUNTY ROAD No. 90), APPROXIMATELY 306m SOUTH OF MAPLEVIEW DRIVE WEST AND APPROXIMATELY 33.0m EAST OF COUNTY ROAD No. 27.
NOTE: A PROTECTIVE WATER VALVE COVER HAS BEN PLACED OVER MONUMENT CAP.
SCALE FACTOR: 0.9996543

NO.	REVISIONS	DATE	APPROVED

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REGISTERED PROFESSIONAL ENGINEER H. G. TOZCU JUNE 2022 PROVINCE OF ONTARIO

CITY OF BARRIE ACCEPTED
DATE. . . . . .
. . . . . DIRECTOR OF ENGINEERING

SALEM AND HIGHWAY 27 RESIDENTIAL SUBDIVISION
GRADING PLAN
PART VI

Barrie
ENGINEERING DEPARTMENT

SCALE HOR. 1:500	VERT.	PROJECT NO.	5067
DESIGN D.L.	DRAWN L.T	SHEET NO.	GR - 6
REVIEWED H.T	DATE JUNE 2021		

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APPENDIX B

Storm Drainage Calculations

WMI & Associates Limited
119 Collier Street, Barrie, Ontario L4M 1H5
p (705) 797-2027 f (705) 797-2028

RUNOFF COEFFICIENT CALCULATIONS
"C" SPREADSHEET

Date: 29-Sep-22 **Project No.:** 21-652

Project: 500 Salem Road **Prepared By:** CJ

RUNOFF COEFFICIENT NUMBERS

Land Cover		Hydrologic Soil Groups		
		A-AB	B-BC	C-D
Cultivated Land	0 - 5% grade	0.22	0.35	0.55
	5 - 10% grade	0.3	0.45	0.6
	10 - 30% grade	0.4	0.65	0.7
Pasture Land	0 - 5% grade	0.1	0.28	0.4
	5 - 10% grade	0.15	0.35	0.45
	10 - 30% grade	0.22	0.4	0.55
Woodlot or Cutover	0 - 5% grade	0.08	0.25	0.35
	5 - 10% grade	0.12	0.3	0.42
	10 - 30% grade	0.18	0.35	0.52
Lakes and Wetlands		0.05	0.05	0.05
Impervious Area	(i.e. buildings, roads, parking lot, etc.)	0.95	0.95	0.95
Gravel	(not used for proposed parking or storage areas)	0.4	0.5	0.6
Residential	Single Family	0.3	0.4	0.5
	Multiple (i.e. semi, townhouse, apartment, etc.)	0.5	0.6	0.7
Industrial	Light	0.55	0.65	0.75
	Heavy	0.65	0.75	0.85
Commercial		0.6	0.7	0.8
Unimproved Areas		0.1	0.2	0.3
Lawn	< 2% grade	0.05	0.11	0.17
	2 - 7% grade	0.1	0.16	0.22
	> 7% grade	0.15	0.25	0.35

Ref: Runoff Coefficient Numbers - Adapted from Design Chart 1.07, Ontario Ministry of Transportation, "MTO Drainage Management Manual", MTO. (1997)

<<< **Elements Requiring Input Information**

PRE-DEVELOPMENT CONDITION - PRE-E

Land Cover		Hydrologic Soil Groups		
		A-AB	B-BC	C-D
Cultivated Land	0 - 5% grade			
	5 - 10% grade			
	10 - 30% grade			
Pasture Land	0 - 5% grade			
	5 - 10% grade	0.39		
	10 - 30% grade			
Woodlot or Cutover	0 - 5% grade			
	5 - 10% grade			
	10 - 30% grade			
Lakes and Wetlands				
Impervious Area	(i.e. buildings, roads, parking lot, etc.)			
Gravel	(not used for proposed parking or storage areas)			
Residential	Single Family			
	Multiple (i.e. semi, townhouse, apartment, etc.)			
Industrial	Light			
	Heavy			
Commercial				
Unimproved Areas				
Lawn	< 2% grade			
	2 - 7% grade			
	> 7% grade			

Total Area (ha) = 0.39 **Runoff Coefficient, C =** **0.15**

PRE-DEVELOPMENT CONDITION - PRE-W

Land Cover		Hydrologic Soil Groups		
		A-AB	B-BC	C-D
Cultivated Land	0 - 5% grade			
	5 - 10% grade			
	10 - 30% grade			
Pasture Land	0 - 5% grade			
	5 - 10% grade	0.35		
	10 - 30% grade			
Woodlot or Cutover	0 - 5% grade			
	5 - 10% grade			
	10 - 30% grade			
Lakes and Wetlands				
Impervious Area	(i.e. buildings, roads, parking lot, etc.)			
Gravel	(not used for proposed parking or storage areas)			
Residential	Single Family			
	Multiple (i.e. semi, townhouse, apartment, etc.)			
Industrial	Light			
	Heavy			
Commercial				
Unimproved Areas				
Lawn	< 2% grade			
	2 - 7% grade			
	> 7% grade			

Total Area (ha) = 0.35 **Runoff Coefficient, C =** **0.15**

POST-DEVELOPMENT CONDITION - A1

Land Cover		Hydrologic Soil Groups		
		A-AB	B-BC	C-D
Cultivated Land	0 - 5% grade			
	5 - 10% grade			
	10 - 30% grade			
Pasture Land	0 - 5% grade			
	5 - 10% grade			
	10 - 30% grade			
Woodlot or Cutover	0 - 5% grade			
	5 - 10% grade			
	10 - 30% grade			
Lakes and Wetlands				
Impervious Area	(i.e. buildings, roads, parking lot, etc.)	0.35		
Gravel	(not used for proposed parking or storage areas)			
Residential	Single Family			
	Multiple (i.e. semi, townhouse, apartment, etc.)			
Industrial	Light			
	Heavy			
Commercial				
Unimproved Areas				
Lawn	< 2% grade			
	2 - 7% grade	0.19		
	> 7% grade			

Total Area (ha) = 0.54 **Runoff Coefficient, C =** **0.65**

POST-DEVELOPMENT CONDITION - A2

Land Cover		Hydrologic Soil Groups		
		A-AB	B-BC	C-D
Cultivated Land	0 - 5% grade			
	5 - 10% grade			
	10 - 30% grade			
Pasture Land	0 - 5% grade			
	5 - 10% grade			
	10 - 30% grade			
Woodlot or Cutover	0 - 5% grade			
	5 - 10% grade			
	10 - 30% grade			
Lakes and Wetlands				
Impervious Area	(i.e. buildings, roads, parking lot, etc.)	0.04		
Gravel	(not used for proposed parking or storage areas)			
Residential	Single Family			
	Multiple (i.e. semi, townhouse, apartment, etc.)			
Industrial	Light			
	Heavy			
Commercial				
Unimproved Areas				
Lawn	< 2% grade			
	2 - 7% grade	0.10		
	> 7% grade			

Total Area (ha) = 0.14 **Runoff Coefficient, C =** **0.31**

WMI & Associates Limited
119 Collier Street, Barrie, Ontario L4M 1H5
p (705) 797-2027 f (705) 797-2028

TIME OF CONCENTRATION & TIME TO PEAK CALCULATIONS
T_C & T_P SPREADSHEET

Date: 29-Sep-22 **Project No.:** 21-652

Project: 500 Salem Road **Prepared By:** CJ

OVERLAND SHEET FLOW TIME OF CONCENTRATION (T_C) CALCULATION, $T_{C, OVER}$

The Runoff Coefficient 'C' governs which Time of Concentration Formula is used: C > 0.40 Bransby Williams Formula
C <= 0.40 Airport Formula (FAA Equation)

Ref: MTO, Drainage Management Manual, pg 28, Ch. 8, 1997

<<< **Elements Requiring Input Information**

Catchment I.D.	Area (ha)	h_1 (m)	h_2 (m)	Length (m)	Runoff Coefficient	h_{DELTA} (m)	Slope (%)
PRE-E	0.39	312.1	306.25	110.6	0.15	5.9	5.3
PRE-W	0.35	312.9	306	118.7	0.15	6.9	5.8

$T_{C, OVER}$ (min.)	
Airport Formula	Bransby Williams Formula
18.8	
18.9	

Airport Formula (FAA Equation)

$$T_{C, OVER} = \frac{3.26\,(1.1-C)\,(L)^{0.5}}{(S)^{0.33}} \text{ (min.)}$$

where, C = Runoff Coefficient
L = Length of Overland Flow Path, (m)
S = Avg. Slope of Overland Flow Path, (%)

Bransby Williams Formula

$$T_{C, OVER} = \frac{0.057\,(L)}{(S)^{0.2}\,(A)^{0.1}} \text{ (min.)}$$

where, L = Length of Overland Flow Path, (m)
S = Avg. Slope of Overland Flow Path, (%)
A = Catchment Area, (ha)

CHANNELIZED FLOW TIME OF CONCENTRATION (T_C) CALCULATION, $T_{C, CHAN}$

Refer to separate sheet attached for the calculation of the Velocity values (i.e. Flow Master Output, Manning's Channel Spreadsheet, etc.).

Catchment I.D.	Length (m)	Velocity (m/s)

$T_{C, CHAN}$ (min.)

$$T_{C, CHAN} = \frac{L}{V} \text{ (min.)}$$

where, L = Length of Channel, (m)
V = Flow Velocity in Channel, (m/s)

PIPED FLOW TIME OF CONCENTRATION (T_C) CALCULATION, $T_{C, PIPE}$

Refer to separate sheet attached for the calculation of the Velocity values (i.e. Culvert Master Output, Manning's Pipe Spreadsheet, etc.).

Catchment I.D.	Length (m)	Velocity (m/s)

$T_{C, PIPE}$ (min.)

$$T_{C, PIPE} = \frac{L}{V} \text{ (min.)}$$

where, L = Length of Pipe, (m)
V = Flow Velocity in Pipe, (m/s)

TOTAL TIME OF CONCENTRATION (T_C) AND TIME TO PEAK (T_P) CALCULATION, $T_{C, TOTAL}$, $T_{P, TOTAL}$

The Total Time of Concentration and Time to Peak values consist of a combination of the Overland, Channel and/or Pipe travel times.

Catchment I.D.	$T_{C, OVER}$ (min.)	$T_{C, CHAN}$ (min.)	$T_{C, PIPE}$ (min.)
PRE-E	18.8		
PRE-W	18.9		

$T_{C, TOTAL}$ (min.)	$T_{P, TOTAL}$ (min.)	$T_{P, TOTAL}$ (hr.)
18.8	**12.6**	**0.21**
18.9	**12.7**	**0.21**

$$T_{C, TOTAL} = T_{C, OVER} + T_{C, CHAN} + T_{C, PIPE} \text{ (min.)}$$

$$T_{P, TOTAL} = 0.67 \times T_{C, TOTAL} \text{ (min.)}$$

WMI & Associates Limited
119 Collier Street, Barrie, Ontario L4M 1H5
p (705) 797-2027 f (705) 797-2028

RATIONAL METHOD CALCULATIONS

Date: 29-Sep-22 **Project No.:** 21-652

Project: 500 Salem Road **Prepared By:** CJ

<<< **Elements Requiring Input Information**

Rainfall Intensity-Duration-Frequency Coefficients from: Barrie WPCC Station + 15% to account for climate change

2-year		5-year		10-year		25-year		50-year		100-year	
A =	678.085	A =	853.608	A =	975.865	A =	1146.275	A =	1236.152	A =	1426.408
B =	4.699	B =	4.699	B =	4.699	B =	4.922	B =	4.699	B =	5.273
C =	0.781	C =	0.766	C =	0.760	C =	0.757	C =	0.751	C =	0.759

Rational Method Formula

$$Q = \frac{C \times I \times A}{360} \quad (m^3/s)$$

where, C = Runoff Coefficient
I = Rainfall Intensity, (mm/hr)
A = Drainage Area, (ha)

Rainfall Intensity Equation (2-100 year storm events)

$$I_{2\text{-}100} = \frac{A}{(B + T_C)^C} \quad (mm/hr)$$

where, A = Rainfall IDF Coefficient
B = Rainfall IDF Coefficient
C = Rainfall IDF Coefficient
T_C = Time of Concentration, (min)

Runoff Coefficient Equations
Based on MTO Drainage Manual (1984), page BD-4

2-year	C_2 =	C
5-year	C_5 =	C
10-year	C_{10} =	C
25-year	C_{25} =	1.10 x C
50-year	C_{50} =	1.20 x C
100-year	C_{100} =	1.25 x C

For storms having a return period of more than 10 years, the Runoff Coefficient, C, will be increased as indicated above, up to a maximum value of 1.

Rainfall Intensity Equation (25mm storm event)
Based on the MOE SWMP Manual (2003), Eq'n 4.9

$$I_{25mm} = (43 \times C) + 5.9 \quad (mm/hr)$$

where, C = Runoff Coefficient

Catchment I.D.	A (ha)	T_C (min.)	C	Q_{25mm} (m^3/s)	Q_2 (m^3/s)	Q_5 (m^3/s)	Q_{10} (m^3/s)	Q_{25} (m^3/s)	Q_{50} (m^3/s)	Q_{100} (m^3/s)
PRE-E	0.39	18.8	0.15	0.002	0.009	0.012	0.014	0.019	0.023	0.026
PRE-W	0.35	18.9	0.15	0.002	0.008	0.011	0.013	0.017	0.020	0.023
***Allowable Site Area To DiPoce**	**0.68**	**10.0**	**0.55**	**0.031**	**0.086**	**0.113**	**0.131**	**0.169**	**0.205**	**0.234**
A1	0.54	10.0	0.65	0.033	0.081	0.106	0.123	0.159	0.192	0.220
A2	0.14	10.0	0.31	0.002	0.010	0.013	0.015	0.020	0.024	0.027
**EXT	0.48	10.0	0.58	0.024	0.064	0.084	0.097	0.125	0.152	0.173

Note: *The allowable release rate is based on Catchment Area 209E from the DiPoce Development (Figure 2-2, C = 0.55)
**Estimated based on the Salem Road reconstruction plans (Storm Drainage Area Plan - STM1, Catchment Areas 10.2 & 10.3).

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Storm Sewer Design Sheet
500 Salem Road

<<< **Elements Requiring Input Information**

Rational Method Calculation:

$Q = 2.78*(C_F*C*I*A)$

where,

Q = peak flow rate (L/s)
C_F = runoff coefficient factor for storms **> 10-yr** (C_F = 1.0 for the 2, 5 & 10-yr storm events and C_F = 1.1, 1.2 & 1.25 for the 25, 50 & 100-yr storm events respectively)
C = runoff coefficient
I = rainfall intensity (mm/hr)
A = area (ha)

Manning's Formula Calculation:

$V = (k*R^{2/3}*S^{1/2}) / n$ $\quad Q = V*A$

MOE Velocity Requirements: 0.8m/s - 6.0m/s

where,

V = mean velocity (m/s)
k = 1.0 for SI units
R = hydraulic radius (m)
S = friction slope (m/s)
n = Mannings Coefficient **0.013**

Rainfall Intensity Calculation:

$I = \frac{A}{(T+B)^C}$

where,

I = Rainfall Intensity (mm/hr)
T = Time of Concentration (min.)
A = Rainfall IDF Coefficient
B = Rainfall IDF Coefficient
C = Rainfall IDF Coefficient

Rainfall IDF Data: **Barrie WPCC** 1979-2003 adjusted for climate change

	5-year	100-year
A =	**853.608**	**1426.408**
B =	**4.699**	**5.273**
C =	**0.766**	**0.759**
Runoff Coeff. Factors, C_F =	1.00	1.25

Date: 29-Sep-22
Project No: 21-652
Prepared by: CJ

Location			Runoff Calculation Data									Sewer Calculation Data							Sewer Profile Data					
Street	Upstream MH	Downstream MH	Drainage Areas (ha) C = 0.20	C = 0.57	C = 0.60	C = 0.65	Individual 2.78CA	Accumulated 2.78CA	Time of Concentration (mins)	Storm Event	Rainfall Intensity (mm/hr)	Peak Runoff Flow (L/s)	Diameter (mm)	Slope (%)	Length (m)	Capacity (L/s)	Velocity (m/s)	Pipe Flow Time (mins)	Pipe Storage Volume (m^3)	Fall in Sewer (m)	Drop in MH (m) DS	Top of Grate Elevation (m) US	Top of Grate Elevation (m) DS	Invert Elevation (m) US	Invert Elevation (m) DS
***Salem**	***206***	***205***		**0.36**			0.57	0.57	10.00	**5-year**	108.92	62.14	**300**	**3.46**	**80.70**	187.65	2.57	0.52	5.9	2.79					
***Salem**	***205***	**1**			***0.12***		0.20	0.77	10.52	**5-year**	106.04	81.72	**375**	**0.50**	**27.50**	129.34	1.13	0.40	3.1	0.14					
A	**1**	**2**				**0.18**	0.33	1.10	10.93	**5-year**	103.94	113.90	**375**	**2.00**	**21.00**	258.68	2.27	0.15	2.4	0.42					
A	**2**	***7***				**0.18**	0.33	1.42	11.08	**5-year**	103.16	146.60	**450**	**2.00**	**70.40**	420.63	2.56	0.46	11.6	1.41					
****Dipoce**	**7**	**8**				**0.18**	0.33	1.75	11.54	**5-year**	100.92	176.25	**525**	**0.80**	**73.90**	401.29	1.80	0.69	16.5	0.59					
Sum of Drainage Areas (ha):			0.00	0.36	0.12	0.54																			
Total Drainage Area (ha):			1.02																						

NOTES:

***** Pipe data from Storm Drainage Area Plan - STM1, Essa Road and Salem Road Expansion, Contract #300044205, prepared by RJ Burnside, City of Barrie Infrastructure Dept., dated July 2, 2020.

****** Pipe data from Grading & Servicing Plan - GR-SS, DiPoce Residential Subdivision, Contract #4560, prepared by Schaeffers Consulting Engineers, City of Barrie Engineering Dept., dated June 2020.
The area of Catchment A1 is presumed to be equally divided between Manhole 1, 2 and 7.

2.7 Quality Control

Water quality control is to be provided for the subject site to achieve the required 80% TSS removal.

Catchments 201-204 are proposed to provide their own quality control. A combination of bioretention facilities like tree pits or infiltration chambers along with Jelly Fish units can be used to achieve treatment train and the required 80% TSS removal. Since, catchment 201 is proposed to discharge directly to the infiltration cell of the SWM Pond H via a headwall, it is proposed that the site use a Jellyfish. Jellyfish unit sizing will be provided in the detailed design stage. In addition, TSS removal can be achieved through SWM Pond infiltration at the infiltration cell of the pond. An in-depth review of the feasible LID techniques within each block is required during the site plan stage.

For the remaining parts of subdivision (15.36 ha) (public ROW, etc.) excluding the undeveloped areas, it is proposed to provide quality control via a treatment train approach – two Jellyfish units, permanent pool, and on-site infiltration techniques. The flow from the proposed townhouses, school block, park block and from the public right of way (ROW) is proposed to be treated via a treatment train approach. Two Jellyfish filter units are proposed upstream of the proposed SWM pond which are sized to provide 80% TSS removal. The flow from the storm sewers is then directed towards the forebay of the cell, which has been designed to provide 80% TSS removal. According to the calculations presented in **Appendix B**, it is required to provide a permanent pool volume of 1,137 m^3. The required and provided permanent pool volumes are summarized in **Table 2-17.**

Table 2-17: Permanent Pool Requirements at Forebay of SWM Pond H

Level of Protection	Enhanced (80%)
Drainage Area (Catchment 200+206+209E)	15.36 ha
Weighted Imperviousness	58%
Total Storage Volume Requirement	197 m^3/ha
Minimum Extended Detention Storage Volume Requirement	40 m^3/ha
Permanent Pool Requirement	157 m^3/ha
Required Permanent Pool Storage Volume	2,412 m^3
Provided Permanent Pool Storage Volume	2,755 m^3

Additional quality control is provided by the proposed infiltration bed within the SWM Pond in accordance with Table 3.2 of the MECP SWM Planning & Design Manual. Therefore, the combined efficiency of the treatment train approach is greater than required 80% TSS removal. The TSS removal efficiency of SWM Pond and Jellyfish is 94% {80% + 70% - (80%*70%)}. The total TSS removed by SWM Pond, Jellyfish, Infiltration bed is 98% {94% + 70% - (94%*70%)}. The high groundwater level is at 290 m which is well below the proposed infiltration bed elevation of 292.20 m. This ensures that the infiltration bed has more than 1 m separation between the high groundwater level. **Table 2-18** summarizes the required and provided infiltration volume at the infiltration cell of the SWM Pond H. Detailed calculations area attached in **Appendix B** for reference.

Table 2-18: Infiltration Volume Summary

Level of Protection	Normal (70%)
Drainage Area (Catchment 200+201+206+209E)	16.39 ha
Weighted Imperviousness	58%
Infiltration Rate	21 m^3/ha
Required Infiltration Volume	344 m^3
Provided Infiltration Volume	785 m^3

2.8 Volumetric Control

The NVCA Guideline does not have a requirement for volumetric control. However, during the completion of the SIS study, it was agreed that the SIS lands will recommend similar volumetric control to the Lake Simcoe Region Conservation Authority (LSRCA) Guidelines to the extent possible.

It is to note that backyard infiltration is not possible because there is not enough depth at the back to provide the 4.5m separation from the trench to the building envelope. Previously, City of Barrie was accepting CB Shield and Atlantis Cells for treatment and infiltration in the boulevard. However, it is understood that City of Barrie wants centralized approach for treatment and infiltration through discussions and reviews of earlier revisions of this comment.

As discussed above, due to land use constraints, preference by the city to not have infiltration in the rights of way and limitations of decentralized infiltration/retention in any townhouse block, although desirable to provide a volumetric control for rain events of ≤25mm, it is therefore

warranted to provide volume control for ≤6.5 mm events. Thus, for the subject site area, a volumetric retention volume of at least 669 m^3 ("interim condition") (6.5mm * 42%imp * 24.49 ha * 10[{m^2/ha} / {m/mm}] = 668.58 m^3) is required within SWM Pond H infiltration area. It is to note that the "interim condition" volume required governs the volumetric control design criteria. The required and provided volume at the infiltration cell is summarized in **Table 2-19.** Calculations are attached in **Appendix B.** Please note that the weighted imperviousness takes into account the undeveloped Catchment 208E in interim condition that is why an imperviousness of 42% is calculated and in the ultimate condition Catchment 208E will provide its own volume control. Please refer to **Appendix B** for detail calculation.

Table 2-19: Infiltration Cell Volumes

Drainage Area (Catchment 200+201+206+208E+209E)	24.49 ha
Weighted Imperviousness	42%
Required Infiltration Volume (Interim)	669 m^3
Required Infiltration Volume (Ultimate)	629 m^3
Provided Infiltration Volume	785 m^3

2.9 Water Balance

According to the Ontario MECP, the subject site is located in the Q1 and Q2 region. Parts of the south east of the subject site are located within the significant recharge area.

A water balance model was prepared for the site to assess the distribution of rainfall run-off and infiltration for the existing (pre-development) conditions and the post-development conditions. The Meteorological data was taken from Environment Canada-Barrie WPCC Station (1978-2006)

The water balance for the site was conducted using a mean annual precipitation of 933 mm. Infiltration factors were based on the MECP SWM Planning and Design Manual (dated 2003).

Based on the water balance calculations presented in **Appendix A**, the pre-development infiltration is 52,053m^3/year and the post-development infiltration is 29,171m^3/year. 22,882 m^3/year of deficit is required to be infiltrated at the post-development stage.

