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FUNCTIONAL SERVICING REPORT

Proposed Subdivision

1942 Woodview Avenue
City of Pickering
Region of Durham

March 2023

Prepared For: **10861808 Canada Corp.**

File: **21150**

VALDOR WATER RESOURCES

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Professional Engineers Ontario

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1.0 INTRODUCTION

Valdor Engineering Inc. has been retained by 10861808 Canada Corp. to provide consulting engineering services for the proposed re-development of their site located at 1942 Woodview Avenue in the City of Pickering as indicated in **Figure 1**.

1.1 Existing Conditions

The site is approximately 1.2 hectares in size and currently contains a detached dwelling have a driveway to Woodview Avenue and landscaped yards.

The site is bound to the north by a lot with a detached dwelling, to the south and west by tree covered areas and to the ease by Woodview Avenue.

1.2 Proposed Development

The proposed development will be in the form of a subdivision consisting of 21 street townhouse units in three blocks, a proposed municipal road terminating in a cul-de-sac and an open space block.

A copy of the draft plan is included in **Appendix "A"** together with a calculation of the equivalent population contained in **Table A1**. The development statistics and the equivalent population data are summarized in **Table 1**.

Table 1. Development Statistics

Land Use	**Area** (Ha)	**No of Units**	**Equivalent Population**
Street Townhomes	0.7111	21	63
Open Space Block	0.3361		
Municipal Road Allowance	0.1664		
Total:	**1.2136**	**21**	**63**

1.3 Purpose of Report

This Functional Servicing Report has been prepared to demonstrate the servicing feasibility of the development in conjunction with the zoning by-law amendment application. It has been prepared based on a review of the topographic survey and information from servicing plans obtained from the municipal archives.

This report outlines the engineering design elements for the proposed development, including water supply, sanitary sewers, storm sewers and stormwater management as well as grading and driveway access all of which are presented in the following sections.

2.0 WATER SUPPLY

The Region of Durham owns and operates twelve drinking water systems using three supply sources including Lake Ontario, Lake Simcoe and groundwater wells. The Region is responsible

for operating and maintaining every component of the water supply system including treatment, storage and distribution of potable water to consumers throughout the Region. In this regard, the Region operates and maintains 6 surface water supply plants, 22 water storage facilities, 18 pumping stations, 23 groundwater wells and approximately 2,400 km of watermains.

The subject site is serviced by the Oshawa / Whitby / Ajax distribution system which delivers treated water through approximately 2,000 kilometres of watermains to provide potable water to consumers in the City of Pickering as well as the City of Oshawa, Community of Courtice, Town of Ajax, Town of Whitby and Community of Brooklin. The source water for the treatment process is drawn from Lake Ontario. A plan of the various drinking water systems in the Region is included in **Appendix "B"**.

The following is a summary of the waster servicing requirements for the development.

2.1 Domestic Demand

The domestic demand is to be calculated using the Region of Durham engineering design standards which include the following parameters:

Residential Average Day Demand:	364 L/person/day
Maximum Day Factor:	2.0
Peak Hour Factor	3.0

Based on the above, it is anticipated that the development will have a water demand as summarized in **Table 2**. A detailed tabulation of the domestic water demand calculation is detailed in **Table B1** of **Appendix "B"**.

Table 2. Domestic Water & Fire Flow Demand

Land Use	Equivalent Population (Persons)	Average Day Demand (L/min)	Maximum Day Demand (L/min)	Peak Hour Demand (L/min)	Fire Flow (L/min)	Maximum Day Plus Fire Flow (L/min)	Maximum Day Plus Fire Flow (L/s)
Street Townhomes	63	15.9	31.9	47.8	8,000	8,032	133.9

2.2 Watermains & Service Connections

The subject development will be serviced by a 200mm diameter water main which will be installed in the proposed municipal road allowance. This watermain will connect to the existing 200mm watermain located on Woodview Avenue. Each townhouse unit will be serviced with a 25mm diameter water service connection.

The existing water service connection is to be capped and abandoned in accordance with the municipal requirements. The configuration of the existing and proposed water services is illustrated in **Figure 2**. A copy of the Region of Durham's standard water service connection is included in **Appendix "B"**.

2.3 Water Meters

In accordance with Region of Durham criteria, each townhouse unit will have a water meter which will be installed in the basement. Water meters are to be purchased from the Region of Durham. A copy of the Region of Durham's standard water meter detail is included in **Appendix "B"**.

2.4 Fire Protection

The fire flow required for the proposed townhouse units was calculated using the criteria indicated in the *Water Supply for Public Fire Protection Manual*, 1999, by the Fire Underwriters Survey (FUS). Appropriate reductions and increases have been applied to the equation such as reduction for low-hazard occupancies, and an increase due to neighbouring building proximity. The fire flow requirement has been based on the size of the individual units and the number of units in each Block of townhomes while incorporating fire separation such that there are no more than 4 consecutive units.

Based on the calculation, the minimum fire suppression flow plus maximum day demand is 8,032 L/min (133.9 L/s) as summarized in **Table 2**. This flow must be available at the nearest hydrant with a minimum pressure of 140 KPa (20 psi). A detailed calculation of the fire flow requirement is provided in **Table B2** which is included in **Appendix "B"**.

Fire protection will be provided by proposed fire hydrants located within the municipal road allowance such that the principle entrance of each dwelling unit is located within 90m of a fire hydrant. The locations of the existing and proposed fire hydrants is indicated in **Figure 2**.

3.0 WASTEWATER SERVICING

The Region of Durham is responsible for wastewater servicing provided to the residents and businesses within the Region including the City of Pickering. The Region operates and maintains 11 sewage treatment plants, 48 sewage pumping stations and approximately 1,400 km of sanitary sewers.

The subject site drains towards the Bayly Street Sanitary Sewer Pumping Station which is located within the service area of the Duffin Creek Water Pollution Control Plant (WPCP) which is located at 901 McKay Road in Pickering. This plant discharges fully treated water into Lake Ontario. The Duffin Creek WPCP, jointly owned and operated by The Regional Municipalities of York and Durham, is a critical component of the York Durham Sewage System (YDSS). In this regard, the plant treats sewage from the City of Pickering and Town of Ajax as well as sewage from York Region communities as far north as the Towns of Aurora and Newmarket, as far west as the City of Vaughan, and the Towns of Richmond Hill and Markham.

The following is a summary of the wastewater servicing analysis for the subject site.

3.1 Wastewater Loading

The wastewater loading has been calculated using the Region of Durham engineering design standards which include the following parameters:

Domestic Flow: Q = 364 L/person/day

Extraneous Flow: *I* = 0.26 L/s/Ha (Infiltration)

Peaking Factor: $K_H = 1 + \frac{14}{4 + \sqrt{P}}$ (K_H =1.5 min., 3.8 max.)

Where: K_H = Harmon Peaking Factor
P = Population in thousands

Design Flow, Q = Q x K_H + *I*

Design Flow Rate (Commercial): 2.08 L/s/day

Based on the above criteria the sewage flow calculations are provided in **Table C1** contained in **Appendix "C"** and the total flow is summarized in **Table 3**.

Table 3. Wastewater Loading Summary

Land Use	Area (Ha)	Equivalent Population (Persons)	Average Daily Flow (L/s)	Harmon Peaking Factor	Peak Daily Flow (L/s)	Infiltration Rate (L/s)	Total Flow (L/s)
Town Homes	1.0472	63	0,265	3.8	1.01	0.272	1.28

3.2 Sanitary Sewers & Service Connections

It is proposed to service the development with a proposed 200mm diameter sanitary sewer to be constructed within the proposed municipal road allowance. This sanitary sewer will discharge to the existing 200mm diameter sanitary sewer on Woodview Avenue.

Each of the dwelling units are to be serviced with individual 105mm diameter sanitary service connections. The existing sanitary service connection is to be capped and abandoned in accordance with the municipal requirements. The location of the existing and proposed sanitary sewers is illustrated in **Figure 3**.

4.0 STORM DRAINAGE

The subject site is located in the Petticoat Creek watershed which is under the jurisdiction of the Toronto & Region Conservation Authority (TRCA). Petticoat Creek drains an area of approximately 27 square kilometres including lands in Pickering, Markham and Toronto. The watercourse flows from its headwaters southerly 49 kilometres and empties into Lake Ontario at Petticoat Creek Conservation Park. Based on a review of the TRCA on-line regulation mapping, the subject site is partially located in their regulated area. A map illustrating the Petticoat watershed is contained in **Appendix "D"** together with the regulation mapping.

In accordance with City standards, a major / minor system storm conveyance concept has been incorporated into the functional servicing design for the subject development. The following sections provide a brief summary of the storm drainage components:

4.1 Minor System Design

As per the City engineering design criteria, the proposed development is to be serviced with a minor storm sewer system that is designed to convey runoff from the 5 year storm event. This storm sewer will outlet to the existing 600mm diameter storm sewer on Woodview Avenue which drains southerly. The location of the existing and proposed storm sewer is illustrated in **Figure 6**.

4.2 Major System Design

The major system for the site is designed to convey rainfall events up to and including the 100 year storm. In this regard, the proposed municipal road will convey runoff to the low point of the road at the east limit where it will be captured by the total capture catchbasins and directed to the detention tank. In event of a rainfall event in excess of the 100 year storm, the overland flow route will be directed to Woodview Avenue.

4.3 Foundation Drainage

The dwelling units will have conventional basements which will require weeping tile. In order to drain the weeping tile, sump pumps will be required which will pump up to a storm service connection. Direct gravity connections to the site storm sewer are not permitted given that it is subject to surcharging in conjunction with the on-site stormwater management measures.

4.4 Roof Drainage

Roof downspouts are to discharge over splash pads to sodded ground surface areas where possible.

4.5 Flood Plain

The subject site is located within an identified flood plain spill zone based on the Toronto and Region Conservation Authority's (TRCA) current approved floodplain mapping. In this regard the Petticoat Creek located on the north side of Finch Avenue overtops Finch Avenue in a regional storm event. A Floodplain Spill Analysis was prepared by Valdor Engineering Inc. dated October 2021 which assessed the impact of this spill and determined that the subject site is not significantly impacted by the spill and therefore the development criteria regarding construction within the floodplain should not apply other than confirmation that the proposed development is floodproofed regarding the minor encroachment of spill within the property boundary and that safe ingress and egress can be achieved for the Regional storm. The analysis also demonstrated that the site will have safe ingress and egress from Woodview Avenue.

5.0 STORMWATER MANAGEMENT

In accordance with the requirements of the City of Pickering the following stormwater management criteria will be implemented:

- Quantity Control is to be provided such that the post-development peak flows will be controlled to the pre-development rates for rainfall events from 2 year up to and including the 100 year storm.
- Level 1 (Enhanced) stormwater quality treatment is to be provided to achieve 80% TSS removal.

Based on the foregoing, the following is a summary of the stormwater mitigation measures that are to be incorporated into the design of the subject site.

5.1 Quantity Control

Stormwater quantity control is typically implemented to minimize the potential for downstream flooding, stream bank erosion and overflows of infrastructure. The impact of the proposed development has been analyzed as follows:

5.1.1 Pre-Development Flow

Pre-development surfaces consist primarily of the existing dwelling and associated driveway, walkways, and grassed areas, which indicate that the existing site condition is relatively pervious with a composite runoff coefficient of 0.30. The pre-development surface conditions are illustrated in **Figure 4.**

Pre-development peak flow calculations were generated using the City's rainfall IDF data in accordance with the municipal standards. The rainfall intensity values, *I*, are calculated in accordance with the City standards as follows:

$$I_2 = \frac{715.076}{(t + 5.262)^{0.815}}$$

$$I_5 = \frac{1082.901}{(t + 6.007)^{0.837}}$$

$$I_{10} = \frac{1313.979}{(t + 6.026)^{0.845}}$$

$$I_{25} = \frac{1581.718}{(t + 6.007)^{0.848}}$$

$$I_{50} = \frac{1828.009}{(t + 6.193)^{0.856}}$$

$$I_{100} = \frac{2096.425}{(t + 6.485)^{0.863}}$$

The peak flows are calculated using the following formula:

$Q = R \times A \times I \times 2.778$ where: Q = peak flow (L/s)
A = area in hectares (Ha)
I = rainfall intensity (mm/hr)

R = composite runoff coefficient
t = time of concentration (min)

The calculation of the pre-development from 2 year to 100 year peak flows are provided on **Table E2** contained in **Appendix "E"** and summarized in the first row of **Table 4.**

Table 4: Storm Drainage Peak Flows

Condition	Peak Flows (L/s)					
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Pre-Development	66.8	91.6	108.5	142.7	174.3	201.1
Post-Development (Unmitigated)	135.8	186.0	220.6	289.9	354.0	408.4
Post-Development (Mitigated)	50.2	63.0	68.4	78.3	82.7	89.0

5.1.2 Post-Development Flow: Unmitigated

Based on a review of the draft plan, the post-development surface conditions for this site are illustrated in **Figure 5.** The surfaces consist mainly of the paved road, sidewalk, townhomes and landscaped areas. Based on these surfaces, the proposed development is more impervious than the existing site condition and the composite runoff coefficient increases from 0.30 to 0.60.

Based on this post-development runoff coefficient the unmitigated 2 year through 100 year post-development peak flow rates are calculated on **Table E3** and are summarized in the second row of **Table 4**.

5.1.3 Post-Development Flow: Mitigated

Given that the site storm sewer will discharge to the municipal storm sewer, the post development peak flows are to be controlled to the 5 year pre-development rate. Based on the foregoing, on-site stormwater detention measures will be necessary.

The stormwater quantity control was modelled using the modified rational method. This method calculates the storage volume using the composite runoff coefficient and the target rate. Through an iterative assessment of various orifice sizes, underground storage configurations and high water levels, a detention system was developed.

Based on the modelling, the post-development mitigated peak flows are summarized in the third row of **Table 4**. A comparison of the flows in the first and third rows of **Table 4** indicates that the mitigated post-development flows have been reduced to be less than the pre-development rates by using a 200mm orifice. Based on the orifice restriction, the required 100 year storage volume of 153.4 m^3 will be provided in a stormwater detention tank in the form of a concrete box culvert located within the municipal road allowance.

The location of the orifice and box culvert is illustrated in **Figure 6**. The orifice calculation, detention calculation and storage volume summary are presented in **Table E4** to **Table E6** which are all contained in **Appendix "E"** together with a storage and discharge summary presented in **Table E1**.

5.2 Quality Control

Based on the City of Pickering criteria, storm water quality control for the subject site is to be designed to achieve "Enhanced" protection level (Level 1 treatment) which entails 80% total suspended solids (TSS) removal.

Roads and driveways can generate motor vehicle related contaminants such as spills of oil, fuel and lubricants and sediment accumulation. In order to provide stormwater quality control for the subject site, an oil / grit separator is proposed. Separators are generally implemented on relatively small sites and are typically in the form of a pre-cast concrete maintenance hole with a deep sump with a special insert which diverts low flows to a lower chamber to capture and store oil and grit from the storm drainage discharge from the site. The insert diverts high flow away from the lower chamber to ensure that captured pollutants do not scour or re-suspend.

For this project a Stormceptor type oil / grit separator has been sized using the manufacturer's modelling software. Based on the simulations, the selected model EF04 provides a TSS removal rate of 80%. The modelling output as well as details for the unit are included in **Appendix "F"**. The location of the oil / grit separator is illustrated in **Figure 6**.

5.3 Water Balance

The objective of water balance criteria is to capture and manage annual rainfall on-site to preserve the pre-development hydrology. Water balance consists of runoff, infiltration and evapotranspiration. The target of this policy is to retain the 5mm rainfall depth on site.

The runoff volume required to be retained is calculated based on the site area as follows:

$$V = A \times D$$

where: V = runoff volume (m^3)
A = area (m^2)
D = rainfall depth (0.005m)

V = 10,472 m^2 x 0.005m
V = 52.36 m^3

The calculation of the water balance requirement is provided in **Table G1** contained in **Appendix "G"**.

A review of the preliminary site plan indicates that there is an opportunity to incorporate infiltration trenches along the north property line. The infiltration trench will be comprised of a trench lined with filter fabric and filled with clear stone. The voids between the stone will provide the required storage volume for the water that is to be infiltrated.

The size of the infiltration trenches necessary to infiltrate the required volume depends on the percolation rate of the native site soils and the elevation of the groundwater table. A Hydrogeological Investigation prepared by Canada Engineering Services Inc. describes the native soils as silty sand, sandy silt till and sand. As a conservative approach, an infiltration rate of 12 mm/hr was used in the sizing calculation for the infiltration trench. With regards to groundwater, the Hydrogeological Investigation provides the groundwater levels which was compared to the base of the infiltration trench to ensure that there is a minimum 1.0m vertical separation.

The calculations for the sizing of the infiltration trench are provided in **Table G1** which is included in **Appendix "G"** together with excerpts from the Hydrogeological Investigation and a detail in the infiltration trench in **Figure G-1**. The location of the proposed infiltration trench is indicated in **Figure 6**.

6.0 VEHICULAR & PEDESTRIAN ACCESS

The draft plan has been developed with consideration for efficient and safe access and circulation of both vehicular and pedestrian traffic.

6.1 Roads & Driveways

Vehicular access to the subject site will be provided by a road connection to Woodview Avenue which is a two lane urban road under the jurisdiction of the City of Pickering. The proposed municipal road will have a 17.0m wide road allowance with an 8.5m pavement width. This road will terminate in a cul-de-sac at the west limit of the site. A copy of the City standard cross section for the road allowance is included in **Appendix "H"**.

Each of the proposed townhouse units will have a single car driveway and a single car attached garage.

6.2 Sidewalks

Pedestrian access will be provided by a municipal sidewalk to be constructed within the boulevard of the proposed municipal road allowance to safely guide residents through the subdivision to the existing municipal sidewalk on Woodview Avenue. A copy of the City standard sidewalk detail is included in **Appendix "H"**.

7.0 GRADING

Based on a topographic survey of the site completed on September 22, 2021, the property slopes from the northwest corner at an elevation of approximately 135.0m, down to the southeast corner of the site, at an elevation of approximately 132.7m. This fall of approximately 2.3m equates to an overall average slope of approximately 1.6% which is considered to be relatively flat. A copy of the topographic survey prepared by Omari Mwinyi Surveying Services Ltd. is included in **Appendix "I"**.

As is typical with all development projects, earthmoving is required, to varying degrees, in order to achieve the municipal design criteria and accommodate the development form.

The subject site is to be graded in accordance with the municipal grading criterion which dictates that road grades are to range from 0.5% to 5.0% and that sodded yard areas are to range from 2.0% to 5.0%. For large grade differentials, a maximum slope 3H : 1V can be used for sodded embankments. In areas where space is limited, retaining walls can be utilized to accommodate grade differentials, however, their use should be minimized.

The grading design is to consider the following factors:

- Achieve the municipality's lot grading criteria.
- Meet the municipality's vertical road design parameters.
- Minimize the requirement for retaining walls.
- Match existing grades along the adjacent properties and road allowances.
- Minimize grade change in the area of trees that are to be preserved.
- Grading within the existing road allowances is to create an urban boulevard having slopes in the range of 2 to 4%.
- Provide an overland flow route to direct drainage to a safe outlet.
- Provide sufficient cover over the storm sewer and sanitary sewer.
- Set basements a minimum of 0.50m above the groundwater table.

A preliminary grading design has been prepared which indicates the proposed road grades, the general lot grading and the proposed finished first floor and basement floor elevations. Based on the established perimeter grades and road grades, it is anticipated that the lot grading will be in the form of standard split drainage. Based on the ground water table elevations which are noted on the grading design, it is anticipated that the dwellings will be slightly raised to ensure that the basement floors are above the water table.

Given that the subject site is relatively flat, no major difficulties are anticipated in achieving the municipal grading design criteria. A copy of the **Functional Grading Plan** (Dwg FGP-1) is appended to the end of the report. A detailed grading plan is to be prepared at the detailed subdivision engineering stage.

8.0 EROSION & SEDIMENT CONTROL DURING CONSTRUCTION

Construction activity, especially operations involving the handling of earthen material, dramatically increases the availability of particulate matter for erosion and transport by surface drainage. In order to mitigate the adverse environmental impacts caused by the release of silt-laden stormwater runoff into receiving watercourses, measures for erosion and sediment control (ESC) are required for construction sites.

The impact of construction on the environment is recognized by the Greater Golden Horseshoe Area Conservation Authorities. In December 2006 they released their document titled "Erosion & Sediment Control Guidelines for Urban Construction". This document provides guidance for the preparation of effective erosion and sediment control plans.

Control measures must be selected that are appropriate for the erosion potential of the site and it is important that they be implemented and modified on a staged basis to reflect the site activities. Furthermore, their effectiveness decreases with sediment loading and therefore inspection and maintenance is required. The selection, implementation, inspection and maintenance of the control features are summarized as follows:

8.1 Control Measures

On moderately sized sites, measures for erosion and sediment control typically include the use of silt fencing, a mud mat and sediment traps. The following is a description of the sediment controls to be implemented on the subject site:

- **Silt Fences** are to be installed adjacent to all property limits subject to drainage from the development area prior to topsoil stripping and in other locations, such as at the bases of topsoil stockpiles.
- **Mud Mat** is to be installed at the construction entrance prior to commencing earthworks to minimize the tracking of mud onto municipal roads.
- **Sediment Traps** are to be installed at all catchbasin and area drain locations once the storm sewer system has been constructed to prevent silt laden runoff from entering the municipal storm sewer system.

8.2 Construction Sequencing

The following is the scheduling of construction activities with respect to sediment controls:

1. Installation of all silt fences prior to any other activities on the site.
2. Construct temporary mud mat for construction access.
3. Strip topsoil and dispose off site.
4. Rough grade the site for the lots and road and dispose of surplus material off site.
5. Install the underground servicing and construct the private lane.
6. Construct the dwelling units.
7. Restore all disturbed areas with final landscape and paving materials.
8. Upon stabilization of all disturbed areas, remove sediment controls.

8.3 ESC Inspection & Maintenance

In order to ensure that the erosion and sediment control measures operate effectively, they are to be regularly monitored and they will require periodic cleaning (e.g., removal of accumulated silt), maintenance and/or re-construction.

Inspections of all of the erosion and sediment controls on the construction site should be undertaken with the following frequency:

- On a weekly basis
- After every rainfall event
- After significant snow melt events
- Prior to forecasted rainfall events

If damaged control measures are found they should be repaired and/or replaced within 48 hours. Site inspection staff and construction managers should refer to the Erosion and Sediment Control Inspection Guide (2008) prepared by the Greater Golden Horseshoe Area Conservation Authorities. This Inspection Guide provides information related to the inspection reporting, problem response and proper installation techniques.

9.0 SUMMARY

Based on the discussions contained herein, the proposed mixed-use development can be adequately serviced with full municipal services (watermain, sanitary and storm) in accordance with the standards of the City of Pickering and the Region of Durham as follows:

Water

- The site will be serviced by a proposed 200mm diameter watermain which will extend along the proposed municipal road and connect to the existing 200mm diameter watermain on Woodview Avenue.
- Each townhouse unit will be provided with a 25mm diameter water service connection with a water meter in the basement.
- Fire protection will be provided by fire hydrants which will be located along the proposed road allowance.
- The subject development will require a maximum day plus fire flow of 133.9 L/s at 140 kPa.

Waste Water

- The proposed subdivision will be serviced by a 200mm diameter sanitary sewer along the proposed municipal road. This proposed sewer will discharge to the existing 200mm diameter sanitary sewer on Woodview Avenue. Each townhouse unit will be serviced with a 100mm diameter connection.
- The subject development will generate a total wastewater flow of 1.28 L/s.

Storm Drainage

- In accordance with City of Pickering criteria, the subject site will be serviced by a minor system discharging to the municipal storm sewer. This storm sewer will outlet to the existing 600mm diameter storm sewer on Woodview Avenue which drains southerly.
- The major system will be comprised of an overland flow route which will convey runoff from rainfall events in excess of the capacity of the municipal storm sewer to a safe outlet.

