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ENGINEERING ARCHITECTURE PLANNING SURVEYING

PETRO GOLD LTD.
535 Bayfield Street, Barrie, ON
Functional Servicing & Stormwater Management Report

405-55 St. Clair Avenue West, TORONTO, ON M4V 2Y7
| WWW.APLINMARTIN.COM | (416) 644-1900

Project No: 21-7026
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Aplin & Martin Consultants Ltd.

Quality Information

Prepared By:
Aplin & Martin Consultants



Name: Shathurshan Balachandran, EIT
Title: Engineering Designer

Approved By:
Aplin & Martin Consultants



Name: Chesley Blahut, P.Eng
Title: Project Manager

Revision History

Revision	Date	Details	Name	Title
1	13-April-2023	SPA	Chesley Blahut	Project Manager

Distribution List

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-	1	Petro Gold Ltd.

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1.0 INTRODUCTION

Aplin Martin has been retained by Petro Gold Ltd. to prepare a Functional Servicing and Stormwater Management Report (FSRSWM) in support of the Site Plan Application for a proposed development for 2 new mixed- use buildings on an existing commercial lot consisting of 2 existing buildings. The two proposed mixed use developments, building 3 and 4 will include residential and retail space. The Site Plan by Keith Loffler McAlpine Architects, on which this report is based, is provided in Appendix A. The objectives of this report are to:

- Determine suitable methods of providing water, sanitary, and storm services for the development.
- Determine suitable methods for the attenuation and treatment of stormwater runoff with respect to the City of Barrie's design guidelines, the Ministry of Environment, Conservation and Parks (MECP) design standards, and the Nottawasaga Valley Conservation Authority (NVCA) Stormwater Management Guidelines.

1.1. Site Description

The proposed development is located at 535 Bayfield Street in the City of Barrie (the City). The site is approximately 1.34 ha in size and consists of two existing 1-storey commercial buildings fronting Bayfield Street. Building 1 is a furniture warehouse, and Building 2 is a restaurant with a drive-thru at the back. The site has one vehicular entrance off Bayfield Street and shares this vehicular access with the adjacent sites to the northwest and southeast. Refer to the Architectural Site Plan by Keith Loffler McAlpine Architects in Appendix A.



Figure 1: - Site Location Plan

As shown in Figure 1, the area is bounded by:

- Bayfield Street to the southwest;
- Existing residential subdivision to the northeast; and,
- Existing commercial buildings to the northwest and southeast.

1.2. Background Information

The following documents and drawings were available for our review. Relevant excerpts from documents listed in *italics* are available for reference in Appendix A:

- *Topographic plan prepared by J.D. Barnes Ltd. (Apr. 2021);*
- Plan and Profile drawings of Bayfield Street;
- Bayfield Street Improvements Sanitary Drainage Plan 99-22 Sh.3 of 44;
- Bayfield Street Improvements Storm Drainage Plan 99-22 Sh.2 of 44;
- *Geotechnical Investigation by Sola Engineering (Apr 2021);*
- *Flow and Pressure Test by Vipond Inc. (Jun 2021), and;*
- *Grade Control & SWM Plan (STM-1) by R. Thibert Design Group (Aug. 2000).*
- *Site Photos of existing outlet structure.*
- *Sub Utility Engineering Investigation by Premier Locates (January 6, 2023)*

1.3. Proposed Development

The proposed development consists of a constructing play area to the east of Building 1 as well as interior work within Building 1 and two new mixed-use buildings (Building 3 and 4) within the site and the addition of a parking lot. Proposed Building 3 is a 4-storey mixed used development which includes a total of 27 residential apartment units and 118 m² of retail space. Proposed Building 4 is a 4-storey mixed use development which includes a total of 21 residential apartment units and 116 m² of retail space, refer to the Architectural Site Plan by Keith Loffler McAlpine Architects in Appendix A for the scope of work.