To satisfy the water balance requirements it is proposed that Blocks 39-42, 43 and 45 provide 5mm infiltration on site. Additional infiltration is proposed within the well cell of SWM Pond H. As discussed in *Section 2.3*, the infiltration bed within the SWM Pond block is sized to provide the

greater of; the quality control requirement (344 m^3), the volumetric control requirement (669 m^3), and the water balance requirement (301 m^3). Based on the criteria stated above, the infiltration within SWM Pond H will be designed to satisfy the 6.5mm retention from the impervious area draining to the SWM Pond in accordance with the volumetric control section above (*Section 2.8*), far exceeding the water balance requirements. Note that the infiltration area within SWM Pond H has been designed to ensure a drawdown time below seventy-two (72) hours. An average infiltration rate of 55mm/hr was taken in accordance with the in-situ testing conducted by RJ Burnside Limited in October 2019 (report attached in **Appendix A**), indicating the native soils at the proposed SWM Pond location has an infiltration rate ranging from 40mm/hr to 70 mm/hr. An infiltration rate of 55mm/hr was used in the design of the infiltration cell as it was the average between the highest and lowest infiltration rate. Additionally, a factor of safety of 2.5 was considered in the design of the infiltration cell for a conservative approach.

The above infiltration measures increase the post-development infiltration volume to 63,177m^3 which is a 21% increase in infiltration from the pre-development conditions. **Table 2-20** presented below summarizes the water balance calculations presented in **Appendix B**.

Table 2-20: Water Budget – Summary Table

Characteristics	Site				
	Pre-Development	Post-Development	Change (Pre to Post)	Post-development with mitigation	Change (pre to post with mitigation)
Inputs (Volumes)					
Precipitation (m^3/year)	240901	240917	0%	240901	0.0%
Total Inputs (m^3/year)	240901	240917	0%	240901	0.0%
Outputs (Volumes)					
Precipitation surplus (m^3/year)	86755	143926	66%	143926	66%
Net Surplus (m^3/year)	86755	143926	66%	143926	66%
Total Evapotranspiration (m^3/year)	154145	96975	-37%	96975	-37%
Total Infiltration (m^3/year)	52053	29171	-44%	63177	21%
Total Runoff (m^3/year)	34702	114754	231%	80748	133%
Total Outputs (m^3/year)	240901	240901	0%	240901	0%

2.10 Phosphorus Loading

NVCA Guidelines require a maximum allowable post-development phosphorus loading of 100% pre-development loading, and best efforts to an additional 20% reduction beyond this level. However, NVCA recognizes that in some circumstances, this 20% reduction cannot be achieved and therefore, NVCA requires that the TP load at the post development stage, at least, matches with that of pre-development.

The NVCA Phosphorus Budget Tool was utilized to calculate both pre- and post-development phosphorus loading based on land use. A pre-development phosphorus load of 2.52 kg/yr and a post-development phosphorus load without BMP of 6.05 kg/yr was found. A post-development loading with BMPs was found to be 0.85 kg/yr. This indicates that the post-development loading with BMPs is 66% less than the pre-development phosphorus load. Refer to **Appendix B** for the NVCA Phosphorus Budget Tool- Development Export Summary.

A treatment train approach to reduce phosphorus is proposed in the post-development condition for Catchment area 200 and 206. This proposed treatment train was assessed for treatment efficiency while catchment area 201-204 draining to a single measure used recommended removal efficiencies provided by the NVCA Phosphorus Loading Development Tool. An overall treatment efficiency of 91% has been proposed through the application of two Jellyfish Unit filters, end-of-pipe-facility with a wet sediment forebay providing MOE Table 3.2 "Normal" quality treatment volume for wet pond as well as infiltration in the SWM pond. The treatment train Total Phosphorus (TP) removal efficiency has been calculated as follows:

- Jellyfish Units @ 50% results in [100% x (1-0.5)] = 50% TP remaining;
- SWM Pond MOE Table 3.2 "Normal" @ 55% results in [50% x (1-0.55)] = 22.5% TP remaining;
- Infiltration in SWM Pond @ 60% results in [22.5% x (1-0.60)] = 9% TP remaining.

As mentioned above the assumed phosphorus remaining after the treatment train is approximately 9% resulting in a proposed removal of 91%.

2.10.1 Jellyfish Units

Two Jellyfish Unit filters are proposed upstream of the proposed SWM pond. According to ETV Certification, filter-based units can remove up to 50% Phosphorus. These two Jellyfish units are proposed to provide 80% TSS removal and 50% phosphorus reduction.

2.10.2 Proposed SWM Pond H

As previously mentioned in Section 2.8, the proposed end-of-pipe facility provides a pond which includes a permanent pool quality volume based on MOE Table 3.2 Wet Pond Sizing for "Enhanced" treatment. The proposed facility provides a permanent pool in excess of the MOE's criteria for Enhanced Level (80% TSS removal) treatment. As per NVCA: Managing New Urban Development in Phosphorus-Sensitive Watersheds (Hutchinson Environmental Sciences Ltd), 63% phosphorus removal can be achieved if a proposed facility provides a permanent pool adequate for a "Enhanced" (80%) Total Suspended Solids removal efficiency.

2.10.3 Infiltration in Proposed SWM Pond H

An infiltration bed is proposed in the SWM pond to provide additional quality control. This

From Appendix B of June 2020 DiPoce FSR

Water Balance Mitigation Calculations

Pre Development Infiltration =	**52,053**	**m^3/y**
Post Development Infiltration without mitigation =	**29,171**	**m^3/y**
Post to Pre Deficit =	**22,882**	**m^3/y**
Mitigation Measures		
Top Soil Amendment =	**0**	**m^3/y**
Rooftop infilitration =	**0**	**m^3/y**
Infiltration Trench within the Park Block=	**380**	**m^3/y**
Infiltration Trench within the School Block=	**3,436**	**m^3/y**
Infiltration Trench within the SWM pond=	**25,015**	**m^3/y**
Infiltration Trench within the Block 39=	**1,700**	**m^3/y**
Infiltration Trench within the Block 40=	**1,766**	**m^3/y**
Infiltration Trench within the Block 41=	**1,287**	**m^3/y**
Infiltration Trench within the Block 42=	**422**	**m^3/y**
Mitgation Voulme Provided =	**34,006**	**m^3/y**
Deficit =	**-11,124**	**m^3/y**

In order to meet the annual pre-development infiltration deficit, the runoff from the site directed to infitlration trenches shall be equal to the annual deficit volume. Therefore,

Infiltration Trench within the SWM pond=

9.00 ha x Annual Precipitation Depth = 25,015 m^3/year

Required Annual Precpitation Depth to meet deficit = 278 mm/yr

A precipitation analysis (rainfall & snowfall) was conducted to estimate an event with sufficient precipitation that produces an annual runoff volume of 25016 m^3/year (or a total depth of annual rainfall equal to 278 mm)

The analysis was performed on daily precipitation data collected from Barrie from 1978 to 2006 by Environment Canada. The data was then arranged into four categories for each year: Total Annual Depth of Precipitation from events less than or equal to 5mm, 10mm, 15mm and 20mm. This yearly data was then used to determine an average annual precipitation depth.

Based on this analysis, it is concluded that precipitation events of depth less than or equal to *6.50 mm* will produce an annual amount of precipitation equal to 278 mm/yr

The total required infiltration trench volume is 6.5 mm x 9 ha x 10 = 585 m^3

Infiltration Trench within the Park Block=

0.17 ha x Annual Precipitation Depth = 380 m^3/year

Required Annual Precpitation Depth to meet deficit = 220 mm/yr

A precipitation analysis (rainfall & snowfall) was conducted to estimate an event with sufficient precipitation that produces an annual runoff volume of 381 m^3/year (or a total depth of annual rainfall equal to 220 mm)

The analysis was performed on daily precipitation data collected from Barrie from 1978 to 2006 by Environment Canada. The data was then arranged into four categories for each year: Total Annual Depth of Precipitation from events less than or equal to 5mm, 10mm, 15mm and 20mm. This yearly data was then used to determine an average annual precipitation depth.

Based on this analysis, it is concluded that precipitation events of depth less than or equal to *5.00 mm* will produce an annual amount of precipitation equal to 220 mm/yr

The total required infiltration trench volume is 5 mm x 0.17 ha x 10 = 8.6 m^3

APPENDIX C

Sanitary and Water Service Calculations

WMI & Associates Limited
119 Collier Street, Barrie, Ontario L4M 1H5
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TOTAL DAILY SANITARY DESIGN FLOW CALCULATIONS

Date: 29-Sep-22 **Project No.:** 21-652

Project: 500 Salem Road **Prepared By:** CJ

<<< **Elements Requiring Input Information**

Total Daily Design Flow Calculations

References: - City of Barrie Sanitary Sewage Collection System Policies and Design Guidelines 2017
- Ontario Building Code (OBC), 2012, Division B, Part 8, Table 8.2.1.3.A. Residential Occupancy & Table 8.2.1.3.B. Other Occupancies

Proposed Condition:

	Establishment:	# of people	# of water closets	# of fuel outlets	# of seats	Gross Floor Area (m^2)	Land Area (ha)	Total Daily Design Sanitary Sewage Volume		Total Daily Design Sanitary Sewage Flow (L/day)
	Residential Uses:									
**	Townhouses (34 units @ 2.57 ppu (medium density)	**87**						**225**	L/person	19,665
										0
	Subtotal =	**87**								**19,665**

Harmon Formula, $M = 1 + \frac{14}{(4 + P^{0.5})}$

where, P = Design population in 1000s

Peaking Factor, M =	**4.26**
Peak Total Daily Design Sanitary Sewage Flow (L/day) =	**83,773**
Peak Extraneous Unit Flow (L/s/ha) =	**0.10**
***Land Area (ha) =**	**0.54**
Peak Extraneous Flow (L/day) =	**4666**
Peak Total Daily Design Flow (L/day) =	**88,439**

Total Average Daily Design Flow (L/day) =	**19,665**
Peak Total Daily Design Flow (L/sec) =	**1.024**

Note:

*** Land area to sanitary sewer is Catchment A1A (0.54ha)**

**** Population density was taken as 2.57ppu to match that of the City of Barrie requirements for water servicing.**

\\WMINAS\Public\Data\Projects\2021\21-652\Design\Sanitary\[220929_Total_Daily_Sanitary_Design_Flow_Calcs.xlsx]Sani_Design_Flows

Proposed Sanitary Flow Calculation

From Appendix C of June 2020 DiPoce FSR

Project No. 4560

Proposed Residential Development, City of Barrie

Site Area:	25.82	ha
Infiltration Rate:	0.1000	L/ha/sec
Residential Generation Rate:	225	L/capita/day
Commercial Generation	28	m3/ha/day

Summary of Average Residential Sanitary Generation Calculation

Tenure Type	Units	Unit Density (cap/unit)	Population	Sanitary Demand (L/cap/day)	Average Demand (L/s)
Townhouses-Residential	194	2.57	499	225	1.299
Medium Density-Residential	136	2.57	350	225	0.911
Commercial	0.275 ha	115/ha	32	225	0.083
Total			**881**		**2.294**

Summary of Sanitary Design Flow Calculation

Average Residential Demand (L/s)	Residential Population (persons)	Harmon's Peaking Factor (M)*	Commercial Demand (L/ha/s)	Commercial Area (ha)	Infiltration (L/ha/s)	Total Area (ha)	Total Peak Flow (L/s)
2.294	881	3.83	0.32	0.27	0.1000	25.82	**11.47**

*Based on equivalent population method

$M = 1 + 14/(4 + (P/1000)^{0.5})$

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MANNING'S PIPE EQUATION
OUTLET SANITARY SEWER PIPE (MIN. SLOPE)

Date: 29-Sep-22 **Project No.:** 21-652

Project: 500 Salem **Prepared By:** CJ

Mannings' Equation		
Pipe Diameter (mm) =	200	
Area =	0.031	m^2
Slope (%) =	0.70	
Manning 'n' =	0.013	
Nom'l Pipe Capacity, Q =	0.027	m^3/sec
Actual Pipe Capacity, Q =	**0.029**	m^3/sec
	28.63	L/sec

Box Culvert	
Height =	0.00
Width =	0
Q =	0.00
Velocity	
0.87	m/s
0.91	m/s
R=	**0.05**
Sf=	**0.0070**

NOTE: The DiPoce sanitary sewer pipe is flowing at 40.1% capacity under the DiPoce peak flows (11.47/28.63=40.1%). The sanitary sewer pipe is flowing at is 43.6% under the DiPoce and subject site peak flows ((11.47+1.02)/28.63=43.6%).

RK CRESCENT

LOUGHEED ROAD

OPEN SPA

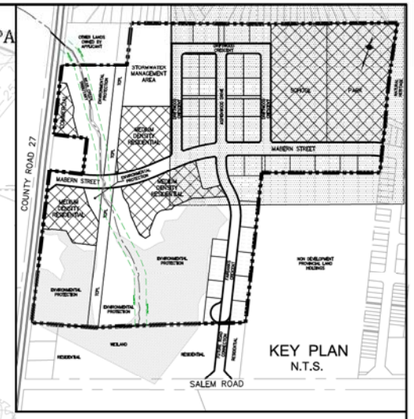
BLOCK

PART 1, 51R-...

LOT 436

LONG TERM STABLE TOS

COUNTY ROAD 27



NOTES:

1. FOR GENERAL AND SPECIAL NOTES REFER TO DWG GN-1.

LEGEND

- DENOTES VALVE AND BOX
- DENOTES HYDRANTS
- DENOTES SINGLE OR DOUBLE CATCH-BASIN
- DENOTES SINGLE OR DOUBLE CATCH-BASIN WITH HEAVY DUTY HONEYCOMB GRATING BOLTED DOWN
- DENOTES SANITARY MAINTENANCE HOLE
- DENOTES STORM MAINTENANCE HOLE
- DENOTES CATCH BASIN MAINTENANCE HOLE
- DENOTES SINGLE SAN. HOUSE CONNECTIONS WITH CLEANOUT
- DENOTES SINGLE WATERMAIN HOUSE CONNECTIONS
- DENOTES PRIVACY FENCE
- DENOTES 2.0m HIGH SOLID WOOD PRIVACY FENCE
- DENOTES CHAIN LINK FENCE

DRIFTWOOD CRES.

ASPENWOOD DR.

FAIRBANKS CRES.

MABERN ST.

BLK 01 TOWNHOUSES

BLK 02 TOWNHOUSES

BLK 03 TOWNHOUSES

BLK 04 TOWNHOUSES

BLK 56 WALKWAY/DRAINAGE

BLK 61 0.3m RESERVE

BLK 62 0.3m RESERVE

BLK 63 0.3m RESERVE

BLK 64 0.3m RESERVE

BLK 65 0.3m RESERVE

BLK 66 0.3m RESERVE

BLK 05 TOWNHOUSES

BLK 12 TOWNHOUSES

BLK 13 TOWNHOUSES

BLK 20 TOWNHOUSES

BLK 06 TOWNHOUSES

BLK 11 TOWNHOUSES

BLK 14 TOWNHOUSES

BLK 19 TOWNHOUSES

BLK 53 WALKWAY

BLK 54 WALKWAY

BLK 07 TOWNHOUSES

BLK 10 TOWNHOUSES

BLK 15 TOWNHOUSES

BLK 18 TOWNHOUSES

BLK 08 TOWNHOUSES

BLK 09 TOWNHOUSES

BLK 16 TOWNHOUSES

BLK 17 TOWNHOUSES

BLK 21 TOWNHOUSES

BLK 22 TOWNHOUSES

BLK 24 TOWNHOUSES

BLK 25 TOWNHOUSES

BLK 26 TOWNHOUSES

BLK 27 TOWNHOUSES

BLK 23 TOWNHOUSES

BLK 55 DRAINAGE

BLK 37 TOWNHOUSES

BLK 28 TOWNHOUSES

BLK 39 MEDIUM DENSITY RESIDENTIAL

BLK 40 MEDIUM DENSITY RESIDENTIAL

BLK 44 STORMWATER MANAGEMENT AREA

WET CELL

INFILTRATION BED

FOREBAY

BLK 43 SCHOOL

BLK 45 PARK

NATURAL HERITAGE

BLOCK 279 N.H.S.

NON DEVELOPMENT PROVINCIAL LAND HOLDINGS

Critical Sanitary Sewer Pipe

REFER TO DWG GP-1

REFER TO DWG GP-3

SPECIAL NOTES:

MABERN STREET

FOR LAYOUT AND OBV. OF EXISTING WATERMAIN AND LAYOUT AND INVERTS OF EXISTING SANITARY SEWERS REFER TO "RECORD DRAWINGS" DATED 21/03/10 – PROJECT No. 032868.200 PREPARED BY R.J. BURNSIDE & ASSOCIATES LIMITED.

COUNTY ROAD 27

FOR LAYOUT AND OBV. OF EXISTING WATERMAIN AND LAYOUT AND INVERTS OF EXISTING SANITARY SEWERS REFER TO "AS-RECORDED DRAWINGS" DATED 20/06/22 – PROJECT No. 032868.200 PREPARED BY R.J. BURNSIDE & ASSOCIATES LIMITED.

FAIRBANKS CRES. EXTENSION

FOR LAYOUT AND OBV. OF FUTURE PROPOSED WATERMAIN AND LAYOUT AND INVERTS OF FUTURE PROPOSED STORM AND SANITARY SEWERS REFER TO "500 SALEM" PROJECT No. 21-652 PREPARED BY WMI & ASSOCIATES LIMITED.

BENCH MARKS U.T.M. COORDINATES: ZONE 17 NAD 83

DISTANCE NOTE
DISTANCES SHOWN HEREON ARE GROUND DISTANCES AND CAN BE CONVERTED TO GRID DISTANCES BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.9997265 AS PER RODNEY GEYER ONTARIO LAND SURVEYOR.

MNR No: 01019860437 – BENCH MARK No: 010860437 – HORIZONTAL CONTROL MONUMENT RECORD
THE HORIZONTAL MONUMENT IS LOCATED ON THE NORTH-WEST SIDE OF THE INTERSECTION OF COUNTY ROAD No 27 (TOWN LINE), AT SALEM ROAD IN SHOULDER OF ROAD AT DRIVEWAY ENTRANCE.
SCALE FACTOR: 0.9999826

MNR No: 03120110001 – BENCH MARK No: 03120110001 – COMBINED CONTROL MONUMENT RECORD
LOCATED BEHIND THE CURB OF ESSA ROAD AT THE NORTH-WEST CORNER OF THE INTERSECTION OF SALEM ROAD, APPROXIMATELY 775m EAST OF THE COUNTY ROAD #27 AND SALEM ROAD INTERSECTION.
NOTE: A PROTECTIVE WATER VALVE COVER HAS BEEN PLACED OVER MONUMENT CAP.

MNR No: 03120080011 – BENCH MARK No: 03120080011 – HORIZONTAL & VERTICAL CONTROL MONUMENT RECORD
LOCATED ON COUNTY ROAD No27 (TOWN LINE ROAD), APPROXIMATELY 4.6km'S SOUTH OF DUNLOP STREET WEST (COUNTY ROAD No. 90), APPROXIMATELY 306m SOUTH OF MAPLEVIEW DRIVE WEST AND APPROXIMATELY 33.0m EAST OF COUNTY ROAD No. 27.
NOTE: A PROTECTIVE WATER VALVE COVER HAS BEEN PLACED OVER MONUMENT CAP.
SCALE FACTOR: 0.9996843

NO.	REVISIONS	DATE	APPROVED

SCHAEFFERS
CONSULTING ENGINEERS
SCHAEFFER & ASSOCIATES LTD.
6 Ronrose Drive, Concord, Ontario L4K 4R3
Tel: (905) 738-6100
Fax: (905) 738-6875
E-mail: design@schaeffers.com

REGISTERED PROFESSIONAL ENGINEER
H. O. TOZCU
JUNE 2022
PROVINCE OF ONTARIO

CITY OF BARRIE
ACCEPTED
DATE. . . . . .
. . . . . .
DIRECTOR OF ENGINEERING

SALEM AND HIGHWAY 27 RESIDENTIAL SUBDIVISION
GENERAL PLAN
PART II

Barrie
ENGINEERING DEPARTMENT

SCALE HOR. 1:750	VERT.	PROJECT NO.	5067
DESIGN M.K.	DRAWN L.T.	SHEET NO.	GP - 2
REVIEWED H.T	DATE JUNE 2021		

F:\Salem\5067\5067-GENERAL\5067 – GP-1-3.dwg, 2022-07-05 11:10:14 AM, LThon, 1:1

WMI & Associates Limited
119 Collier Street, Barrie, Ontario L4M 1H5
p (705) 797-2027 f (705) 797-2028

TOTAL DAILY DOMESTIC WATER SUPPLY FLOW CALCULATIONS
500 Salem Road

Date: 29-Sep-22 **Project No.:** 21-652

Project: 500 Salem Road **Prepared By:** CJ

<<< **Elements Requiring Input Information**

Total Daily Design Flow Calculations

References:
- Ontario Building Code (OBC), 2012, Division B, Part 8, Table 8.2.1.3.A. Residential Occupancy & Table 8.2.1.3.B. Other Occupancies
- Ministry of the Environment (MOE), Design Guidelines for Drinking-Water Systems (2008), Chapter 3
- City of Barrie Water Transmission and Distribution Design Standard

Proposed Condition:

Establishment:	# of people	# of water closets	# of fuel outlets	# of seats	Gross Floor Area (m^2)	Land Area (ha)	Total Daily Design Volume		Avg Day Demand ADD (L/s)	Max Day Demand MDD (L/s)	Peak Hourly Demand PHD (L/s)
Residential Uses:											
Townhouses (34 units @ 2.57ppu (medium density))	**87.0**						**225**	L/person	0.23	1.66	2.50
								L/person	0.00	0.00	0.00
Subtotal =	**87.0**								**0.23**	**1.66**	**2.50**
									Peaking Factor =	**7.32**	**11.02**

Notes:

\\WMINAS\Public\Data\Projects\2021\21-652\Design\Water\[220929_Total_Daily_Domestic_Water_Supply_Flow_Calcs.xlsx]Water_Supply_Flows

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FIRE PROTECTION WATER DEMAND DESIGN CALCULATIONS
FIRE UNDERWRITERS SURVEY METHOD

Date: 29-Sep-22 **Project No.:** 21-652

Project: 500 Salem Road **Prepared By:** CJ

<<< **Elements Requiring Input Information**

Fire Protection Water Storage

Reference: Part II Water Supply for Public Fire Protection, Fire Underwriters Survey, 1999
F=220*C*√A
where F=the required fire flow in litre per minute
C=coefficient related to type of construction
1.5 for wood frame construction
1.0 for ordinary construction - brick or other masonry wall, combustible floor and interior
0.8 for non-combustible construction - unprotected metal structure components masonry or metals walls
0.6 for fire resistive - fully protected frame floors, roof
A= the total floor area in square metres - incl. all storeys excluding basements 50% below grade

C=	1.5	
*A=	174	
F=	4353	
Apply reduction for low contents fire hazard	-25	%
F=	3265	
Apply reduction for automatic sprinklers designed to NFPA 13 (30%), systems with water supply (10%) and systems with electronic supervision (10%)	0	%
F=	3265	litres/min
F=	54.4	litres/sec
Add to flow for separation per side where separation is less than 45m. Max increase is 75%	75	%
F=	5713	litres/min
F=	**95.2**	litres/sec

Note:
*Floor area of the largest single unit in each Townhouse block (assumed to be 3 storeys)

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Watermain Headloss Calculations
500 Salem Road

<<< **Elements Requiring Input Information**

Velocity, $V = \frac{Q}{A}$ (m/s)

where, Q = Flow (m^3/s)
A = Cross-Sectional Area (m^2)