Stormwater Management

- Based on the City of Pickering requirements the following stormwater management measures are to be implemented:
    - Peak flows will be restricted through the use of a 200mm diameter orifice with the provision of 153.4 m^3 of underground detention of stormwater for the 100 year storm event. The storage volume will be provided within a box culvert in order that discharge can be controlled to the 5 year pre-development rate.
    - Quality control will be provided by an oil / grit separator which has been sized to provide “Enhanced” protection (Level 1 treatment) quality control. In this regard, the Stormceptor Model EF04 has been selected which will provide a Total Suspended Solids (TSS) removal rate of 80%.
    - The site will retain the 5mm rainfall depth by providing at least 52.36 m^3 of required retention volume by implementing an infiltration trench in the rear yard of the townhouse units.

Vehicular & Pedestrian Access

- Vehicular access to the subject site will be provided by a road connection to Woodview Avenue which is under the jurisdiction of the City of Pickering. The proposed municipal road will have a 17.0m wide road allowance with an 8.5m pavement width. This road will terminate in a cul-de-sac at the west limit of the site.
- Pedestrian access will be provided by a municipal sidewalk to be constructed within the boulevard of the proposed municipal road allowance to safely guide residents through the subdivision to the existing municipal sidewalk on Woodview Avenue.

Grading

- The subject site is relatively flat and based on the Functional Grading Plan, no major difficulty is anticipated in achieving the municipal grading design criteria.

Erosion & Sediment Control During Construction

- Erosion and sediment controls are to be implemented during construction to prevent silt laden runoff from leaving the site in accordance with the “Erosion & Sediment Control Guidelines for Urban Construction” (December 2006).

10.0 REFERENCES & BIBLIOGRAPHY

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- Valdor Engineering Inc., **2D Floodplain Spill Analysis**, October 2021

Respectfully Submitted,

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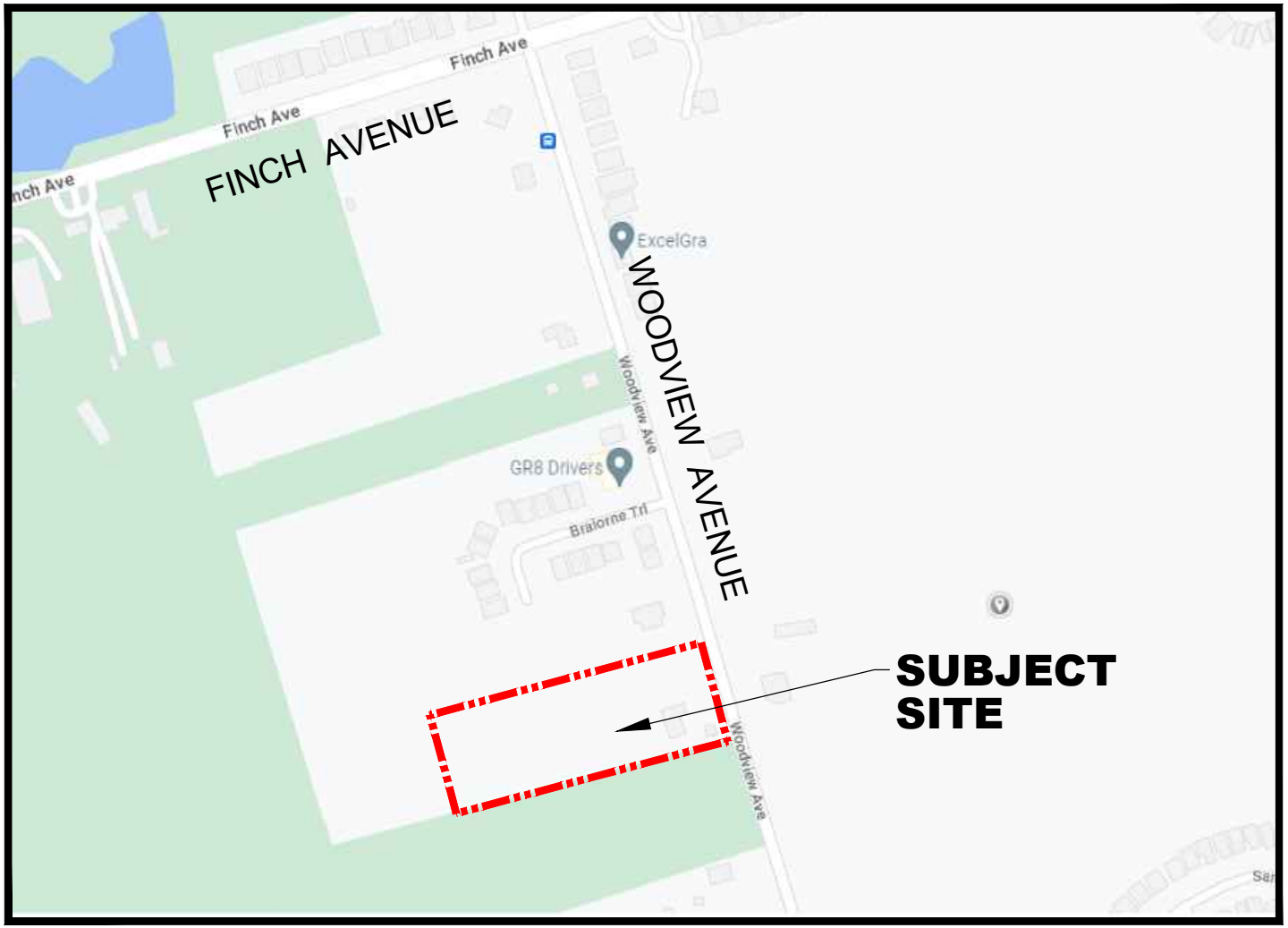

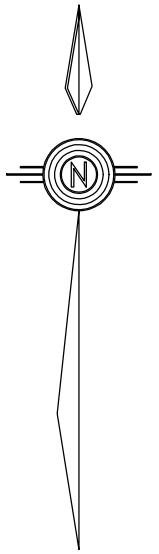

LEGEND

PROPERTY BOUNDARY

PROPOSED SUBDIVISION

1942 Woodview Avenue City of Pickering, Ontario

PROPOSED SITE LOCATION

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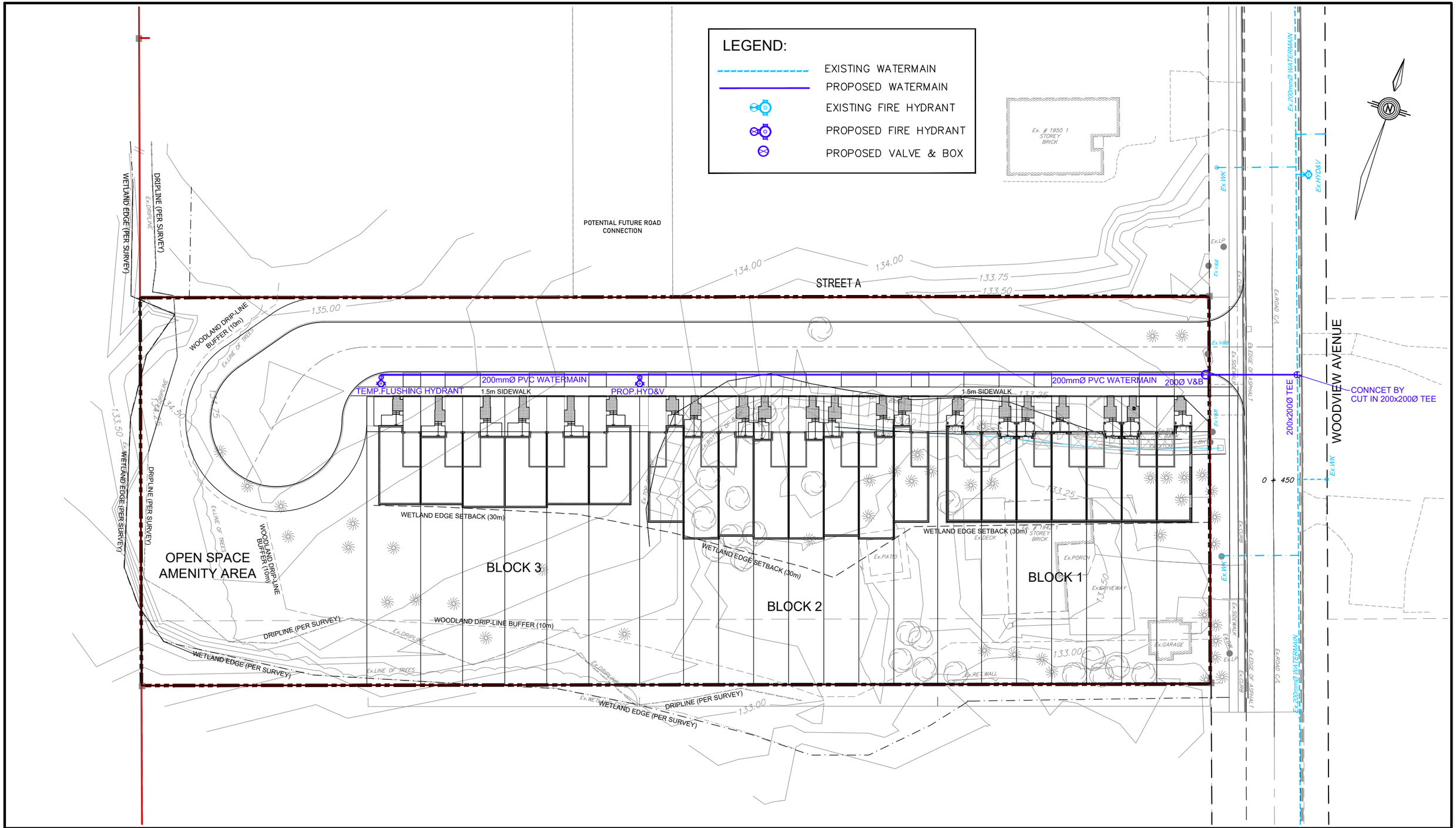
SCALE	N.T.S.	CKD. BY	D.A.G.	DWG.	FIGURE 1
DATE	MAR. 07, 2023	DRAWN BY	D.N.Z.	PROJECT	21150



PROPOSED SUBDIVISION
1942 Woodview Avenue City of Pickering

WATER SERVICING

DRAWN BY: D.N.Z.			
CKD. BY: D.A.G.			
DATE: MAR. 07, 2023	SCALE: 1:600	PROJECT: 21150	DWG.: FIG-2

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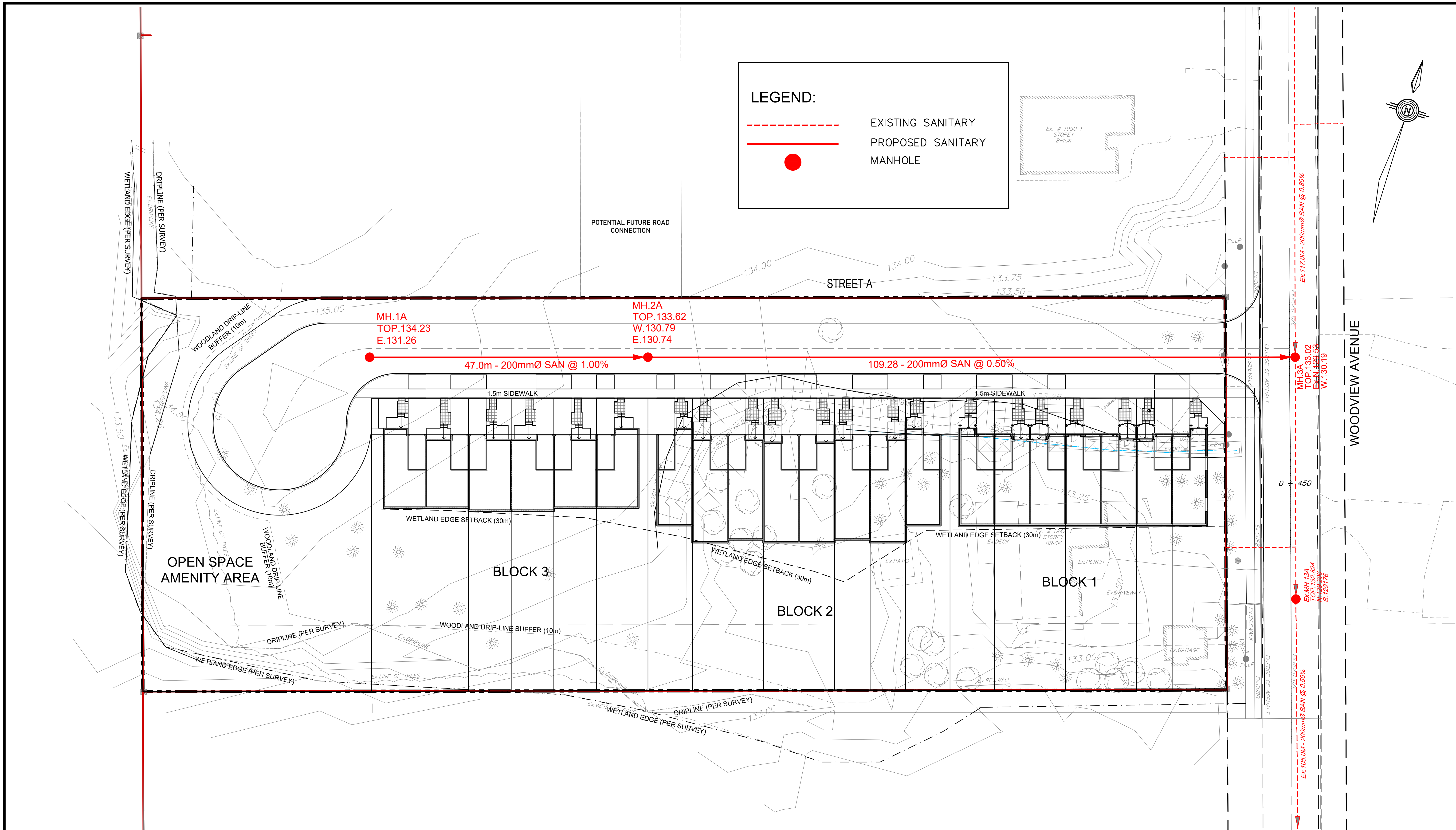
E-MAIL: info@valdor-engineering.com
www.valdor-engineering.com



PROPOSED SUBDIVISION
1942 Woodview Avenue City of Pickering

SANITARY SERVICING

DRAWN BY: D.N.Z.				
CKD. BY: D.A.G.				
DATE: MAR. 07, 2023	SCALE: 1:600	PROJECT: 21150	DWG.: FIG-3	

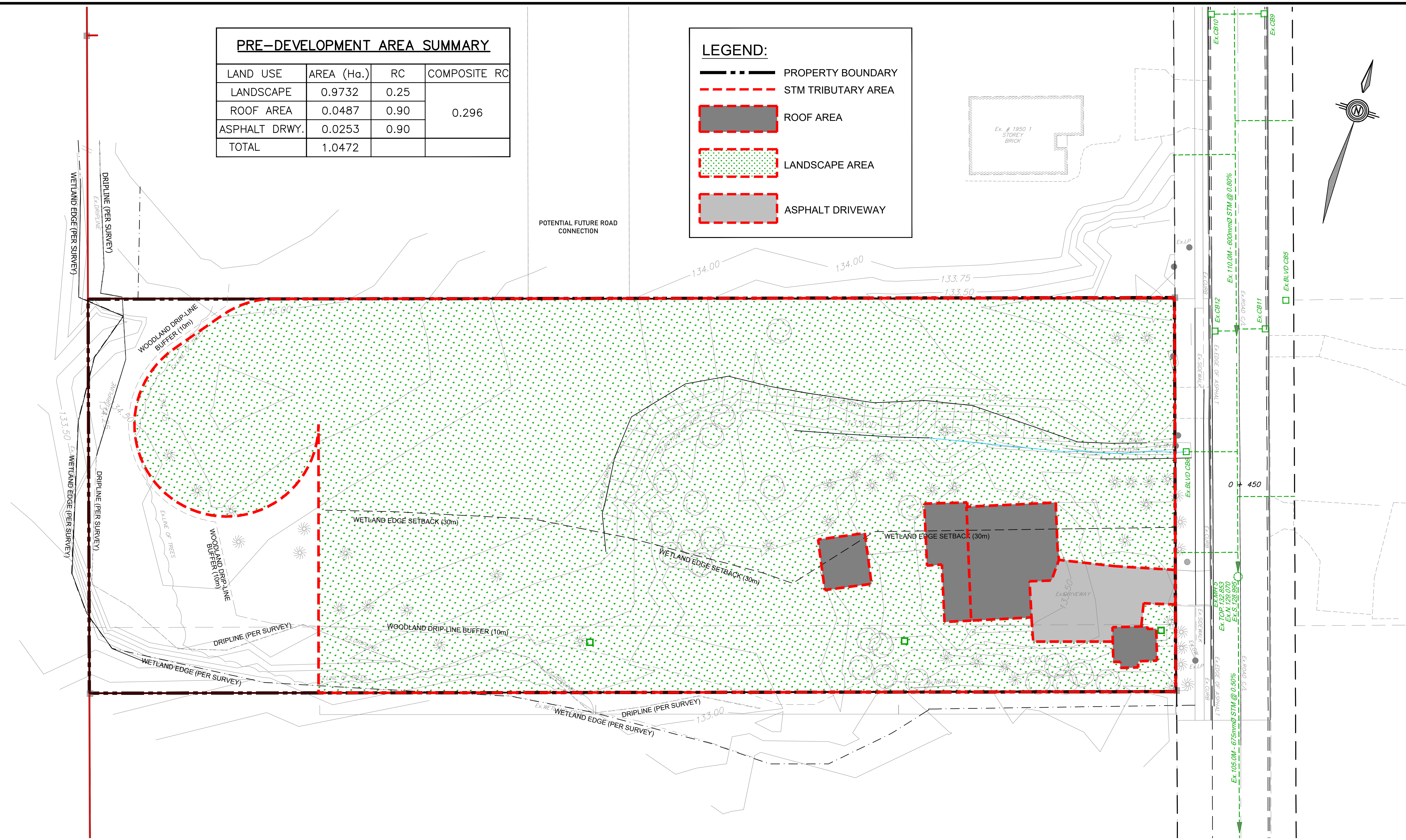
VALDOR ENGINEERING INC.
Consulting Engineers - Project Managers
571 Chrislea Road, Unit 4, 2nd Floor, Woodbridge, Ontario, L4L 8A2
TEL (905)264-0054, FAX (905)264-0069
E-MAIL: info@valdor-engineering.com
www.valdor-engineering.com

PRE–DEVELOPMENT AREA SUMMARY

LAND USE	AREA (Ha.)	RC	COMPOSITE RC
LANDSCAPE	0.9732	0.25	0.296
ROOF AREA	0.0487	0.90	
ASPHALT DRWY.	0.0253	0.90	
TOTAL	1.0472		

LEGEND:

- PROPERTY BOUNDARY
- STM TRIBUTARY AREA
- ROOF AREA
- LANDSCAPE AREA
- ASPHALT DRIVEWAY



PROPOSED SUBDIVISION
1942 Woodview Avenue City of Pickering

PRE - DEVELOPMENT STORM DRAINAGE CONDITION

DRAWN BY:	D.N.Z.
CKD. BY:	D.A.G.
DATE:	MAR. 07, 2023
SCALE:	1:600
PROJECT:	21150
DWG.:	FIG-4

VALDOR ENGINEERING INC.
Consulting Engineers - Project Managers
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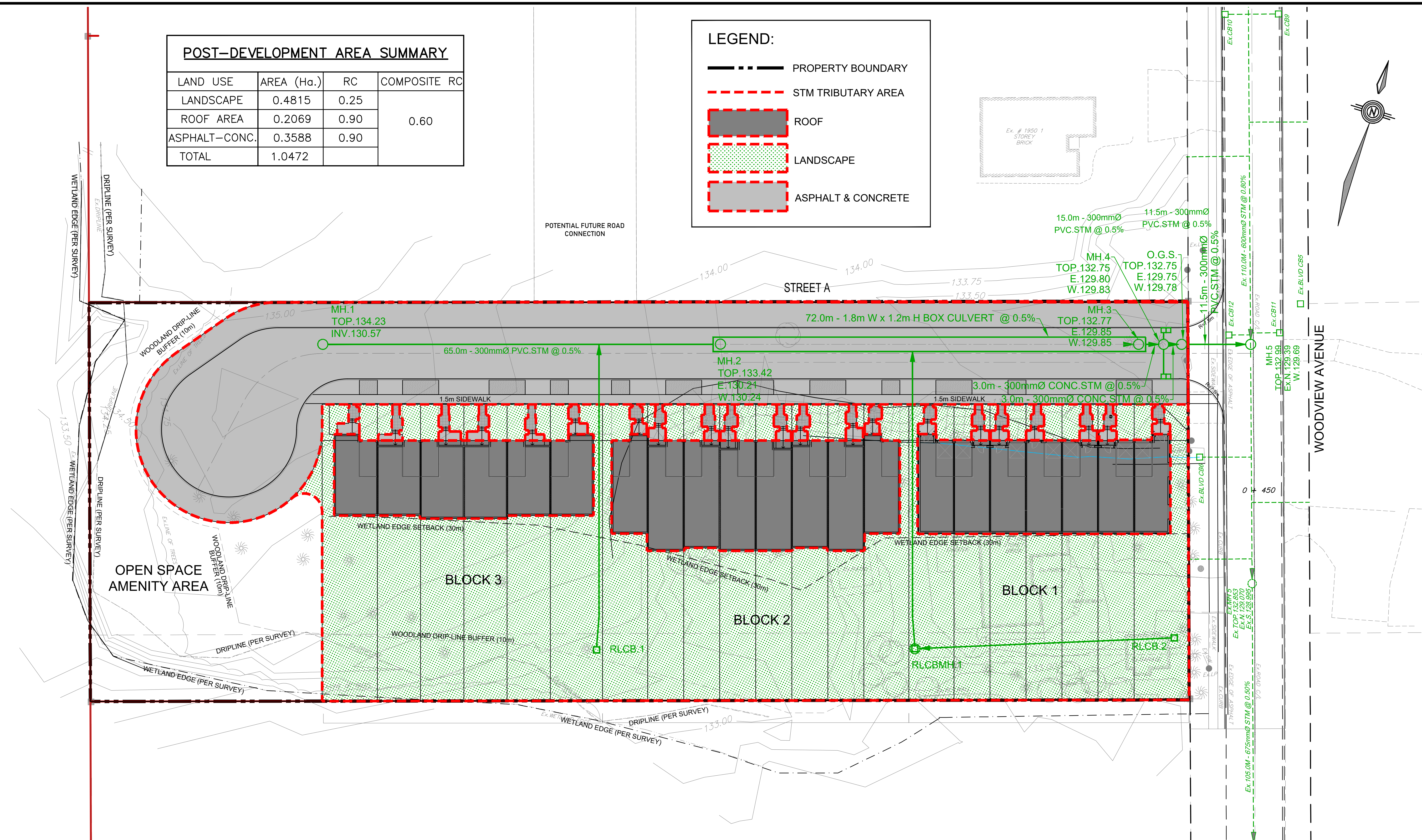
E-MAIL: info@valdor-engineering.com
www.valdor-engineering.com

POST-DEVELOPMENT AREA SUMMARY			
LAND USE	AREA (Ha.)	RC	COMPOSITE RC
LANDSCAPE	0.4815	0.25	0.60
ROOF AREA	0.2069	0.90	
ASPHALT-CONC.	0.3588	0.90	
TOTAL	1.0472		

LEGEND:

- PROPERTY BOUNDARY
- STM TRIBUTARY AREA
- ROOF
- LANDSCAPE
- ASPHALT & CONCRETE



PROPOSED SUBDIVISION
1942 Woodview Avenue City of Pickering

POST - DEVELOPMENT STORM DRAINAGE CONDITION

DRAWN BY:	D.N.Z.
CKD. BY:	D.A.G.
DATE:	MAR. 07, 2023
SCALE:	1:600
PROJECT:	21150
DWG.:	FIG-5

VALDOR ENGINEERING INC.
Consulting Engineers - Project Managers
571 Chrislea Road, Unit 4, 2nd Floor, Woodbridge, Ontario, L4L 8A2
TEL (905)264-0054, FAX (905)264-0069
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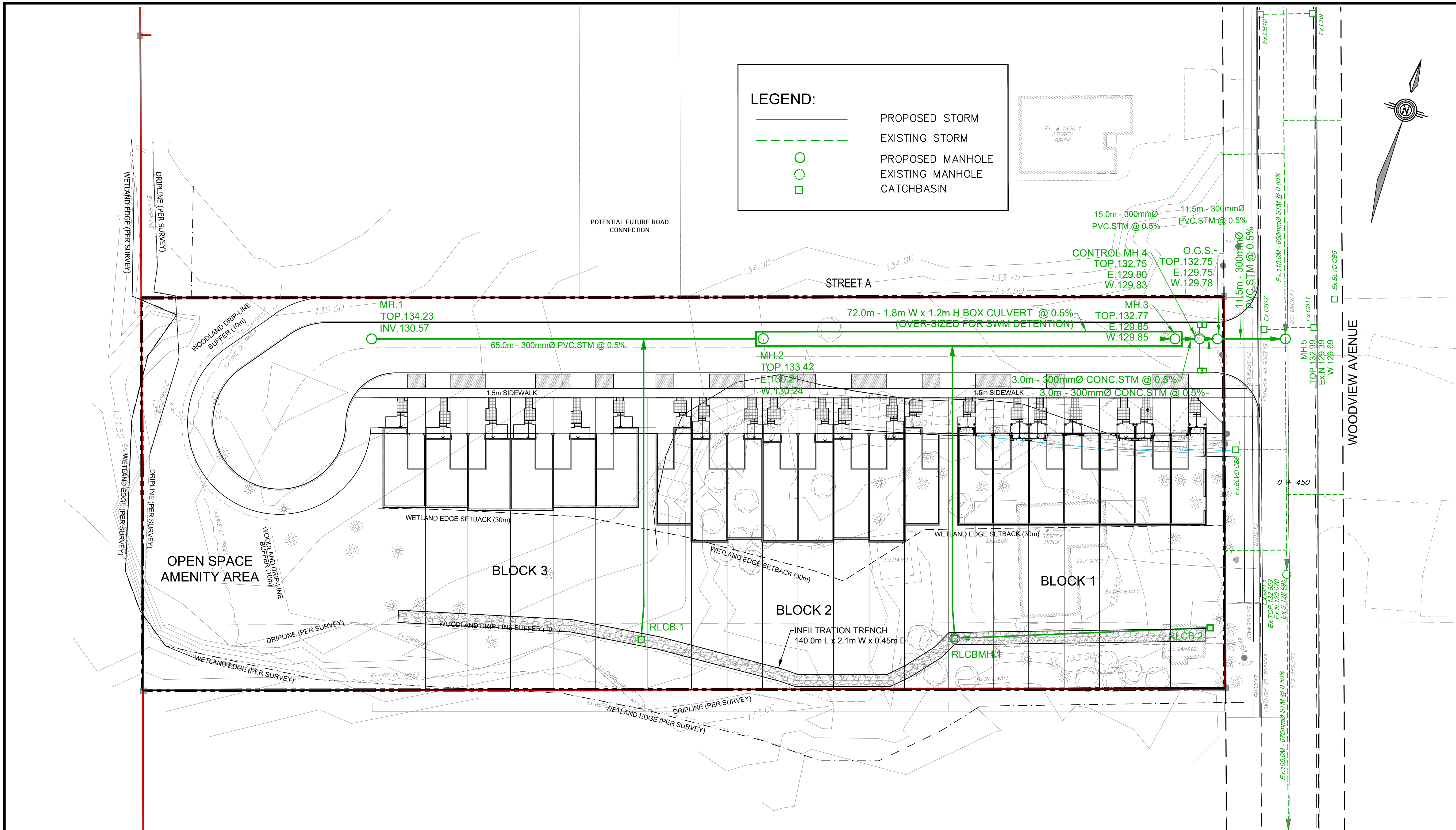
www.valdor-engineering.com



LEGEND:
PROPOSED STORM
EXISTING STORM
PROPOSED MANHOLE
EXISTING MANHOLE
CATCHBASIN
POTENTIAL FUTURE ROAD CONNECTION
STREET A
WOODVIEW AVENUE
MH.1
TOP.134.23
INV.130.57
65.0m - 300mmØ PVC.STM @ 0.5%
MH.2
TOP.133.42
E.130.21
W.130.24
72.0m - 1.8m W x 1.2m H BOX CULVERT @ 0.5%
(OVER-SIZED FOR SWM DETENTION)
MH.3
TOP.132.77
E.129.85
W.129.85
CONTROL MH.4
TOP.132.75
E.129.80
W.129.83
O.G.S.
TOP.132.75
E.129.75
W.129.78
15.0m - 300mmØ
PVC.STM @ 0.5%
11.5m - 300mmØ
PVC.STM @ 0.5%
11.5m - 300mmØ
PVC.STM @ 0.5%
3.0m - 300mmØ CONC.STM @ 0.5%
3.0m - 300mmØ CONC.STM @ 0.5%
MH.5
TOP.132.99
Ex.N.129.39
W.129.69
1.5m SIDEWALK
1.5m SIDEWALK
BLOCK 1
BLOCK 2
BLOCK 3
OPEN SPACE
AMENITY AREA
WETLAND EDGE SETBACK (30m)
WOODLAND DRIP-LINE BUFFER (10m)
INFILTRATION TRENCH
140.0m L x 2.1m W x 0.45m D
RLCB.1
RLCB.2
RLCBMH.1
WETLAND EDGE (PER SURVEY)
DRIPLINE (PER SURVEY)

PROPOSED SUBDIVISION
1942 Woodview Avenue City of Pickering

STORM SERVICING

DRAWN BY: D.N.Z.	CKD. BY: D.A.G.	DATE: MAR. 07, 2023	SCALE: 1:600
PROJECT: 21150	DWG.: FIG-6		

VALDOR ENGINEERING INC.
Consulting Engineers - Project Managers
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APPENDIX "A"

Draft Plan & Equivalent Population Calculations

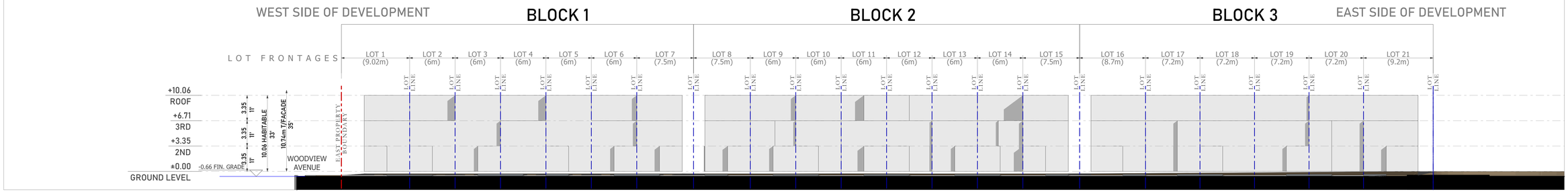
VALDOR ENGINEERING INC.
571 Chrislea Road, Unit 4, 2nd Floor, Vaughan, ON L4L 8A2
Tel: 905-264-0054 Fax: 905-264-0069 info@valdor-engineering.com
www.valdor-engineering.com

TABLE: A1

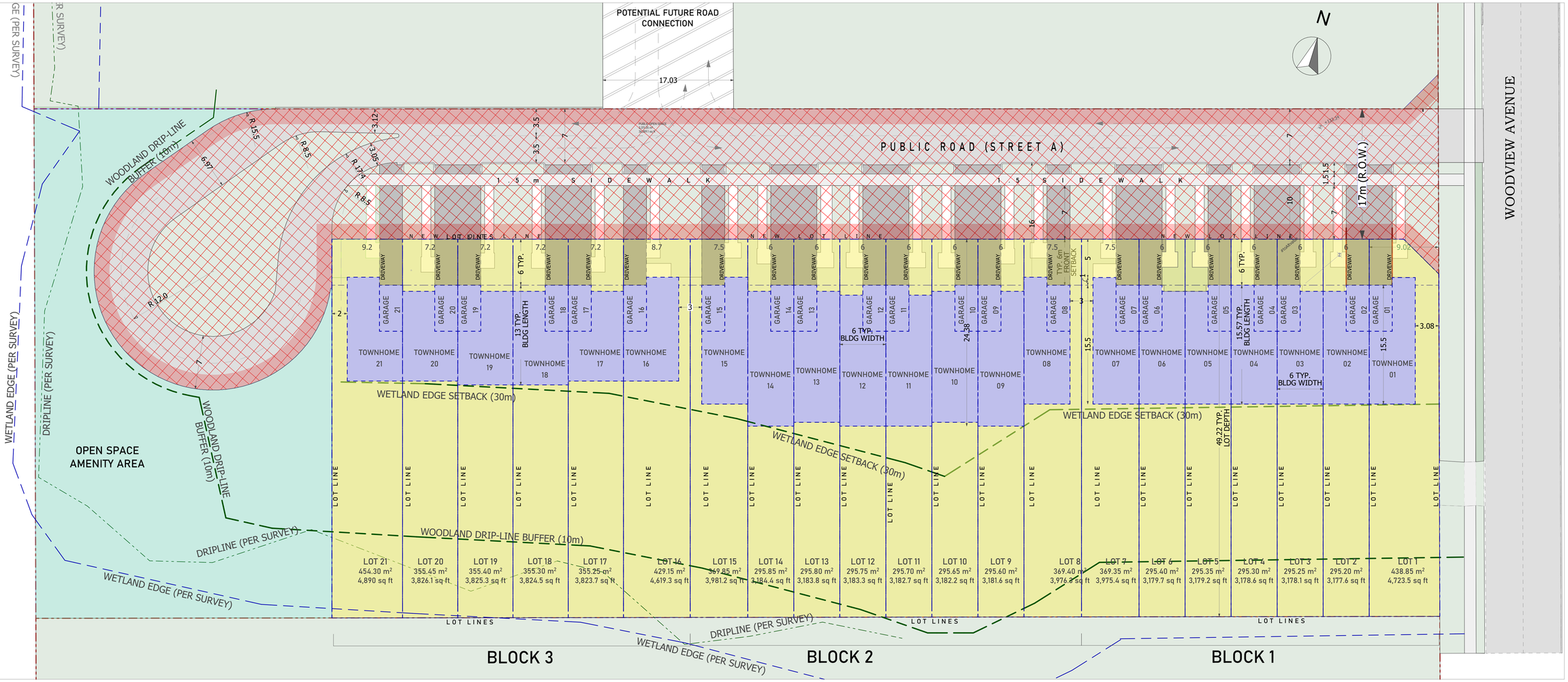
EQUIVALENT POPULATION

Project Name: **1942 Woodbiew Avenue, Pickering**
File: 21150
Date: March 2023

Unit Type	Population Density	Residential Units	Commercial Floor Area (sq.m)	Equivalent Population
1 Bedroom	1.5 persons per unit			0
1 Bedroom + Den	2.5 persons per unit			0
2 Bedroom	2.5 persons per unit			0
2 Bedroom + Den	3.5 persons per unit			0
Townhome	3.0 persons per unit	21		63
Commercial	86 persons/ha			0
Total:		**21**	**0**	**63**



NORTH ELEVATION



P S A
312 - 3701 Chesswood Drive
Toronto, Ontario, M3J 2P6
T: (416) 849-0991 F: (416) 849-0992
psarchitect.ca
info@psarchitect.ca
PS ARCHITECT

PROPOSED SITE LAND USE PLAN

1942 WOODVIEW AVE RESIDENTIAL

PROJ. ID: 21012

1942 WOODVIEW AVE RESIDENTIAL

1942 WOODVIEW AVE PICKERING ONTARIO CANADA

SCALE: 1:250

PLANNING VERSION: Ai

2022-10-03

APPENDIX "B"

Water System Calculations & Details

VALDOR

VALDOR ENGINEERING INC.
571 Chrislea Road, Unit 4, 2nd Floor, Vaughan, ON L4L 8A2
Tel: 905-264-0054 Fax: 905-264-0069 info@valdor-engineering.com
www.valdor-engineering.com

TABLE: B1

WATER DEMAND CALCULATION

Project Name: **1942 Woodview Avenue, Pickering**
File: 21150
Date: March 2023

Critera:

	Eqv. Population	Base Demand		Peaking Factors	
Residential	63	364	L/capita/day	Max Day	2.00
				Peak Hour	3.00

Demand:

	Average Day (L/day)	Average Day (L/min)	Max Day (L/min)	Peak Hour (L/min)	
Residential	22,932	15.9	31.9	47.8	

VALDOR ENGINEERING INC.
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TABLE: B2

CALCULATION OF REQUIRED FIRE FLOW

In accordance to Water Supply for Public Fire Protection, Fire Underwriters Survey 1999

Project Name: **1942 Woodview Avenue**
File: 21150
Date: March 2023

Notes: **TOWNHOME DWELLINGS**
Assume:
-4 consecutive units maximum
-6, 7 or 8 Unit Townhouse block with fire resistant separation
2000 sq.ft. Units

Type of Construction - Ordinary Construction

C = 1.0

Total Floor Area:	743	sq.m
A =	743	sq.m

(Total Floor Area includes all storeys, but excludes basements at least 50 percent below grade)

$F = 220\ C\ \sqrt{A}$

F = 5,997 L/min

F = 6,000 (to nearest 1,000 Lmin)

Occupancy Factor

		Charge
Type:	Non-Combustible	-25%
	f_1 =	-25%

$F' = F \times (1+f_1)$

F' = 4,500 L/min

Sprinkler Credit

		Charge
NFPA 13 Sprinkler Standard:	NO	0%
Standard Water Supply:	NO	0%
Fully Supervised System:	NO	0%
Total Charge to Fire Flow:	f_2 =	0%

Exposure Factor

		Charge
Side 1 - Distance to Building (m):	0 to 3m	25%
Side 2 - Distance to Building (m):	0 to 3m	25%
Side 3 - Distance to Building (m):	3.1 to 10m	20%
Side 4 - Distance to Building (m):	3.1 to 10m	20%
	f_3 =	75% (maximum of 75%)

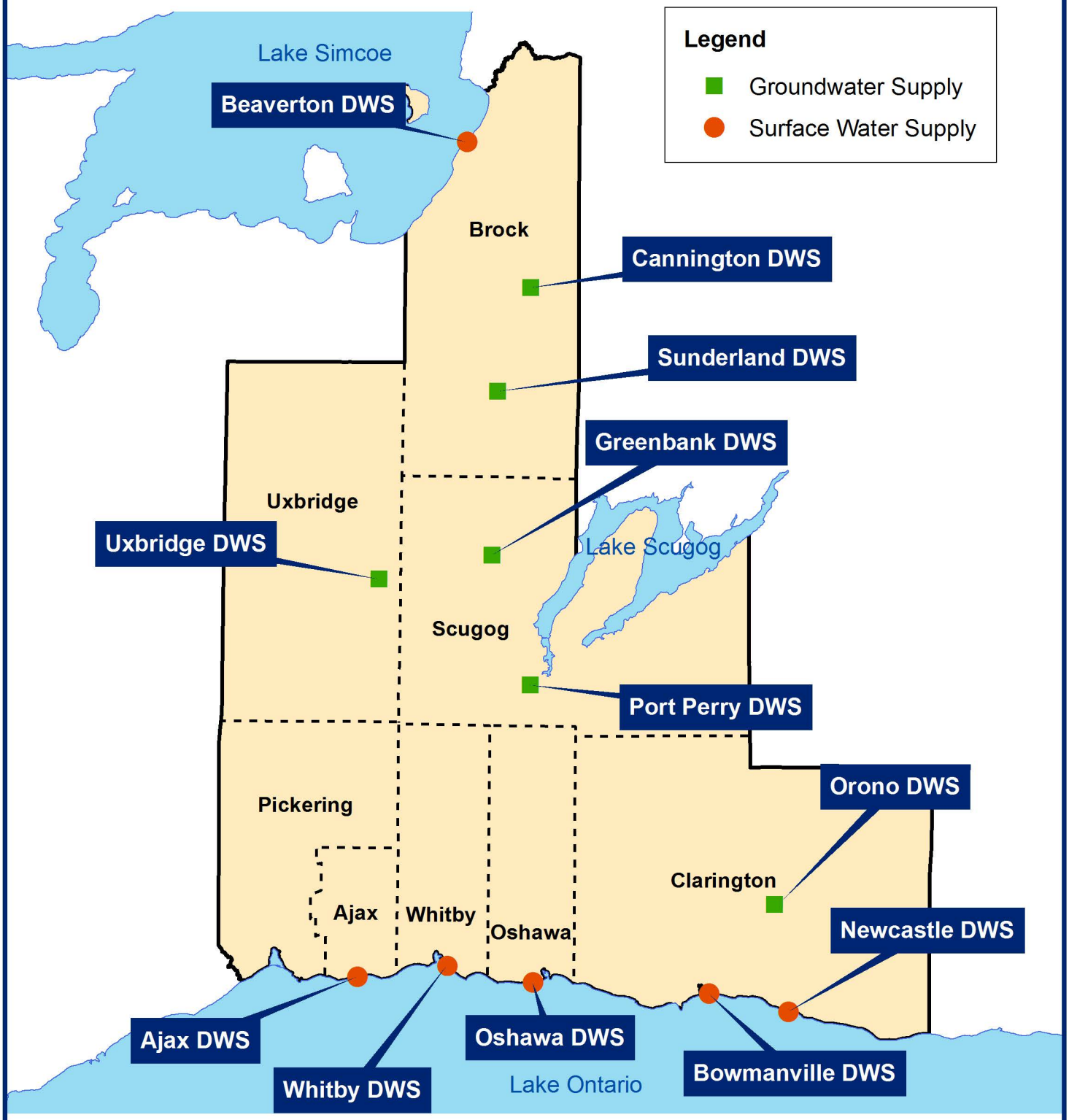
$F'' = F' + F' \times f_2 + F' \times f_3$

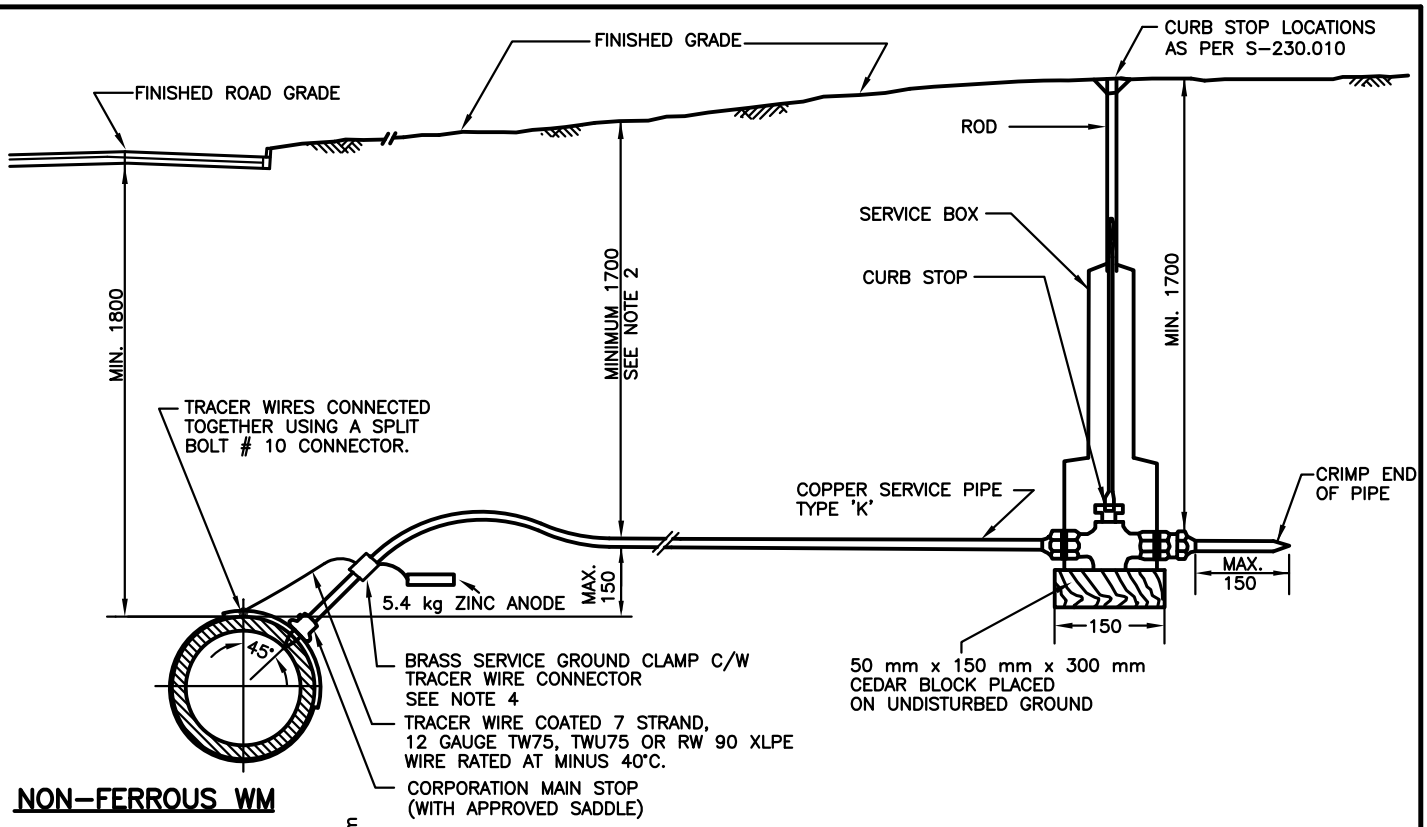
F'' = 7,875 L/min

REQUIRED FIRE FLOW

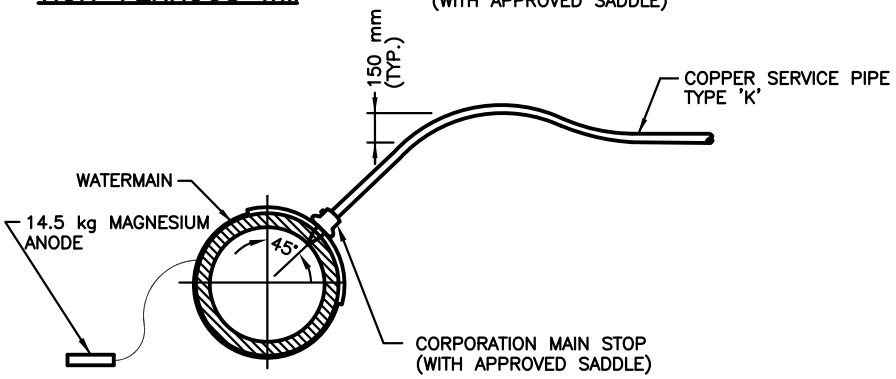
F'' = **8,000** **L/min** (to nearest 1,000 L/min)

Regional Municipality of Durham
Works Department
Municipal Drinking Water Supply System
(DWS)