The zoning, gross floor area, building height, and occupancy will remain unchanged for both existing Building 1 and Building 2. The existing parking areas adjacent to Bayfield Street, and the existing restaurant (Building 2) with its drive-thru and parking area will remain unchanged, with exception of some curb re-alignments for a proposed sidewalk.

The parking lot servicing the proposed shopping centre will be expanded to include 63 parking spaces. The total re-developed area is 0.58 ha, refer to Fig-01 in Appendix D.

2.0 DOMESTIC AND FIREFIGHTING WATER SUPPLY

2.1. Existing Water Supply

The site is serviced by a 300 mm diameter watermain along Bayfield Street. The two existing commercial buildings connect to the municipal watermain via a 50 mm diameter and fire water service. Refer to Drawing C02 in Appendix E for details.

There is an existing municipal fire hydrant adjacent to the site on Bayfield Street to provide firefighting coverage for the nearby existing buildings.

2.2. Proposed Water Supply

A proposed 100 mm diameter domestic service and a separate 250 mm fire service connection to the existing 300 mm diameter watermain within Bayfield Street will provide domestic and firefighting supply to the proposed development. Separate water services have been provided in accordance with the City of Barrie Water Transmission and Distribution Design Standards. A proposed backflow preventor will be installed on the fire water service at the property line and a proposed water meter chamber will be installed on the domestic water service at the property line.

The domestic water and fire flow demands have been determined in accordance with the City of Barrie's Design Criteria and as per the Fire Underwriter's Survey (FUS) design criteria. The projected domestic water demand under Maximum Day and Peak Flows are estimated to be 0.88 L/s and 1.33 L/s, respectively. Fire flow demands for the development are estimated to be 183.33 L/s. This brings the total sum of Maximum Day + Fire Flow to be 184.21 L/s at a minimum of 20 PSI.

Refer to **Appendix B** for the detailed domestic water demands calculations and the step-by-step process as per FUS guidelines and requirements.

Fire Hydrant flow testing was completed by Vipond Inc. on June 2021, which indicated an available fire flow of 3080 USGPM, or 194 L/s at 20 PSI. Refer to **Appendix B** for the original testing results.

As this fire flow of 194 L/s at 20 PSI exceeds the required Maximum Day + Fire Flow demand of 184.21 L/s, the municipal water system therefore has adequate flow and pressure to service the proposed development.

3.0 SANITARY SERVICING

3.1. Existing Sanitary Servicing

There is an existing municipal 250mm sanitary sewer within Bayfield Street that drains south along Bayfield Street. The two existing commercial buildings connect to the existing 250mm diameter municipal sanitary sewer via a 200 mm diameter sanitary service.

The existing development will result in a peaked commercial flow of 0.29 L/s based off a gross commercial floor area of 0.32 ha and a gross drainage area of 0.76 ha. Refer to **Appendix C** for detailed calculations of existing commercial flows.

3.2. Proposed Sanitary Servicing

The existing 200mm diameter service to Bayfield Street is to be maintained. Internal servicing to the site will include a single 200 mm diameter sanitary sewer to drain existing Building 1 and proposed Building 3 and 4. Refer to **Drawing C02** in **Appendix E**.

3.3. Sanitary Discharge

The proposed development consists of 48 residential units and a total of 234 m² of commercial retail space. The proposed development will result in projected population of 80 persons and a peaked residential flow of 1.67 L/s. The proposed development will also result in a projected peaked commercial flow of 0.02 L/s. Infiltration has been accounted for with an inflow of 0.10 L/s/ha, which results in 0.06 L/s of additional flow, based off the total developed area of 0.58 ha. The total projected peaked sanitary flows for the proposed development is calculated to be 1.74 L/s. The total post development peaked sanitary flows for the entire site area is calculated to be 2.03 L/s Refer to *Table 1* and Appendix C for detailed calculations.