Minor Head Loss, $H_L = (K_1+K_2+K_3\ldots) \times V^2/2g$

where, $\sum K =$ $(K_1+K_2+K_3\ldots)$
V = mean velocity (m/s)
g = 9.81 (acceleration due to gravity, m/s^2)

Hazen -Williams Equation (re-arranged for Friction Slope)
(Friction Head Loss Calculation)

$$\text{Friction Slope, } S = \frac{(V)^{1/0.54}}{(0.85CR^{0.63})^{1/0.54}} \times 100 \text{ (m/100m)}$$

where, V = mean velocity (m/s)
k = 0.85 for SI units
C = Roughness Coefficient
R = hydraulic radius (m)

Total Head Loss = Friction Head Loss + Minor Head Loss

Pressure (psi) = Pressure Head (m) x 1.422

Total HGL = Ground Elev. + Pressure Head

Date: 29-Sep-22
Project No: 21-652
Prepared by: CJ

Description	Pipe Design Coefficient C	Forcemain *Flow (L/s)	Forcemain Diameter (mm)	Forcemain Velocity (m/s)	Forcemain Unit Friction Head Loss (m/100m)	Forcemain Distance (m)	Forcemain Friction Head Loss (m)	Sum of Minor Loss Coeff. ∑K=	Minor Head Loss (m)	Total Head Loss (m)	Total Pressure Loss (psi)	**Pressure @ Pt. A (psi)	Pressure Head @ Pt. A (m)	Ground Elev. @ Pt. A (m)	Total HGL @ Pt. A (m)	Ground Elev. @ Pt. B (m)	Total HGL @ Pt. B (m)	Pressure Head @ Pt. B (m)	Pressure @ Pt. B (psi)
Internal Watermain	**120**	**1.66**	**300**	0.02	0.00	**96.00**	0.00	**1.00**	0.00	0.00	0.00	**41.6**	29.25	**307.70**	336.95	**309.60**	336.95	27.35	**38.90**

NOTES: **- Minor losses are estimated to be equal to a sum of 1.0.**

*** -Maximum Daily Demand (MDD) =1.66L/s. See Total Dail Domestic Water Supply Flow Calculation sheet.**

**** -Residual pressure taken from DiPoce FSR dated June 2020 in Appendix D is 41.6psi (287kPa) at Node J-119 watermain under the MDD+FF condition. Only the MDD considered for the subject site as the fire flow of 155L/s is accounted for in the pressure of 41.6psi.**

Scenario: MDD+FF
Current Time Step: 0.000 h
Fire Flow Node FlexTable: Fire Flow Report

From Appendix D of June 2020 DiPoce FSR

ID	Label	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (L/s)	Fire Flow (Available) (L/s)	Pressure (Calculated Residual) (kPa)	Demand (L/s)	Hydraulic Grade (m)
4435	J-6	2	True	76.00	77.00	448	0.00	347.32
4712	J-112	2	True	150.00	151.00	393	0.13	347.32
4715	J-113	2	True	150.00	151.00	362	0.15	347.32
4717	J-114	2	True	150.00	151.00	373	1.00	347.32
4719	J-115	2	True	150.00	151.00	333	0.15	347.32
4721	J-116	2	True	150.00	151.00	368	0.30	347.32
4725	J-117	2	True	150.00	151.00	383	0.44	347.32
4729	J-118	2	True	0.00	221.00	171	0.61	347.32
4731	J-119	2	True	150.00	151.00	287	0.00	347.32
4735	J-120	2	True	150.00	151.00	308	1.06	347.32
4738	J-121	2	True	150.00	151.00	327	0.52	347.32
4741	J-122	2	True	150.00	151.00	401	0.77	347.32
4744	J-123	2	True	150.00	151.00	397	2.25	347.32
4747	J-124	2	True	200.00	201.00	308	2.19	347.32
4750	J-125	2	True	283.00	284.00	286	0.25	347.32

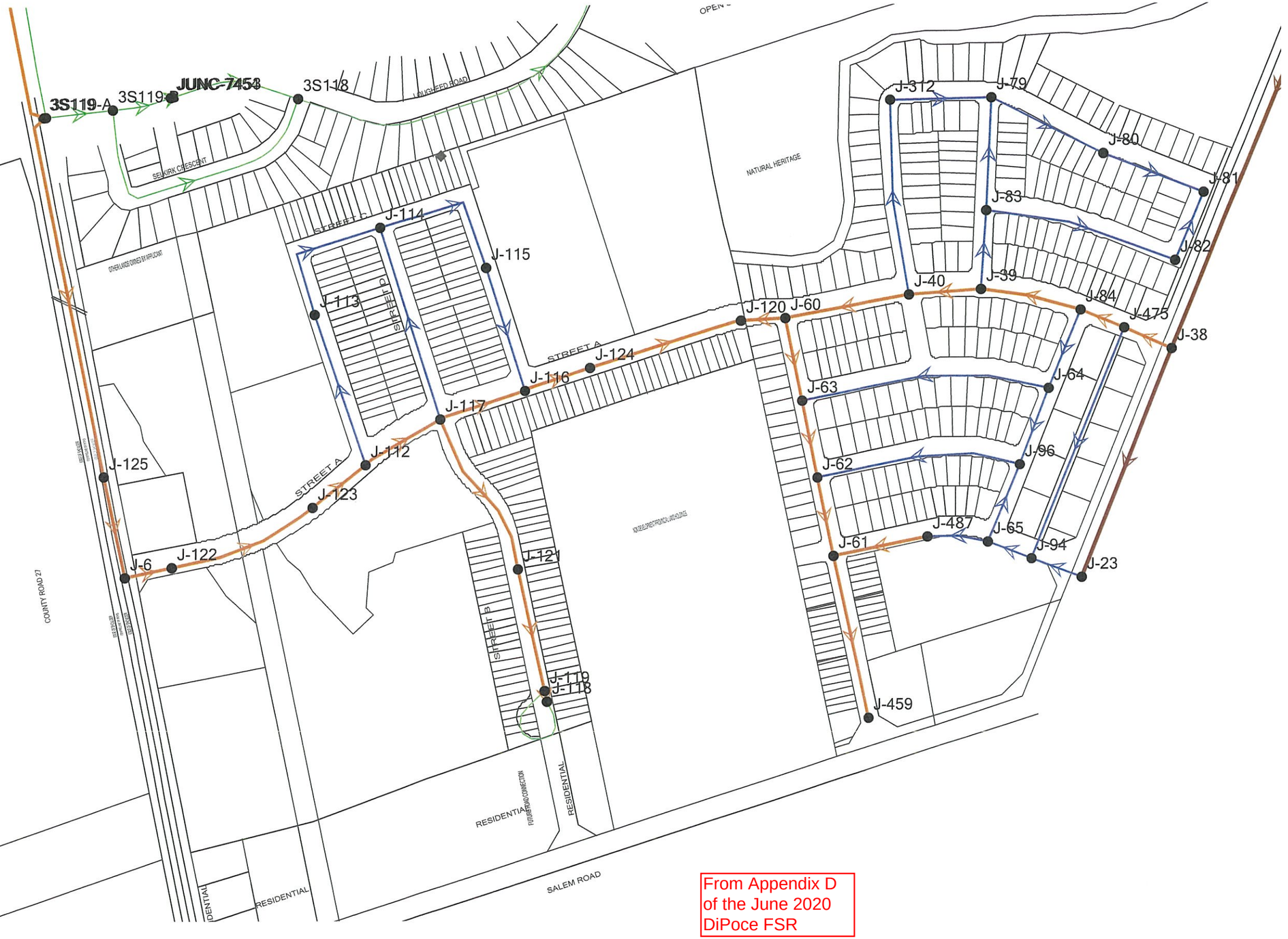
=41.6psi

Scenario: MDDTFF

Color Coding Legend

Pipe: Diameter (mm)

	<=	150.0
	<=	200.0
	<=	250.0
	<=	300.0
	<=	400.0
	<=	500.0
		Other



From Appendix D of the June 2020 DiPoce FSR

APPENDIX D

Geotechnical Investigation and Hydrogeological Report

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL • ENVIRONMENTAL • HYDROGEOLOGICAL • BUILDING SCIENCE
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A REPORT TO
LSR SALEM

A GEOTECHNICAL INVESTIGATION FOR PROPOSED RESIDENTIAL SUBDIVISION

500 SALEM ROAD

TOWN OF INNISFIL

REFERENCE NO. 2203-S111

JULY 2022

DISTRIBUTION

1 Digital - LSR Salem
1 Copy - Soil Engineers Ltd. (Newmarket)
1 Copy - Soil Engineers Ltd. (Richmond Hill)

TABLE OF CONTENTS

TABLES

ENCLOSURES

1.0 INTRODUCTION

In accordance with the written authorization dated March 23, 2022, from Mr. Adam Steeves of LSR Salem, a geotechnical investigation was carried out at 500 Salem Road in the Town of Innifil.

The purpose of this investigation was to reveal the subsurface conditions and determine the engineering properties of the disclosed soils for the design and construction of proposed residential subdivision. The geotechnical findings and resulting recommendations are presented in this Report.

2.0 SITE AND PROJECT DESCRIPTION

The Town of Innisfill is situated in the Lake Simcoe basin, where the glacial till has been partly eroded in places by glacial Lake Algonquin and filled with lacustrine sand and silt.

The subject land parcel, encompassing an approximate area of 3.33 hectares, is located to the north of Salem Road and approximately 60 m east of County Road 27 in the Town of Innisfil. An Environmental Land, consisting of a creek with wetland on both sides, separates the land parcel into two. The investigated area is located to the east of the Environmental Land, which encompasses an approximate area of 0.68 hectares. Based on aerial photographs and our site visit, earth works had occurred in the past within the investigated area. The existing site gradient generally descends north-westerly towards the creek.

Based on the Conceptual Site Plan provided by Innovative Planning Solutions, the site will be regraded for townhouse development, with municipal services and paved roadways meeting urban standards.

3.0 FIELD WORK

The field work, consisting of three (3) sampled boreholes extending to a depth of 6.6 m to 8.1 m, was performed on April 7, 2022, at the locations shown on the Location Plan, Drawing No. 1.

The boreholes were advanced at intervals to the sampling depths by a track-mounted, continuous-flight power-auger machine equipped for soil sampling. Standard Penetration Tests, using the procedures described on the enclosed “List of Abbreviations and Terms,” were performed at the sampling depths. The test results are recorded as the Standard

Penetration Resistance (or 'N' values) of the subsoil. The relative density of the non-cohesive strata is inferred from the 'N' values. Split-spoon samples were recovered for soil classification and laboratory testing. The field work was supervised and the findings were recorded by a Geotechnical Technician.

Upon the completion of borehole drilling and sampling, three (3) monitoring wells were installed in the boreholes to facilitate groundwater monitoring and a hydrogeological study, performed by other consultant. Details of the monitoring wells are included in the corresponding borehole logs.

The ground elevation of each borehole location was determined using hand-held Global Navigation Satellite System (GNSS) survey equipment.

4.0 SUBSURFACE CONDITIONS

The boreholes were drilled in the open area, covered with weed. The investigation has revealed that beneath the topsoil and a layer of earth fill, the area is underlain by sand and silty sand till deposits.

Detailed descriptions of the encountered subsurface conditions from the boreholes are presented on the Borehole Logs, comprising Figures 1 to 3, inclusive. The revealed stratigraphy is plotted on the Subsurface Profiles, Drawing No. 2. The engineering properties of the disclosed soils are discussed herein.

4.1 **Topsoil** (All Boreholes)

The revealed topsoil thickness is 15 to 25 cm in the boreholes. Topsoil thicker may be found beyond the borehole locations, particularly in treed and low lying areas.

4.2 **Earth Fill** (All Boreholes)

A layer of earth fill, extending to a depth of 0.7 m to 2.2 m, was contacted beneath the topsoil. It consisted of silty clay, with rootlets, organics, and rock fragments.

The recorded 'N' values ranged from 8 to 35 blows per 30 cm of penetration, indicating that the fill was non-uniform in compaction.

The water content values of the earth fill samples ranged from 7% to 21%, with a median of 17%, indicating generally moist conditions.

One must be aware that the samples retrieved from boreholes may not be truly representative of the geotechnical and environmental quality of the earth fill. It can be assessed by laboratory testing and/or test pits if necessary.

4.3 **Sand** (All Boreholes)

The sand deposit was encountered beneath the earth fill and extends to a depth of 5.6 m to 6.6 m from the prevailing ground surface in the boreholes. It is fine to medium grained, with a trace of silt. Grain size analyses were performed on two representative samples; the results are plotted on Figure 4.

The recorded 'N' values of the sand deposit ranged from 14 to 65, with a median of 31 blows per 30 cm of penetration, indicating that the deposit is compact to very dense, being generally dense in relative density. The natural water content values of the sand samples range from 2% to 22%, with a median of 17%, indicating generally wet conditions and is likely water bearing. The relatively low 'N' value can be a result of disturbance in the deposit by the hydrostatic pressure during the drilling and sampling operation.

The engineering properties of the sand deposit are presented below:

- Low frost susceptibility and high in water erodibility.
- Pervious, with an estimated coefficient of permeability of 10^{-2} to 10^{-3} cm/sec and a percolation time of 4 min/cm to 8 min/cm.
- The shear strength is derived from internal friction and is soil density dependent.
- The deposit will slough to its angle of repose in excavation, runs with water seepage and will boil with piezometric head of 0.3 m.
- Fair pavement-supportive material, with an estimated California Bearing Ratio (CBR) value of over 12%.
- Low corrosivity to buried metal, with an estimated electrical resistivity of 6000 ohm.cm.

4.4 **Silty Sand Till** (Boreholes 1 and 3)

The native silty sand till stratum was contacted in the lower stratigraphy of the boreholes. The boreholes were terminated within the till deposit and the lower limit of the till was not established.

The silty sand till is heterogeneous in structure, consisting of a random mixture of particle sizes ranging from clay to gravel, with sand and silt being the dominant fraction. Sample examinations disclosed that the till deposit was slightly cemented and displayed some cohesion when remoulded. Grain size analysis was performed on a representative sample and the result is plotted on Figure 5.

High resistance in borehole drilling was detected, indicating probable cobbles or boulders in the till mantle. The obtained 'N' values are 11, 48 and 80 blows per 30 cm penetration, indicating the till is compact to very dense in relative density.

The natural water content value of the till samples is 10%, indicating moist conditions.

The engineering properties of the silty sand till deposit are listed below:

- Moderate to moderately high frost susceptibility and low water erodibility.
- Relatively pervious, with an estimated coefficient of permeability of 10^{-4} cm/sec, and a percolation time of 12 min/cm.
- The till will be relatively stable in steep excavation; however, the sand layers in the till deposit may slough after prolonged exposure.
- A fair pavement-supportive material, with an estimated CBR value of 8%.
- Moderate corrosivity to buried metal, with an estimated electrical resistivity of 4500 ohm/cm.

4.5 Compaction Characteristics of the Revealed Soils

The obtainable degree of compaction is primarily dependent on the soil moisture and, to a lesser extent, on the type of compactor used and the effort applied. As a general guide, the typical water content values of the revealed soils for Standard Proctor compaction are presented in Table 1.

Table 1 - Estimated Water Content for Compaction

Soil Type	Determined Natural Water Content (%)	Water Content (%) for Standard Proctor Compaction	
		100% (optimum)	Range for 95% or +
Existing Earth Fill	7 to 21 (median 17)	15	11 to 18
Sand	2 to 22 (median 17)	8	5 to 10
Silty Sand Till	10	10	8 to 13

The above values show that the till is suitable for structural compaction while the sand is generally too wet. The wet sand can be properly stockpiled to allow draining of the excess water prior to backfilling. The existing earth fill must be sorted free of organics and other deleterious material prior to reuse for structural backfill.

When compacting the till on the dry side of the optimum, the compactive energy will frequently bridge over the chunks in the soil and be transmitted laterally into the soil mantle. Therefore, the lifts of these soils must be limited to 20 cm or less before compaction.

Rock and boulders will prevent transmission of the compactive energy into the underlying material to be compacted. Any boulders over 15 cm in size must be sorted and not be included for structural backfill and/or construction of engineered fill.

5.0 GROUNDWATER CONDITION

The boreholes were checked for the presence of groundwater and cave-in upon completion of drilling. Free groundwater was measured at depths of 2.1 m to 3.4 m (or El. 304.8 m to 305.6 m) upon borehole completion. Cave-in was logged at depths of 4.6 m and 6.1 m (or El. 300.8 m to 304.1 m) in the boreholes. The groundwater and cave-in depths are plotted on the Borehole Logs and summarized in Table 2.

Table 2 - Groundwater and Cave-in Levels Upon Completion

Borehole No.	Ground Elevation (m)	Borehole Depth (m)	Groundwater/Cave-In* Level	
			Depth (m)	Elevation (m)
1	306.9	8.1	2.1/6.1*	304.8/300.8*
2	308.3	6.6	3.4/4.6*	304.9/303.7*
3	308.7	6.6	3.1/4.6*	305.6/304.1*

Groundwater was recorded in the monitoring wells on July 8, 2022. The well records are summarized in Table 3.

Table 3 - Groundwater Records in Monitoring Wells

Monitoring Well No.	Ground Elevation (m)	Well Depth (m)	July 8, 2022	
			Depth (m)	Elevation (m)
1	306.9	6.0	1.5	305.4
2	308.3	6.0	2.4	305.9
3	308.7	6.0	2.6	306.1

Free groundwater level was recorded in the monitoring wells at a depth of 1.5 m to 2.4 m (or El. 305.4 m to 306.1 m). The recorded water level may represent the groundwater regime in the vicinity and it could have been derived from the creek. It is subject to seasonal fluctuations.

6.0 DISCUSSION AND RECOMMENDATIONS

The investigation has disclosed that beneath the topsoil and a layer of earth fill, the site is underlain by sand and silty sand till deposits.

Free groundwater level was recorded in the monitoring wells at a depth of 1.5 m to 2.4 m (or El. 305.4 m to 306.1 m). The recorded water level may represent the groundwater regime in the vicinity and it could have been derived from the creek. It is subject to seasonal fluctuations.

Based on the Conceptual Site Plan, the site will be regraded for the townhouse development, with municipal services and paved roadways meeting urban standards. The geotechnical findings which warrant special consideration are presented below:

1. The topsoil must be removed before site grading and development. It can be stockpiled on site and reused in landscaped areas of the new subdivision. Any surplus should be removed off site.
2. The history and quality of fill are not known. The existing fill is not suitable for supporting any structure sensitive to movement. In using the fill for engineered fill or structural backfill, it should be subexcavated, inspected for its geotechnical and chemical properties, sorted free of topsoil or deleterious material, aerated and properly compacted in layers.
3. Where additional fill is required for site grading, it is economical to place an engineered fill to the development.

4. The houses can be constructed on conventional spread and strip footings founded on engineered fill or native subsoil.
5. It is recommended that the slab-on-grade or basement floor of new structures must be at least 1.0 m above the highest groundwater level; otherwise, underfloor subdrains will be required. Where the lowest floor level is less than 0.5 m above the highest groundwater level, or submerged into the groundwater, the underground structure must be waterproofed and designed with a raft foundation to resist the hydrostatic uplift pressure.

The recommendations appropriate for the project described in Section 2.0 are presented herein. One must be aware that the subsurface conditions may vary between boreholes. Should this become apparent during construction, a geotechnical engineer must be consulted to determine whether the following recommendations require revision.

6.1 Site Preparation

Prior to site grading, the topsoil must be removed. The topsoil can be stockpiled on site to be reused in landscaped areas. Any surplus should be removed off site.

If the existing earth fill is to be reused as engineered/structural fill, the type and quality of material must be reviewed in order to confirm suitability. The engineering requirements for a certifiable fill for house foundations, municipal services, and pavement construction are presented below:

1. After the existing topsoil is removed, the subgrade must be inspected and proof-rolled prior to any fill placement. The existing fill should be subexcavated, sorted free of topsoil inclusions and deleterious materials, if any, aerated and properly compacted in layers.
2. Inorganic soils must be used, and they must be uniformly compacted in 20 cm thick lifts to 98% or + of the maximum Standard Proctor dry density (SPDD) up to the proposed finished grade. The soil moisture must be properly controlled near the optimum. If the foundations are to be built soon after the fill placement, the densification process for the engineered fill must be increased to 100% of the maximum SPDD.
3. Rock and boulders over 15 cm in size must be sorted and not be included for structural backfill and/or construction of engineered fill.
4. If the engineered fill is compacted with the moisture content on the wet side of the optimum, the underground services and pavement construction should not begin until

the pore pressure within the fill mantle has completely dissipated. This must be further assessed at the time of the engineered fill construction.

5. If imported fill is to be used, it should be inorganic soils, free of deleterious or any material with environmental issue (contamination). Any potential imported earth fill from off site must be reviewed for geotechnical and environmental quality by the appropriate personnel as authorized by the developer or agency, before it is hauled to the site.
6. The engineered fill must extend over the entire graded area; the engineered fill envelope and finished elevations must be clearly and accurately defined in the field, and they must be precisely documented by qualified surveyors.
7. If the engineered fill is to be left over the winter months, adequate earth cover, or equivalent, must be provided for protection against frost action. Placement of engineered fill and backfill material shall be free of any frozen material.
8. Where the ground is wet due to subsurface water seepage, an appropriate subdrain scheme must be implemented prior to the fill placement.
9. Where the fill is to be placed on sloping ground, the area must be benched or flattened to 1 vertical (V):3 horizontal (H) so that it is suitable for safe operation of the compactor and the required compaction can be obtained.
10. The fill operation must be inspected on a full-time basis by a technician under the direction of a geotechnical engineer.
11. The footing and underground services subgrade must be inspected by the geotechnical consulting firm that inspected the engineered fill placement. This is to ensure that the foundations are placed within the engineered fill envelope, and the integrity of the fill has not been compromised by interim construction, environmental degradation and/or disturbance by the footing excavation.
12. Any excavation carried out in certified engineered fill must be reported to the geotechnical consultant who supervised the fill placement in order to document the locations of the excavation and/or to supervise reinstatement of the excavated areas to engineered fill status. If construction on the engineered fill does not commence within a period of 2 years from the date of certification, the condition of the engineered fill must be assessed for re-certification.
13. Despite stringent control in the placement of engineered fill, variations in soil type and density may occur in engineered fill. Therefore, strip footings and the upper section of foundation walls constructed on engineered fill will require continuous reinforcement. The required number and size of reinforcing bars must be assessed by considering the uniformity as well as the thickness of the engineered fill beneath the foundations.
14. In sewer construction, the engineered fill is considered to have the same structural proficiency as a natural inorganic soil.

6.2 House Foundations

The houses can be constructed on conventional footings founded on engineered fill or native subsoil. If there is a basement structure, the structure must be designed at least 1.0 above the highest groundwater table. The design bearing pressures for conventional footings and raft foundation founded on the engineered fill or native subsoil are presented below:

- Maximum Soil Bearing Pressure, at Serviceability Limit State (SLS) = 150 kPa
- Factored Ultimate Bearing Pressure, at Ultimate Limit State (ULS) = 240 kPa

The total and differential settlements of footings designed using the bearing pressure at SLS is estimated to be 25 mm and 20 mm, respectively.

Foundations exposed to weathering or in unheated areas should have at least 1.4 m of earth cover for protection against frost action.

The foundation subgrade should be inspected by the geotechnical engineer or a senior geotechnical technician to ensure that the revealed conditions are compatible with the foundation design requirements.

The foundation must be poured immediately after subgrade inspection. For raft foundation construction, the area will have to be left open for forming and rebar installation. The subgrade, thus, must be protected by a mud-slab of lean concrete immediately after exposure and inspection. This will prevent construction disturbance and costly rectification of the bearing subsoil.