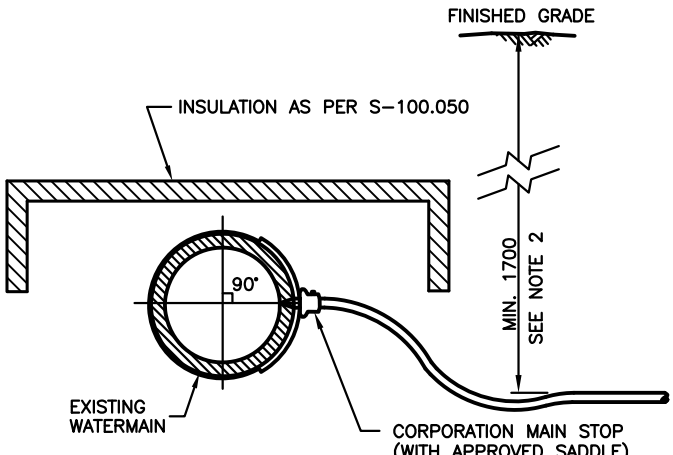




NON-FERROUS WM



FERROUS WM



LOWERING WATER SERVICES

NOTES

1. THE WATER CONNECTION SHALL BE LAID FROM THE MAIN TO 150 mm BEYOND THE PROPERTY LINE, IN NEW SUBDIVISIONS ONLY.
2. HORIZONTAL GOOSE NECK SHALL BE USED WHEN COVER LESS THAN 1700 mm.
3. WATERMAIN SHALL BE TAPPED UNDER PRESSURE.
4. SERVICE GROUND CLAMPS AND SPLIT BOLT SHALL BE WRAPPED WITH ELECTRICAL PUTTY.
5. ANODE SHALL BE PLACED AT LEAST 1.0 m AWAY FROM THE SERVICE AND AS DEEP AS THE BOTTOM OF THE SERVICE.
6. ANODE SHALL BE LOCATED BETWEEN THE MAIN STOP AND CURB STOP.
7. PLUMBING CONTRACTOR TO REMOVE TAIL PIECE AND HOOK UP TO CURB STOP.
8. CATHODIC PROTECTION, BONDING CABLE AND TRACER WIRE SHALL BE AS PER S-201.030, S-201.031.
9. MINIMUM SEPARATION DISTANCE BETWEEN TAPPED COUPLINGS SHALL BE 1.0 m.
10. COUPLINGS SHALL NOT BE PERMITTED BETWEEN THE MAIN STOP AND THE CURB STOP WITHOUT PERMISSION OF THE REGION OF DURHAM,

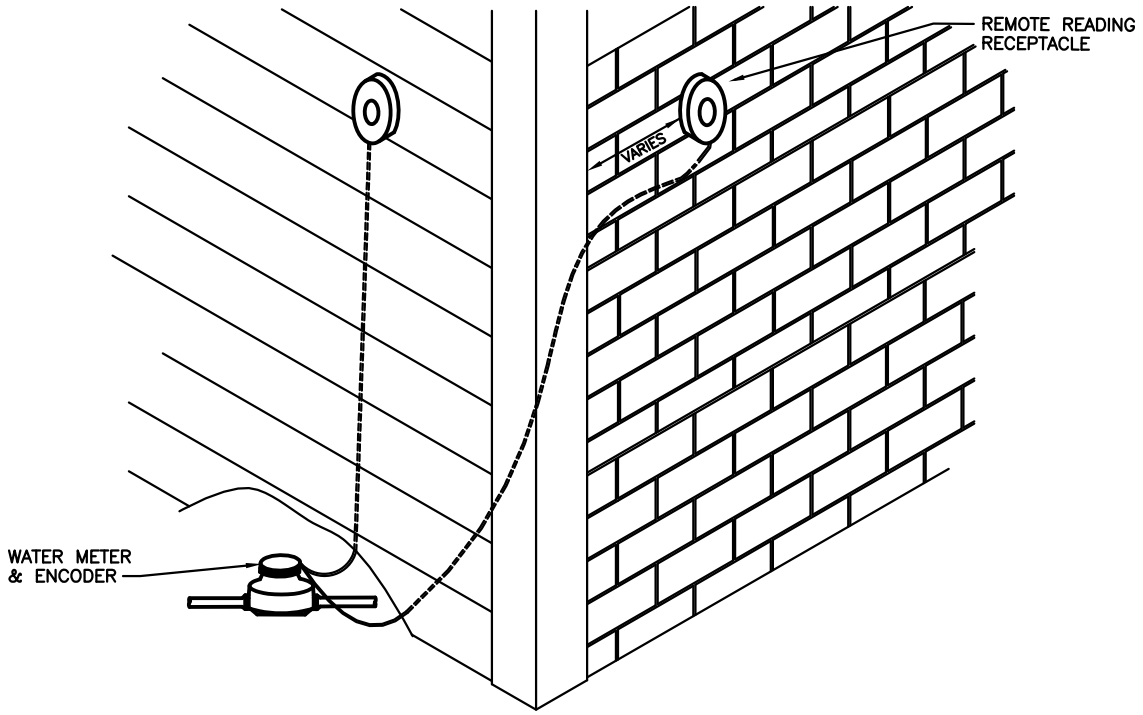
ALL DIMENSIONS IN MILLIMETRES EXCEPT WHERE NOTED.

DURHAM REGION
WORKS DEPARTMENT

19 mm AND 25 mm COPPER WATER SERVICE

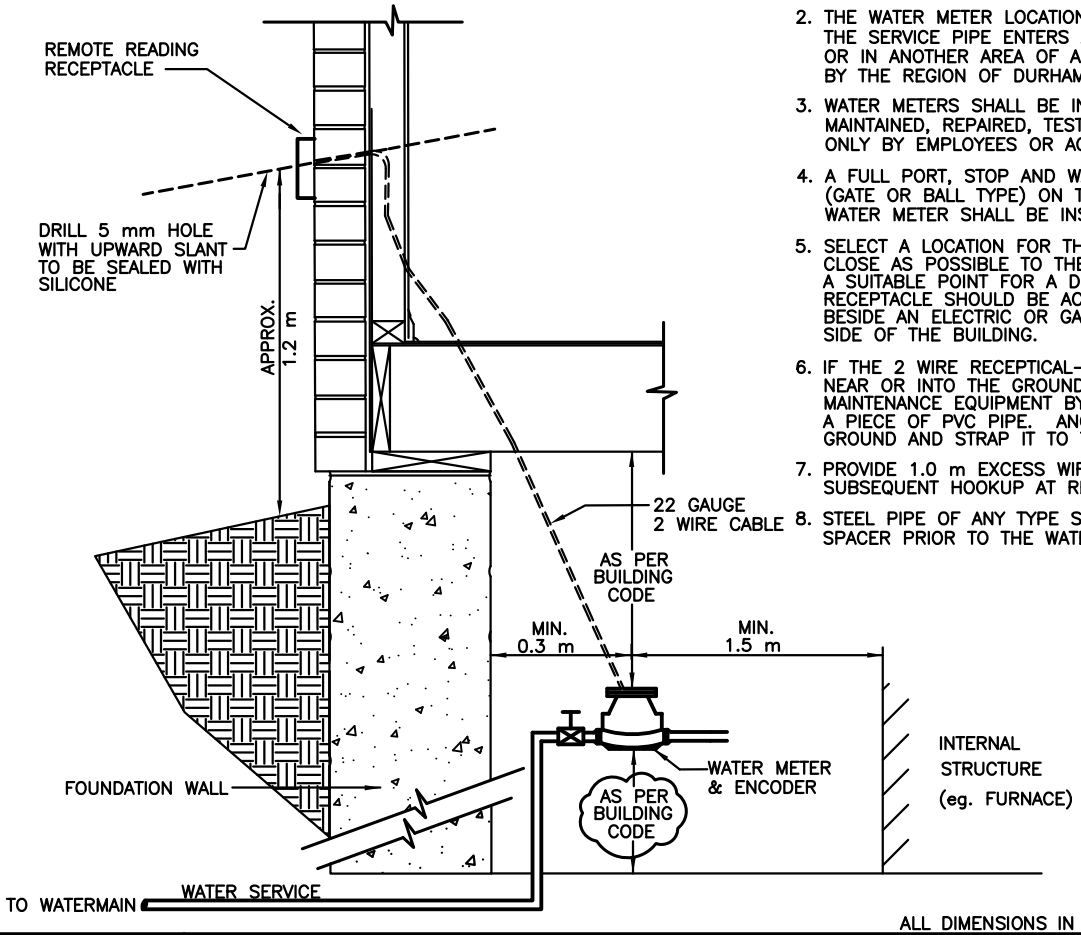
DWG. DATE:	1981 04
REVISION NO.:	19
REV. DATE:	2014 04
SCALE:	N.T.S.

S-230.020



NOTES

1. THE WATER METER SHALL BE READILY ACCESSIBLE.
2. THE WATER METER LOCATION SHALL BE LOCATED WHERE THE SERVICE PIPE ENTERS A BUILDING'S FULL BASEMENT OR IN ANOTHER AREA OF A BUILDING OR LOCATION APPROVED BY THE REGION OF DURHAM.
3. WATER METERS SHALL BE INSTALLED, SEALED, REPLACED MAINTAINED, REPAIRED, TESTED, INSPECTED AND REMOVED ONLY BY EMPLOYEES OR AGENTS OF THE REGION OF DURHAM.
4. A FULL PORT, STOP AND WASTE CORPORATION VALVE (GATE OR BALL TYPE) ON THE INLET SIDE OF A WATER METER SHALL BE INSTALLED.
5. SELECT A LOCATION FOR THE RECEPTACLE WHICH IS AS CLOSE AS POSSIBLE TO THE METER AND WHICH PROVIDES A SUITABLE POINT FOR A DRILLED HOLE. LOCATION OF RECEPTACLE SHOULD BE ACCESSIBLE, PREFERABLY BESIDE AN ELECTRIC OR GAS METER ON THE DRIVEWAY SIDE OF THE BUILDING.
6. IF THE 2 WIRE RECEPTICAL–TO–ENCODER CABLE RUNS NEAR OR INTO THE GROUND, PROTECT IT FROM LAWN MAINTENANCE EQUIPMENT BY PLACING THE WIRE INSIDE A PIECE OF PVC PIPE. ANCHOR THE PIPE INTO THE GROUND AND STRAP IT TO THE MOUNTING SURFACE.
7. PROVIDE 1.0 m EXCESS WIRE AT EACH END FOR SUBSEQUENT HOOKUP AT RECEPTACLE AND AT METER.
8. STEEL PIPE OF ANY TYPE SHALL NOT BE USED AS A SPACER PRIOR TO THE WATER METER BEING INSTALLED.



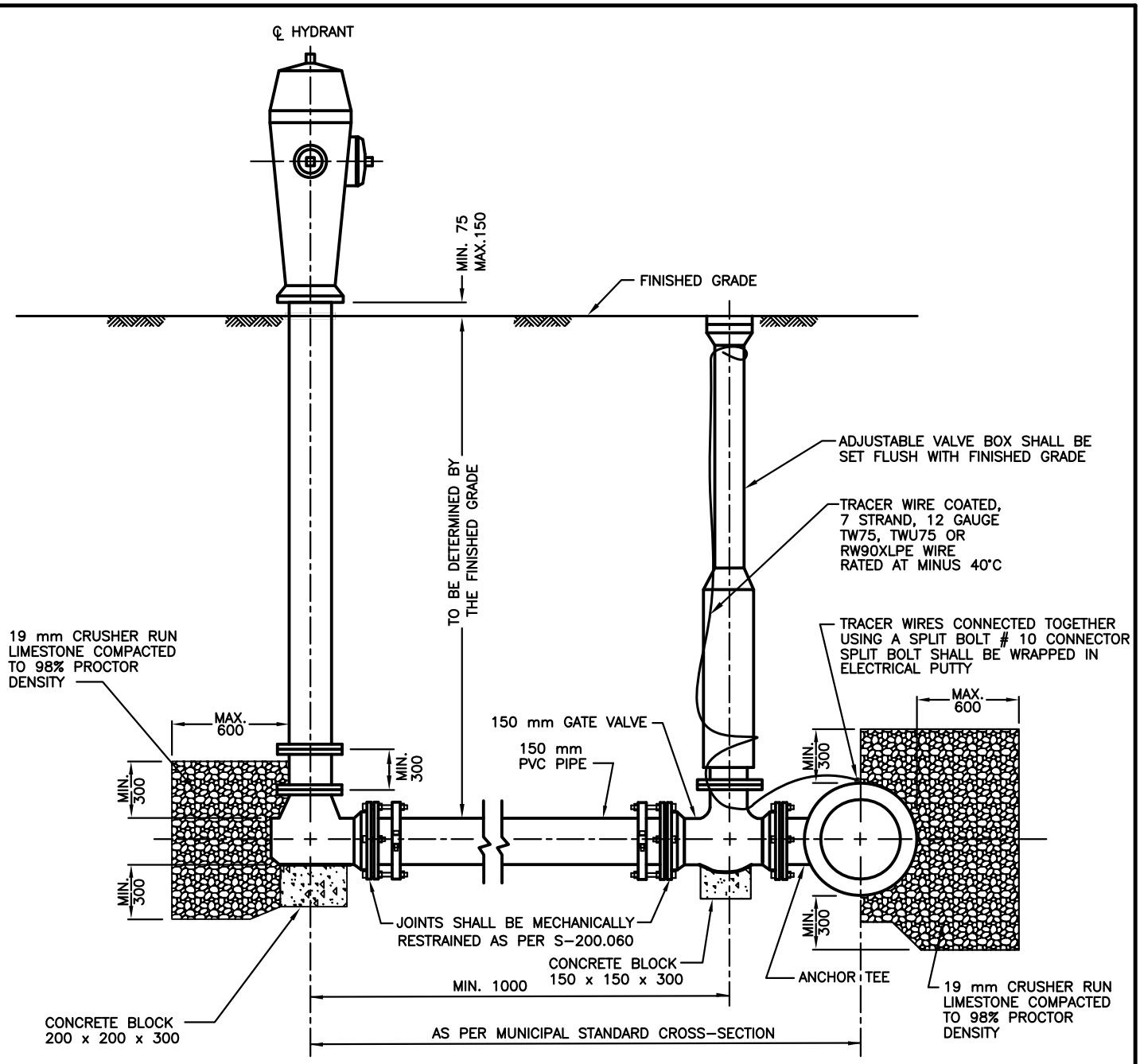
ALL DIMENSIONS IN MILLIMETRES EXCEPT WHERE NOTED.

DURHAM REGION
WORKS DEPARTMENT

METER, VALVE, PRO READ ARB RECEPTACLE AND WIRE INSTALLATION

DWG. DATE:	1995 02
REVISION NO.:	6
REV. DATE:	2013 04
SCALE:	N.T.S.

S-240.010



NOTES

1. JOINTS SHALL BE MECHANICALLY RESTRAINED.
2. BEDDING AS PER S–200.010.
3. HYDRANT EXTENSIONS SHALL BE INSTALLED AT BOTTOM OF BARREL.
4. ANCHOR TEE, VALVE & HYDRANT SHALL BE COMPLETELY BACKFILLED WITH 19 mm CRUSHER RUN LIMESTONE.
5. IF HYDRANT REQUIRES ACCESS ACROSS DITCH, INSTALLATION SHALL BE AS PER S–210.030.
6. TRACER WIRE COATED, AS PER AMPL.
7. TRACER WIRE SHALL BE INSTALLED AT ALL HYDRANT LOCATIONS.
8. CATHODIC PROTECTION, BONDING CABLE AND TRACER WIRE SHALL BE AS PER S–201.030, S–201.031.

ALL DIMENSIONS IN MILLIMETRES EXCEPT WHERE NOTED.

DURHAM REGION
WORKS DEPARTMENT

HYDRANT SET WITH MECHANICALLY RESTRAINED JOINTS

DWG. DATE:	1978 03
REVISION NO.:	18
REV. DATE:	2014 04
SCALE:	N.T.S.

S-210.010

APPENDIX "C"

Wastewater Calculations & Details

VALDOR ENGINEERING INC.
571 Chrislea Road, Unit 4, 2nd Floor, Vaughan, ON L4L 8A2
Tel: 905-264-0054 Fax: 905-264-0069 info@valdor-engineering.com
www.valdor-engineering.com

TABLE: C1

WASTEWATER LOADING CALCULATION

Project Name: **1942 Woodview Avenue, Pickering**
File: 21150
Date: March 2023

Criteria:

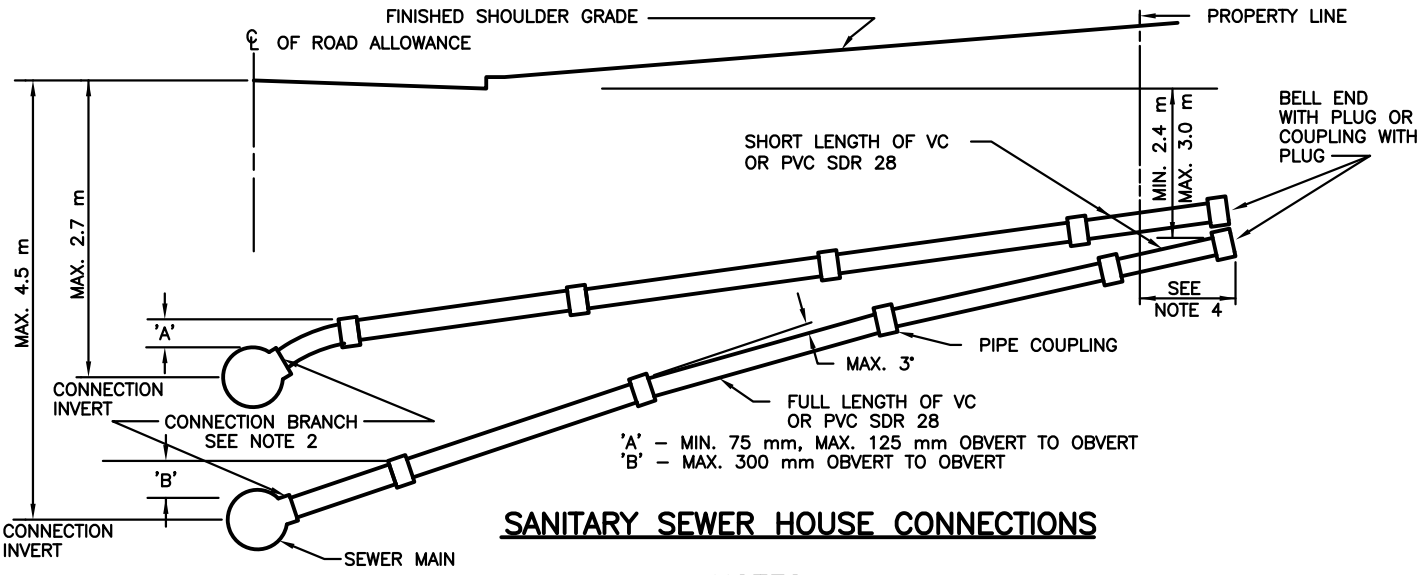
Peak flow design parameters

Avg. Flow Rate (Residential): 364 L/person/day

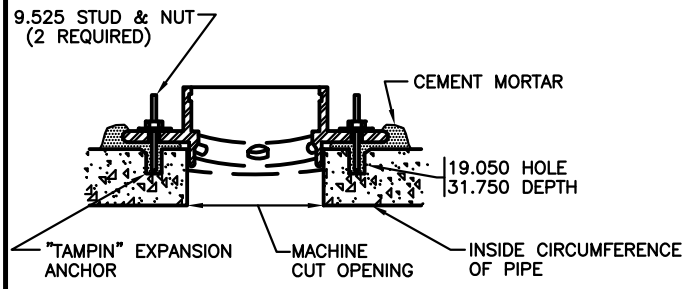
Infiltration Rate: 0.26 L/s/ha

Residential Peaking Factor: 1 + (14 / (4+(P/1000)^0.5)) where P is population in thousands
(Min = 1.5, Max = 3.8)

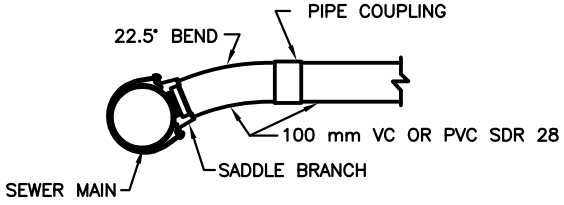
	Site Area (ha.)	Residential				Infiltration (L/s)	Total Peak Flow (L/s)
		Equivalent Population	Average Flow (L/s)	Peaking Factor	Peak Flow (L/s)		
Street Townhomes	1.0472	63	0.265	3.8	1.01	0.272	**1.28**
TOTAL	**1.0472**	**63.0**					**1.28**

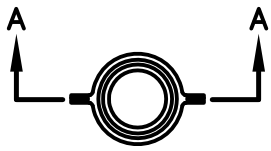


SANITARY SEWER HOUSE CONNECTIONS

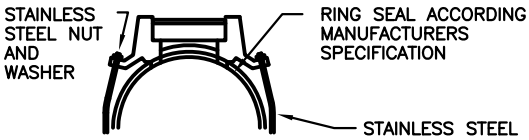


MORTAR–ON SADDLES FOR CONCRETE MAINS OVER 450 mm DIAMETER





TOP VIEW

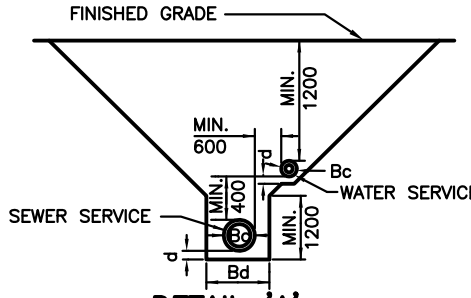


SECTION 'A–A'

CAST–IRON SADDLE BRANCH FOR CONNECTION TO EXISTING MAINS OTHER THAN PVC

NOTES:

1. IN NEW SUBDIVISIONS THE SANITARY SEWER AND WATER SERVICE CONNECTIONS SHALL BE INSTALLED IN SEPARATE TRENCHES. IN CASES WHERE THE SEPARATE TRENCH INSTALLATION IS NOT PRACTICAL, SANITARY SEWER AND WATER SERVICE CONNECTIONS MAY BE INSTALLED IN A COMMON TRENCH AS PER DETAIL 'A'.
2. IN NEW SUBDIVISIONS ALL CONNECTIONS TO THE SEWERS ARE TO BE MADE WITH A FACTORY MANUFACTURED 'T'. FOR CONNECTIONS TO EXISTING SANITARY SEWERS, OTHER THAN PVC A SADDLE CONNECTION MAY BE USED. MORTAR–ON SADDLES SHALL BE USED ON CONCRETE PIPE GREATER THAN 450 mm DIAMETER. CONNECTIONS TO EXISTING PVC SEWERS SHALL BE MADE WITH A FACTORY MANUFACTURED TEE OR AN APPROVED SADDLE. CONNECTIONS TO EXISTING A.B.S. TRUSS PIPE SHALL BE MADE WITH A SOLVENT WELDED SADDLE. A FACTORY MANUFACTURED WYE SHALL BE USED IN THE FIRST UPSTREAM LEG FOR ALL SEWER CONNECTIONS.
3. 45° STRAP ON SADDLE SHALL BE USED ON SEWERS OTHER THAN PVC PIPE, WHEN LATERAL INTERSECTS SEWER MAIN AT AN ACUTE ANGLE.
4. THE SEWER CONNECTION SHALL BE LAID FROM THE MAIN TO 1.5 m BEYOND THE PROPERTY LINE IN NEW SUBDIVISIONS ONLY.
5. THE END OF ALL SEWER PIPE SHALL BE MACHINED. ALL CUTTING AND MACHINE SHALL BE DONE BY CONTRACTOR.
6. A COUPLING SHALL BE INSTALLED AT DEAD END AND SHALL BE PLUGGED USING A WATER TIGHT PLUG.
7. DEFLECTIONS OF PIPE AT JOINTS IS NOT TO EXCEED 75 mm
   I.E.: 150 mm MAXIMUM DEFLECTION FOR A 3 m LENGTH OF ASBESTOS CEMENT PIPE
   75 mm MAXIMUM DEFLECTION FOR 1.8 m LENGTH OF VETRIFIED CLAY PIPE
8. PIPE COUPLING SHALL BE 'RING–TITE' OR EQUIVALENT. PVC SHALL BE BELL AND SPIGOT JOINT.
9. REFER TO STD. S–200.010 FOR BEDDING REQUIREMENTS.
10. WHEN MORTAR–ON SADDLES ARE USED, A MACHINE CUT OPENING SHALL BE MADE IN THE SANITARY SEWER WITH A CORING MACHINE.
11. 2% MIN. GRADE TO 10% MAX. GRADE FOR 100 mm DIA. PIPE.
12. 1% MIN. GRADE TO 10% MAX. GRADE FOR 150 mm DIA. PIPE.