Existing Peaked Sanitary Flows (L/s)	Proposed Peaked Sanitary Flows (L/s)
0.29	2.03

Table 1: Existing and Proposed Sanitary Flows

3.4. Sanitary Capacity

A downstream sanitary sewer analysis was completed in order to demonstrate that the proposed development does not have any negative impacts on the capacity of the existing sanitary sewers downstream of the subject site. The analysis was conducted following the City of Barrie Sanitary Sewage Collection System Policies and Design Guideline and the Ministry of Environment Design Guideline for Sewage Works 2008 and the Bayfield Street Outlet Sanitary and Storm Sewer Plan and Profile Drawings prepared by Richardson Engineering Ltd.

The downstream sanitary analysis was completed on the existing 200 mm diameter sanitary sewer draining southeast towards Priority Plaza before connecting to the existing 250 mm diameter trunk sanitary sewer draining east towards the Bayfield Links Subdivision. Refer to **Figure 7 and 8** for the Sanitary Downstream Analysis in **Appendix C**.

Under existing conditions, the site is zoned as commercial with a resulting peaked commercial flow of 0.29 L/s. Refer to **Table 1**. The downstream analysis shows that under existing conditions the highest flow ratio (pipe capacity over design flow) is 74%. Under proposed conditions the peaked sanitary flows generated is 2.03 L/s. The downstream analysis shows that under proposed conditions the highest flow ratio is 77%.

4.0 STORMWATER MANAGEMENT

4.1. Existing Storm Servicing

The following storm sewer borders the site:

- An 825 mm diameter storm sewer along the east side of Bayfield Street draining south.

The site also contains a SWM Outlet Control Structure for quantity and quality controls, refer to Section 4.3 for details.

4.2. Design Criteria

Stormwater Management for the proposed development is designed in accordance with the City of Barrie's Storm Drainage & Stormwater Management Policies & Design Guidelines, the Ministry of Environment, Conservation and Parks (MECP) stormwater management criteria, as well as the criteria outlined in the NVCA Stormwater Technical Guide. A summary of the stormwater management (SWM) criteria applicable to this project is as follows:

- **Quantity Control** - Post-development flows shall be controlled to pre-development flows up to and including the 100-year storm event.
- **Quality Control** - Provide an enhanced level of quality control per MECP guidelines (i.e. 80% TSS removal).
- **Water Balance** - A minimum of the first 5 mm of rainfall should be retained on site.
- **Stormwater Nutrient Management** - The NVCA requires the matching of post-development phosphorous loads to pre-development levels as a minimum standard. The NVCA prefers all new development to achieve a 20% reduction from pre-development levels in phosphorous loadings or best efforts approach.

4.3. Existing Drainage

As per Section 1.2, the existing stormwater management design for the site was prepared by R. Thibert Design Group, and is available in Appendix A.

The existing site generally slopes from west to east, refer to Fig-02 in Appendix D. Minor drainage is captured by a series of catchbasin manholes (CBMH's No.1 and No.2) and conveyed to the SWM Detention Facility on the north side of the existing site, while major drainage is conveyed directly into the SWM Detention Facility via overland flow. Drainage within the SWM Detention Facility is then discharged to the adjacent northeast property via a SWM Outlet Control Structure.

Refer to the topographic survey by J.D Barnes in Appendix A for the location of the SWM Outlet Control Structure, in addition to the SWM Detention Facility.

4.4. Existing Quantity Control

The existing site contains a SWM Outlet Control Structure (Section 4.3) that provides quantity control during storm events. The required on-site storage as a result of this quantity control is provided by the existing SWM Detention Facility on the northeast border of the site. Existing drainage conveyed through the SWM Outlet Control Structure enters the neighbouring private property to the northeast, refer to Fig-02 in Appendix D.