The building foundations should meet the requirements specified in the latest Ontario Building Code and the structures should be designed to resist an earthquake force using Site Classification ‘D’ (stiff soil).

6.3 Basement and Slab-On-Grade Construction

Continuous groundwater is apparent at a depth of 1.5 m to 2.6 m (or El. 305.4 m to 306.1 m). The recorded water level may represent the groundwater regime in the vicinity. It is recommended that the basement floor or slab-on-grade of the structures should be founded at least 1.0 m above the highest groundwater level.

In conventional design, the basement structure, founded at least 1.0 m above the highest groundwater level, should be provided with a perimeter drainage system at the wall base as shown on Drawing No. 3. The subdrains should be encased in fabric filter to protect them against blockage by silting and connected to positive outlets. In case where the basement floor is less than 1.0 m above the highest groundwater level, an underfloor drainage system is recommended in the basement floor bedding.

The subgrade for conventional basement floor and slab-on-grade should consist of sound native soil or properly compacted inorganic earth fill. The slab should be constructed on granular bedding, 20 cm thick, consisting of 19-mm Crusher-Run Limestone (CRL), or equivalent, compacted to 98% SPDD. In case underfloor drainage is necessary, the thickness of granular bedding should be increased to 30 cm.

If the basement structure is founded less than 0.5 m above the highest groundwater level or submerged into the groundwater, the underground structure must be waterproofed and designed with a raft foundation to resist the hydrostatic uplift pressure. The basement slab will be poured on a granular fill above the raft where the underground utilities and pipes will be laid.

The soil parameters in Section 6.8 can be used for evaluation of the lateral pressure and uplift pressure.

The external grading should be such that runoff is directed away from the foundation and structures.

6.4 Underground Services

The subgrade for underground service pipes should consist of sound native soils or properly compacted inorganic earth fill. A Class 'B' bedding, consisting of compacted 19-mm CRL, or equivalent, is recommended for construction of underground services. Where saturated sand is evident in the subgrade soils or where dewatering is required, a Class 'A' concrete bedding should be considered.

The pipe joints connecting into the manholes and catch basins must be leak-proof to prevent the migration of fines through the joints. Openings to subdrains and catch basins should be shielded with a fabric filter to prevent blockage by silting.

In order to prevent pipe floatation when the sewer trench is deluged with water, a soil cover of not less than two times the diameter of the pipe should be in place at all times after completion of the pipe installation.

All metal fittings for the underground services should be protected against soil corrosion. For estimation of anode weight requirements, the estimated electrical resistivity of the disclosed soil can be used. This, however, should be confirmed by testing the soil along the service pipe alignment at the time of site service construction. The proposed anode weight requirement must meet the minimum requirement as specified by the Town Standard.

6.5 Backfilling in Trenches and Excavated Areas

The backfill in service trenches should be compacted to at least 95% SPDD. In the zone within 1.0 m below the pavement, the material should be compacted to 98% SPDD, with the water content controlled at 2% or 3% drier than the optimum. The lift of each backfill layer should be limited to a thickness of 20 cm, or the thickness should be determined by test strips at the time of compaction.

In normal construction practice, the problem areas of settlement largely occur adjacent to manholes, catch basins, service crossings, foundation walls and columns. In areas which are inaccessible to a heavy compactor, granular backfill should be used for compaction with a smaller vibratory compactor.

One must be aware of the possible consequences during trench backfilling and exercise caution as described below:

- When construction is carried out in freezing winter weather, allowance should be made for these following conditions. Despite stringent backfill monitoring, frozen soil layers may inadvertently be mixed with the structural trench backfill. Should the in-situ soils have a water content on the dry side of the optimum, it would be impossible to wet the soils due to the freezing condition, rendering difficulties in obtaining uniform and proper compaction. Furthermore, the freezing condition will prevent flooding of the backfill when it is required, such as in a narrow vertical trench section, or when the trench box is removed. The above will invariably cause backfill settlement that may become evident within one to several years, depending on the depth of the trench which has been backfilled.
- In areas where the underground services construction is carried out during the winter months, prolonged exposure of the trench walls will result in frost heave within the soil

mantle of the walls. This may result in some settlement as the frost recedes, and repair costs will be incurred prior to final surfacing of the new pavement and the slab-on-grade.

- To backfill a deep trench, one must be aware that future settlement is to be expected, unless the side of the cut is flattened to at least 1V:1.5+H, and the lifts of the fill and its moisture content are stringently controlled; i.e., lifts should be no more than 20 cm (or less if the backfilling conditions dictate) and uniformly compacted to achieve at least 95% SPDD, with the moisture content on the wet side of the optimum.
- It is often difficult to achieve uniform compaction of the backfill in the lower vertical section of a trench which is an open cut or is stabilized by a trench box, particularly in the sector close to the trench walls or the sides of the box. These sectors must be backfilled with granular fill or sand. In a trench stabilized by a trench box, the void left after the removal of the box will be filled by the backfill. It is necessary to backfill this sector with granular fill or sand, and the compacted backfill must be flooded for a few days, prior to the placement of the backfill above this sector, i.e., in the upper sloped trench section. This measure is necessary in order to prevent consolidation of inadvertent voids and loose backfill which will compromise the compaction of the backfill in the upper section.
- In areas where groundwater movement is expected in the sand fill mantle, anti-seepage collars should be provided.

6.6 **Driveways, Sidewalks, Interlocking Stone Pavement**

The driveway at the entrances to the garages should be backfilled with non-frost susceptible granular material, with a recommended frost taper at a slope of 1V:1H.

Concrete sidewalks should be designed to tolerate seasonal movement. Any structure in areas which are sensitive to frost-induced ground movement must be constructed on a free-draining, non-frost-susceptible granular material such as Granular ‘B’. The material should extend to 0.3 to 1.4 m below the slab or pavement surface, depending on the degree of tolerance to movement, and be provided with positive drainage, such as weeper subdrains connected to manholes or catch basins.

The exterior grade should slope away from the structures to prevent ponding of water adjacent to the structures.

6.7 Pavement Design

The road pavement should meet the Town's standard. The recommended road pavement design for local roads is presented in Table 4.

Table 4 - Pavement Design

Course	Thickness (mm)	OPS Specifications
Asphalt Surface	40	HL 3
Asphalt Binder	60	HL 8
Granular Base	150	OPSS Granular 'A' or equivalent
Granular Sub-base	400	OPSS Granular 'B' or equivalent

In preparation of the road subgrade, all topsoil and compressible material should be removed. After fine grading and before placement of the granular base, the subgrade must be proof-rolled. Any soft spot as identified must be sub-excavated and replaced with selected inorganic material, compacted to the specified density. The subgrade within 1.0 m below the underside of the granular sub-base must be compacted to at least 98% SPDD, with the water content at 2% to 3% drier than its optimum. The granular base and sub-base should be compacted to 100% SPDD.

The road subgrade will suffer a strength regression if water is allowed to saturate the mantle. The following measures should, therefore, be incorporated in the construction procedures and road design:

- The subgrade should be properly crowned and smooth-rolled to allow interim precipitation to be properly drained prior to pavement construction.
- Lot areas adjacent to the roads should be properly graded to prevent ponding of large amounts of water.
- If the roads are to be constructed during wet seasons and extensive soft subgrade occurs, the granular sub-base may require thickening. This can be assessed during construction.
- Fabric filter-encased curb subdrains are required on both sides of roadway to meet the Town's requirements.

6.8 Soil Parameters

The recommended soil parameters for the project design are given in Table 5.

Table 5 - Soil Parameters

Unit Weight and Bulk Factor	**Unit Weight γ (kN/m^3)**		**Estimated Bulk Factor**	
	Bulk	**Submerged**	**Loose**	**Compacted**
Existing Earth Fill	20.5	10.5	1.25	1.00
Sand	21.5	11.5	1.20	1.00
Silty Sand Till	22.5	12.5	1.30	1.03

Lateral Earth Pressure Coefficients	**Active K_a**	**At Rest K_0**	**Passive K_p**
Compacted Earth Fill	0.40	0.55	2.50
Sand	0.30	0.45	3.40
Silty Sand Till	0.30	0.50	3.10

Coefficients of Friction	
Between Concrete and sound native Soil	0.35
Between Concrete and Granular Base	0.50

6.9 Excavation

Excavation should be carried out in accordance with Ontario Regulation 213/91. The types of soils are classified in Table 6.

Table 6 - Classification of Soils for Excavation

Material	Type
Sound Till	2
Earth Fill, drained Sand	3
Saturated Soils	4

Continuous groundwater is expected in the sand deposit. Any excavation into the saturated soils will require vigorous pumping from closely spaced sumps and sump wells.

Excavation into the tills containing boulders may require extra effort and the use of a heavy-duty excavator.

Prospective contractors must be asked to assess the in situ subsurface conditions for soil cuts by digging test pits to 0.5 m below the anticipated depth of excavation. These test pits should be allowed to remain open for a few hours to assess the trenching conditions.

7.0 LIMITATIONS OF REPORT

This report was prepared by Soil Engineers Ltd. for the account of LSR Salem, and for review by its designated consultants and government agencies. Use of this report is subject to the conditions and limitations of the contractual agreement.

The material in the report reflects the judgement of Cedric Ramos, B.A.Sc. and Kin Fung Li, P.Eng., in light of the information available to it at the time of preparation. Any use which a Third Party makes of this report, or any reliance on decisions to be made based on it, is the responsibility of such Third Parties. Soil Engineers Ltd. accepts no responsibility for damages, if any, suffered by any Third Party as a result of decisions made or actions based on this report.

SOIL ENGINEERS LTD.

Cedric Ramos, B.A.Sc.

Kin Fung Li, P.Eng.

CR/KFL

LIST OF ABBREVIATIONS AND DESCRIPTION OF TERMS

The abbreviations and terms commonly employed on the borehole logs and figures, and in the text of the report, are as follows:

SAMPLE TYPES

AS Auger sample
CS Chunk sample
DO Drive open (split spoon)
DS Denison type sample
FS Foil sample
RC Rock core (with size and percentage recovery)
ST Slotted tube
TO Thin-walled, open
TP Thin-walled, piston
WS Wash sample

PENETRATION RESISTANCE

Dynamic Cone Penetration Resistance:

A continuous profile showing the number of blows for each foot of penetration of a 2-inch diameter, 90° point cone driven by a 140-pound hammer falling 30 inches.

Plotted as '—●—'

Standard Penetration Resistance or 'N' Value:

The number of blows of a 140-pound hammer falling 30 inches required to advance a 2-inch O.D. drive open sampler one foot into undisturbed soil.

Plotted as '○'

WH Sampler advanced by static weight
PH Sampler advanced by hydraulic pressure
PM Sampler advanced by manual pressure
NP No penetration

SOIL DESCRIPTION

Cohesionless Soils:

'N' (blows/ft)	Relative Density
0 to 4	very loose
4 to 10	loose
10 to 30	compact
30 to 50	dense
over 50	very dense

Cohesive Soils:

Undrained Shear Strength (ksf)	'N' (blows/ft)	Consistency
less than 0.25	0 to 2	very soft
0.25 to 0.50	2 to 4	soft
0.50 to 1.0	4 to 8	firm
1.0 to 2.0	8 to 16	stiff
2.0 to 4.0	16 to 32	very stiff
over 4.0	over 32	hard

Method of Determination of Undrained Shear Strength of Cohesive Soils:

x 0.0 Field vane test in borehole; the number denotes the sensitivity to remoulding

△ Laboratory vane test

☐ Compression test in laboratory

For a saturated cohesive soil, the undrained shear strength is taken as one half of the undrained compressive strength

METRIC CONVERSION FACTORS

1 ft = 0.3048 metres
1lb = 0.454 kg
1 inch = 25.4 mm
1ksf = 47.88 kPa

JOB NO.: 2203-S111

LOG OF BOREHOLE: 1

FIGURE NO.: 1

PROJECT DESCRIPTION: Proposed Residential Subdivision

METHOD OF BORING: Flight Auger (Hollow Stem)

PROJECT LOCATION: 500 Salem Road, Town of Innisfil

DRILLING DATE: April 7, 2022

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
306.9	Ground Surface							
0.0	**20 cm of Topsoil**				0			
	EARTH FILL Dark brown silty clay occ. organics, rootlets and rock fragments	1	DO	12			17	
		2	DO	21	1		13	
		3	DO	8			21	
304.7					2			
2.2	Grey, compact to dense, wet **SAND** traces of silt and gravel	4	DO	30			22	
		5	DO	32	3		21	
		6	DO	14	4		21	
301.3					5			
5.6	Grey, compact to dense **SILTY SAND TILL** traces of clay and gravel occ. sand seams and layers occ. cobbles and boulders	7	DO	11	6		10	
		8	DO	48	7		10	
298.8					8			
8.1	**END OF BOREHOLE** Installed 50 mm Ø monitoring well to 6.0 m completed with 3.1 m screen Sand backfill from 2.3 to 6.0 m Bentonite seal from 0.0 m to 2.3 m Provided with a momument steel casing				9			W.L. @ El. 304.8 m upon completion Cave-in @ El. 300.8 m upon completion
					10			

JOB NO.: 2203-S111

LOG OF BOREHOLE: 2

FIGURE NO.: 2

PROJECT DESCRIPTION: Proposed Residential Subdivision

METHOD OF BORING: Flight Auger (Hollow Stem)

PROJECT LOCATION: 500 Salem Road, Town of Innisfil

DRILLING DATE: April 7, 2022

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
308.3	Ground Surface							
0.0	**15 cm of Topsoil**				0			
	EARTH FILL Dark brown silty clay occ. organics, rootlets and rock fragments	1	DO	21			7	
307.6 0.7	Compact to dense **SAND** traces of silt and gravel — — gravelly wet below 2.3 m	2	DO	43	1		7	
		3	DO	27	2		10	
		4	DO	33			17	
	— — disturbed	5	DO	7	3		18	
		6	DO	31	4 5		19	
	— — brown grey	7	DO	48	6		12	
301.7 6.6	**END OF BOREHOLE** Installed 50 mm Ø monitoring well to 6.0 m completed with 3.1 m screen Sand backfill from 2.3 to 6.0 m Bentonite seal from 0.0 m to 2.3 m Provided with a momument steel casing				7 8 9 10			W.L. @ El. 304.9 m upon completion Cave-in @ El. 303.7 m upon completion

Soil Engineers Ltd.

JOB NO.: 2203-S111

LOG OF BOREHOLE: 3

FIGURE NO.: 3

PROJECT DESCRIPTION: Proposed Residential Subdivision

METHOD OF BORING: Flight Auger (Hollow Stem)

PROJECT LOCATION: 500 Salem Road, Town of Innisfil

DRILLING DATE: April 7, 2022

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
308.7	Ground Surface				
0.0	**25 cm of Topsoil**				0
	EARTH FILL Dark brown silty clay occ. organics, rootlets and rock fragments	1	DO	35	
308.0 0.7	Brown, compact to very dense **SAND** gravelly traces of silt and gravel wet below 2.3 m	2	DO	65	1
		3	DO	21	2
		4	DO	25	
		5	DO	24	3
					4
		6	DO	65	5
303.1 5.6	Grey, very dense **SILTY SAND TILL** traces of clay and gravel occ. sand seams and layers occ. cobbles and boulders	7	DO	80	6
302.1 6.6	**END OF BOREHOLE** Installed 50 mm Ø monitoring well to 6.0 m completed with 3.1 m screen Sand backfill from 2.3 to 6.0 m Bentonite seal from 0.0 m to 2.3 m Provided with a momument steel casing				7 8 9 10

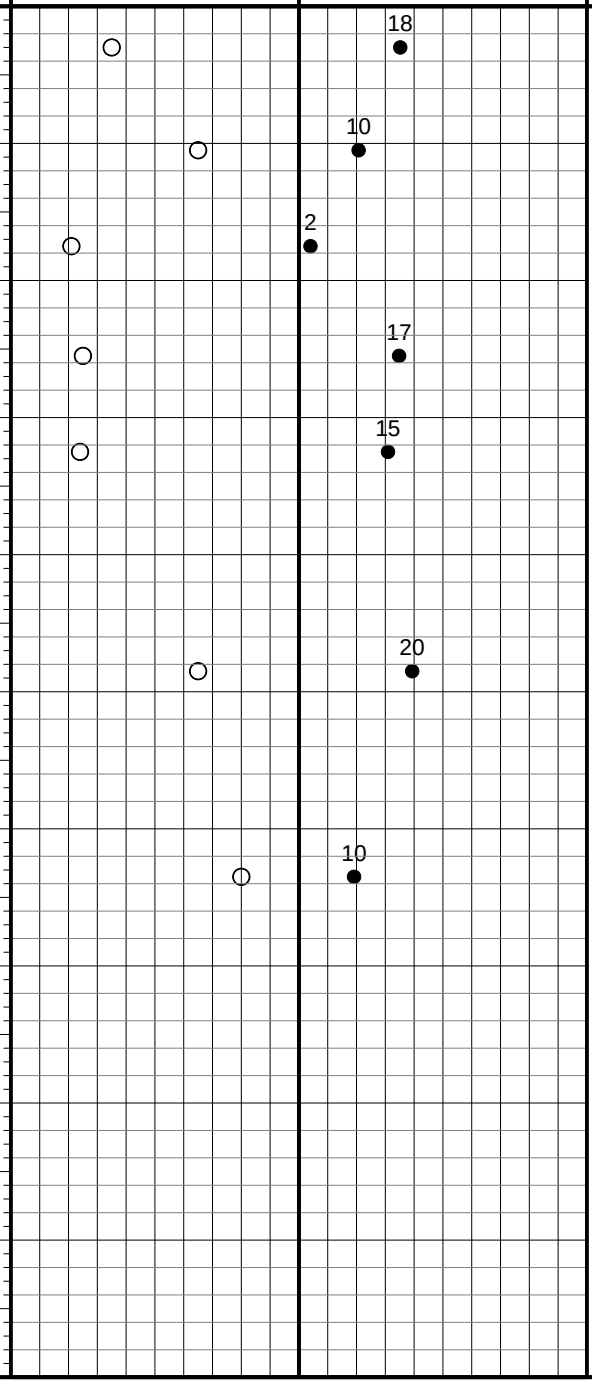
Dynamic Cone (blows/30 cm): 10 30 50 70 90

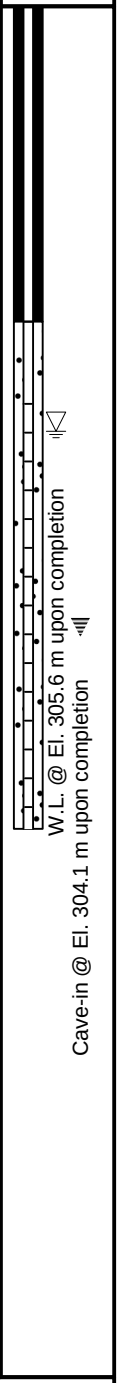
Shear Strength (kN/m²): 50 100 150 200

Penetration Resistance (blows/30 cm): 10 30 50 70 90

Atterberg Limits: PL — LL

Moisture Content (%): 10 20 30 40





Soil Engineers Ltd.

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GRAIN SIZE DISTRIBUTION

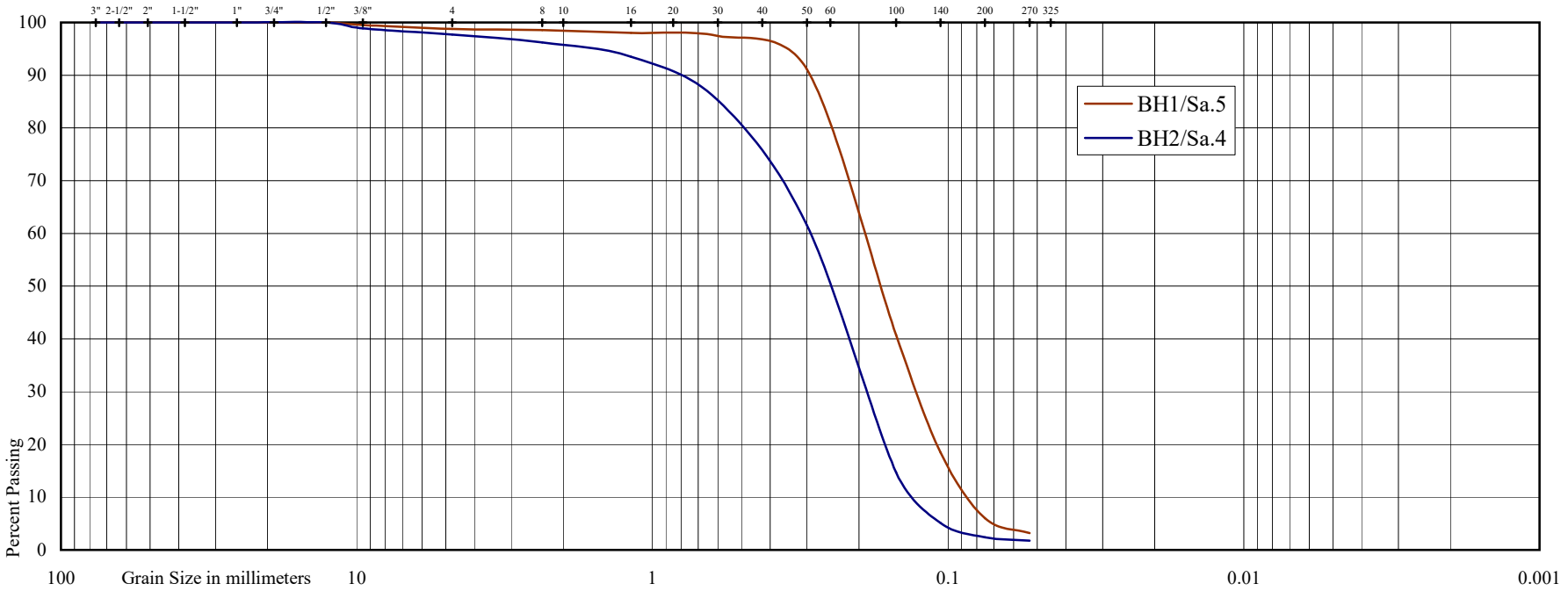
Reference No: 2203-S111

U.S. BUREAU OF SOILS CLASSIFICATION

GRAVEL		SAND				SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	V. FINE		

UNIFIED SOIL CLASSIFICATION

GRAVEL		SAND			SILT & CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



Project: Proposed Residential Development

Location: 500 Salem Road, Town of Innisfil

Borehole No:	1	2
Sample No:	5	4
Depth (m):	3	2.3
Elevation (m):	303.9	306.0

BH/Sa.:	1/5	2/4
Liquid Limit (%) =	-	-
Plastic Limit (%) =	-	-
Plasticity Index (%) =	-	-
Moisture Content (%) =	21	17
Estimated Permeability (cm./sec.) =	10^{-3}	10^{-2}