DETAIL 'A'
COMMON TRENCH DETAIL

d = MIN. 75 mm, DEPTH OF BEDDING BELOW PIPE.
Bc = OUTSIDE DIAMETER
Bd = MINIMUM WIDTH OF TRENCH
= Bc + 600 mm WITH MIN. OF 900 mm OR Bc + WIDTH OF SHORING + 600 mm

ALL DIMENSIONS IN MILLIMETRES EXCEPT WHERE NOTED.

DURHAM REGION
WORKS DEPARTMENT

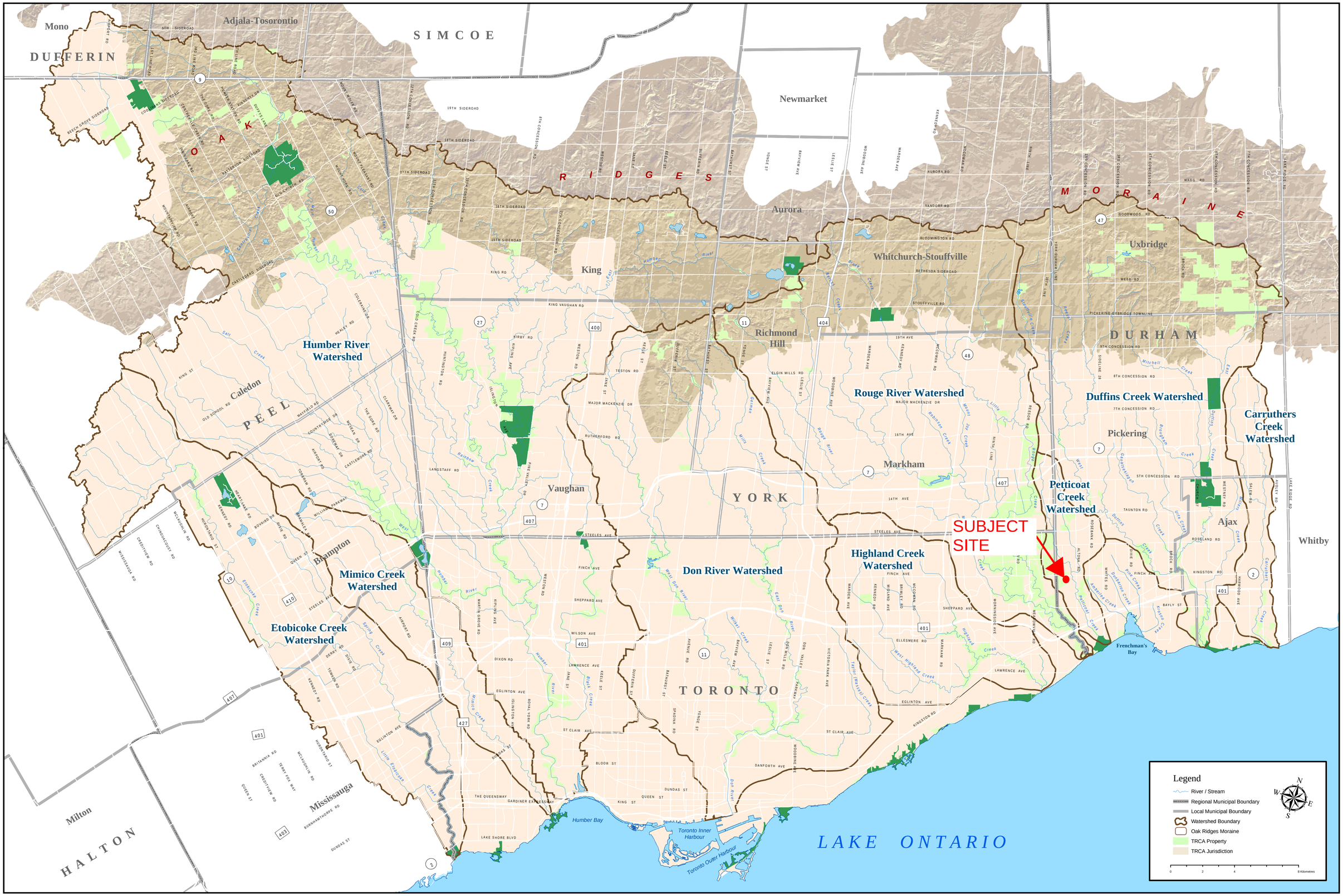
SANITARY SEWER HOUSE CONNECTIONS AND SADDLES (100 mm & 150 mm PIPE)

DWG. DATE:	1981 04
REVISION NO.:	12
REV. DATE:	2013 04
SCALE:	N.T.S.

S-100.010

APPENDIX "D"

Watershed Map, Regulation Map & IDF Data


Mono
Adjala-Tosorontio
SIMCOE
DUFFERIN
Newmarket
Aurora
King
Whitchurch-Stouffville
Uxbridge
Richmond Hill
DURHAM
Caledon
PEEL
Humber River Watershed
Rouge River Watershed
Duffins Creek Watershed
Carruthers Creek Watershed
Pickering
Markham
Vaughan
YORK
Petticoat Creek Watershed
Ajax
Whitby
SUBJECT SITE
Brampton
Mimico Creek Watershed
Etobicoke Creek Watershed
Don River Watershed
Highland Creek Watershed
TORONTO
Frenchman's Bay
Milton
HALTON
Mississauga
Humber Bay
Toronto Inner Harbour
Toronto Outer Harbour
LAKE ONTARIO
Legend
River / Stream
Regional Municipal Boundary
Local Municipal Boundary
Watershed Boundary
Oak Ridges Moraine
TRCA Property
TRCA Jurisdiction
0
2
4
8 Kilometres

TRCA REGULATION MAPPING

Map Layers

TRCA Conceptual Regulated Area

Parcel Boundary

City of Pickering IDF Curve Parameters

Parameter	Return Period					
	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
A	715.076	1082.901	1313.979	1581.718	1828.009	2096.425
B	5.262	6.007	6.026	6.007	6.193	6.485
C	0.815	0.837	0.845	0.848	0.856	0.863

Notes:
Rainfall Intensity, I (mm/hr) = $A/(t+B)^C$, where t is time duration in minutes
IDF Data Source: Toronto City (1940-2007)

City of Pickering Rainfall Intensity

Rainfall Intensity (mm/hr)

Return Period	Duration (min)								
	5	*10*	*15*	*30*	*60*	*120*	*360*	*720*	*1440*
2 Year	109.2	76.1	61.7	39.1	23.8	14.0	5.7	3.4	1.9
5 Year	151.9	101.6	85.0	54.6	32.6	18.7	7.6	4.4	2.5
10 Year	180.1	118.5	100.5	64.9	38.5	21.8	8.9	5.1	2.8
25 Year	215.8	139.8	120.1	77.9	45.9	25.7	10.4	6.0	3.3
50 Year	242.3	155.7	134.6	87.5	51.4	28.7	11.6	6.6	3.6
100 Year	268.5	171.4	148.9	97.0	56.8	31.6	12.8	7.2	3.9

City of Pickering Rainfall Depth

Rainfall Depth (mm)

Return Period	Duration (min)								
	5	*10*	*15*	*30*	*60*	*120*	*360*	*720*	*1440*
2 Year	9.1	12.7	15.4	19.5	23.8	27.9	34.5	41.1	45.9
5 Year	12.7	16.9	21.3	27.3	32.6	37.4	45.8	53.2	59.0
10 Year	15.0	19.7	25.1	32.4	38.5	43.6	53.2	61.3	67.6
25 Year	18.0	23.3	30.0	38.9	45.9	51.5	62.7	71.4	78.5
50 Year	20.2	25.9	33.6	43.7	51.4	57.3	69.7	79.0	86.7
100 Year	22.4	28.6	37.2	48.5	56.8	63.1	76.6	86.5	94.7

APPENDIX "E"

Stormwater Quantity Control Calculations

VALDOR ENGINEERING INC. **TABLE 4**

File: 21150
Date: March 2023

Project: 1942 Woodview Avenue, City of Pickering

PEAK FLOW SUMMARY

	RUNOFF COEFFICIENT	PEAK FLOW (L/s)					
		2 YEAR	5 YEAR	10 YEAR	25 YEAR	50 YEAR	100 YEAR
Pre-Development	0.30	66.8	91.6	108.5	142.7	174.3	201.1
Post-Development Unmitigated	0.60	135.8	186.0	220.6	289.9	354.0	408.4
Post-Development Mitigated	0.60	50.2	63.0	68.4	78.3	82.7	89.0

VALDOR ENGINEERING INC. **TABLE E1**

File: 21150
Date: March 2023

Project: 1942 Woodview Avenue, City of Pickering

STORAGE AND DISCHARGE SUMMARY

CONDITION	DRAINAGE AREA (ha)	STORAGE HWL (m)	ORIFICE				PRE-DEVELOPMENT RELEASE RATE (L/S)	STORAGE REQUIRED (cu.m.)	STORAGE PROVIDED (cu.m.)
			LOCATION	INVERT (m)	DIAMETER (mm)	RELEASE RATE (L/s)			
2-Year	1.0472	130.25	MH	129.80	200	50.2	66.8	50.7	58.3
5-Year		130.45				63.0	91.6	75.2	84.2
10-Year		130.55				68.4	108.5	94.4	97.2
25-Year		130.75				78.3	142.7	115.8	123.1
50-Year		130.85				82.7	174.3	135.1	136.1
100-Year		131.00				89.0	201.1	153.4	155.5

VALDOR ENGINEERING INC. **TABLE E2**
File: 21150
Date: March 2023

Project: 1942 Woodview Avenue, City of Pickering

PRE-DEVELOPMENT PEAK FLOW CALCULATION (Unmitigated)

Surface Type	Area (ha.)	Runoff Coefficient
Impervious	0.0253	0.90
Roof	0.0487	0.90
Landscape	0.9732	0.25
TOTAL AREA	1.0472	0.30

2 Year Pre-Development Flow

$I = A / (t_c+B)^C$

I = Rainfall Rate (mm/hr)			A =	715.076
Ca =	1		B =	5.262
T =	10	minutes	C =	0.815
I =	77.6	mm/hr		
R =	0.30			
2 yr R =	0.30	(composite)		
N =	2.78			

Q = R x A x I x N 2 year Q = 66.8 L/s

Total 2-Year Q = 66.8 L/s

5 Year Pre-Development Flow

$I = A / (t_c+B)^C$

I = Rainfall Rate (mm/hr)			A =	1082.901
Ca =	1		B =	6.007
T =	10	minutes	C =	0.837
I =	106.3	mm/hr		
R =	0.30			
5 yr R =	0.30	(composite)		
N =	2.78			

Q = R x A x I x N x Ca 5 year Q = 91.6 L/s

Total 5-Year Q = 91.6 L/s

10 Year Pre-Development Flow

I = Rainfall Rate (mm/hr)			A =	1313.979
Ca =	1		B =	6.026
T =	10	minutes	C =	0.845
I =	126.0	mm/hr		
R =	0.30			
10 yr R =	0.30	(composite)		
N =	2.778			

Q = R x A x I x N x Ca 10 year Q = 108.5 L/s

Total 10-Year Q = 108.5 L/s

TABLE E2 (Cont'd)

25 Year Pre-Development Flow

$I = A / (t_c+B)^C$

I = Rainfall Rate (mm/hr)			A =	1581.718
Ca =	1.1		B =	6.007
T =	10	minutes	C =	0.848
I =	150.6	mm/hr		
R =	0.30			
25 yr R =	0.30	(composite)		
N =	2.78			

Q = R x A x I x N — 25 year Q = 142.7 L/s

Total 25-Year Q = 142.7 L/s

50 Year Pre-Development Flow

$I = A / (t_c+B)^C$

I = Rainfall Rate (mm/hr)			A =	1828.009
Ca =	1.2		B =	6.193
T =	10	minutes	C =	0.856
I =	168.6	mm/hr		
R =	0.30			
50 yr R =	0.30	(composite)		
N =	2.78			

Q = R x A x I x N x Ca — 50 year Q = 174.3 L/s

Total 50-Year Q = 174.3 L/s

100 Year Pre-Development Flow

I = Rainfall Rate (mm/hr)			A =	2096.425
Ca =	1.25		B =	6.485
T =	10	minutes	C =	0.863
I =	186.7	mm/hr		
R =	0.30			
100 yr R =	0.30			
N =	2.78			

Q = R x A x I x N x Ca — 100 year Q = 201.1 L/s

Total 100-Year Q = 201.1 L/s

VALDOR ENGINEERING INC. **TABLE E3**
File: 21150
Date: March 2023

Project: 1942 Woodview Avenue, City of Pickering

POST-DEVELOPMENT PEAK FLOW CALCULATION (Unmitigated)

Surface Type	Area (ha.)	Runoff Coefficient
Impervious	0.3588	0.90
Roof	0.2069	0.90
Landscape	0.4815	0.25
TOTAL AREA	1.0472	0.60

2 Year Post-Development Flow

$I = A / (t_c+B)^C$

I = Rainfall Rate (mm/hr)		A =	715.076
Ca =	1	B =	5.262
T =	10 minutes	C =	0.815
I =	77.6 mm/hr		
2 yr R =	0.60 (composite)		
N =	2.78		

Q = R x A x I x N x Ca — 2 year Q = 135.8 L/s

Total 2-Year Q = 135.8 L/s

5 Year Post-Development Flow

$I = A / (t_c+B)^C$

I = Rainfall Rate (mm/hr)		A =	1082.901
Ca =	1	B =	6.007
T =	10 minutes	C =	0.837
I =	106.3 mm/hr		
5 yr R =	0.60		
N =	2.78		

Q = R x A x I x N x Ca — 5 year Q = 186.0 L/s

Total 5-Year Q = 186.0 L/s

10 Year Post-Development Flow

$I = A / (t_c+B)^C$

I = Rainfall Rate (mm/hr)		A =	1313.979
Ca =	1	B =	6.026
T =	10 minutes	C =	0.845
I =	126.0 mm/hr		
10 yr R =	0.60		
N =	2.78		

Q = R x A x I x N x Ca — 10 year Q = 220.6 L/s

Total 10-Year Q = 220.6 L/s

TABLE E3 (Cont'd)

25 Year Post-Development Flow

$I = A / (t_c+B)^C$

I = Rainfall Rate (mm/hr)		A =	1581.718
Ca =	1.1	B =	6.007
T =	10 minutes	C =	0.848
I =	150.6 mm/hr		
25 yr R =	0.60		
N =	2.78		

Q = R x A x I x N x Ca — 25 year Q = 289.9 L/s

Total 25-Year Q = 289.9 L/s

50 Year Post-Development Flow

$I = A / (t_c+B)^C$

I = Rainfall Rate (mm/hr)		A =	1828.009
Ca =	1.2	B =	6.193
T =	10 minutes	C =	0.856
I =	168.6 mm/hr		
50 yr R =	0.60		
N =	2.78		

Q = R x A x I x N x Ca — 50 year Q = 354.0 L/s

Total 50-Year Q = 354.0 L/s

100 Year Post-Development Flow

$I = A / (t_c+B)^C$

I = Rainfall Rate (mm/hr)		A =	2096.425
Ca =	1.25	B =	6.485
T =	10 minutes	C =	0.863
I =	186.7 mm/hr		
100 yr R =	0.60		
N =	2.78		

Q = R x A x I x N x Ca — 100 year Q = 408.4 L/s

Total 100-Year Q = 408.4 L/s

VALDOR ENGINEERING INC. **TABLE: E4-1**

File: 21150
Date: March 2023

Project: 1942 Woodview Avenue, City of Pickering

CONTROL ORIFICE DESIGN

2 YEAR STORM

2 Year High Water Level	=	130.25	m
Orifice			
Orifice Coefficient (C)	=	0.61	(Plate)
Acceleration due to gravity (g)	=	9.81	m/s/s
Orifice Invert Elevation	=	129.80	m
Orifice Diameter	=	200	mm
Orifice Springline Elevation		129.900	m
Cross section area of orifice (A)	=	0.0314	sq.m.
Head (H)	=	0.35	m
Actual Discharge (Q) (C x A x (2 x g x H)^0.5)	=	**50.2**	L/s

VALDOR ENGINEERING INC. **TABLE: E4-2**

File: 21150
Date: March 2023

Project: 1942 Woodview Avenue, City of Pickering

CONTROL ORIFICE DESIGN

5 YEAR STORM

5 Year High Water Level	=	130.45	m
Orifice			
Orifice Coefficient (C)	=	0.61	(Plate)
Acceleration due to gravity (g)	=	9.81	m/s/s
Orifice Invert Elevation	=	129.80	m
Orifice Diameter	=	200	mm
Orifice Springline Elevation		129.900	m
Cross section area of orifice (A)	=	0.0314	sq.m.
Head (H)	=	0.55	m
Actual Discharge (Q) (C x A x (2 x g x H)^0.5)	=	**63.0**	L/s

VALDOR ENGINEERING INC. **TABLE: E4-3**

File: 21150
Date: March 2023

Project: 1942 Woodview Avenue, City of Pickering

CONTROL ORIFICE DESIGN

10 YEAR STORM

10 Year High Water Level	=	130.55	m
Orifice			
Orifice Coefficient (C)	=	0.61	(Plate)
Acceleration due to gravity (g)	=	9.81	m/s/s
Orifice Invert Elevation	=	129.80	m
Orifice Diameter	=	200	mm
Orifice Springline Elevation		129.900	m
Cross section area of orifice (A)	=	0.0314	sq.m.
Head (H)	=	0.65	m
Actual Discharge (Q) (C x A x (2 x g x H)^0.5)	=	**68.4**	L/s

VALDOR ENGINEERING INC. **TABLE: E4-4**

File: 21150
Date: March 2023

Project: 1942 Woodview Avenue, City of Pickering

CONTROL ORIFICE DESIGN

25 YEAR STORM

25 Year High Water Level	=	130.75	m
Orifice			
Orifice Coefficient (C)	=	0.61	(Plate)
Acceleration due to gravity (g)	=	9.81	m/s/s
Orifice Invert Elevation	=	129.80	m
Orifice Diameter	=	200	mm
Orifice Springline Elevation		129.900	m
Cross section area of orifice (A)	=	0.0314	sq.m.
Head (H)	=	0.85	m
Actual Discharge (Q) (C x A x (2 x g x H)^0.5)	=	**78.3**	L/s

VALDOR ENGINEERING INC. **TABLE: E4-5**

File: 21150
Date: March 2023

Project: 1942 Woodview Avenue, City of Pickering

CONTROL ORIFICE DESIGN

50 YEAR STORM

50 Year High Water Level	=	130.85	m
Orifice			
Orifice Coefficient (C)	=	0.61	(Plate)
Acceleration due to gravity (g)	=	9.81	m/s/s
Orifice Invert Elevation	=	129.80	m
Orifice Diameter	=	200	mm
Orifice Springline Elevation		129.900	m
Cross section area of orifice (A)	=	0.0314	sq.m.
Head (H)	=	0.95	m
Actual Discharge (Q) (C x A x (2 x g x H)^0.5)	=	**82.7**	L/s

VALDOR ENGINEERING INC. **TABLE: E4-6**

File: 21150
Date: March 2023

Project: 1942 Woodview Avenue, City of Pickering

CONTROL ORIFICE DESIGN

100 YEAR STORM

100 Year High Water Level	=	131.00	m
Orifice			
Orifice Coefficient (C)	=	0.61	(Plate)
Acceleration due to gravity (g)	=	9.81	m/s/s
Orifice Invert Elevation	=	129.80	m
Orifice Diameter	=	200	mm
Orifice Springline Elevation		129.900	m
Cross section area of orifice (A)	=	0.0314	sq.m.
Head (H)	=	1.10	m
Actual Discharge (Q) (C x A x (2 x g x H)^0.5)	=	**89.0**	L/s

VALDOR ENGINEERING INC.

File: 21150
Date: March 2023

TABLE: E5-1

Storage Volume Calculations - Rational Method

2-year Storm - City of Brampton

Project: 1942 Woodview Avenue, City of Pickering

Total Area (ha)	1.047
Runoff Coefficient	0.60
Maximum Discharge Through Orifice (L/s)	50.2
Discharged Volume per 5 min Interval (cu.m)	15.1

Time (min)	Intensity (mm/hr)	Groundwater Discharge (L)	Runoff Volume (cu.m)	Discharged Volume (cu.m)	Storage Volume (cu.m)
0	0.0	0.000	0.000	0.000	0.000
5	2.3	0.000	1.215	1.215	0.000
10	2.5	0.000	1.328	1.328	0.000
15	2.8	0.000	1.465	1.465	0.000
20	3.1	0.000	1.638	1.638	0.000
25	3.6	0.000	1.863	1.863	0.000
30	4.1	0.000	2.167	2.167	0.000
35	5.0	0.000	2.602	2.602	0.000
40	6.2	0.000	3.276	3.276	0.000
45	8.5	0.000	4.462	4.462	0.000
50	13.5	0.000	7.085	7.085	0.000
55	32.9	0.000	17.238	15.066	2.172
60	107.2	0.000	56.236	15.066	41.171
65	42.8	0.000	22.445	15.066	7.379
70	22.9	0.000	12.031	12.031	0.000
75	15.4	0.000	8.094	8.094	0.000
80	11.6	0.000	6.077	6.077	0.000
85	9.3	0.000	4.864	4.864	0.000
90	7.7	0.000	4.060	4.060	0.000
95	6.7	0.000	3.489	3.489	0.000
100	5.8	0.000	3.063	3.063	0.000
105	5.2	0.000	2.733	2.733	0.000
110	4.7	0.000	2.470	2.470	0.000
115	4.3	0.000	2.256	2.256	0.000
120	4.0	0.000	2.078	2.078	0.000
125	3.7	0.000	1.928	1.928	0.000
130	3.4	0.000	1.799	1.799	0.000
135	3.2	0.000	1.687	1.687	0.000
140	3.0	0.000	1.590	1.590	0.000
145	2.9	0.000	1.504	1.504	0.000
150	2.7	0.000	1.427	1.427	0.000
155	2.6	0.000	1.358	1.358	0.000
160	2.5	0.000	1.297	1.297	0.000
165	2.4	0.000	1.241	1.241	0.000
170	2.3	0.000	1.190	1.190	0.000
175	2.2	0.000	1.143	1.143	0.000
180	2.1	0.000	1.101	1.101	0.000

Total Storage Volume Required (cu.m) **50.7**

VALDOR ENGINEERING INC.