The SWM Outlet Control Structure is provided in-detail on drawing STM-1 by R. Thibert Design Group in Appendix A, and contains three separate components working in parallel:

- A 75 mm diameter orifice tube;
- A 125 mm wide rectangular contracted weir; and,
- A second trapezoidal sharp-edge weir.

The SWM Outlet Control Structure accepts low periods of drainage by using the 75 mm diameter orifice tube, which has an invert of 284.80 m.

Once the 75 mm diameter orifice tube reaches 100% capacity, the water level will rise to the sill of the 125 mm wide rectangular contracted weir, which has a sill invert of 285.28 m.

According to drawing STM-1 by R. Thibert Design Group in Appendix A, peak flows generated by the 100-year event will be conveyed entirely by the orifice tube and rectangular contracted weir. This will result in a high water level of 285.67 m during the 100 year event, which is the same elevation as the top of the rectangular contracted weir.

Peak flows in excess of the 100 year event will not only be conveyed through the 75 mm orifice tube and the 125 mm wide rectangular contracted weir, in addition to the trapezoidal sharp-edge weir, which has an sill invert of 285.67 m and a weir top elevation of 260.15 m.

4.5. Existing Quality Control

As per the initial Stormwater Management Design in Appendix A, the SWM Outlet Control Structure also contains a quality control component which has been sized for the existing development. After being controlled to a lesser release rate via the orifice tube and weir structures discussed in Section 4.4, drainage is then treated for quality control via an existing ditch with geotextile fabric and rip-rap stone before being discharged to the neighbouring property.

4.6. Proposed Drainage

The proposed SWM strategy control the post development flows through the existing SWM Outlet Control Structure and to provide quantity control through the use of a proposed underground storm tank. (Section 4.3).

4.7. Allowable Release Rate

In accordance with the design criteria identified in Section 4.2, post development flows generated by the proposed development shall be controlled to existing rates of discharge, up to and including the 100-year storm event.

The allowable release rate can be found by calculating the existing rates of discharge from the SWM Control Outlet Structure under various amounts of head.

Refer to *Table 2* for the 100 year allowable release rate from the SWM Control Outlet Structure.

Storm Event	Existing HWL (m)	75 mm Diameter Orifice		125 mm Wide Rectangular Contracted Weir		Allowable Release Rate (L/s)
		Head (m)	Discharge (L/s)	Head (m)	Discharge (L/s)	
100 Year	285.56	0.76	10.7	0.27	31.4	42.2

Table 2: Allowable Release Rate

As seen on drawing STM-1 by R. Thibert Design Group in Appendix A, the differing head between the 75 mm diameter orifice and the rectangular contracted weir is due to the weir being located above the orifice, and therefore having a higher starting invert. In addition, the trapezoidal sharp-edge weir has not been counted in the analysis of the allowable release rate, as it is only used during storm events in excess of the 100 year event (Section 4.4).

It is understood that the City's quantity control criteria Section 4.2 is applicable to each storm event from the 2 year to the 100 year, but only the 100 year allowable release rate has been provided in *Table 1*. This is because the existing design completed by R. Thibert Design Group Appendix A only provided the high water level of the 100 year event, and did not include any additional stormwater management information. As a result, it is not possible to determine the allowable release rates of lesser stormwater events on the SWM Control Outlet Structure.

4.8. Quantity Control

As discussed in Section 4.6, the SWM Control Structure is to be maintained, and a proposed underground storage tank will provide quantity control required by the proposed development. The proposed underground storage tank will be sized to an allowable release rate of 42.2 L/s. The proposed storage tank will outlet into the existing SWM Control Structure at the existing invert of 284.80 m which will control the flows to the allowable release rate.

Storm Event	75 mm Diameter Orifice		125 mm Wide Rectangular Contracted Weir		Proposed Release Rate (L/s)
	Head (m)	Discharge (L/s)	Head (m)	Discharge (L/s)	
100 Year	0.76	10.7	0.27	31.4	42.2

Table 3: Proposed Release Rate

By discharging the underground storage tank to the existing SWM Control Outlet Structure at the existing invert of 284.80 m the allowable release rate, thereby satisfying the quantity control criteria identified in Section 4.2. The modified rational method was used to quantify the required storage from the proposed development (Table 4), refer to detail calculations in Appendix D.