Classification of Sample [& Group Symbol]: SAND

Fine to medium grained, traces of silt and gravel

Figure: 4

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

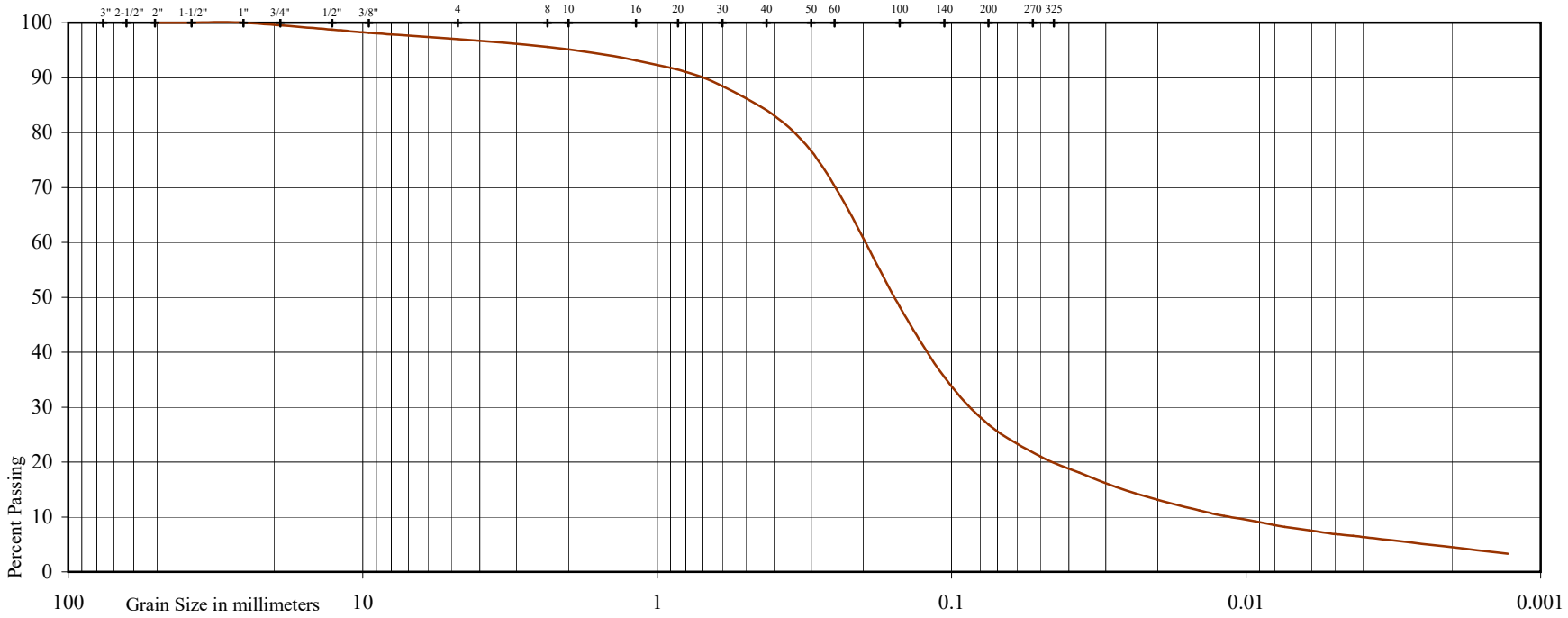
Reference No: 2203-S111

U.S. BUREAU OF SOILS CLASSIFICATION

GRAVEL		SAND				SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	V. FINE		

UNIFIED SOIL CLASSIFICATION

GRAVEL		SAND			SILT & CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



Project: Proposed Residential Development

Location: 500 Salem Road, Town of Innisfil

Borehole No: 3

Sample No: 7

Depth (m): 6.1

Elevation (m): 302.6

Liquid Limit (%) = -

Plastic Limit (%) = -

Plasticity Index (%) = -

Moisture Content (%) = 10

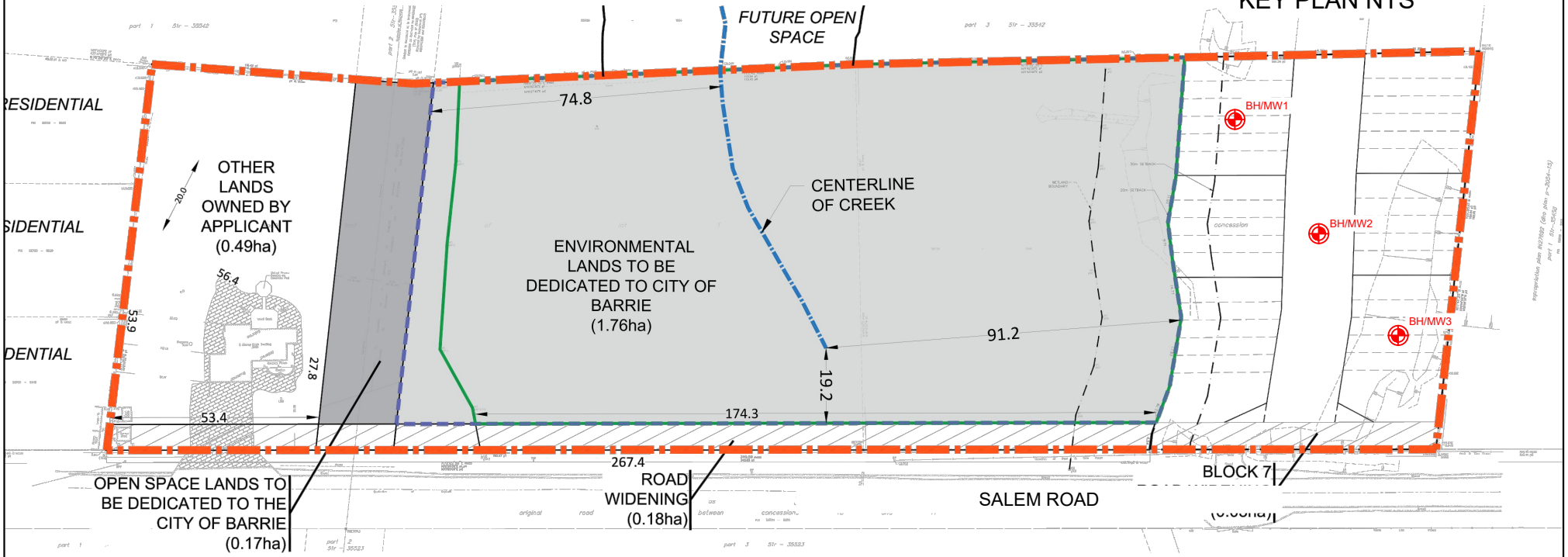
Estimated Permeability (cm./sec.) = 10^{-4}

Classification of Sample [& Group Symbol]: SILTY SAND TILL

traces of clay and gravel

Figure: 5

KEY PLAN NTS



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Borehole/Monitoring Well Location Plan

SITE: 500 Salem Road, Town of Innisfil			
DESIGNED BY: CR	**CHECKED BY:** KFL	**DWG NO.:** 1	
SCALE: 1:1500	**REF. NO.:** 2203-S111	**DATE:** August 2022	**REV** -

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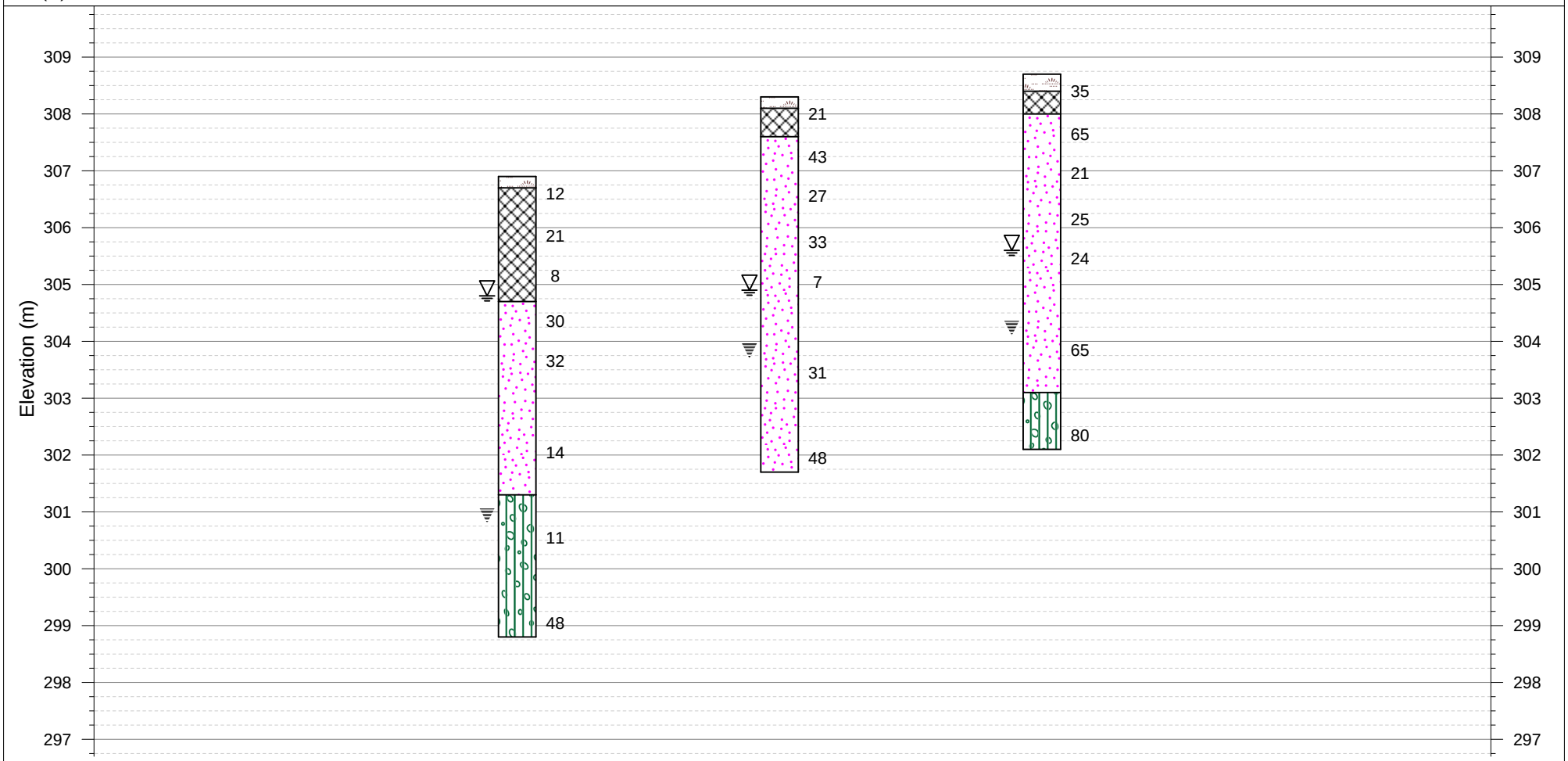
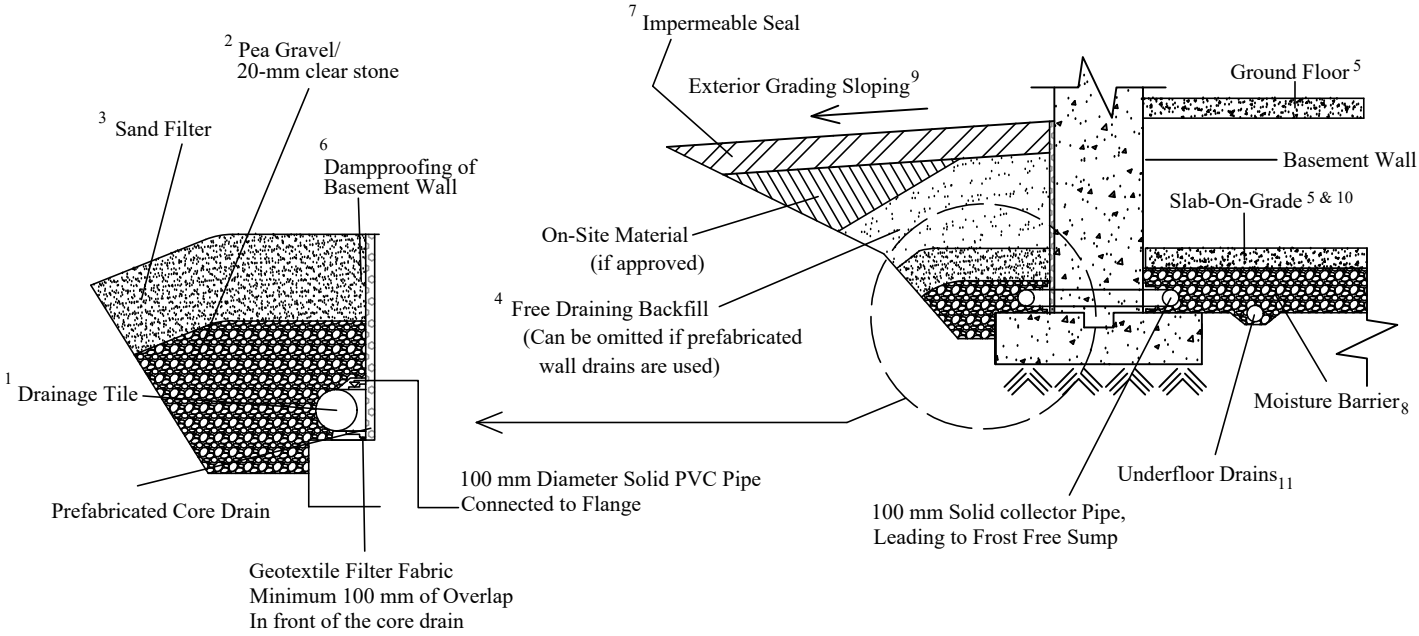
SUBSURFACE PROFILE
DRAWING NO. 2
SCALE: AS SHOWN

JOB NO.: 2203-S111
REPORT DATE: July 2022
PROJECT DESCRIPTION: Proposed Residential Subdivision
PROJECT LOCATION: 500 Salem Road, Town of Innisfil

LEGEND
FILL | SAND | SILTY SAND TILL | TOPSOIL
CAVE-IN | WATER LEVEL (END OF DRILLING)





NOTES:

1. **Drainage tile**: consists of 100 mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet.
   Invert to be at minimum of 150 mm (6") below underside of basement floor slab.

2. **Pea gravel**: at 150 mm (6") on the top and sides of drain. If drain is not placed on concrete footing, provide 100 mm (4") of pea gravel below drain.
   The pea gravel may be replaced by 20 mm clear stone provided that the drain is covered by a porous geotextile membrane of Terrafix 270R or equivalent.

3. **Filter material**: consists of C.S.A. fine concrete aggregate. A minimum of 300 mm (12") on the top and sides of gravel.
   This may be replaced by an approved porous geotextile membrane of Terrafix 270R or equivalent.

4. **Free-draining backfill**: OPSS Granular 'B' or equivalent, compacted to 95% to 98% (maximum) Standard Proctor dry density.
   Do not compact closer than 1.8 m (6') from wall with heavy equipment.
   This may be replaced by on-site material if prefabricated wall drains (Miradrain) extending from the finished grade to the bottom of the basement wall are used.

5. **Do not backfill** until the wall is supported by the basement floor slab and ground floor framing, or adquate bracing.

6. **Dampproofing** of the basement wall is required before backfilling

7. **Impermeable backfill seal** of compacted clay, clayey silt or equivalent. If the original soil in the vicinity is a free-draining sand, the seal may be omitted.

8. **Moisture barrier**: 20-mm clear stone or compacted OPSS Granular 'A', or equivalent. The thickness of this layer should be 150 mm (6") minimum.

9. **Exterior Grade**: slope away from basement wall on all the sides of the building.

10. **Slab-On-Grade** should not be structurally connected to walls or foundations.

11. **Underfloor drains*** should be placed in parallel rows at 6 to 8 m (20'-25') centre, on 100 mm (4") of pea gravel with 150 mm (6") of pea gravel on top and sides. The invert should be at least 300 mm (12") below the underside of the floor slab.
    The drains should be connected to positive sumps or outlets. Do not connect the underfloor drains to the perimeter drains.

* Underfloor drains can be deleted where not required.

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Details of Perimeter Drainage System

SITE 500 Salem Road, Town of Innisfil			
DESIGNED BY K.L.	**CHECKED BY** B.S.	**DWG NO.** 3	
SCALE N.T.S.	**REF. NO.** 2203-S111	**DATE** July 2022	**REV** -

Ian D. Wilson Associates Ltd.
since 1974

Tel: 519.233.3500
Fax: 519.233.3501

P. O. Box 299
Clinton, Ontario
N0M 1L0

Wilson Associates

Consulting Hydrogeologists

September 14, 2022

Mr. Adam Steeves
12343 County Rd 27
Springwater Township, ON
L0L 1Y3

Dear Mr. Steeves:

Re: Hydrogeological Study and Water Balance Analysis
Proposed Residential Townhome Subdivision
500 Salem Road, Town of Innisfil

It is proposed to develop the easterly 0.685ha portion (the subject lands) of the property at 500 Salem Road, in the Town of Innisfil, as a residential townhome subdivision.

As requested by WMI & Associates Limited (WMI), this report has been prepared to address the requirements of the June 2013 "Hydrogeological Assessment Submissions: Conservation Authority Guidelines for Development Applications" (the CA Guideline).

Provided for this study were the following documentation:

- A Geotechnical Investigation for Proposed Residential Subdivision, 500 Salem Road, Town of Innisfil. Soil Engineers Ltd. (SEL), July 2022.
- Draft Plan of Subdivision, Innovative Planning Solutions, November 25, 2021.
- Drainage Plan (undated), WMI.

Copies of selected portions of the above documentation are attached for reference.

LOCATION AND HYDROGEOLOGICAL SETTING

The subject lands at 500 Salem Road occupy the eastern 0.685ha portion of the existing 3.33ha parcel of land situated to the northeast of the intersection of Salem Road and County Road 27. The subject lands are currently mostly cleared, and exhibit an overall slope to the northwest, with an overall relief of approximately 6 metres. Based on site observation and historical aerial imagery, the site appears to be largely disturbed by previous site grading/extraction.

The subject lands abut a wetland, which contains a tributary of Bear Creek, to the immediate west.

Lands surrounding the site are mainly undeveloped open space and forest, with an industrial facility to the southeast.

The subject lands are located near the boundary between the Simcoe Lowlands and the western periphery of the Peterborough Drumlin physiographic regions of southern Ontario. According to Ontario Geological Survey Map 2645 "Quaternary Geology of the Eastern Half of the Barrie and Elmvale Areas", the upper soils in the vicinity of the site consist of glaciofluvial ice-contact stratified sediments of sand to gravelly sand, with silty sand to sand glacial till mapped nearby to the west. The SEL logs for three exploratory boreholes completed on the property are consistent with the Quaternary geology mapping, reporting mainly a sand upper overburden, with silty sand till reported at depth.

According to Ontario Geological Survey Map P.3212 "Bedrock Topography of the Barrie Area", the overburden is approximately 200m deep. Local and regional well records indicate a typically granular, but stratified upper overburden (i.e. the upper 60m), underlain by a mainly fine-grained, stratified lower overburden. Copies of representative local well records are attached for reference.

The bedrock beneath the site consists of limestone and dolostone of the Simcoe Group.

Records for local water wells indicate that potable groundwater is obtained either from granular deposits in the upper overburden (i.e. the upper 15m), or the intermediate overburden (i.e. 45m to 55m). The lower overburden and bedrock beneath the site are not locally typically used as a source of potable groundwater due to the likelihood of obtaining lower yields of aesthetically-poorer quality groundwater.

According to the Simcoe County website interactive mapping, the site is located within Well Head Protection Area WHPA-Q2, within a significant groundwater recharge area, and within a highly vulnerable aquifer area.

WATERTABLE

As part of the geotechnical investigation, SEL installed monitoring wells in the three boreholes completed within the subject lands for subsequent watertable observations. The water levels were observed on July 8, 2022 to range between 1.5m and 2.6m below grade. Based on the setting of the site, adjacent to a wetland, shallow watertable conditions are anticipated in spring months.

WATER BUDGET ANALYSIS

The following assumptions are made for this assessment:

- Based on the WMI drainage plan and small site area, the site is assumed to act as one catchment.

- According to calculations provided by WMI, the 0.685ha site will exhibit the following pervious and impervious areas:

  Pre-Development: 100% pervious (6,850m^2)

  Post-Development: 39% pervious (2,655m^2)
  33% impervious non-rooftop (2,265m^2)
  28% impervious rooftop (1,930m^2)

- The water surplus for the site is assumed to be 288mm/year, as identified for the Middle Nottawasaga River subwatershed by the Nottawasaga Valley SPA Approved Assessment Report (846mm precipitation, 558mm actual evapotranspiration).

The following tables provide a water budget analysis following the general guidance of the April 2013 Conservation Authority Guidelines for Hydrogeological Assessments.

Table 1 - Water Budget - Pre-Development Conditions

Catchment Designation	Site	
	Undeveloped Pervious	Total
Area (m^2)	6850	6850
Pervious Area (m^2)	6850	6850
Impervious Area (m^2)	0	0
Impervious Factors (Per MECP Guidelines and this Report)		
Topography Infiltration Factor	Rolling 0.2	
Soil Infiltration Factor	Sand 0.4	
Land Cover Infiltration Factor	Cleared 0.1	
MECP Infiltration Factor	0.7	
Actual Infiltration Factor	0.7	
Run-Off Coefficient	0.3	
Runoff from Impervious Surfaces	0	
Inputs (per Unit Area)		
Precipitation (mm/year)	846	846
Run-On (mm/year)	0	0
Other Inputs (mm/year)	0	0
Total Inputs (mm/year)	846	846
Outputs (per Unit Area)		
Precipitation Surplus (mm/year)	288	288
Net Surplus (mm/year)	288	288
Evapotranspiration (mm/year)	558	558
Pervious Area Infiltration (mm/year)	202	202
Impervious Area Infiltration (mm/year)	0	0
Total Infiltration (mm/year)	202	202
Runoff Pervious Areas (mm/year)	86	86
Runoff Impervious Areas (mm/year)	0	0
Total Runoff (mm/year)	86	86
Total Outputs (mm/year)	846	846
Difference (Inputs - Outputs) (mm/year)	0	0

Inputs (Volume)		
Precipitation (m^3/year)	5795	5795
Run-On (m^3/year)	0	0
Other Inputs (m^3/year)	0	0
Total Inputs (m^3/year)	5795	5795
Outputs (Volume)		
Precipitation Surplus (m^3/year)	1973	1973
Net Surplus (m^3/year)	1973	1973
Evapotranspiration (m^3/year)	3822	3822
Pervious Area Infiltration (m^3/year)	1384	1384
Impervious Area Infiltration (m^3/year)	0	0
Total Infiltration (m^3/year)	1384	1384
Runoff Pervious Areas (m^3/year)	589	589
Runoff Impervious Areas (m^3/year)	0	0
Total Runoff (m^3/year)	589	589
Total Outputs (m^3/year)	5795	5795
Difference (inputs - outputs) (m^3/year)	0	0

Table 2 - Water Budget - Post-Development Conditions

Catchment Designation	Site			
	Pervious	Impervious non-roof	Impervious roof	Total
Area (m^2)	2655	2265	1930	6850
Pervious Area (m^2)	2650	0	0	2650
Impervious Area (m^2)	0	2265	1930	4195
Impervious Factors (Per MECP Guidelines and this Report)				
Topography Infiltration Factor	Rolling 0.2	Rolling 0.2	Rolling 0.2	
Soil Infiltration Factor	Sand 0.4	Sand 0.4	Sand 0.4	
Land Cover Infiltration Factor	Cleared 0.1	Cleared 0.1	Cleared 0.1	
MECP Infiltration Factor	0.7	0	0	
Actual Infiltration Factor	0.7	0	0	
Run-Off Coefficient	0.3	1	1	
Runoff from Impervious Surfaces**	0	0.8**	0.8**	
Inputs (per Unit Area)				
Precipitation (mm/year)	846	846	846	846
Run-On (mm/year)	0	0	0	0
Other Inputs (mm/year)	0	0	0	0
Total Inputs (mm/year)	846	846	846	846
Outputs (per Unit Area)				
Precipitation Surplus (mm/year)	288	677	677	525
Net Surplus (mm/year)	288	677	677	525
Evapotranspiration (mm/year)	558	169	169	321
Pervious Area Infiltration (mm/year)	202	0	0	79
Impervious Area Infiltration (mm/year)	0	0	0	0
Total Infiltration (mm/year)	202	0	0	79
Runoff Pervious Areas (mm/year)	86	0	0	34
Runoff Impervious Areas (mm/year)	0	677	677	413
Total Runoff (mm/year)	86	677	677	447
Total Outputs (mm/year)	846	846	846	847
Difference (Inputs - Outputs) (mm/year)	0	0	0	1***

Inputs (Volume)				
Precipitation (m^3/year)	2246	1916	1633	5795
Run-On (m^3/year)	0	0	0	0
Other Inputs (m^3/year)	0	0	0	0
Total Inputs (m^3/year)	2246	1916	1633	5795
Outputs (Volume)				
Precipitation Surplus (m^3/year)	765	1533	1307	3605
Net Surplus (m^3/year)	765	1533	1307	3605
Evapotranspiration (m^3/year)	1482	383	326	2191
Pervious Area Infiltration (m^3/year)	536	0	0	536
Impervious Area Infiltration (m^3/year)	0	0	0	0
Total Infiltration (m^3/year)	536	0	0	536
Runoff Pervious Areas (m^3/year)	228	0	0	228
Runoff Impervious Areas (m^3/year)	0	1533	1307	2840
Total Runoff (m^3/year)	228	1533	1307	3068
Total Outputs (m^3/year)	2246	1916	1633	5795
Difference (Inputs - Outputs) (m^3/year)	0	0	0	0

Note: ** Per guidelines, evaporation from impervious areas assumed to be 20% of precipitation.