File: 21150
Date: March 2023

TABLE: E5-2

Storage Volume Calculations - Rational Method

5-year Storm - City of Brampton

Project: 1942 Woodview Avenue, City of Pickering

Total Area (ha)	1.047
Runoff Coefficient	0.60
Maximum Discharge Through Orifice (L/s)	63.0
Discharged Volume per 5 min Interval (cu.m)	18.9

Time (min)	Intensity (mm/hr)	Groundwater Discharge (L)	Runoff Volume (cu.m)	Discharged Volume (cu.m)	Storage Volume (cu.m)
0	0.0	0.000	0.000	0.000	0.000
5	2.9	0.000	1.500	1.500	0.000
10	3.1	0.000	1.647	1.647	0.000
15	3.5	0.000	1.828	1.828	0.000
20	3.9	0.000	2.057	2.057	0.000
25	4.5	0.000	2.357	2.357	0.000
30	5.3	0.000	2.767	2.767	0.000
35	6.4	0.000	3.359	3.359	0.000
40	8.2	0.000	4.289	4.289	0.000
45	11.3	0.000	5.950	5.950	0.000
50	18.4	0.000	9.678	9.678	0.000
55	45.9	0.000	24.102	18.886	5.216
60	145.4	0.000	76.301	18.886	57.415
65	60.0	0.000	31.451	18.886	12.565
70	31.9	0.000	16.753	16.753	0.000
75	21.2	0.000	11.119	11.119	0.000
80	15.7	0.000	8.238	8.238	0.000
85	12.4	0.000	6.517	6.517	0.000
90	10.3	0.000	5.383	5.383	0.000
95	8.7	0.000	4.585	4.585	0.000
100	7.6	0.000	3.993	3.993	0.000
105	6.7	0.000	3.539	3.539	0.000
110	6.1	0.000	3.179	3.179	0.000
115	5.5	0.000	2.887	2.887	0.000
120	5.0	0.000	2.646	2.646	0.000
125	4.7	0.000	2.443	2.443	0.000
130	4.3	0.000	2.271	2.271	0.000
135	4.0	0.000	2.122	2.122	0.000
140	3.8	0.000	1.992	1.992	0.000
145	3.6	0.000	1.878	1.878	0.000
150	3.4	0.000	1.778	1.778	0.000
155	3.2	0.000	1.687	1.687	0.000
160	3.1	0.000	1.607	1.607	0.000
165	2.9	0.000	1.534	1.534	0.000
170	2.8	0.000	1.467	1.467	0.000
175	2.7	0.000	1.407	1.407	0.000
180	2.6	0.000	1.352	1.352	0.000

Total Storage Volume Required (cu.m) **75.2**

VALDOR ENGINEERING INC.

File: 21150
Date: March 2023

TABLE: E5-3

Storage Volume Calculations - Rational Method

10-year Storm - City of Brampton

Project: 1942 Woodview Avenue, City of Pickering

Total Area (ha)	1.047
Runoff Coefficient	0.60
Maximum Discharge Through Orifice (L/s)	68.4
Discharged Volume per 5 min Interval (cu.m)	20.5

Time (min)	Intensity (mm/hr)	Groundwater Discharge (L)	Runoff Volume (cu.m)	Discharged Volume (cu.m)	Storage Volume (cu.m)
0	0.0	0.000	0.000	0.000	0.000
5	3.2	0.000	1.678	1.678	0.000
10	3.5	0.000	1.845	1.845	0.000
15	3.9	0.000	2.051	2.051	0.000
20	4.4	0.000	2.313	2.313	0.000
25	5.1	0.000	2.657	2.657	0.000
30	6.0	0.000	3.128	3.128	0.000
35	7.3	0.000	3.811	3.811	0.000
40	9.3	0.000	4.888	4.888	0.000
45	13.0	0.000	6.823	6.823	0.000
50	21.3	0.000	11.196	11.196	0.000
55	53.9	0.000	28.293	20.531	7.762
60	172.9	0.000	90.691	20.531	70.160
65	70.6	0.000	37.034	20.531	16.503
70	37.3	0.000	19.551	19.551	0.000
75	24.6	0.000	12.890	12.890	0.000
80	18.1	0.000	9.501	9.501	0.000
85	14.3	0.000	7.485	7.485	0.000
90	11.7	0.000	6.161	6.161	0.000
95	10.0	0.000	5.231	5.231	0.000
100	8.7	0.000	4.545	4.545	0.000
105	7.7	0.000	4.018	4.018	0.000
110	6.9	0.000	3.603	3.603	0.000
115	6.2	0.000	3.266	3.266	0.000
120	5.7	0.000	2.989	2.989	0.000
125	5.3	0.000	2.756	2.756	0.000
130	4.9	0.000	2.558	2.558	0.000
135	4.6	0.000	2.388	2.388	0.000
140	4.3	0.000	2.239	2.239	0.000
145	4.0	0.000	2.109	2.109	0.000
150	3.8	0.000	1.994	1.994	0.000
155	3.6	0.000	1.891	1.891	0.000
160	3.4	0.000	1.799	1.799	0.000
165	3.3	0.000	1.716	1.716	0.000
170	3.1	0.000	1.641	1.641	0.000
175	3.0	0.000	1.572	1.572	0.000
180	2.9	0.000	1.509	1.509	0.000

Total Storage Volume Required (cu.m) **94.4**

VALDOR ENGINEERING INC.

File: 21150
Date: March 2023

TABLE: E5-4

Storage Volume Calculations - Rational Method

25-year Storm - City of Brampton

Project: 1942 Woodview Avenue, City of Pickering

Total Area (ha)	1.047
Runoff Coefficient	0.60
Maximum Discharge Through Orifice (L/s)	78.3
Discharged Volume per 5 min Interval (cu.m)	23.5

Time (min)	Intensity (mm/hr)	Groundwater Discharge (L)	Runoff Volume (cu.m)	Discharged Volume (cu.m)	Storage Volume (cu.m)
0	0.0	0.000	0.000	0.000	0.000
5	3.7	0.000	1.958	1.958	0.000
10	4.1	0.000	2.153	2.153	0.000
15	4.6	0.000	2.396	2.396	0.000
20	5.2	0.000	2.704	2.704	0.000
25	5.9	0.000	3.108	3.108	0.000
30	7.0	0.000	3.662	3.662	0.000
35	8.5	0.000	4.468	4.468	0.000
40	10.9	0.000	5.740	5.740	0.000
45	15.3	0.000	8.030	8.030	0.000
50	25.2	0.000	13.222	13.222	0.000
55	64.1	0.000	33.624	23.478	10.146
60	206.9	0.000	108.545	23.478	85.068
65	84.0	0.000	44.074	23.478	20.596
70	44.2	0.000	23.173	23.173	0.000
75	29.0	0.000	15.236	15.236	0.000
80	21.4	0.000	11.207	11.207	0.000
85	16.8	0.000	8.815	8.815	0.000
90	13.8	0.000	7.246	7.246	0.000
95	11.7	0.000	6.146	6.146	0.000
100	10.2	0.000	5.334	5.334	0.000
105	9.0	0.000	4.713	4.713	0.000
110	8.0	0.000	4.222	4.222	0.000
115	7.3	0.000	3.826	3.826	0.000
120	6.7	0.000	3.499	3.499	0.000
125	6.1	0.000	3.224	3.224	0.000
130	5.7	0.000	2.991	2.991	0.000
135	5.3	0.000	2.791	2.791	0.000
140	5.0	0.000	2.616	2.616	0.000
145	4.7	0.000	2.463	2.463	0.000
150	4.4	0.000	2.328	2.328	0.000
155	4.2	0.000	2.207	2.207	0.000
160	4.0	0.000	2.099	2.099	0.000
165	3.8	0.000	2.002	2.002	0.000
170	3.6	0.000	1.913	1.913	0.000
175	3.5	0.000	1.833	1.833	0.000
180	3.4	0.000	1.759	1.759	0.000

Total Storage Volume Required (cu.m) **115.8**

VALDOR ENGINEERING INC.

File: 21150
Date: March 2023

TABLE: E5-5

Storage Volume Calculations - Rational Method

50-year Storm - City of Brampton

Project: 1942 Woodview Avenue, City of Pickering

Total Area (ha)	1.047
Runoff Coefficient	0.60
Maximum Discharge Through Orifice (L/s)	82.7
Discharged Volume per 5 min Interval (cu.m)	24.8

Time (min)	Intensity (mm/hr)	Groundwater Discharge (L)	Runoff Volume (cu.m)	Discharged Volume (cu.m)	Storage Volume (cu.m)
0	0.0	0.000	0.000	0.000	0.000
5	4.0	0.000	2.088	2.088	0.000
10	4.4	0.000	2.302	2.302	0.000
15	4.9	0.000	2.566	2.566	0.000
20	5.5	0.000	2.903	2.903	0.000
25	6.4	0.000	3.348	3.348	0.000
30	7.5	0.000	3.959	3.959	0.000
35	9.2	0.000	4.850	4.850	0.000
40	11.9	0.000	6.265	6.265	0.000
45	16.8	0.000	8.826	8.826	0.000
50	28.0	0.000	14.665	14.665	0.000
55	71.8	0.000	37.684	24.821	12.864
60	231.2	0.000	121.310	24.821	96.490
65	94.3	0.000	49.469	24.821	24.649
70	49.4	0.000	25.899	24.821	1.079
75	32.3	0.000	16.936	16.936	0.000
80	23.6	0.000	12.394	12.394	0.000
85	18.5	0.000	9.705	9.705	0.000
90	15.1	0.000	7.947	7.947	0.000
95	12.8	0.000	6.718	6.718	0.000
100	11.1	0.000	5.813	5.813	0.000
105	9.8	0.000	5.122	5.122	0.000
110	8.7	0.000	4.578	4.578	0.000
115	7.9	0.000	4.139	4.139	0.000
120	7.2	0.000	3.778	3.778	0.000
125	6.6	0.000	3.476	3.476	0.000
130	6.1	0.000	3.219	3.219	0.000
135	5.7	0.000	2.999	2.999	0.000
140	5.4	0.000	2.808	2.808	0.000
145	5.0	0.000	2.640	2.640	0.000
150	4.8	0.000	2.492	2.492	0.000
155	4.5	0.000	2.361	2.361	0.000
160	4.3	0.000	2.243	2.243	0.000
165	4.1	0.000	2.136	2.136	0.000
170	3.9	0.000	2.040	2.040	0.000
175	3.7	0.000	1.953	1.953	0.000
180	3.6	0.000	1.873	1.873	0.000

Total Storage Volume Required (cu.m) **135.1**

VALDOR ENGINEERING INC.

File: 21150
Date: March 2023

TABLE: E5-6

Storage Volume Calculations - Rational Method

100-year Storm - City of Brampton

Project: 1942 Woodview Avenue, City of Pickering

Total Area (ha)	1.047
Runoff Coefficient	0.60
Maximum Discharge Through Orifice (L/s)	89.0
Discharged Volume per 5 min Interval (cu.m)	26.7

Time (min)	Intensity (mm/hr)	Groundwater Discharge (L)	Runoff Volume (cu.m)	Discharged Volume (cu.m)	Storage Volume (cu.m)
0	0.0	0.000	0.000	0.000	0.000
5	4.3	0.000	2.237	2.237	0.000
10	4.7	0.000	2.471	2.471	0.000
15	5.3	0.000	2.761	2.761	0.000
20	6.0	0.000	3.132	3.132	0.000
25	6.9	0.000	3.622	3.622	0.000
30	8.2	0.000	4.298	4.298	0.000
35	10.1	0.000	5.289	5.289	0.000
40	13.1	0.000	6.869	6.869	0.000
45	18.6	0.000	9.740	9.740	0.000
50	31.1	0.000	16.313	16.313	0.000
55	80.3	0.000	42.139	26.708	15.431
60	255.0	0.000	133.784	26.708	107.076
65	105.4	0.000	55.314	26.708	28.606
70	55.2	0.000	28.964	26.708	2.255
75	36.0	0.000	18.872	18.872	0.000
80	26.2	0.000	13.754	13.754	0.000
85	20.4	0.000	10.727	10.727	0.000
90	16.7	0.000	8.753	8.753	0.000
95	14.1	0.000	7.374	7.374	0.000
100	12.1	0.000	6.363	6.363	0.000
105	10.7	0.000	5.592	5.592	0.000
110	9.5	0.000	4.986	4.986	0.000
115	8.6	0.000	4.498	4.498	0.000
120	7.8	0.000	4.098	4.098	0.000
125	7.2	0.000	3.763	3.763	0.000
130	6.6	0.000	3.480	3.480	0.000
135	6.2	0.000	3.237	3.237	0.000
140	5.8	0.000	3.026	3.026	0.000
145	5.4	0.000	2.842	2.842	0.000
150	5.1	0.000	2.680	2.680	0.000
155	4.8	0.000	2.535	2.535	0.000
160	4.6	0.000	2.406	2.406	0.000
165	4.4	0.000	2.290	2.290	0.000
170	4.2	0.000	2.185	2.185	0.000
175	4.0	0.000	2.089	2.089	0.000
180	3.8	0.000	2.002	2.002	0.000

Total Storage Volume Required (cu.m) **153.4**

VALDOR ENGINEERING INC. **TABLE: E6-1**

File: 21150

Date: March 2023

Project: 1942 Woodview Avenue, City of Pickering

UNDERGROUND STORAGE - BOX

	Length (m)	**Width** (m)	**Height** (m)	**VOLUME** (cu.m)
Box Culvert				
	72.0	1.8	0.45	58.3
TOTAL				**58.3**

CB & MH STORAGE

MH / CB No	**INV** (m)	**HWL** (m)	**PONDING DEPTH** (m)	**DIAMETER** (m)	**AVAILABLE STORAGE** (cu.m.)
TOTAL					**0.0**

2 YEAR STORAGE PROVIDED:	**58.3**

2 YEAR STORAGE REQUIRED:	**50.7**

VALDOR ENGINEERING INC. **TABLE: E6-2**

File: 21150

Date: March 2023

Project: 1942 Woodview Avenue, City of Pickering

UNDERGROUND STORAGE - BOX

	Length (m)	**Width** (m)	**Height** (m)	**VOLUME** (cu.m)
Box Culvert				
	72.0	1.8	0.65	84.2
TOTAL				**84.2**

CB & MH STORAGE

MH / CB No	**INV** (m)	**HWL** (m)	**PONDING DEPTH** (m)	**DIAMETER** (m)	**AVAILABLE STORAGE** (cu.m.)
TOTAL					**0.0**

5 YEAR STORAGE PROVIDED:	**84.2**

5 YEAR STORAGE REQUIRED:	**75.2**

VALDOR ENGINEERING INC.

TABLE: E6-3

File: 21150

Date: March 2023

Project: 1942 Woodview Avenue, City of Pickering

UNDERGROUND STORAGE - BOX

	Length (m)	**Width** (m)	**Height** (m)	**VOLUME** (cu.m)
Box Culvert				
	72.0	1.8	0.75	97.2
TOTAL				**97.2**

CB & MH STORAGE

MH / CB No	**INV** (m)	**HWL** (m)	**PONDING DEPTH** (m)	**DIAMETER** (m)	**AVAILABLE STORAGE** (cu.m.)
TOTAL					**0.0**

10 YEAR STORAGE PROVIDED:	**97.2**

10 YEAR STORAGE REQUIRED:	**94.4**

VALDOR ENGINEERING INC. **TABLE: E6-4**

File: 21150

Date: March 2023

Project: 1942 Woodview Avenue, City of Pickering

UNDERGROUND STORAGE - BOX

	Length (m)	**Width** (m)	**Height** (m)	**VOLUME** (cu.m)
Box Culvert				
	72.0	1.8	0.95	123.1
TOTAL				**123.1**

CB & MH STORAGE

MH / CB No	**INV** (m)	**HWL** (m)	**PONDING DEPTH** (m)	**DIAMETER** (m)	**AVAILABLE STORAGE** (cu.m.)
TOTAL					**0.0**

25 YEAR STORAGE PROVIDED:	**123.1**

25 YEAR STORAGE REQUIRED:	**115.8**

VALDOR ENGINEERING INC. **TABLE: E6-5**

File: 21150

Date: March 2023

Project: 1942 Woodview Avenue, City of Pickering

UNDERGROUND STORAGE - BOX

	Length (m)	**Width** (m)	**Height** (m)	**VOLUME** (cu.m)
Box Culvert				
	72.0	1.8	1.05	136.1
TOTAL				**136.1**

CB & MH STORAGE

MH / CB No	**INV** (m)	**HWL** (m)	**PONDING DEPTH** (m)	**DIAMETER** (m)	**AVAILABLE STORAGE** (cu.m.)
TOTAL					**0.0**

50 YEAR STORAGE PROVIDED:	**136.1**

50 YEAR STORAGE REQUIRED:	**135.1**

VALDOR ENGINEERING INC. **TABLE: E6-6**

File: 21150

Date: March 2023

Project: 1942 Woodview Avenue, City of Pickering

UNDERGROUND STORAGE - BOX

	Length (m)	Width (m)	Height (m)	VOLUME (cu.m)
Box Culvert				
	72.0	1.8	1.2	155.5
TOTAL				**155.5**

CB & MH STORAGE

MH / CB No	INV (m)	HWL (m)	PONDING DEPTH (m)	DIAMETER (m)	AVAILABLE STORAGE (cu.m.)
TOTAL					**0.0**

100 YEAR STORAGE PROVIDED:	**155.5**

100 YEAR STORAGE REQUIRED:	**153.4**

APPENDIX "F"

Stormwater Quality Control Calculations

Stormceptor®

FORTERRA

Stormceptor® EF Sizing Report

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

03/08/2023

Province:	Ontario
City:	Pickering
Nearest Rainfall Station:	TORONTO CITY
Climate Station Id:	6158355
Years of Rainfall Data:	20

Site Name:	1942 Woodview Avenue

Drainage Area (ha):	1.047
Runoff Coefficient 'c':	0.60

Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	20.30
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Site Sediment Transport Rate (kg/ha/yr):	

Project Name:	Proposed Townhouse Development
Project Number:	21150
Designer Name:	Paul Ma
Designer Company:	Valdor Engineering
Designer Email:	pma@valdor-engineering.com
Designer Phone:	647-884-3832
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	80
EFO6	89
EFO8	94
EFO10	97
EFO12	98

Recommended Stormceptor EFO Model: EFO4

Estimated Net Annual Sediment (TSS) Load Reduction (%): 80

Water Quality Runoff Volume Capture (%): > 90

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THIRD-PARTY TESTING AND VERIFICATION

►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

►**Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterwavs.

PARTICLE SIZE DISTRIBUTION (PSD)

►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

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Stormceptor® EF Sizing Report

Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.5	8.7	8.7	0.87	52.0	44.0	100	8.7	8.7
1	20.2	28.9	1.75	105.0	87.0	98	19.9	28.6
2	16.4	45.3	3.49	210.0	175.0	87	14.3	42.9
3	11.8	57.1	5.24	314.0	262.0	80	9.5	52.3
4	8.1	65.2	6.99	419.0	349.0	76	6.2	58.5
5	6.6	71.9	8.73	524.0	437.0	72	4.8	63.3
6	5.2	77.1	10.48	629.0	524.0	68	3.6	66.9
7	2.7	79.8	12.22	733.0	611.0	65	1.7	68.6
8	3.6	83.4	13.97	838.0	699.0	64	2.3	70.9
9	2.0	85.4	15.72	943.0	786.0	63	1.3	72.2
10	1.9	87.3	17.46	1048.0	873.0	63	1.2	73.4
11	1.6	88.9	19.21	1153.0	961.0	62	1.0	74.4
12	1.8	90.7	20.96	1257.0	1048.0	61	1.1	75.5
13	1.0	91.6	22.70	1362.0	1135.0	59	0.6	76.0
14	1.0	92.7	24.45	1467.0	1222.0	56	0.6	76.6
15	1.3	93.9	26.20	1572.0	1310.0	54	0.7	77.3
16	1.0	95.0	27.94	1677.0	1397.0	53	0.5	77.8
17	0.4	95.3	29.69	1781.0	1484.0	49	0.2	78.0
18	0.4	95.7	31.44	1886.0	1572.0	47	0.2	78.2
19	0.2	95.9	33.18	1991.0	1659.0	44	0.1	78.3
20	0.6	96.5	34.93	2096.0	1746.0	42	0.3	78.5
21	0.0	96.5	36.67	2200.0	1834.0	40	0.0	78.5
22	0.5	97.0	38.42	2305.0	1921.0	38	0.2	78.7
23	0.7	97.7	40.17	2410.0	2008.0	37	0.3	79.0
24	0.0	97.7	41.91	2515.0	2096.0	35	0.0	79.0
25	0.3	98.0	43.66	2620.0	2183.0	34	0.1	79.1
30	0.3	98.3	52.39	3144.0	2620.0	28	0.1	79.2
35	0.8	99.1	61.12	3667.0	3056.0	24	0.2	79.4
40	0.4	99.5	69.86	4191.0	3493.0	22	0.1	79.4
45	0.5	100.0	78.59	4715.0	3929.0	19	0.1	79.5
Estimated Net Annual Sediment (TSS) Load Reduction =								**80 %**

Climate Station ID: 6158355 *Years of Rainfall Data*: 20

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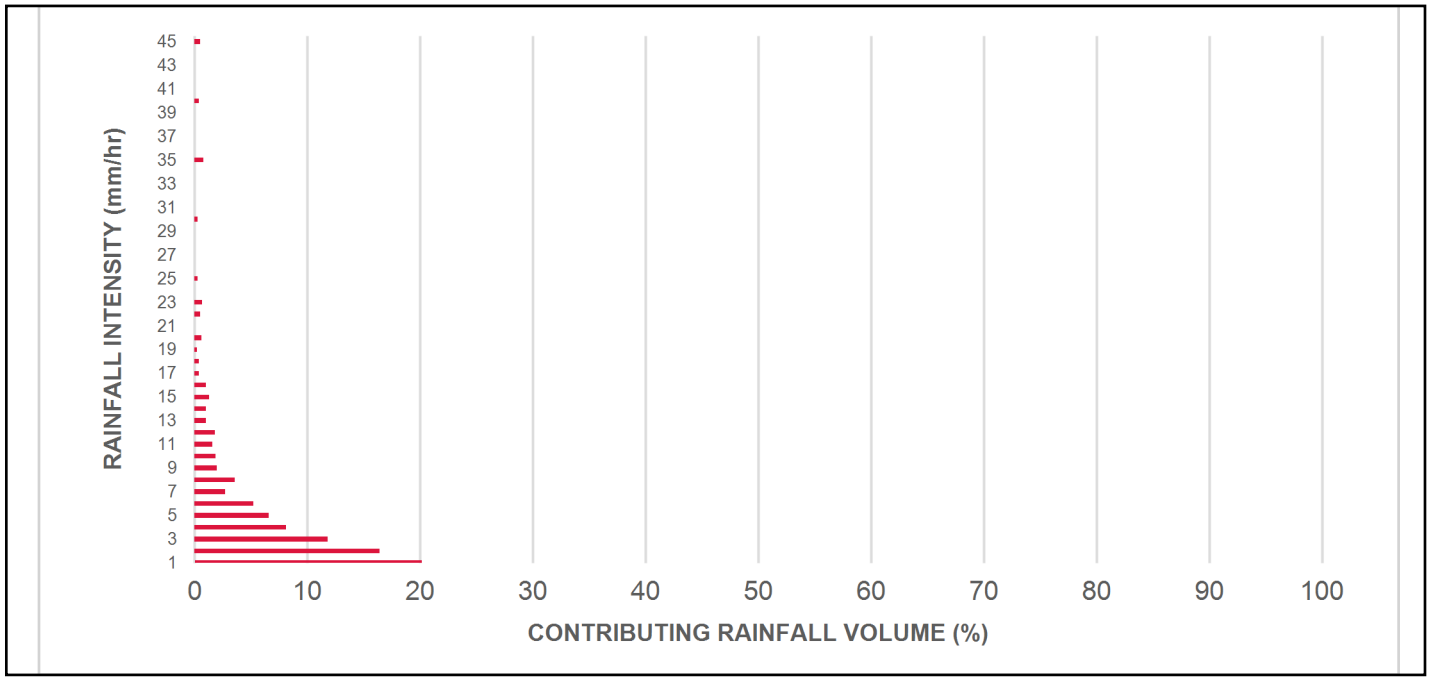
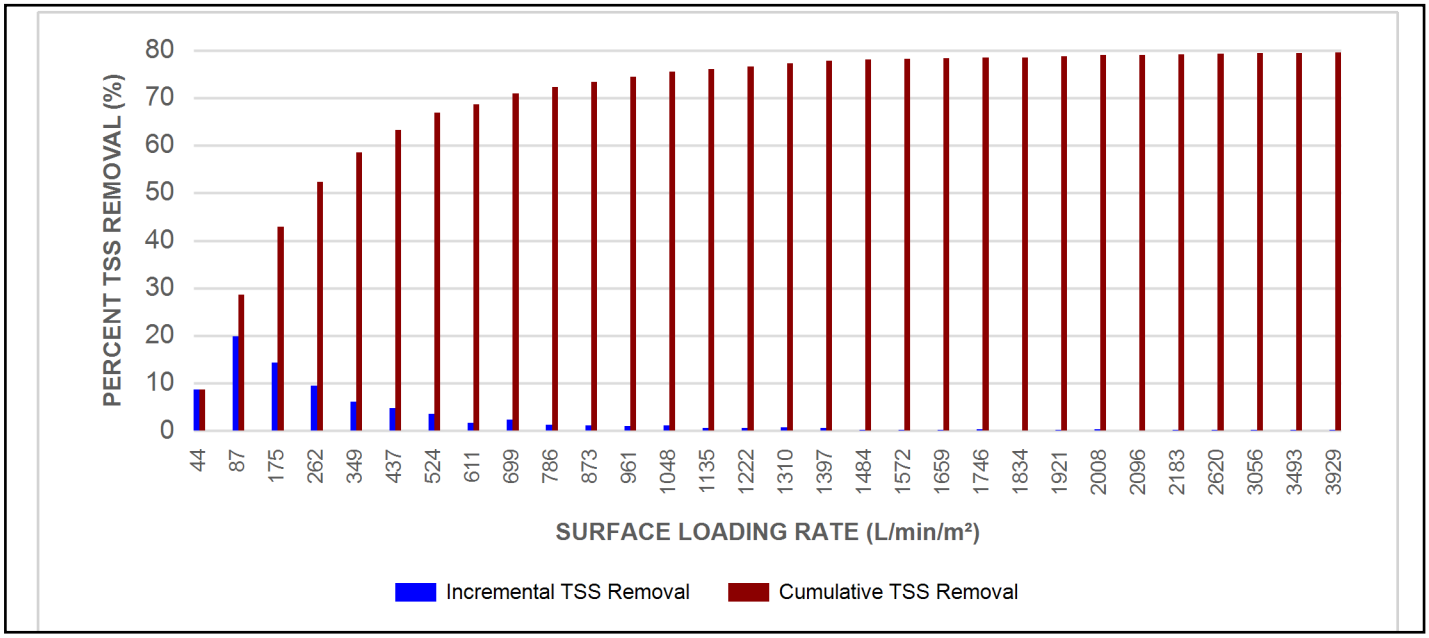
RAINFALL DATA FROM TORONTO CITY RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



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Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

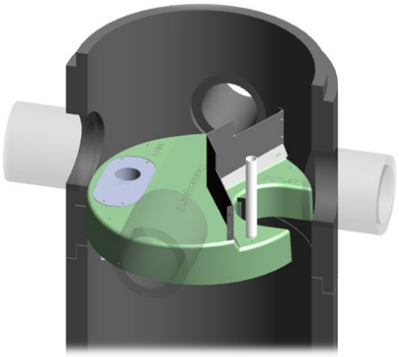
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

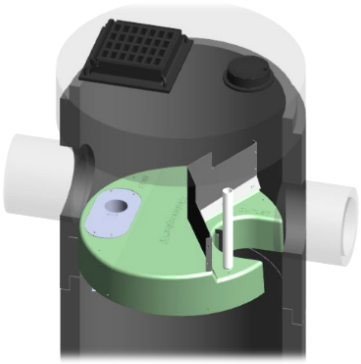
DESIGN FLEXIBILITY

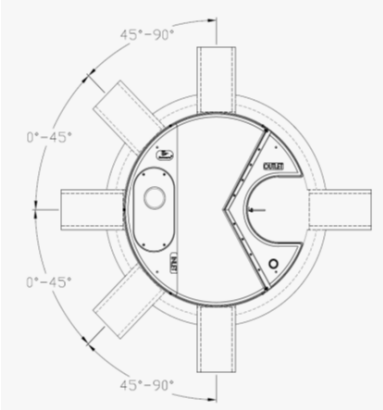
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

►While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.







INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.

0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.

45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity

** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD PERFORMANCE SPECIFICATION FOR "OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall

remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m^2.

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

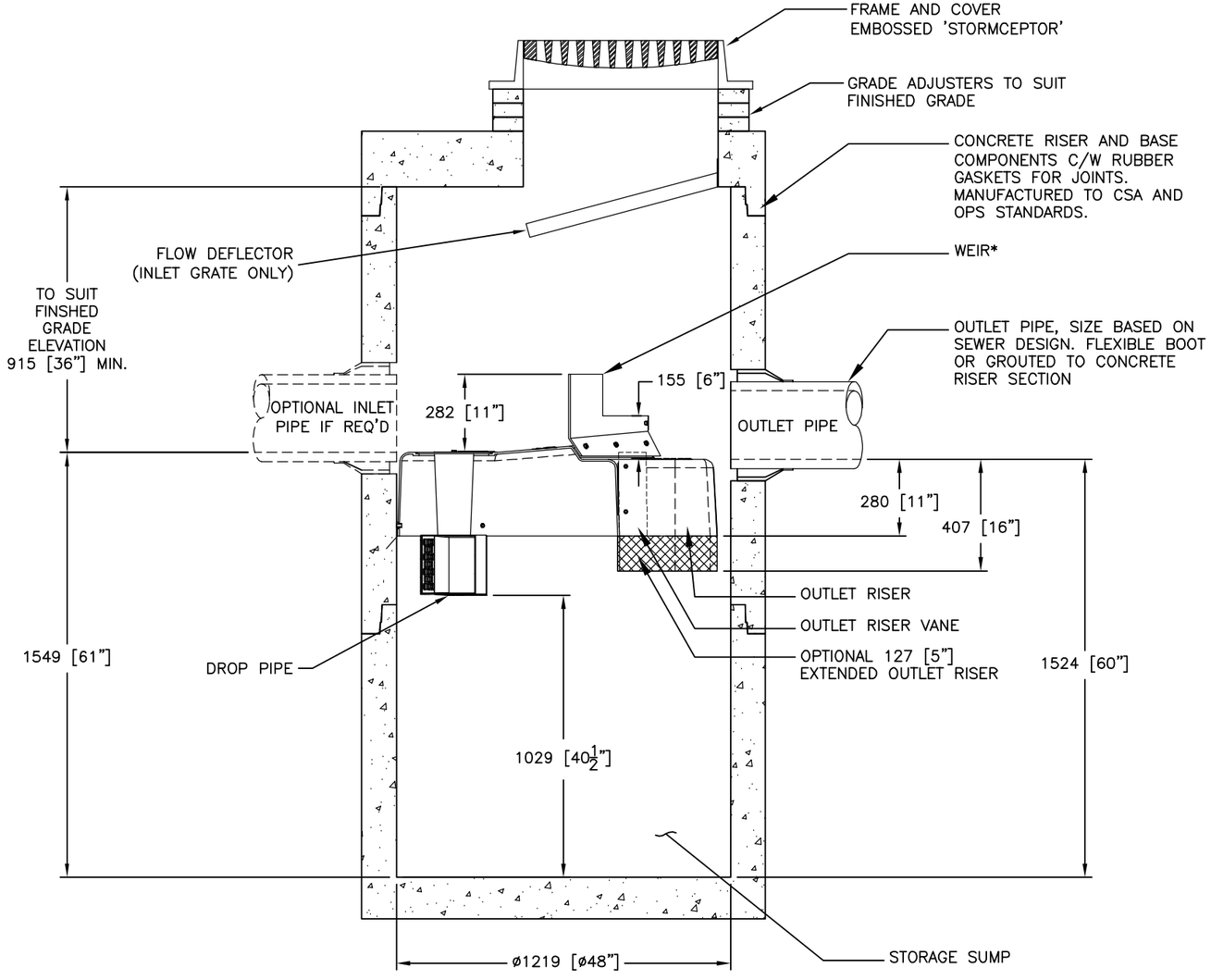
3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

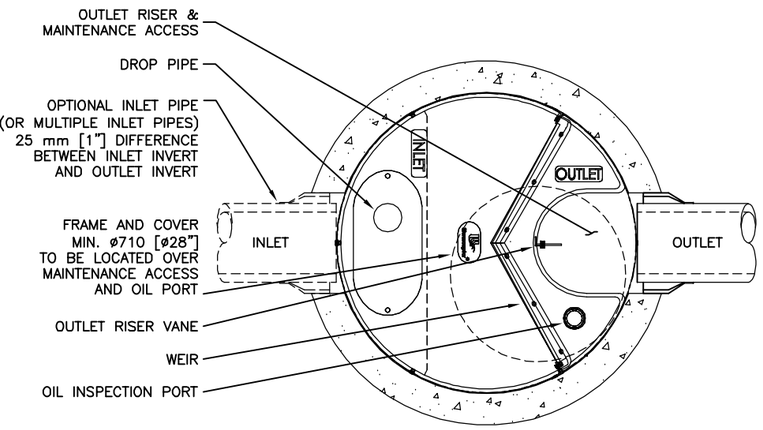
The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to

assess whether light liquids captured after a spill are effectively retained at high flow rates.

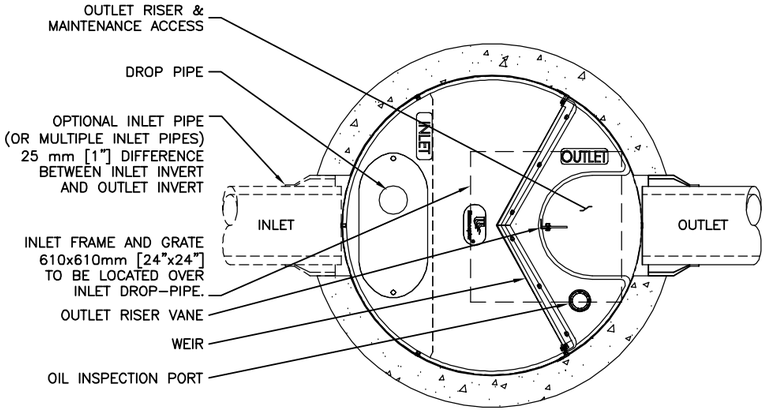
3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m^2 to 2600 L/min/m^2) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.** However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.



SECTION VIEW



PLAN VIEW (STANDARD)



PLAN VIEW (INLET TOP)

FOR SITE SPECIFIC DRAWINGS PLEASE CONTACT YOUR LOCAL STORMCEPTOR REPRESENTATIVE. SITE SPECIFIC DRAWINGS ARE BASED ON THE BEST AVAILABLE INFORMATION AT THE TIME. SOME FIELD REVISIONS TO THE SYSTEM LOCATION OR CONNECTION PIPING MAY BE NECESSARY BASED ON AVAILABLE SPACE OR SITE CONFIGURATION REVISIONS. ELEVATIONS SHOULD BE MAINTAINED EXCEPT WHERE NOTED ON BYPASS STRUCTURE (IF REQUIRED).

GENERAL NOTES:

* MAXIMUM SURFACE LOADING RATE (SLR) INTO LOWER CHAMBER THROUGH DROP PIPE IS 1135 L/min/m^2 (27.9 gpm/ft^2) FOR STORMCEPTOR EF4 AND 535 L/min/m^2 (13.1 gpm/ft^2) FOR STORMCEPTOR EFO4 (OIL CAPTURE CONFIGURATION). WEIR HEIGHT IS 150 mm (6 INCH) FOR EF04.

1. ALL DIMENSIONS INDICATED ARE IN MILLIMETERS (INCHES) UNLESS OTHERWISE SPECIFIED.
2. STORMCEPTOR STRUCTURE INLET AND OUTLET PIPE SIZE AND ORIENTATION SHOWN FOR INFORMATIONAL PURPOSES ONLY.
3. UNLESS OTHERWISE NOTED, BYPASS INFRASTRUCTURE, SUCH AS ALL UPSTREAM DIVERSION STRUCTURES, CONNECTING STRUCTURES, OR PIPE CONDUITS CONNECTING TO COMPLETE THE STORMCEPTOR SYSTEM SHALL BE PROVIDED AND ADDRESSED SEPARATELY.
4. DRAWING FOR INFORMATION PURPOSES ONLY. REFER TO ENGINEER'S SITE/UTILITY PLAN FOR STRUCTURE ORIENTATION.
5. NO PRODUCT SUBSTITUTIONS SHALL BE ACCEPTED UNLESS SUBMITTED 10 DAYS PRIOR TO PROJECT BID DATE, OR AS DIRECTED BY THE ENGINEER OF RECORD.

INSTALLATION NOTES

A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STRUCTURE (LIFTING CLUTCHES PROVIDED)
C. CONTRACTOR WILL INSTALL AND LEVEL THE STRUCTURE, SEALING THE JOINTS, LINE ENTRY AND EXIT POINTS (NON-SHRINK GROUT WITH APPROVED WATERSTOP OR FLEXIBLE BOOT)
D. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT THE DEVICE FROM CONSTRUCTION-RELATED EROSION RUNOFF.
E. DEVICE ACTIVATION, BY CONTRACTOR, SHALL OCCUR ONLY AFTER SITE HAS BEEN STABILIZED AND THE STORMCEPTOR UNIT IS CLEAN AND FREE OF DEBRIS.

STANDARD DETAIL
NOT FOR CONSTRUCTION

SITE SPECIFIC DATA REQUIREMENTS

STORMCEPTOR MODEL	EFO4
STRUCTURE ID	*
HYDROCARBON STORAGE REQ'D (L)	*
WATER QUALITY FLOW RATE (L/s)	*
PEAK FLOW RATE (L/s)	*
RETURN PERIOD OF PEAK FLOW (yrs)	*
DRAINAGE AREA (HA)	*
DRAINAGE AREA IMPERVIOUSNESS (%)	*

PIPE DATA:	I.E.	MAT'L	DIA	SLOPE %	HGL
INLET #1	*	*	*	*	*
INLET #2	*	*	*	*	*
OUTLET	*	*	*	*	*

* PER ENGINEER OF RECORD

MARK	DATE	REVISION DESCRIPTION	BY
1	6/8/18	UPDATES	JSK
0	5/26/17	INITIAL RELEASE	JSK

Stormceptor® EF

SCALE = NTS

imbrium®
407 FAIRVIEW DRIVE, WHITBY, ON, L1N 9A9
TF 800-565-4501 CA 416-800-9000 INTL +1-416-800-9000

DATE: 10/13/2017

DESIGNED:	DRAWN:
JSK	JSK
CHECKED:	APPROVED:
BSF	SP
PROJECT No.:	SEQUENCE No.:
EFO4	*

SHEET: 1 OF 1

APPENDIX "G"

Water Balance Calculations

VALDOR ENGINEERING INC.
File: 21150
March 2023

TABLE: G1

1942 Woodview Avenue, Pickering

WATER BALANCE CALCULATIONS - INFILTRATION TRENCH

1. VOLUME TO RETAIN

A = Area =	10472	sq.m.
D =	0.005	m
Abstractions (I) =	0.00000	m
Required Volume to Retain = A x (D - I) =	**52.36**	cu.m.

2. INFILTRATION TRENCH SIZE

Percolation Rate (P) =	12.00	mm/hr
Maximum Retention Time (T) =	72	hours
Max Infiltration Trench Height Allowable (D) = (PT/(1000*S)) =	0.86	m

*MOE recommend max depth of 1.5m

Drawdown Time at Selected Trench Height

T = (d / P) x 1000 =	38	hours

Clear Stone Trench Size

Trench Base Area (A) =	294.0	sq.m
Trench Height, D =	0.45	m
Trench Length, L =	140.00	m
Trench Width, W =	2.10	m
Void Ratio =	0.4	
Volume =	**52.92**	cu.m.

September 16, 2022 Report No. 210189-H1

11861808 CANADA CORPORATION
1060 Salk Road, Unit 1
Pickering, Ontario
L1W 3C5

Attention: Mr. Nadeem Munir

HYDROGEOLOGICAL INVESTIGATION
PROPOSED RESIDENTIAL SUBDIVISION
1942 WOODVIEW AVENUE, PICKERING, ONTARIO

Prepared for:

11861808 CANADA CORPORATION

CANADA ENGINEERING SERVICES INC.
39 Davisbrook Blvd., Scarborough
Toronto, Ontario M1T 2H6
Phone 416 492 4000
Fax 416 492 4001
Email cesi@cesi.ca

findings are plotted on the Borehole Log Numbers 1 to 8. Grain size graphs are shown on Figure Number 1.

The locations of the boreholes and monitoring wells were established by staff from Canada Engineering Services Inc., and are shown on Drawing Number 2 in Appendix B. The ground surface elevation of each borehole was taken off the Topographic Survey Plan by Omari B. Mwinyi, dated September 22, 2022.

The site location, the borehole locations, the borehole logs, the grain size analysis graphs and the geotechnical terms and symbols used in this report are shown in Appendix "B".

3.1 Soil Descriptions

The soils found in the boreholes at this site were as described below:

3.1.1 Topsoil

A layer of topsoil was encountered at the surfaces of all the boreholes. This layer consisted of a dark grey to black silty sand, some organics. It was moist and in a loose state and varied in thickness from 150 mm to 750 mm thick.

3.1.2 Silty Sand

Below the topsoil layer in all the boreholes was a layer of sandy silt fill with trace clay and gravel. This layer was grey in colour, was moist and in a compact state. It extended down to depths of 2.4 m, 2.6 m, 0.9 m, 3.0 m, 2.3 m, 2.4 m, 4.5 m and 2.1 m in Borehole Numbers 1, 2, 3, 4, 5, 6, 7 and 8 respectively.

3.1.3 Sandy Silt Till

Below the silty sand layer was a layer of native sandy silt till, trace gravel in all boreholes except in Borehole Number 3. Occasional sand seams were found in this layer. This layer was grey in colour, was wet and in a loose to dense state. It extended down to depths of 5.0 m, 4.5 m, 4.2 m, 4.4 m, 5.0 m, 6.5 m and 4.2 m in Borehole Numbers 1, 2, 4, 5, 6, 7 and 8 respectively. Borehole Numbers 1, 6 and 7 were terminated in this layer.

3.1.4 Sand

A layer of grey sand was found at the bottom of four boreholes, immediately below the sandy silt till layer in Borehole Numbers 2, 4, 5 and 8, and below the silty sand layer in Borehole Number 3. This layer was wet and in a loose to dense state.

4.0 GROUNDWATER

Groundwater was encountered in all the boreholes upon completion at depths of 4.8 m, 2.1 m, 2.0 m, 2.1 m, 2.3 m, 1.5 m, 2.2 m and 1.5 m in Borehole Numbers 1 to 8 respectively. Four monitoring wells were installed in Borehole Numbers 2, 4, 7 and 8 and water level readings were taken on February 01, August 8 and 23, 2022. The highest recorded water level was at 1.89 m depth or at elevation 132.61 m, in Borehole Number 2,

Water is expected to be a major concern at this site. Temporary and permanent de-watering will be required to lower the groundwater level, both during and after and after construction.

4.1 Monitoring Well Installation Data

Monitoring wells were installed at the bottom of Borehole Numbers 2, 4, 7 and 8 and consisted of a 3.1 m screen at the bottom of the well with a 50-mm internal diameter. The screens were connected to PVC pipes also with internal diameters of 50 mm. The wells were backfilled with sand up to a depth of 3.6 m above the base of the screens and thereafter, were filled with bentonite pellets. The wells were raised well above ground level and protective metal casings with locks were installed, which could be opened and closed for future water level readings.

The locations of the wells are shown on Drawing Number 2, and their surface elevations are shown in Table Number 2. The elevations were referenced to the Topographic Plan of Survey by Omari B. Mwinyi, dated September 22, 2021.

Borehole Log Numbers 2, 4, 7 and 8 with monitoring wells are shown in Appendix B. Well identities, their dates of installations, their surface elevations, their depths, their base elevations, the lengths of their screens and the lengths of the sand backfill from the bases of the screens to just above the tops of the screens are shown in Table Number 2 below:

Table Number 2

Borehole ID	Date of Installation	Surface Elevation (masl)	Depth of Borehole (m)	Elevation of Base of Well (masl)	Length of Well Screen (m)	Length of Sand Backfill (m)
BH 2	Oct. 14, 2021	134.5	6.6	129.17	3.1	3.6
BH 4	Oct. 18, 2021	133.4	6.6	127.92	3.1	3.6
BH 7	Oct. 14, 2021	133.9	6.6	127.96	3.1	3.6
BH 8	Oct. 18, 2021	132.85	6.6	126.76	3.1	3.6

4.2 Dates of Water Level Reading, Depths and Elevations

Water level readings were taken on the following dates and their depths and elevations are recorded in Table Number 3 below.

Table Number 3

Borehole ID	Date of reading	Depth of Water Level (m)	Elevation of Water Level Reading (masl)	Remarks
BH 2	Oct. 14, 2021	2.1	132.4	Upon Completion
BH 4	Oct. 18, 2021	2.1	131.3	Upon Completion
BH 7	Oct. 14, 2021	2.2	131.7	Upon Completion
BH 8	Oct. 18, 2021	1.5	131.35	Upon Completion
BH 2	February 1, 2022	1.89	132.61	**Highest Water Level**
BH 4	February 1, 2022	1.2	132.2	
BH 7	February 1, 2022	1.78	132.12	
BH 8	February 1, 2022	0.98	131.87	
BH 2	August 8, 2022	2.79	131.71	
BH 4	August 8, 2022	1.67	131.73	High Water Level

BH 7	August 8, 2022	2.38	131.52	
BH 8	August 8, 2022	1.6	131.25	
BH 2	August 23, 2022	2.89	131.61	
BH 4	August 23, 2022	1.78	131.62	High Water Level
BH 7	August 23, 2022	2.51	131.39	
BH 8	August 23, 2022	1.69	131.16	

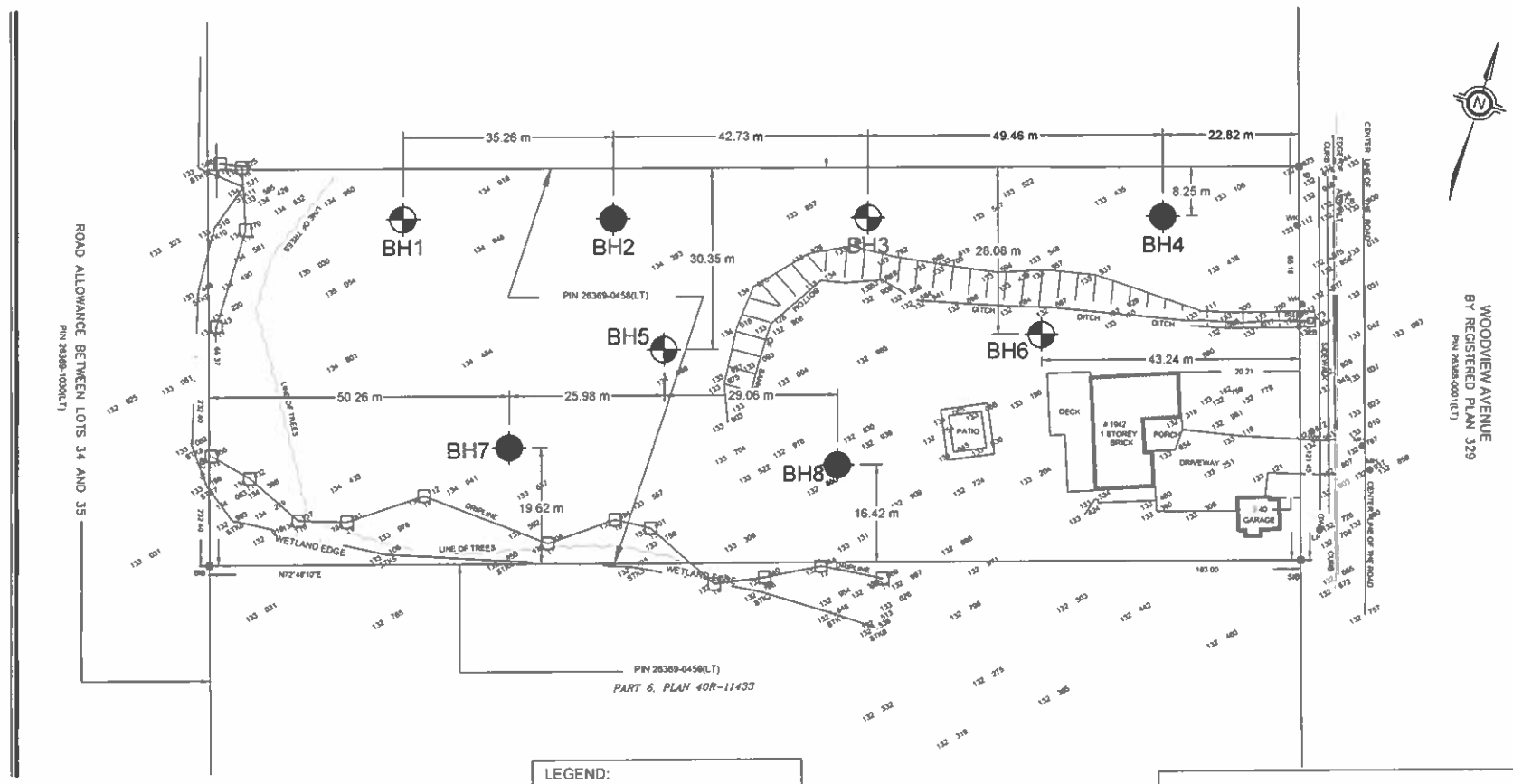
4.3 Ground Water Sampling

One groundwater sample was collected using a new dedicated low density polyethylene bailer and a new pair of nitrile powder-free gloves was worn during the sampling operations. The samples were placed in labeled coloured jars and vials of various sizes that were supplied by the laboratory and stored within individual bubble wrap bags in a cooler filled with ice packs to maintain a temperature of approximately 4°C. The samples were transported and temporarily stored in our laboratory and then submitted to Eurofin Laboratories in Ottawa, Ontario, within 7 days of collection. They were kept in a cooler or refrigerator, prior to shipment to the laboratory.