Storm Event	Area (ha)	Required Storage (m ³)	Storage Provided (m ³)
100-Year	1.34	672.3	691.7

Table 4: Proposed Storage

The underground storm tank will have a proposed footprint area of 1036.80 m², with a depth of 0.70 m for a net storage volume of 691.74 m³. Refer to the underground storm tank shop drawings prepared by BARR Plastics Inc. in Appendix D.

The total site area of 1.34 ha has been used to determine the total storage required as the entire site drainage will be conveyed into the proposed underground storm tank. Refer to the Site Grading Plan in Appendix E and Fig-04 in Appendix D.

As required to control the drainage from Catchment A1-Post to the existing SWM Control Outlet Structure, catch basins have been provided and sized to capture the 100 year flows with 50% blockage. Refer to Table 5 for a summary of the storm drainage flows entering each catchbasin and the allowable inlet flow rate. As seen in Table 4 the total storm drainage flows entering the catchbasins is calculated to be 147.8 l/s which is less than the allowable inlet flow rate of 203.8 L/s. Therefore, in a 100 year storm event the proposed catchbasins will be able to convey the 100 year flows with 50% blockage. Refer to Fig-06 in Appendix D for catchbasin catchment area plan and detailed calculations.

100 Year Drainage from A1						Double Area Drain Flow (50% Blockage)
Outlet	Area ¹	Runoff	Time	Intensity	Flow	
ID		Coefficient	t	$i=A*(t^C)$	$Q=CiA/360$	
	ha	C	min	mm/hr	L/s	
CB3	0.1	0.95	10.00	180.44	47.7	78.5
CB4	0.18	0.95	10.00	180.44	85.8	85.8
CB5	0.01	0.95	10.00	180.44	4.8	23.2
CBMH2	0.02	0.95	10.00	180.44	9.5	16.3
TOTAL (l/s)					147.8	203.8

Table 5: 100-year Capture of Catchbasins with 50% Blockage

4.9. Quality Control

As per Section 4.2, the water quality objective for the site is to achieve 80% TSS removal. The total site area of 1.34 ha has been used to achieve this objective. A proposed Hydroworks Oil Grit Separator – HydroStorm HS-8 is proposed upstream of the existing outlet structure to achieve 80% TSS removal. Refer to the Site Servicing Plan in Appendix E for details of the OGS unit alignment. Refer Appendix D for OGS Unit sizing report and ETV Verification report.

Catchment	Initial TSS	Jellyfish TSS Removal	Remaining TSS	Total TSS Removal
A1 Post	100%	80%	20%	80%

Table 6: Quality Control Summary

As can be seen in Table 6, the proposed HydroStorm HS-8 OGS Unit will remove 80% of TSS from the area of development, thereby demonstrating an ‘Enhanced’ level of treatment and fulfilling the quality control criteria of Section 4.2.

4.10. Erosion Control

As required by NVCA, a minimum on-site retention of 5 mm across the total site area of 1.34 ha is required to achieve the erosion control criteria (Section 4.2). This equates to a required retention volume of 69.5 m³. A water balance analysis was completed on site to determine that the volume required to match pre to post infiltration is 7.90 m³. Refer to Appendix D for water balance calculations. Therefore, the infiltration volume required will be governed by the 69.5 m³ as per the NVCA requirements.

As per Section 4.2, the 5 mm storm event is to be retained on-site. To address this, the proposed underground storage tank has been sized to provide retention of the 5 mm event (Table 7). Refer to Fig-05 in Appendix D for the area of proposed development draining to the underground storage tank.