*** Minor differences attributable to rounding.

Table 3 - Water Budget - Post-Development Conditions with Mitigation

Based on the above assessment, approximately 848m^3/year (65%) of the runoff from the impervious rooftop areas of the site will need to be infiltrated in order to maintain the overall rate of infiltration relative to pre-development conditions.

Catchment Designation	Site			
	Pervious	Impervious non-roof	Impervious roof	Total
Area (m^2)	2655	2265	1930	6850
Pervious Area (m^2)	2650	0	0	2650
Impervious Area (m^2)	0	2265	1930	4195
Impervious Factors (Per MECP Guidelines and this Report)				
Topography Infiltration Factor	Rolling 0.2	Rolling 0.2	Rolling 0.2	
Soil Infiltration Factor	Sand 0.4	Sand 0.4	Sand 0.4	
Land Cover Infiltration Factor	Cleared 0.1	Cleared 0.1	Cleared 0.1	
MECP Infiltration Factor	0.7	0	0	
Actual Infiltration Factor	0.7	0	0	
Run-Off Coefficient	0.3	1	1	
Runoff from Impervious Surfaces**	0	0.8**	0.8**	
Inputs (per Unit Area)				
Precipitation (mm/year)	846	846	846	846
Run-On (mm/year)	0	0	0	0
Other Inputs (mm/year)	0	0	0	0
Total Inputs (mm/year)	846	846	846	846
Outputs (per Unit Area)				
Precipitation Surplus (mm/year)	288	677	677	525
Net Surplus (mm/year)	288	677	677	525
Evapotranspiration (mm/year)	558	169	169	321
Pervious Area Infiltration (mm/year)	202	0	0	79
Impervious Area Infiltration (mm/year)	0	0	439	123
Total Infiltration (mm/year)	202	0	0	202
Runoff Pervious Areas (mm/year)	86	0	0	34
Runoff Impervious Areas (mm/year)	0	677	238	290
Total Runoff (mm/year)	86	677	238	324

Total Outputs (mm/year)	846	846	846	847
Difference (Inputs - Outputs) (mm/year)	0	0	0	1***
Inputs (Volume)				
Precipitation (m^3/year)	2246	1916	1633	5795
Run-On (m^3/year)	0	0	0	0
Other Inputs (m^3/year)	0	0	0	0
Total Inputs (m^3/year)	2246	1916	1633	5795
Outputs (Volume)				
Precipitation Surplus (m^3/year)	765	1533	1307	3605
Net Surplus (m^3/year)	765	1533	1307	3605
Evapotranspiration (m^3/year)	1482	383	326	2191
Pervious Area Infiltration (m^3/year)	536	0	0	536
Impervious Area Infiltration (m^3/year)	0	0	848	848
Total Infiltration (m^3/year)	536	0	848	1384
Runoff Pervious Areas (m^3/year)	228	0	0	228
Runoff Impervious Areas (m^3/year)	0	1533	459	1992
Total Runoff (m^3/year)	228	1533	1307	2220
Total Outputs (m^3/year)	2246	1916	1633	5795
Difference (Inputs - Outputs) (m^3/year)	0	0	0	0

Note: ** Per guidelines, evaporation from impervious areas assumed to be 20% of precipitation.

*** Minor differences attributable to rounding.

Table 4 - Water Budget Summary

Parameter	Site				
	Pre-Development	Post-Development	% Change (Pre to Post)	Post Development with Mitigation*	Change (Pre to Post with Mitigation)*
Inputs (Volumes)					
Precipitation (m^3/year)	5795	5795	0	5795	0
Run-On (m^3/year)	0	0	0	0	0
Other Inputs (m^3/year)	0	0	0	0	0
Total Inputs (m^3/year)	5795	5795	0	5795	0
Outputs (Volumes)					
Precipitation Surplus (m^3/year)	1973	3605	83	3605	83
Net Surplus (m^3/year)	1973	3605	83	3605	83
Evapotranspiration (m^3/year)	3822	2191	-43	2191	-43
Pervious Area Infiltration (m^3/year)	1384	536	-61	536	-61
Impervious Area Infiltration (m^3/year)	0	0	0	848	+65*
Total Infiltration (m^3/year)	1384	536	-61	1384	0
Runoff Pervious Areas (m^3/year)	589	228	-61	228	-61
Runoff Impervious Areas (m^3/year)	0	2840	100	1992	100
Total Runoff (m^3/year)	589	3068	420	2220	277
Total Outputs (m^3/year)	5795	5795	0	5795	0

Note: * Mitigation assumes that 65% of the runoff (848m^3/year) from the rooftops will infiltrate into attenuation facilities. This represents about 15% of overall precipitation on the entire site each year (5,795m^3/year).

It is understood from WMI that the subdivision to the north (DiPoche) has accounted for the subject lands in terms of storm drainage and LIDs, as such it is planned to utilize these offsite controls. It is assumed that the LID facilities to the north will be able to accommodate annual infiltration of 848m^3/year, in addition to that site's own infiltration requirements.

SUMMARY

1. The upper overburden in the vicinity of the site is reported to consist of sand overlying silty sand till.

2. Shallow watertable conditions are indicated on the subject lands.

3. The site is located within Well Head Protection Area WHPA-Q2, within a significant groundwater recharge area, and within a highly vulnerable aquifer area.

4. Based on known site conditions (i.e. sand soils, rolling relief, cleared cover), an MECP infiltration factor of 0.7 is indicated for the site.

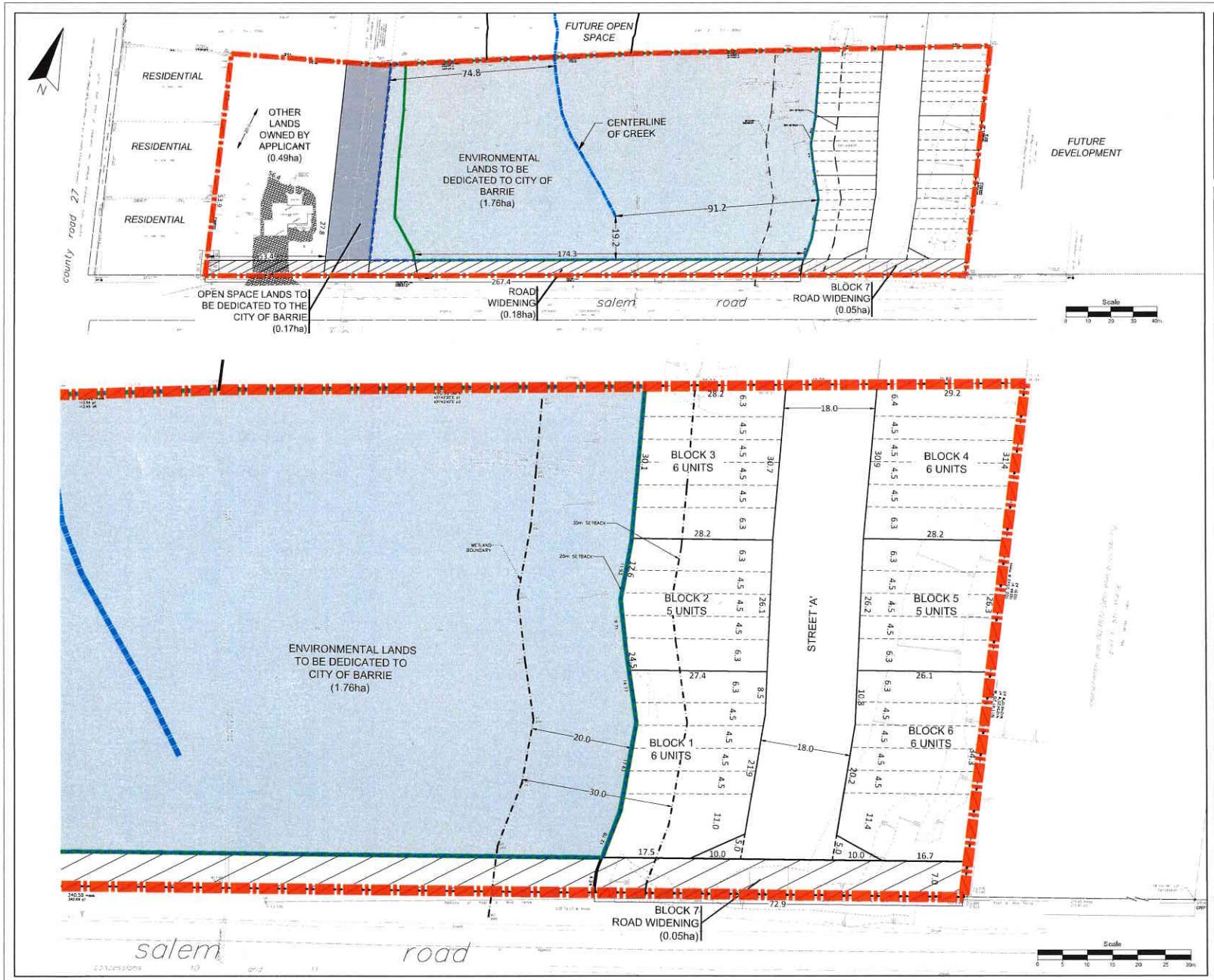
5. Water budget analysis indicates that the development proposal of the site will reduce overall infiltration by about 61% from pre-development conditions.

6. Due to the calculated loss in overall infiltration of the development proposal in comparison to pre-development conditions, infiltration enhancement measures must be adopted to infiltrate approximately 65% of runoff from impervious rooftop surfaces. It is understood that the subdivision to the north (DiPoche) has accounted for the subject lands in terms of storm drainage and LIDs, as such it is planned to utilize these offsite controls. It is assumed that the LID facilities to the north will be able to accommodate annual infiltration of 848m^3/year, in addition to that site's own infiltration requirements.

Should there be any questions regarding the above information and analysis, please feel free to contact this office.

Yours sincerely.
IAN D. WILSON ASSOCIATES LIMITED

Geoffrey Rether, P.Geo.



KEY MAP

DRAFT PLAN OF SUBDIVISION

PART OF SOUTH HALF OF LOT 1, CONCESSION 11,
GEOGRAPHIC TOWNSHIP OF INNISFIL,
TOWN OF INNISFIL,
COUNTY OF SIMCOE

LEGEND

- SUBJECT LANDS
  - AREA: 3.33ha
  - FRONTAGE: 340.3m (incl. develop. limit)
- DEVELOPMENT LIMIT (AREA:0.73ha)
- WETLAND BOUNDARY
- WETLAND SETBACK
- ENVIRONMENTAL LANDS TO BE DEDICATED TO THE CITY OF BARRIE
- OPEN SPACE LANDS TO BE DEDICATED TO THE CITY OF BARRIE

OWNER'S CERTIFICATE

I HEREBY AUTHORIZE INNOVATIVE PLANNING SOLUTIONS TO PREPARE THIS DRAFT PLAN OF SUBDIVISION AND SUBMIT THIS DRAFT PLAN OF SUBDIVISION FOR APPROVAL.

DATE _____ OWNER'S NAME: _____

SURVEYOR'S CERTIFICATE

I CERTIFY THAT THE BOUNDARIES OF THE LAND TO BE SUBDIVIDED AND THEIR RELATIONSHIP TO ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN.

DATE _____ NEIL A. LEGROW, O.L.S.

ADDITIONAL INFORMATION REQUIRED UNDER SECTION 51(17) OF THE PLANNING ACT

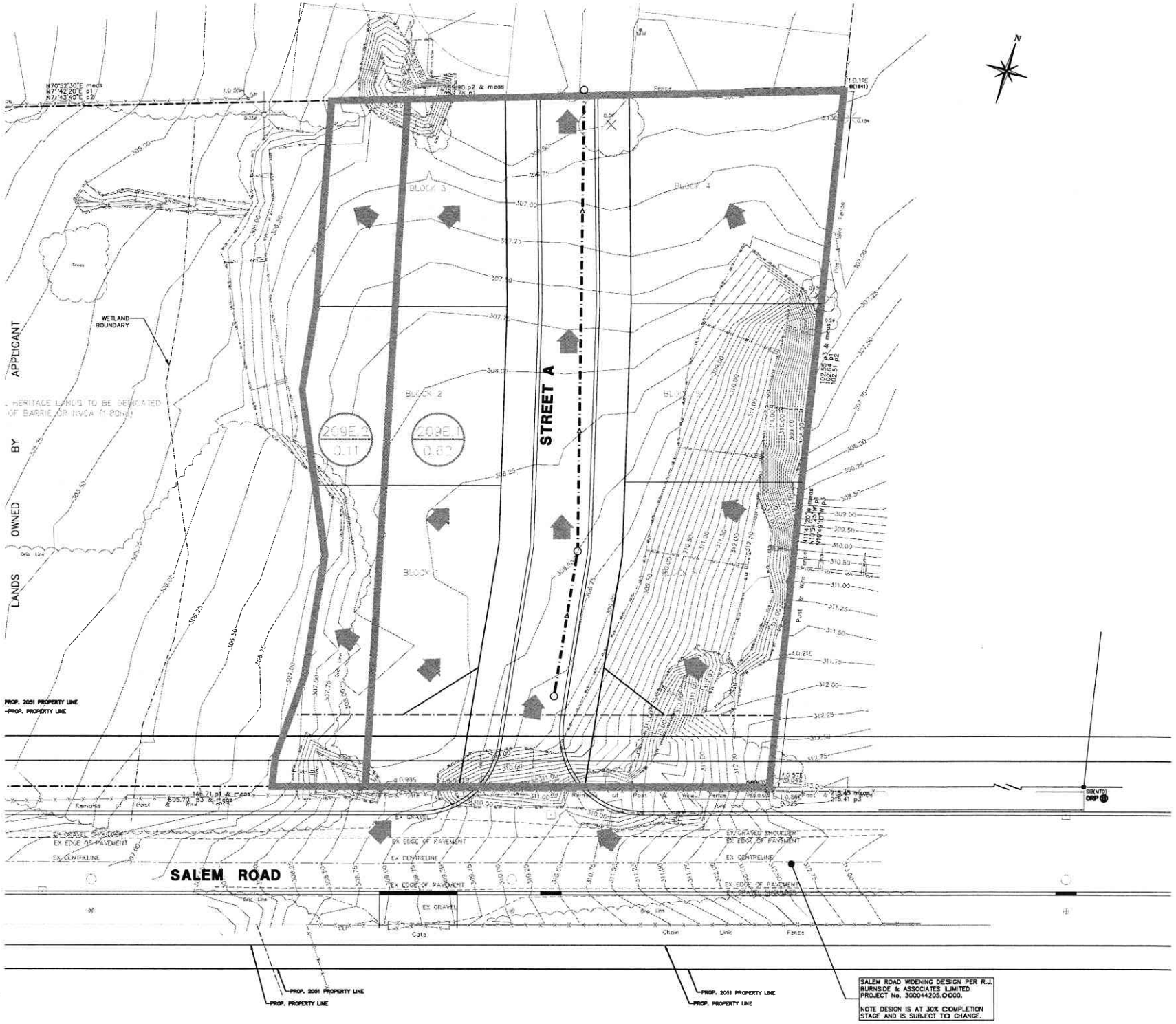
a) SHOWN ON PLAN	g) SHOWN ON PLAN
b) SHOWN ON PLAN	h) MUNICIPAL WATER
c) SEE KEY PLAN	i) SAND, SILT, CLAY
d) RESIDENTIAL	j) SHOWN ON PLAN
e) SHOWN ON PLAN	k) MUNICIPAL WATER & SEWAGE
f) SHOWN ON PLAN	l) NONE

LAND USE STATISTICS

LAND USE	LOT / BLK No.	UNITS	AREA (ha)
Residential - Townhouse	1 - 6	34	0.61
Road Widening	7		0.05
Street 'A'			0.17
TOTAL	7	34	0.73ha

IPS INNOVATIVE PLANNING SOLUTIONS
PLANNERS • PROJECT MANAGERS • LAND DEVELOPERS
847 WELHAM ROAD, UNIT 8, BARRIE, ON L4N 0B7
tel 705-812-3281 fax 705-812-3436 • info@ipsconsultinginc.com www.ipsconsultinginc.com

Date:	November 25, 2021	Drawn By:	A.S.
File:	20-992	Checked:	T.K.


APPLICANT
OWNED BY
LANDS
WETLAND BOUNDARY
HERITAGE LANDS TO BE DEDICATED
OF BARRIE OR INVCA (1 BOW)
BLOCK 1
BLOCK 2
BLOCK 3
BLOCK 4
STREET A
209E 2
0.11
209E 1
0.82
PROP. 2051 PROPERTY LINE
PROP. PROPERTY LINE
SALEM ROAD
EX GRAVEL SHOULDER
EX EDGE OF PAVEMENT
EX CENTRELINE
EX GRAVEL
Chain Link Fence
Gate
Fence
Post
Trees
PROP. 2051 PROPERTY LINE
PROP. PROPERTY LINE
PROP. 2051 PROPERTY LINE
PROP. PROPERTY LINE
SALEM ROAD WIDENING DESIGN PER R.J. BURNSIDE & ASSOCIATES LIMITED PROJECT No. 300044205.0000.
NOTE DESIGN IS AT 30% COMPLETION STAGE AND IS SUBJECT TO CHANGE.

The Ontario Water Resources Commission Act

WATER WELL RECORD

310/SE

Water management in Ontario

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 | 5708744 | MUNICIP 57005 | CON CON | 11

COUNTY OR DISTRICT: SIMCOE

TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: INNISFIL TWP

CON: CON 11

BLOCK, TRACT, SURVEY, ETC.:

LOT: 001

DATE COMPLETED: DAY 28 MO 01 YR 72

[redacted] R.R.#2 THORNTON

RC: 07280 | RC: 4 | ELEVATION: 1000 | RC: 5 | BASIN CODE: 22

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH – FEET FROM	DEPTH – FEET TO
BROWN	FILL			0	4
GREY	SILT	SAND		4	30
GREY	CLAY			30	49
BROWN	SAND	GRAVEL		49	

31: aa046aa1 | aa030ac28 | aa049ast

32:

41 WATER RECORD

WATER FOUND AT – FEET	KIND OF WATER
0049	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH – FEET FROM	DEPTH – FEET TO
05	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.188	0	~~0~~ 0049
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.): | DIAMETER: INCHES | LENGTH: FEET

MATERIAL AND TYPE: NO SCREEN | DEPTH TO TOP OF SCREEN: FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT – FEET FROM	DEPTH SET AT – FEET TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☒ PUMP 2 ☐ BAILER

PUMPING RATE: ~~02~~ 0002 GPM | DURATION OF PUMPING: 06 HOURS 00 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: 15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
012 FEET	036 FEET	029 FEET	024 FEET	020 FEET	014 FEET

1 ☐ PUMPING 2 ☒ RECOVERY

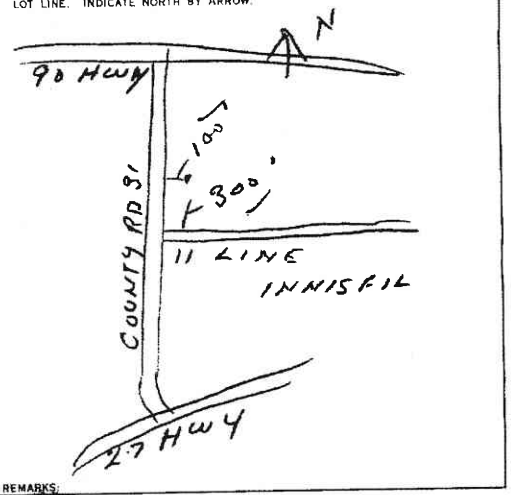
IF FLOWING, GIVE RATE: GPM | PUMP INTAKE SET AT: [redacted] 47 FEET | WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP | RECOMMENDED PUMP SETTING: 047 FEET | RECOMMENDED PUMPING RATE: ~~02~~ 0002 GPM

000.1 GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

FINAL STATUS OF WELL: 1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED

WATER USE 01: 1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED ☐ OTHER

METHOD OF DRILLING: 1 ☒ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: ANDERSON DRILLING | LICENCE NUMBER: 1204

ADDRESS: RR#2 THORNTON

NAME OF DRILLER OR BORER: O ANDERSON | LICENCE NUMBER: 1204

SIGNATURE OF CONTRACTOR: Oscar Anderson | SUBMISSION DATE: DAY 31 MO. 1 YR 72

OFFICE USE ONLY

DATA SOURCE: 1 | CONTRACTOR: 1204 | DATE RECEIVED: 130472

DATE OF INSPECTION: | INSPECTOR:

REMARKS:

P | WI

CSS.S8

OWRC COPY

MINISTRY OF THE ENVIRONMENT
The Ontario Water Resources Act

WATER WELL RECORD

31058

Ontario

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 | 5710487 | MUNICIP. 5700 | CON. CON | 10

COUNTY OR DISTRICT: Simcoe | TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: INNISFIL | CON., BLOCK, TRACT, SURVEY, ETC.: 10 BP | LOT: 001 BP

[redacted] RR# 5 BARRIE | DATE COMPLETED: DAY 07 MO. 10 YR. 78

UTM: 07250 | RC: 5 | ELEVATION: 000 | RC: 5 | BASIN CODE: 22

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
Top	Soil			0	1
	SAND			1	5
				5	28
GRAY	CLAY				

31: 0001 02 | 0005 28 | 0028 05

32:

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0015	1 ☒ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
30	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☒ CONCRETE 4 ☐ OPEN HOLE	2½	0	0028 28
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET

MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT LEAD PACKER, ETC.)
10-13	14-17	
18-21	22-25	
26-29	30-33	

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☐ BAILER | PUMPING RATE: GPM | DURATION OF PUMPING: 00 HOURS 30 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: 15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
013 FEET	10 FEET	11 FEET	12 FEET	10 FEET	10 FEET