Due diligence was exercised in observing all technical procedures in putting down monitoring wells and sealing them so that there is no future cross-contamination or surface contamination, while following the Ontario Water Resources Act. When taking water from the ground or discharging to sewers, Ontario Regulation 387/04 should be followed.

4.4 Ground Water Testing

The water sample was tested at Eurofin Laboratories against the Durham Region sanitary sewers and storm sewers Bylaw criteria. Eurofin Laboratories is a Canadian Association for Laboratory Accreditation (CALA) Accredited Laboratory in accordance with ISO/IEC 17025:2020 - "General Requirements for the Competence of Testing and Calibration Laboratories" for analysis of all parameters for the Durham Region Storm and Sanitary Sewer Bylaw testing of water. The results indicated that the Total Suspended Solids (TSS) had exceedance (observed 1020 mg/L against 350 mg/L permitted) for sanitary sewers. For the storm sewer, the



LEGEND:

- BOREHOLE LOCATION
- MONITORING WELL LOCATION

SCALE

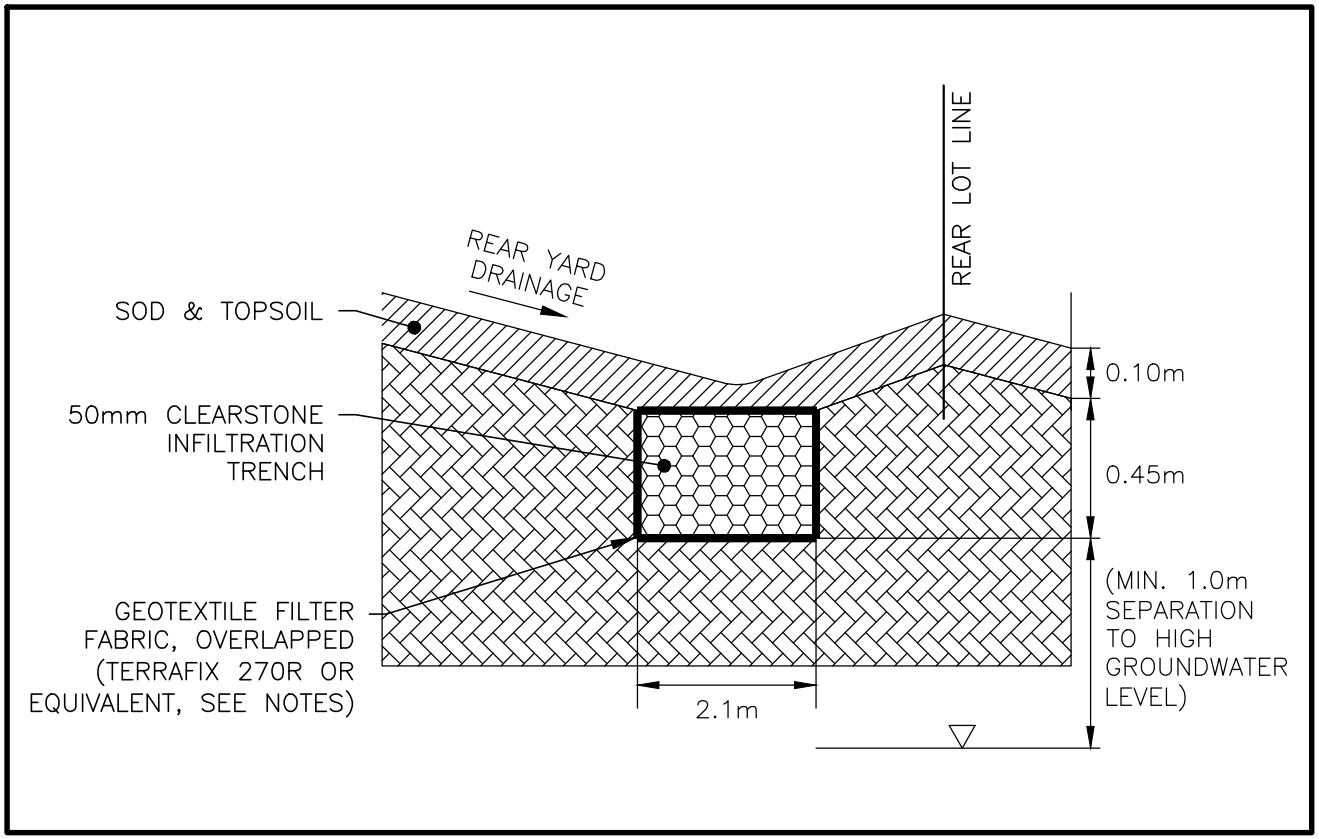
0 2 4 6 8 10 20 30 Metres

NOTE:

This drawing was prepared from survey by OMARI B. MWINYI, dated September 16, 2021

CLIENT	11861808 CANADA CORP 1400 BAYLY STREET PICKERING, ON L1W 3R2	PROJECT	GEOTECHNICAL INVESTIGATION 1942 WOODVIEW AVENUE PICKERING, ON L1V 1L6
TITLE	SITE PLAN SHOWING BOREHOLE LOCATIONS		
SCALE: AS SHOWN	DATE: SEP 16/22		
DRAWING NO: 2	PROJECT No: 210189		

CANADA ENGINEERING SERVICES INC.
39 DAVISBROOK BOULEVARD
SCARBOROUGH, ONTARIO M1T 2H6
Ph: 416 492 4000 Fax: 416 492 4001
E-mail address: cesi@cesi.ca



PROPOSED SUBDIVISION

1942 Woodview Avenue City of Pickering, Ontario

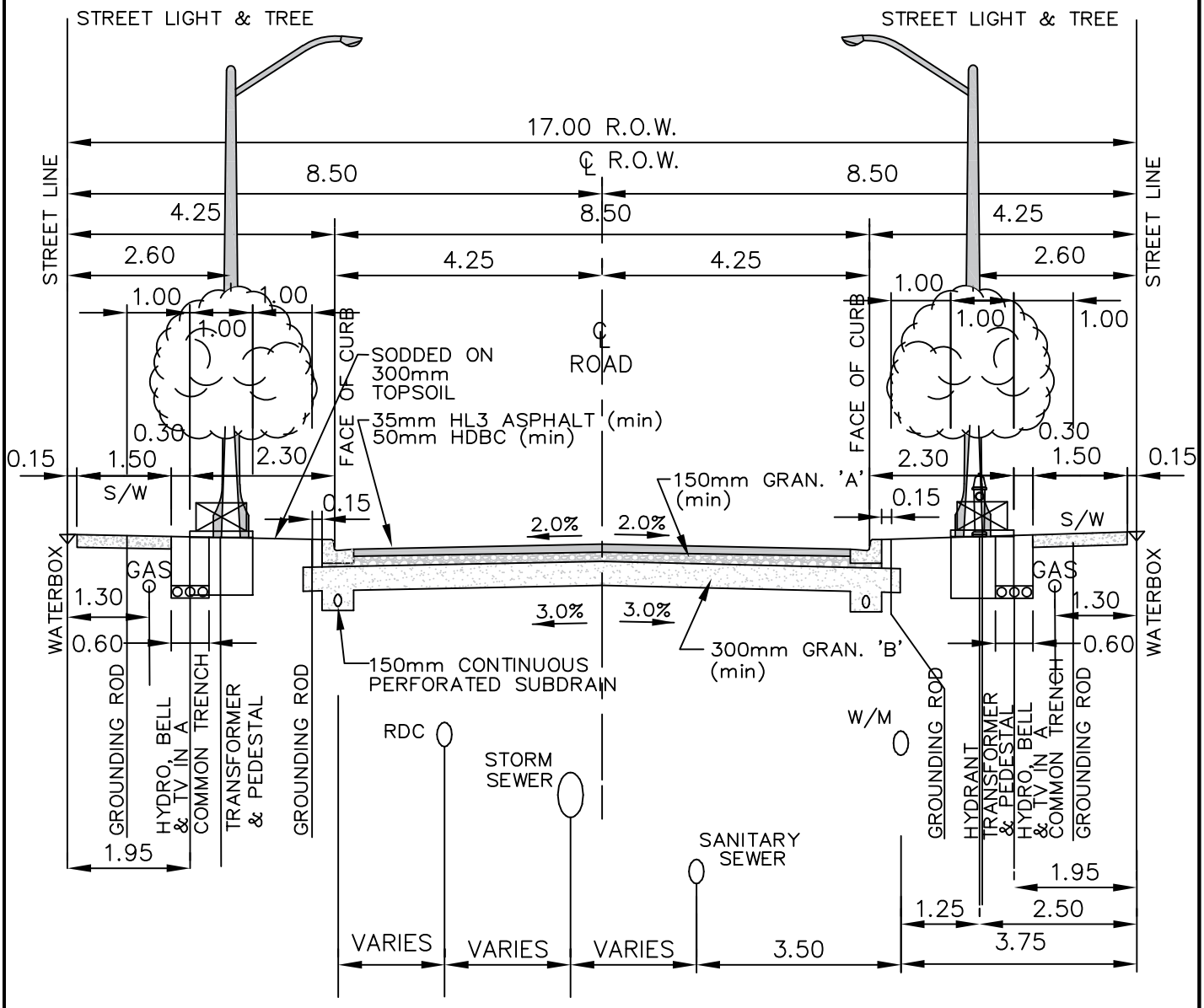
SWALE INFILTRATION TRENCH DETAIL

VALDOR ENGINEERING INC.
Consulting Engineers - Project Managers
571 Chrislea Road, Unit 4, 2nd Floor, Woodbridge, Ontario, L4L 8A2
TEL (905)264-0054, FAX (905)264-0069
E-MAIL: info@valdor-engineering.com
www.valdor-engineering.com

SCALE	N.T.S.	CKD. BY	D.A.G.	DWG.	FIGURE G-1
DATE	MAR. 07, 2023	DRAWN BY	D.N.Z.	PROJECT	21150

APPENDIX "H"

Road Details

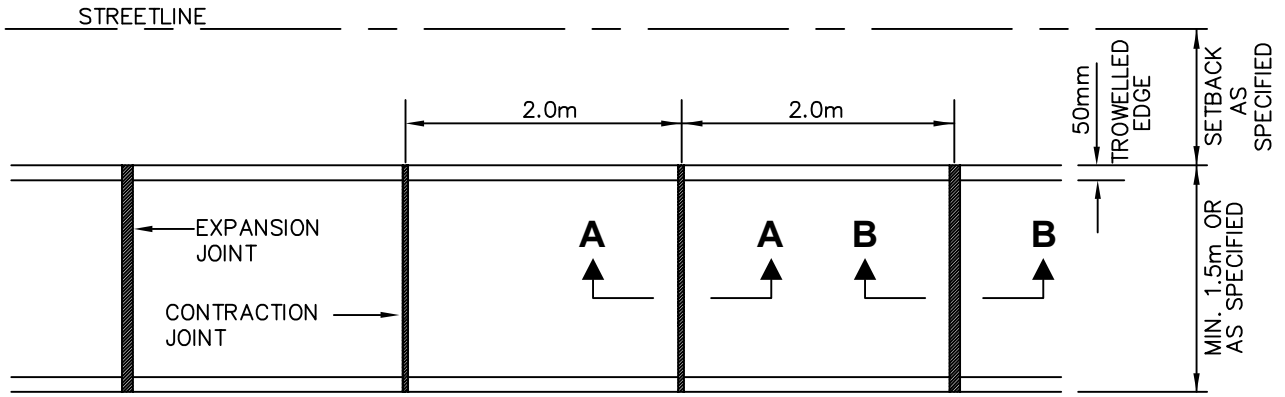


MINIMUM COVER	
GAS MAIN	0.9m
BELL TELEPHONE	0.6m
BELL CONDUIT	0.6m
HYDRO	0.6m
CABLE TELEVISION	0.6m
STORM SEWER	1.8m
RDC	1.8m
SANITARY SEWER	2.5m
WATERMAIN	1.8m

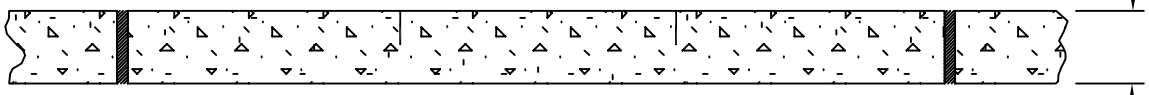
All dimensions are in metres unless otherwise noted.

City of Pickering — Engineering Services Department

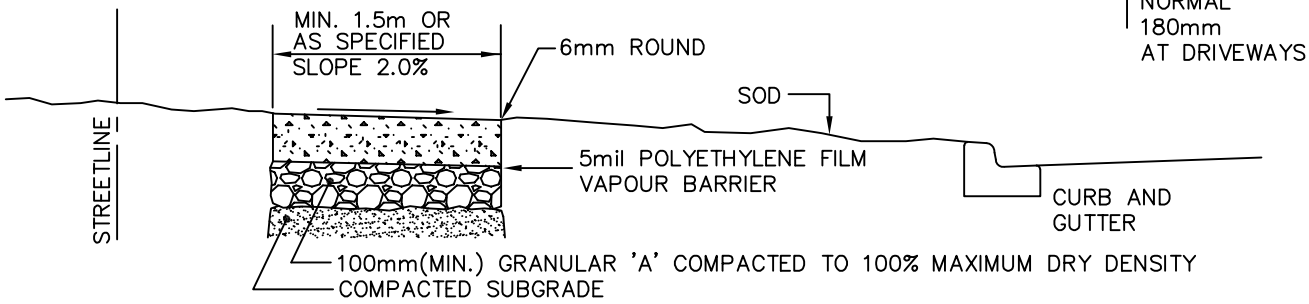
DRAWN J. BARKER	TYPICAL CROSS-SECTION 17.0m ROAD ALLOWANCE 8.5m PAVEMENT	REVISION NO. 1
APPROVED R. STARR		DATE OCTOBER 2019
DATE SEPTEMBER 2010		P-733DH



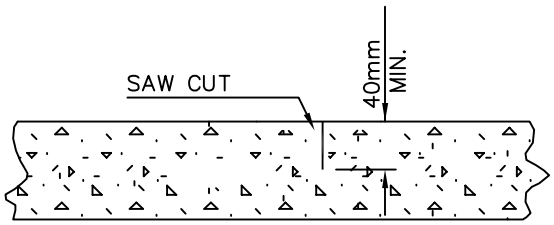
PLAN



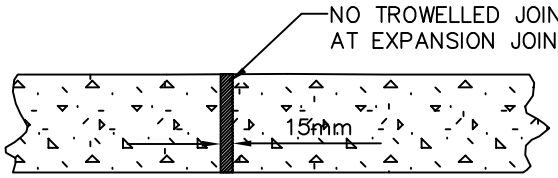
LONGITUDINAL SECTION



BOULEVARD SECTION



SECTION A-A
CONTRACTION JOINT DETAIL



SECTION B-B
EXPANSION JOINT DETAIL

NOTES:

1. EXPANSION JOINTS ARE REQUIRED WHERE THE SIDEWALK ABUTS OTHER CONCRETE STRUCTURES, WALKS, CURBS, UTILITY POLES, HYDRANTS, MANHOLES AND AT ANY OTHER LOCATION AT THE DISCRETION OF THE ENGINEER.
2. CONTRACTION JOINTS TO BE SAW CUT WITHIN 24 HOURS OF CONCRETE PLACEMENT. DUST FROM SAW CUTTING TO BE MINIMIZED.
3. CONCRETE TO CONFORM TO OPSS 1350, 32 MPa., 5%–8% AIR CONTENT & A MAXIMUM SLUMP OF 80mm.
4. CONSTRUCTION TO CONFORM TO OPSS 351.
5. TESTING IN ACCORDANCE WITH CITY OF PICKERING MINIMUM TESTING REQUIREMENTS.
6. 102x102 MW13.3xMW13.3 WELDED WIRE FABRIC TO BE PLACED 50mm ABOVE THE BOTTOM SURFACE OF THE SIDEWALK IN INDUSTRIAL AND COMMERCIAL DRIVEWAYS ONLY.

All dimensions are in millimetres unless otherwise noted.

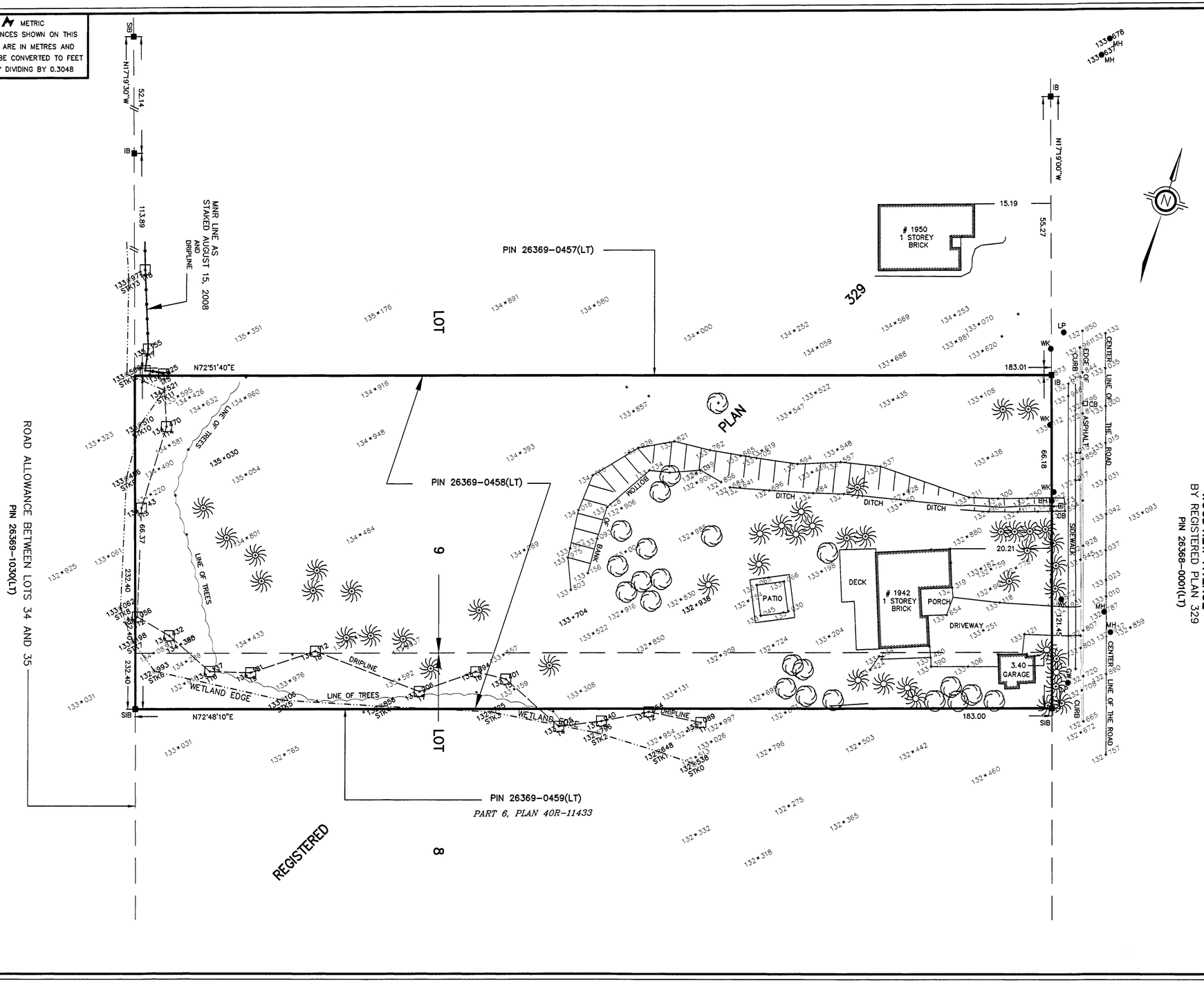
City of Pickering — Engineering Services Department

DRAWN P.HELGESEN	STANDARD SIDEWALK	REVISION NO. 1
APPROVED R. STARR		DATE NOVEMBER 2019
DATE MAY 2012		P–610

APPENDIX "I"

Topographic Survey

METRIC
DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048



TOPOGRAPHICAL PLAN

PART OF LOTS 8 AND 9
REGISTERED PLAN 329
CITY OF PICKERING

REGIONAL MUNICIPALITY OF DURHAM

SCALE 1 : 500

0 2 4 6 8 10 20 30 Metres

LEGEND

■	DENOTES SURVEY MONUMENT FOUND
IB	DENOTES IRON BAR
SIB	DENOTES STANDARD IRON BAR
LP	DENOTES LAMP POST
MH	DENOTES MANHOLE
	DENOTES DECIDUOUS TREE
	DENOTES CONIFEROUS TREE
CB	DENOTES CATCH BASIN
WK	DENOTES WATER KEY
	DENOTES MNR LINE
	DENOTES WETLAND EDGE
	DENOTES DRIPLINE
GW	DENOTES GUY WIRE
BH	DENOTES BOREHOLE
N	DENOTES NORTH
E	DENOTES EAST
S	DENOTES SOUTH
W	DENOTES WEST

ELEVATIONS :

ELEVATIONS SHOWN HEREON ARE GEODETIC AND ARE DERIVED FROM BENCH MARK NO. 1-089. BRASS TABLET SET HORIZONTALLY IN SOUTH FACE OF CONCRETE BASE OF HYDRO POLE, LOCATED 0.7KM SOUTH OF FINCH AVENUE, 67M EAST OF THE CENTRELINE OF WOODVIEW AVENUE AND 0.2M BELOW TOP OF CONCRETE. HAVING AN ELEVATION OF 131.236M.

BEARINGS:

BEARINGS HEREON ARE ASTRONOMIC AND ARE REFERRED TO THE WESTERLY LIMIT OF WOODVIEW AVENUE HAVING A BEARING OF N17°19'00"W AS SHOWN ON PLAN 40R-778.

SURVEYOR'S CERTIFICATE

I CERTIFY THAT;

THE SURVEY WAS COMPLETED ON THE 16TH DAY OF SEPTEMBER 2021.

Sept. 22, 2021
DATE

OMARI B. MWINYI
ONTARIO LAND SURVEYOR

PROJECT		PROJECT No.
No.1942 WOODVIEW AVENUE		21-076-T
DRAFTSPERSON	CALCULATIONS	CHECKED BY
SUGI	E:\OMSL\21-076\21-076	O.M.