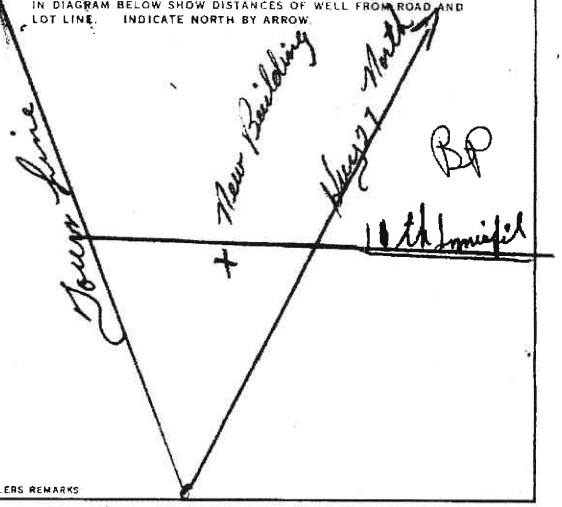
1 ☐ PUMPING 2 ☐ RECOVERY

IF FLOWING, GIVE RATE: GPM | PUMP INTAKE SET AT: FEET | WATER AT END OF TEST: 1 ☐ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☐ DEEP | RECOMMENDED PUMP SETTING: 026 FEET | RECOMMENDED PUMP RATE: 0002 GPM

LOCATION OF WELL 0107

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS

FINAL STATUS OF WELL

1 ☒ WATER SUPPLY | 2 ☐ OBSERVATION WELL | 3 ☐ TEST HOLE | 4 ☐ RECHARGE WELL | 5 ☐ ABANDONED, INSUFFICIENT SUPPLY | 6 ☐ ABANDONED, POOR QUALITY | 7 ☐ UNFINISHED

WATER USE 01

1 ☒ DOMESTIC | 2 ☐ STOCK | 3 ☐ IRRIGATION | 4 ☐ INDUSTRIAL | ☐ OTHER | 5 ☐ COMMERCIAL | 6 ☐ MUNICIPAL | 7 ☐ PUBLIC SUPPLY | 8 ☐ COOLING OR AIR CONDITIONING | 9 ☐ NOT USED

METHOD OF DRILLING 6

1 ☐ CABLE TOOL | 2 ☐ ROTARY (CONVENTIONAL) | 3 ☐ ROTARY (REVERSE) | 4 ☐ ROTARY (AIR) | 5 ☐ AIR PERCUSSION | 6 ☒ BORING | 7 ☐ DIAMOND | 8 ☐ JETTING | 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: ROTH WELL Digging | LICENCE NUMBER: 4608

ADDRESS: RR#5 BARRIE

NAME OF DRILLER OR BORER: B Roth | LICENCE NUMBER: 4608

SIGNATURE OF CONTRACTOR: P Roth per B Roth | SUBMISSION DATE: DAY 4 MO. 12 YR. 78

OFFICE USE ONLY

DATA SOURCE: 1 | CONTRACTOR: 4608 | DATE RECEIVED:

DATE OF INSPECTION: May 11/76 | INSPECTOR: BP

REMARKS:

MINISTRY OF THE ENVIRONMENT COPY

FORM 7 07-091

MINISTRY OF THE ENVIRONMENT
The Ontario Water Resources Act

WATER WELL RECORD

Ontario

31056

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

(11) 5715823

MUNICIP. 57005 CON. CON 11

COUNTY OR DISTRICT: Simcoe
TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: INNISFIL
CON., BLOCK, TRACT, SURVEY, ETC.: 11
LOT: 001
DATE COMPLETED: DAY 06 MO. 05 YR. 78

[redacted] RR # 2 THURNTON

072.00 RC 5 ELEV CCC 5 BASIN CODE 23

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
	SAND			0	17

(31) 0017 28

32

(41) WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0008	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

(51) CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
30	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☒ CONCRETE 4 ☐ OPEN HOLE	2 1/2	0	0017
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET

MATERIAL AND TYPE:
DEPTH TO TOP OF SCREEN FEET:

(61) PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	DEPTH SET AT - FEET TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
10-13	14-17	
18-21	22-25	
26-29	30-33	

(71) PUMPING TEST

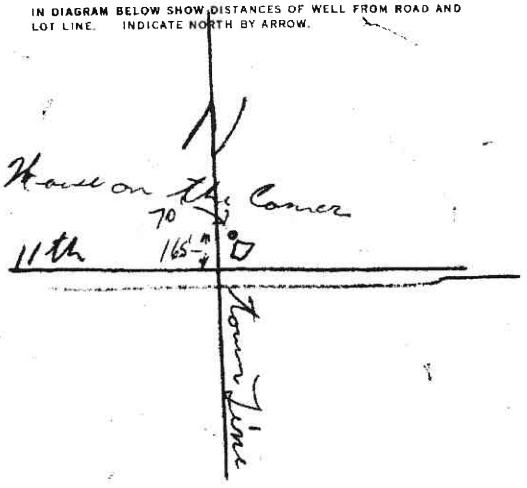
PUMPING TEST METHOD: 1 ☐ PUMP 2 ☒ BAILER
PUMPING RATE: GPM
DURATION OF PUMPING: HOURS MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: 1 ☐ PUMPING 2 ☐ RECOVERY			
009 FEET	FEET	15 MINUTES FEET	30 MINUTES FEET	45 MINUTES FEET	60 MINUTES FEET

IF FLOWING, GIVE RATE: GPM
PUMP INTAKE SET AT: FEET
WATER AT END OF TEST: 1 ☐ CLEAR 2 ☐ CLOUDY
RECOMMENDED PUMP TYPE: ☒ SHALLOW ☐ DEEP
RECOMMENDED PUMP SETTING: 014 FEET
RECOMMENDED PUMP RATE: 0003 GPM
GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

FINAL STATUS OF WELL 1
1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED

WATER USE 01
1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED

METHOD OF DRILLING 6
1 ☐ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☒ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: ROTH WELL DRILLING — LICENCE NUMBER: 4608
ADDRESS: RR # 2 BARRIE ONT
NAME OF DRILLER OR BORER: B ROTH — LICENCE NUMBER: 4608
SIGNATURE OF CONTRACTOR: B Roth — SUBMISSION DATE: DAY 9 MO. 8 YR. 78

MINISTRY OF THE ENVIRONMENT COPY

OFFICE USE ONLY

DATA SOURCE: 1 — CONTRACTOR: 4608 — DATE RECEIVED: 310179
DATE OF INSPECTION: 19/6/79 — INSPECTOR:
REMARKS: File does not appear to be GSS.SS
P 99
WI

FORM 7 07-091

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

31 D/6 E

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

(11) 5715880 MUNICIP. 57005 CON. CON 10

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON. BLOCK, TRACT, SURVEY, ETC.	LOT
Simcoe	Innisfil	X	002

OWNER (SURNAME FIRST)	ADDRESS	DATE COMPLETED
Unilock Ltd.	287 Armstrong Ave., Georgetown L7G 4S3	DAY 31 MO 01 YR 79

(21) UTM ZONE 17 EASTING 601650 NORTHING 4907250 DC 5 ELEVATION 1020 DC 5 BASIN CODE 23

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
	sand	gravel		0	4
	med. sand			4	15
	clay	gravel, streaks of sand		15	52
grey	clay			52	99
	fine to med.	sand		99	139
	fine sand	silt		137	155
		total depth: 139 feet			

(31) 0004 28 | 0015 04 | 0062 05 | 0128 | 0099 06 | 0139 08 | 0155 0806

(32)

(41) WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0130 ~~139~~	1 ☒ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

(51) CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
06	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	0.188	+ 2	0134
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET
018 ~~slot~~	06000	05

MATERIAL AND TYPE: S.S. wire wound

DEPTH TO TOP OF SCREEN: ~~packer~~ 0131 FEET

(61) PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD, PACKER, ETC.)
0139	0155	drill cuttings

(71) PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
1 ☒ PUMP 2 ☐ BAILER ~~air~~	0005 GPM	03 HOURS 00 MINS

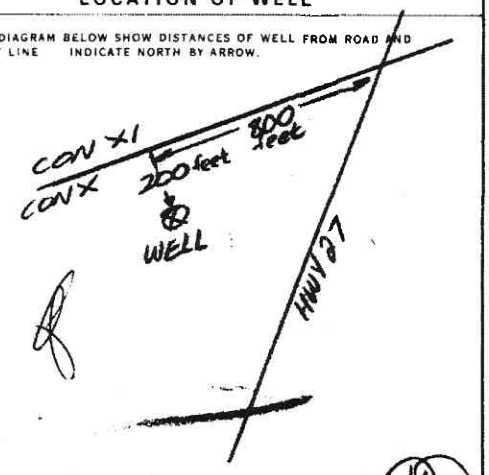
STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: 1 ☐ PUMPING 2 ☐ RECOVERY			
		15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
109 FEET	FEET	FEET	FEET	FEET	FEET

IF FLOWING GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST
GPM	FEET	1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
☐ SHALLOW ☒ DEEP	130 FEET	0005 GPM

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS

FINAL STATUS OF WELL	1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED
WATER USE 04	1 ☐ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☒ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED
METHOD OF DRILLING 2	1 ☐ CABLE TOOL 2 ☒ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR	LICENCE NUMBER
Snider Drilling Limited.	4816

ADDRESS: Craighurst, Ontario.

NAME OF DRILLER OR BORER	LICENCE NUMBER
Michael Arnold.	

SIGNATURE OF CONTRACTOR	SUBMISSION DATE
Ralph Snider.	DAY ____ MO ____ YR ____

OFFICE USE ONLY

DATA SOURCE	CONTRACTOR	DATE RECEIVED
1	4816	05 04 79

DATE OF INSPECTION: | INSPECTOR:

REMARKS: PLOTTED Aug 8/79

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506—4—77

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 — 5722089

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON.	BLOCK, TRACT, SURVEY, ETC.	LOT
SIMCOE	INNISFIL	XI		1

OWNER: [redacted] ADDRESS: 601A Young St. BARRIE, ONT — DATE COMPLETED: DAY 14 MONTH April YEAR 87

21 — ZONE — EASTING — NORTHING — RC — ELEVATION — RC — BASIN CODE

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
Black	Top Soil			0	1
yellow	Sand			1	15
yellow	Sand	Streaks of Grey Clay		15	55
Grey	Clay	Stones		55	105
yellow	Sand	+ Brown Clay		105	155
Grey	Clay	Sand		155	175
yellow	Sand			175	180

31 — 32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
175 180	☒ 1 FRESH ☐ 3 SULPHUR ☐ 2 SALTY ☐ 4 MINERAL
	☐ 1 FRESH ☐ 3 SULPHUR ☐ 2 SALTY ☐ 4 MINERAL
	☐ 1 FRESH ☐ 3 SULPHUR ☐ 2 SALTY ☐ 4 MINERAL
	☐ 1 FRESH ☐ 3 SULPHUR ☐ 2 SALTY ☐ 4 MINERAL
	☐ 1 FRESH ☐ 3 SULPHUR ☐ 2 SALTY ☐ 4 MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
6 1/4	☒ 1 STEEL ☐ 2 GALVANIZED ☐ 3 CONCRETE ☐ 4 OPEN HOLE	.188	+1'	158
5	☒ 1 STEEL ☐ 2 GALVANIZED ☐ 3 CONCRETE ☐ 4 OPEN HOLE	.188	158	177
	☐ 1 STEEL ☐ 2 GALVANIZED ☐ 3 CONCRETE ☐ 4 OPEN HOLE			

SCREEN

SIZE OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET
10	6	3

MATERIAL AND TYPE: Stainless Steel — DEPTH TO TOP OF SCREEN: 187 FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
1 ☐ PUMP 2 ☒ BAILER	9 GPM	HOURS MINS

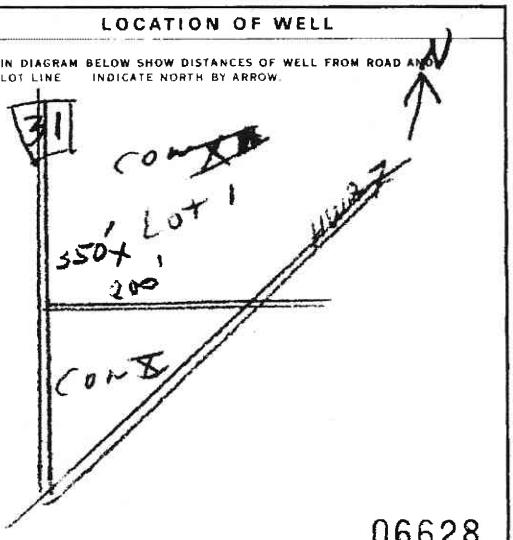
STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: ☒ 1 PUMPING ☐ 2 RECOVERY			
		15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
103½ FEET	160 FEET	FEET	FEET	FEET	160 FEET

IF FLOWING, GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST
GPM	FEET	☒ 1 CLEAR ☐ 2 CLOUDY

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
☐ SHALLOW ☒ DEEP	170 FEET	8 GPM

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS: 06628

FINAL STATUS OF WELL

☒ 1 WATER SUPPLY ☐ 2 OBSERVATION WELL ☐ 3 TEST HOLE ☐ 4 RECHARGE WELL ☐ 5 ABANDONED, INSUFFICIENT SUPPLY ☐ 6 ABANDONED, POOR QUALITY ☐ 7 UNFINISHED

WATER USE

☐ 1 DOMESTIC ☐ 2 STOCK ☐ 3 IRRIGATION ☐ 4 INDUSTRIAL ☐ 5 COMMERCIAL ☐ 6 MUNICIPAL ☐ 7 PUBLIC SUPPLY ☐ 8 COOLING OR AIR CONDITIONING ☐ OTHER ☐ 9 NOT USED

METHOD OF DRILLING

☐ 1 CABLE TOOL ☒ 2 ROTARY (CONVENTIONAL) ☐ 3 ROTARY (REVERSE) ☐ 4 ROTARY (AIR) ☐ 5 AIR PERCUSSION ☐ 6 BORING ☐ 7 DIAMOND ☐ 8 JETTING ☐ 9 DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: HENRY HAMMERS — LICENCE NUMBER: 2514

ADDRESS: 644 St. Vincent St. BARRIE

NAME OF DRILLER OR BORER: SAME — LICENCE NUMBER:

SIGNATURE OF CONTRACTOR: Henry Hammers — SUBMISSION DATE: DAY MO YR

OFFICE USE ONLY

DATE RECEIVED: SEP 02 1987

CSS.ES

FORM NO. 0506—4—77 FORM 7

MINISTRY OF THE ENVIRONMENT COPY

Ontario Ministry of the Environment

Well A 059618 (Print Below)
A059618

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Well Owner's Information

[redacted]

SALEM ROAD
County/District/Municipality | City/Town/Village: INNISFIL | Province: Ontario | Postal Code

UTM Coordinates NAD 83 | Zone | Easting | Northing | GPS Unit Make | Model | Mode of Operation: ☐ Undifferentiated ☐ Averaged ☐ Differentiated, specify

Zone	Easting	Northing
17	601597	4907569

Overburden and Bedrock Materials (see instructions on the back of this form)

General Colour	Most Common Material	Other Materials	General Description	Depth From (FEET)	Depth To (FEET)
BROWN	SAND	GRAVEL		0	45'
GREY	SAND	SILT	VERY DENSE	45'	80'
GREY	SILT	CLAY		80'	84'

Annular Space/Abandonment Sealing Record

Depth Set at From (FEET)	Depth Set at To (FEET)	Type of Sealant Used (Material and Type)	Volume Placed (Cubic Metres)
0	10'	BENTONITE HOLEPLUG	
10'	70'	BENTONITE GROUT	
70'	72'	BENTONITE HOLEPLUG	
72'	84'	SILICA SAND	

Method of Construction

☐ Cable Tool ☐ Diamond ☐ Public ☐ Commercial ☐ Not used
☐ Rotary (Conventional) ☐ Jetting ☐ Domestic ☐ Municipal ☐ Dewatering
☐ Rotary (Reverse) ☐ Driving ☐ Livestock ☐ Test Hole ☑ Monitoring
☐ Rotary (Air) ☐ Digging ☐ Irrigation ☐ Cooling & Air Conditioning
☐ Air percussion ☑ Boring ☐ Industrial
☐ Other, specify ☐ Other, specify

Status of Well

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

Location of Well

Please provide a map below showing:
- all property boundaries, and measurements sufficient to locate the well in relation to fixed points,
- an arrow indicating the North direction
- detailed drawings can be provided as attachments no larger than legal size (8.5" by 14")
- vidigital pictures of inside of well can also be provided

SEE ATTACHED

Results of Well Yield Testing

Check box if after test of well yield, water was:
☐ Clear and sand free
☐ Cannot develop to sand-free state

If pumping discontinued, give reason:

Pumping test method

Pump intake set at (Metres)

Pumping rate (Litres/min)

Duration of pumping ____ hrs + ____ min

Final water level end of pumping (Metres)

Recommended pump type ☐ Shallow ☐ Deep

Recommended pump depth ____ Metres

Recommended pump rate (Litres/min)

If flowing give rate (Litres/min)

	Draw Down Time (Min)	Draw Down Water Level (Metres)	Recovery Time (Min)	Recovery Water Level (Metres)
Static Level			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	

Water Details

Water found at Depth	Kind of Water
____ Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals
____ Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals
____ Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals

Casing Used

☐ Galvanized ☐ Steel ☐ Fibreglass ☑ Plastic ☐ Concrete

Screen Used

☐ Galvanized ☐ Steel ☐ Fibreglass ☑ Plastic ☐ Concrete

No Casing and Screen Used

☐ Open Hole

Disinfected? ☐ Yes ☐ No

Casing and Well Details

Diameter of the Hole (Centimetres) 8¼

Depth of the Hole (Metres) (FEET) 84'

Wall Thickness (Metres) SCH 40

Inside Diameter of the Casing (Metres) 2"

Depth of the Casing (Metres) (FEET) 74'

Date Well Completed (yyyy/mm/dd) 2007/08/02

Was the well owner's information package delivered? ☐ Yes ☑ No

Date the Well Record and Package Delivered to Well Owner (yyyy/mm/dd)

Well Contractor and Well Technician Information

Business Name of Well Contractor: LANTECH DRILLING SERVICES INC.

Well Contractor's Licence No.: 6809

Business Address (Street No./Name, number, RR): 3661 MT. ALBERT ROAD

Municipality: SHARON

Province: ONTARIO

Postal Code: L0G1V0

Business E-mail Address:

Bus. Telephone No. (inc. area code): 9054782243

Name of Well Technician (Last Name, First Name): TODD PASCO

Well Technician's Licence No.: 2252

Signature of Technician

Date Submitted (yyyy/mm/dd): 2007/08/20

Ministry Use Only

Audit No.: Z 63332

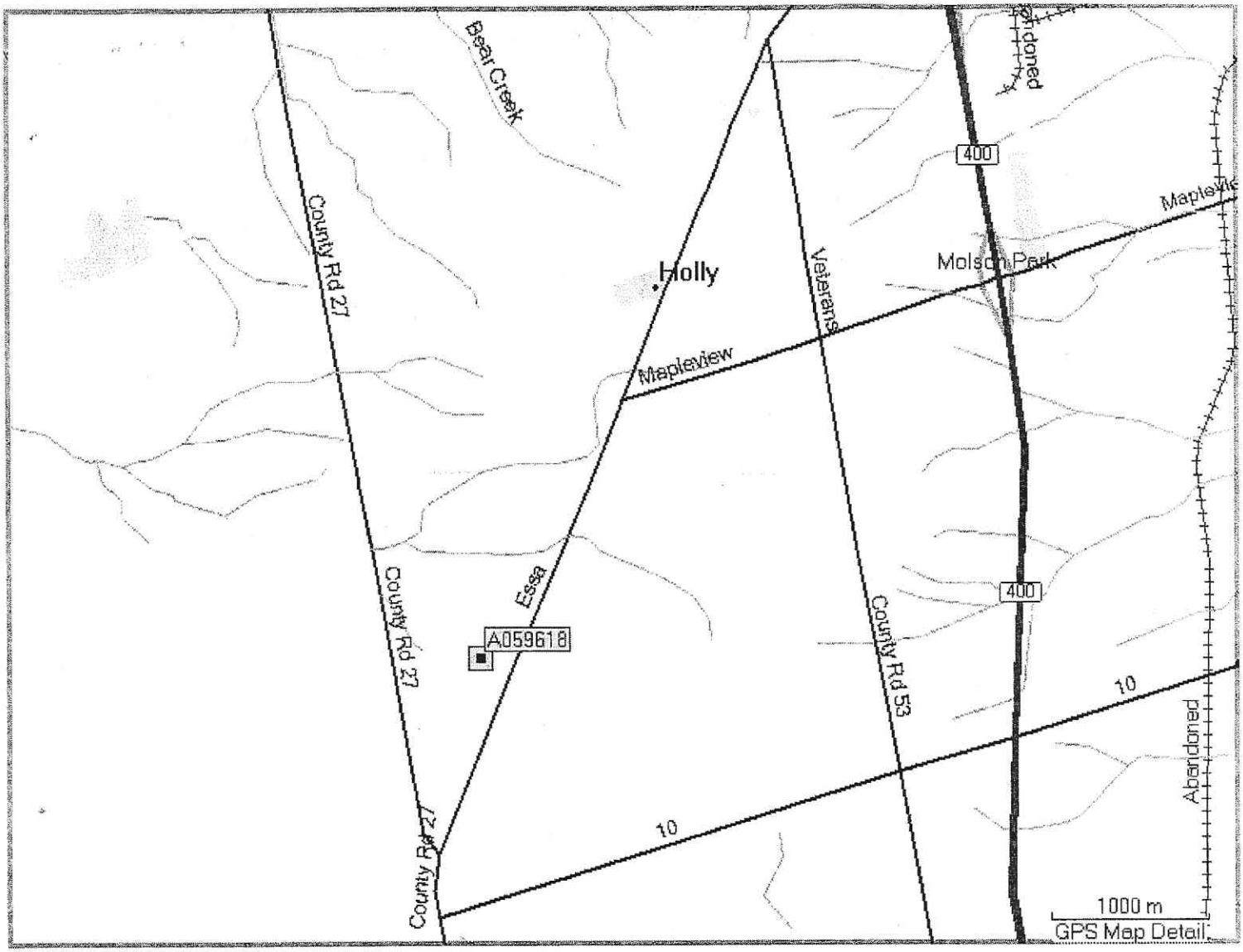
Well Contractor No.: 6809

Date Received (yyyy/mm/dd): AUG 28 2007

Date of Inspection (yyyy/mm/dd)

Remarks:

0506E (11/2006) Ministry's Copy



AUG 2 8 2007

Z 63332

6809

Ontario — Ministry of the Environment

Measurements recorded in: ☐ Metric ☑ Imperial

Well Tag No. (Place Sticker and Print Below): **A076132**

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
	PRATT DEVELOPMENT		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
27 CLAPPERTON ST, STE 300	BARRIE	ON	L4M3E6	9057224500

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
4885 SALEM RD.			

County/District/Municipality	City/Town/Village	Province	Postal Code
SIMCOE COUNTY	INNISFIL	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	601441	4907354		

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
BROWN	SAND	GRAVEL	~~[illegible]~~ DENSE	0'	15'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
15'	2'	SAND	
2'	0	BENTONITE	

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
2"	PLASTIC		15'	+2.5'

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	Depth (m/ft) To
2"	PLASTIC	.010	15'	5'

Water Details

Water found at Depth	Kind of Water	
2' (m/ft) ☐ Gas	☐ Fresh ☑ Untested ☐ Other, specify	
(m/ft) ☐ Gas	Water found at Depth ☐ Fresh ☐ Untested ☐ Other, specify	
(m/ft) ☐ Gas	Water found at Depth ☐ Fresh ☐ Untested ☐ Other, specify	

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)
15'	0'	6.5"

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)

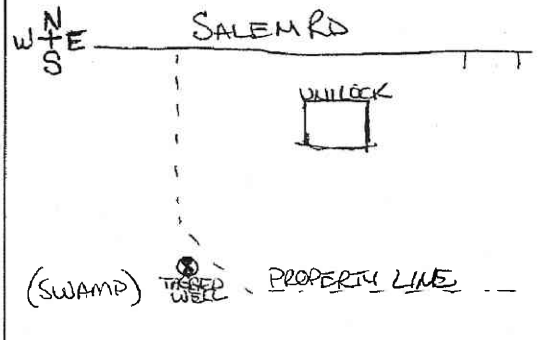
Well production (l/min / GPM)

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.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
LONDON SOIL TEST LTD	7190

Business Address (Street Number/Name)	Municipality
R.R. #6 DUNDALK	

Province	Postal Code	Business E-mail Address
ON	N0C1B0	

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
5194555777	RAYMOND TREMBLAY

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
2315	[signature]	2011 01 18

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☐ Yes ☐ No		2011 01 18

Ministry Use Only

Audit No. Z133800

Received FEB 01 2012

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BARRIE	MISSISSAUGA	OSHAWA	NEWMARKET	GRAVENHURST	HAMILTON
TEL: (705) 721-7863	TEL: (905) 542-7605	TEL: (905) 440-2040	TEL: (905) 853-0647	TEL: (705) 684-4242	TEL: (905) 777-7956
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 542-2769

A REPORT TO
LSR SALEM

A GEOTECHNICAL INVESTIGATION
FOR
PROPOSED RESIDENTIAL SUBDIVISION

500 SALEM ROAD

TOWN OF INNISFIL

REFERENCE NO. 2203-S111

JULY 2022

DISTRIBUTION

1 Digital - LSR Salem
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The above values show that the till is suitable for structural compaction while the sand is generally too wet. The wet sand can be properly stockpiled to allow draining of the excess water prior to backfilling. The existing earth fill must be sorted free of organics and other deleterious material prior to reuse for structural backfill.

When compacting the till on the dry side of the optimum, the compactive energy will frequently bridge over the chunks in the soil and be transmitted laterally into the soil mantle. Therefore, the lifts of these soils must be limited to 20 cm or less before compaction.

Rock and boulders will prevent transmission of the compactive energy into the underlying material to be compacted. Any boulders over 15 cm in size must be sorted and not be included for structural backfill and/or construction of engineered fill.

5.0 GROUNDWATER CONDITION

The boreholes were checked for the presence of groundwater and cave-in upon completion of drilling. Free groundwater was measured at depths of 2.1 m to 3.4 m (or El. 304.8 m to 305.6 m) upon borehole completion. Cave-in was logged at depths of 4.6 m and 6.1 m (or El. 300.8 m to 304.1 m) in the boreholes. The groundwater and cave-in depths are plotted on the Borehole Logs and summarized in Table 2.

Table 2 - Groundwater and Cave-in Levels Upon Completion

Borehole No.	Ground Elevation (m)	Borehole Depth (m)	Groundwater/Cave-In* Level	
			Depth (m)	Elevation (m)
1	306.9	8.1	2.1/6.1*	304.8/300.8*
2	308.3	6.6	3.4/4.6*	304.9/303.7*
3	308.7	6.6	3.1/4.6*	305.6/304.1*

Groundwater was recorded in the monitoring wells on July 8, 2022. The well records are summarized in Table 3.

Table 3 - Groundwater Records in Monitoring Wells

Monitoring Well No.	Ground Elevation (m)	Well Depth (m)	July 8, 2022	
			Depth (m)	Elevation (m)
1	306.9	6.0	1.5	305.4
2	308.3	6.0	2.4	305.9
3	308.7	6.0	2.6	306.1

Free groundwater level was recorded in the monitoring wells at a depth of 1.5 m to 2.4 m (or El. 305.4 m to 306.1 m). The recorded water level may represent the groundwater regime in the vicinity and it could have been derived from the creek. It is subject to seasonal fluctuations.

6.0 DISCUSSION AND RECOMMENDATIONS

The investigation has disclosed that beneath the topsoil and a layer of earth fill, the site is underlain by sand and silty sand till deposits.

Free groundwater level was recorded in the monitoring wells at a depth of 1.5 m to 2.4 m (or El. 305.4 m to 306.1 m). The recorded water level may represent the groundwater regime in the vicinity and it could have been derived from the creek. It is subject to seasonal fluctuations.

Based on the Conceptual Site Plan, the site will be regraded for the townhouse development, with municipal services and paved roadways meeting urban standards. The geotechnical findings which warrant special consideration are presented below:

1. The topsoil must be removed before site grading and development. It can be stockpiled on site and reused in landscaped areas of the new subdivision. Any surplus should be removed off site.
2. The history and quality of fill are not known. The existing fill is not suitable for supporting any structure sensitive to movement. In using the fill for engineered fill or structural backfill, it should be subexcavated, inspected for its geotechnical and chemical properties, sorted free of topsoil or deleterious material, aerated and properly compacted in layers.
3. Where additional fill is required for site grading, it is economical to place an engineered fill to the development.

JOB NO.: 2203-S111

LOG OF BOREHOLE: 1

FIGURE NO.: 1

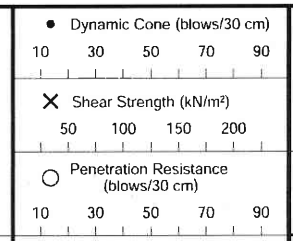
PROJECT DESCRIPTION: Proposed Residential Subdivision

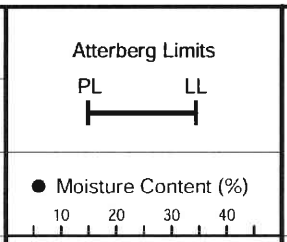
METHOD OF BORING: Flight Auger (Hollow Stem)

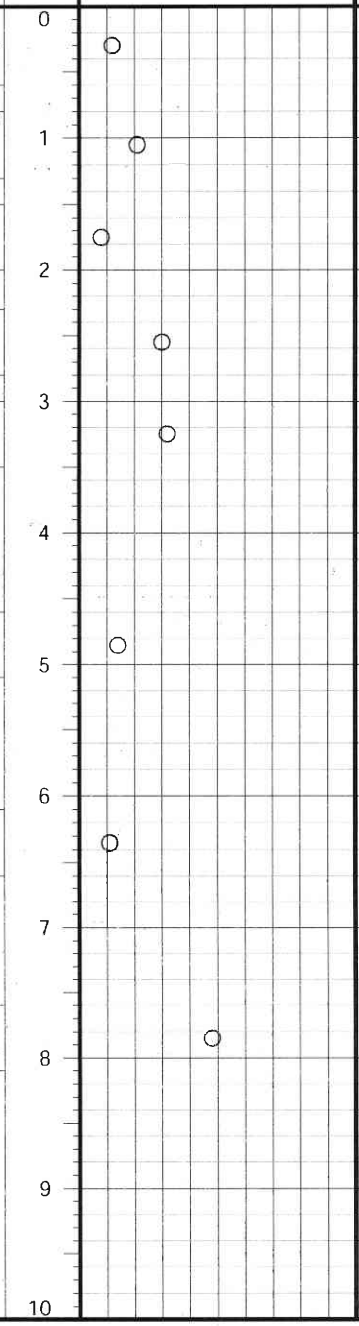
PROJECT LOCATION: 500 Salem Road, Town of Innisfil

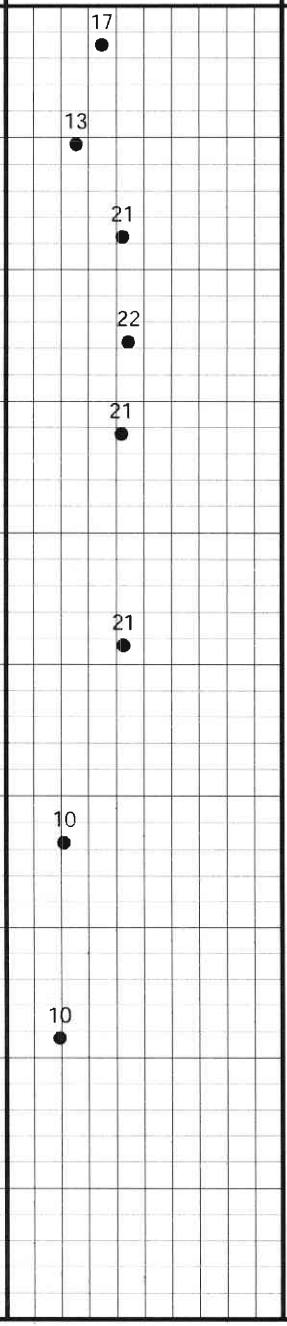
DRILLING DATE: April 7, 2022

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
306.9 / 0.0	Ground Surface			
	20 cm of Topsoil			
	EARTH FILL Dark brown silty clay occ. organics, rootlets and rock fragments	1	DO	12
		2	DO	21
		3	DO	8
304.7 / 2.2	Grey, compact to dense, wet **SAND** traces of silt and gravel	4	DO	30
		5	DO	32
		6	DO	14
301.3 / 5.6	Grey, compact to dense **SILTY SAND TILL** traces of clay and gravel occ. sand seams and layers occ. cobbles and boulders	7	DO	11
		8	DO	48
298.8 / 8.1	**END OF BOREHOLE** Installed 50 mm Ø monitoring well to 6.0 m completed with 3.1 m screen Sand backfill from 2.3 to 6.0 m Bentonite seal from 0.0 m to 2.3 m Provided with a momument steel casing			









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JOB NO.: 2203-S111

LOG OF BOREHOLE: 2

FIGURE NO.: 2

PROJECT DESCRIPTION: Proposed Residential Subdivision

METHOD OF BORING: Flight Auger (Hollow Stem)

PROJECT LOCATION: 500 Salem Road, Town of Innisfil

DRILLING DATE: April 7, 2022

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
308.3	Ground Surface							
0.0	**15 cm of Topsoil**				0			
	EARTH FILL Dark brown silty clay occ. organics, rootlets and rock fragments	1	DO	21			7	
307.6 / 0.7	Compact to dense **SAND** traces of silt and gravel — gravelly wet below 2.3 m	2	DO	43	1		7	
		3	DO	27	2		10	
		4	DO	33			17	
	— disturbed	5	DO	7	3		18	
		6	DO	31	4		19	
	— brown grey	7	DO	48	5		12	
301.7 / 6.6	**END OF BOREHOLE** Installed 50 mm Ø monitoring well to 6.0 m completed with 3.1 m screen Sand backfill from 2.3 to 6.0 m Bentonite seal from 0.0 m to 2.3 m Provided with a momument steel casing				6 7 8 9 10			W.L. @ El. 304.9 m upon completion Cave-in @ El. 303.7 m upon completion

JOB NO.: 2203-S111

LOG OF BOREHOLE: 3

FIGURE NO.: 3

PROJECT DESCRIPTION: Proposed Residential Subdivision

METHOD OF BORING: Flight Auger (Hollow Stem)

PROJECT LOCATION: 500 Salem Road, Town of Innisfil

DRILLING DATE: April 7, 2022

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
308.7	Ground Surface				0
0.0	**25 cm of Topsoil**	1	DO	35	
	EARTH FILL Dark brown silty clay occ. organics, rootlets and rock fragments				
308.0 / 0.7	Brown, compact to very dense **SAND** gravelly traces of silt and gravel wet below 2.3 m	2	DO	65	1
		3	DO	21	2
		4	DO	25	
		5	DO	24	3
					4
		6	DO	65	5
303.1 / 5.6	Grey, very dense **SILTY SAND TILL** traces of clay and gravel occ. sand seams and layers occ. cobbles and boulders	7	DO	80	6
302.1 / 6.6	**END OF BOREHOLE** Installed 50 mm Ø monitoring well to 6.0 m completed with 3.1 m screen Sand backfill from 2.3 to 6.0 m Bentonite seal from 0.0 m to 2.3 m Provided with a momument steel casing				7
					8
					9
					10

Dynamic Cone (blows/30 cm) 10 30 50 70 90

Shear Strength (kN/m²) 50 100 150 200

Penetration Resistance (blows/30 cm) 10 30 50 70 90

Atterberg Limits PL LL

Moisture Content (%) 10 20 30 40

18 10 2 17 15 20 10

WATER LEVEL

W.L. @ El. 305.6 m upon completion

Cave-in @ El. 304.1 m upon completion

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GRAIN SIZE DISTRIBUTION

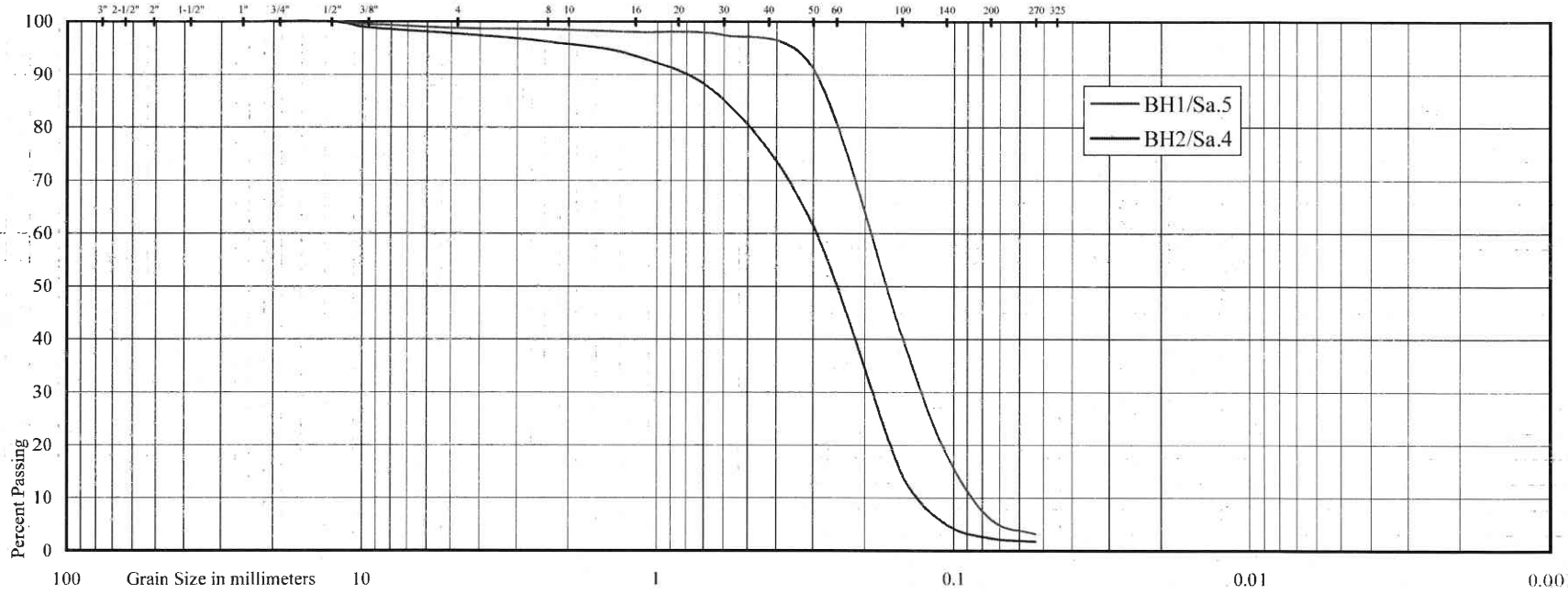
Reference No: 2203-S111

U.S. BUREAU OF SOILS CLASSIFICATION

GRAVEL		SAND				SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	V. FINE		

UNIFIED SOIL CLASSIFICATION

GRAVEL		SAND			SILT & CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



Project: Proposed Residential Development

Location: 500 Salem Road, Town of Innisfil

Borehole No:	1	2
Sample No:	5	4
Depth (m):	3	2.3
Elevation (m):	303.9	306.0

BH/Sa.:	1/5	2/4
Liquid Limit (%) =	-	-
Plastic Limit (%) =	-	-
Plasticity Index (%) =	-	-
Moisture Content (%) =	21	17
Estimated Permeability (cm./sec.) =	10^{-3}	10^{-2}

Classification of Sample [& Group Symbol]: SAND

Fine to medium grained, traces of silt and gravel

Figure: 4

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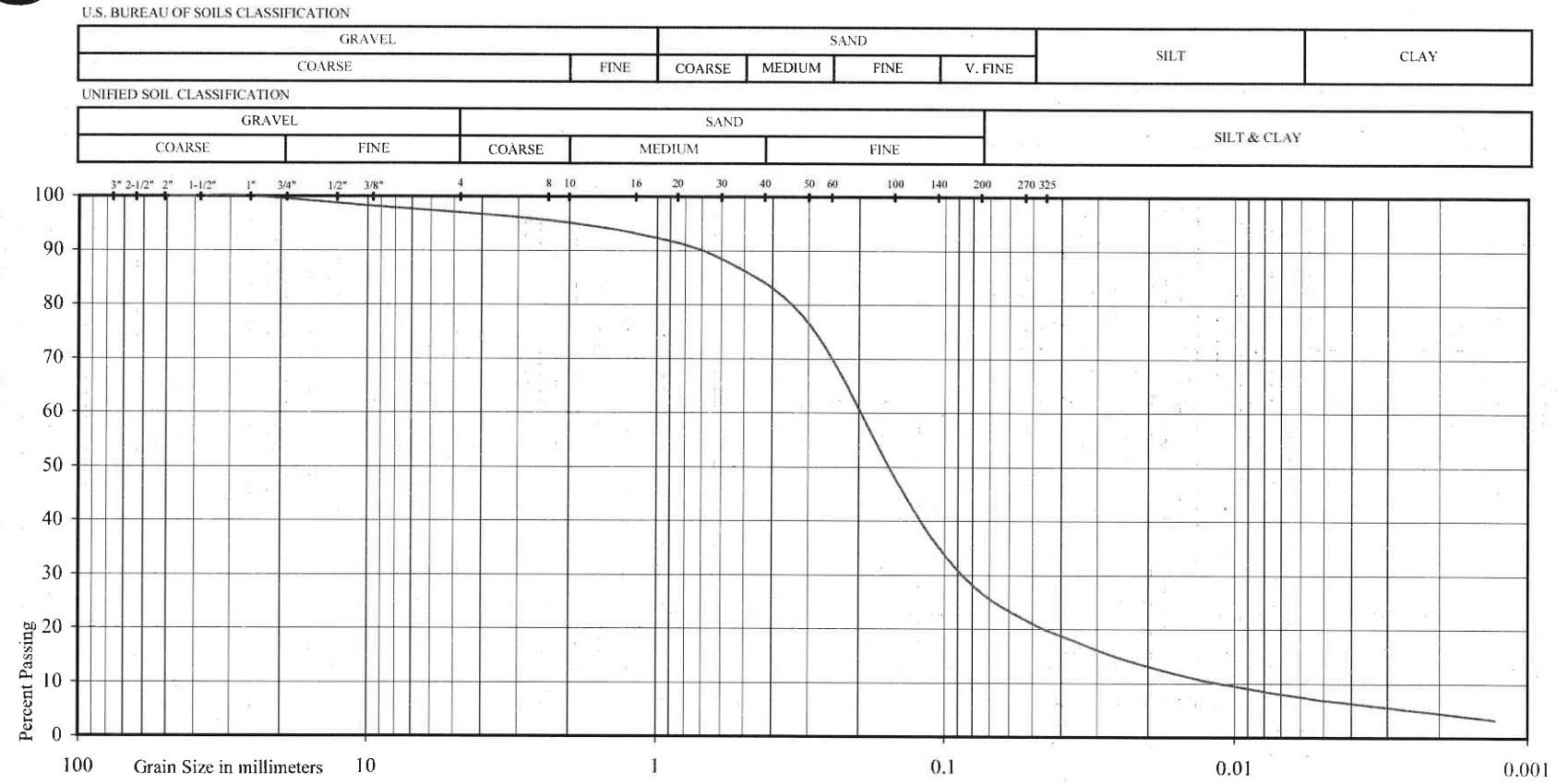
GRAIN SIZE DISTRIBUTION

Reference No: 2203-S111



Project: Proposed Residential Development

Location: 500 Salem Road, Town of Innisfil

Borehole No: 3

Sample No: 7

Depth (m): 6.1

Elevation (m): 302.6

Liquid Limit (%) = -

Plastic Limit (%) = -

Plasticity Index (%) = -

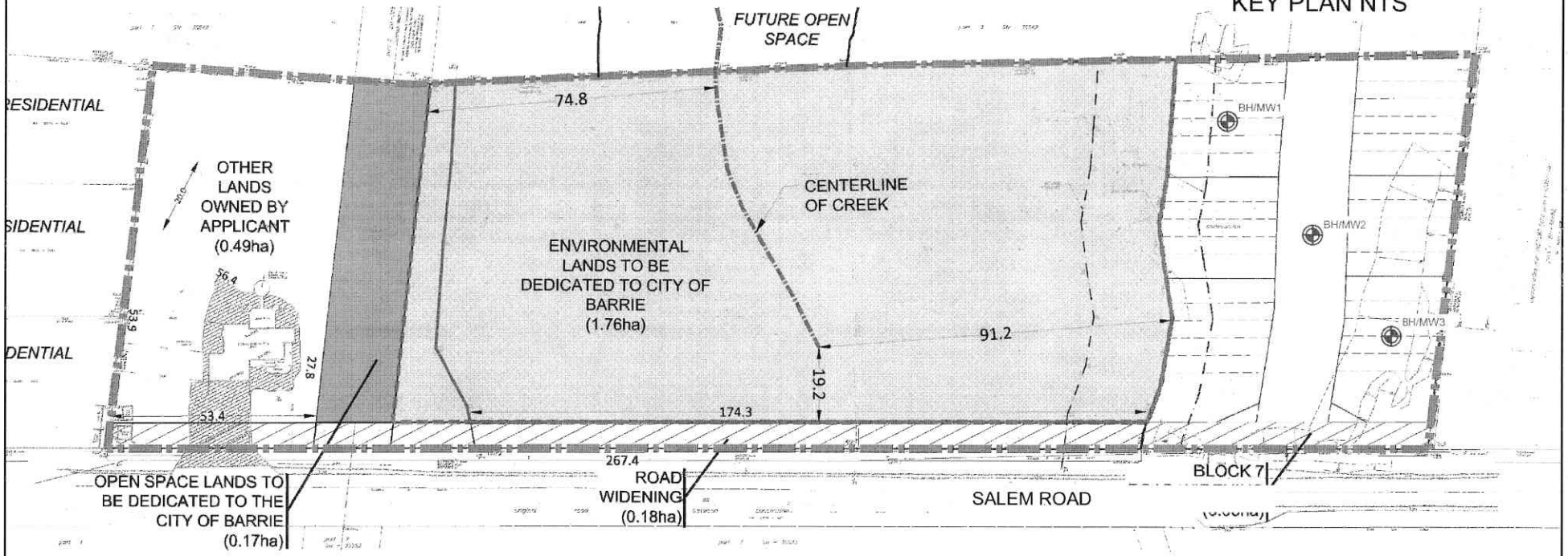
Moisture Content (%) = 10

Estimated Permeability (cm./sec.) = 10^{-4}

Classification of Sample [& Group Symbol]: SILTY SAND TILL
traces of clay and gravel

Figure: 5

KEY PLAN NTS



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Borehole/Monitoring Well Location Plan

SITE: 500 Salem Road, Town of Innisfil

DESIGNED BY: CR	**CHECKED BY:** KFL	**DWG NO.:** 1	
SCALE: 1:1500	**REF. NO.:** 2203-S111	**DATE:** August 2022	**REV** -

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SUBSURFACE PROFILE
DRAWING NO. 2
SCALE: AS SHOWN

JOB NO.: 2203-S111
REPORT DATE: July 2022
PROJECT DESCRIPTION: Proposed Residential Subdivision
PROJECT LOCATION: 500 Salem Road, Town of Innisfil

LEGEND
FILL | SAND | SILTY SAND TILL | TOPSOIL

CAVE-IN | WATER LEVEL (END OF DRILLING)