LID	Area of Proposed Development Draining to LID (m ²)	Required Storage (m ³)	Provided Storage (m ³)
Underground Storage Tank	13,900	69.5	82.9

Table 7: Erosion Control Summary

As per the Hydrogeological Investigation in Appendix A, the soils have a percolation rate of 86 mm/hour and a corresponding design infiltration rate of 34 mm/hr, refer to drawdown calculations in Appendix D.

The proposed underground storage tank will be constructed with a 0.20m layer of clear stone gravel which will allow for infiltration into the ground. Refer to the underground storm tank shop drawings prepared by BARR Plastics Inc. in Appendix D. As per the Hydrogeological Investigation by Harden Environmental Services Ltd., no groundwater was detected in the boreholes tested, refer to an excerpt of the report in Appendix A.

4.11. Stormwater Nutrient Management

As per Section 4.2, the NVCA requires the matching of post-development phosphorous loads to pre-development levels. Pre-development and post-development phosphorus loading from the area of development of the site are determined using the NVCA Phosphorus Loading Development Tool (*Table 8*).

	Area (ha)	Impervious Area (ha)	BMP	BMP Efficiency (%)	Phosphorus Loading (kg/yr)
Existing	1.34	1.06	-	-	1.29
Proposed	1.34	1.17	-	-	2.05
Proposed	0.58	1.17	Infiltration Trench	60%	1.72

Table 8: Phosphorus Loading Summary

The proposed infiltration trench will treat the total site area (1.34 ha) and provide a 0.33 kg/yr reduction in phosphorus loading. Refer to Appendix D for detailed calculations and output from the NVCA Phosphorus Loading Development Tool.

4.12. SWM Summary

A summary table for quantity, quality and water balance has been provided below indicating the required and provided SWM measures for this development. See *Table 9* below for additional information.

SWM Measure	Value Required	Value Provided
Quantity - SWM Control Outlet Structure	42.2 L/s Allowable	42.2 L/s Discharge
Storage - SWM Detention Facility	672.3 m ³	691.7 m ³
Quantity - Catchbasin Sizing	147.8 L/s	203.8 L/s
Quality - Infiltration Trench	80% TSS Removal	80% TSS Removal
Erosion Control - Infiltration Trench	5 mm retention	5 mm retention

Table 9: SWM Summary

4.13. Erosion Control During Construction

Erosion and sediment control measures will be installed for all phases and activities during construction. To reduce high concentrations of sediment in the site runoff and to minimize damages to natural downstream system, temporary sediment control devices are proposed for existing catch basins on site. In addition, a temporary sediment trap with a volume of 177 m³ is proposed to detain runoff and allow suspended particles to settle before the runoff is discharged.

Regular inspections of the erosion and sediment control measures will also be conducted to ensure proper operations. Refer to the ESC Plan & Details drawing in Appendix E for additional information.

Once all phases of construction have been completed, removal of the erosion and sediment control measures can take place.

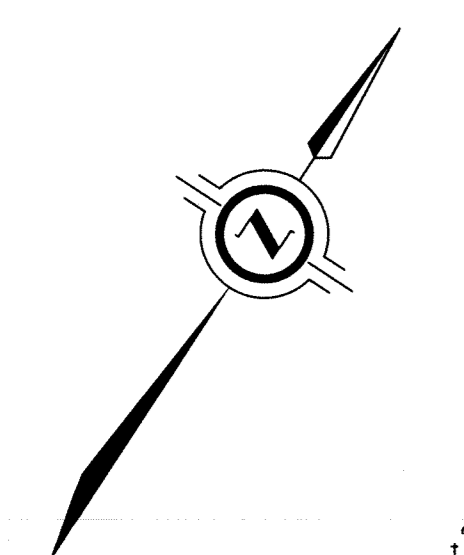
5.0 CONCLUSIONS AND RECOMMENDATIONS

Based on our reflection of the proposed development along with all supporting documentation the following conclusions and recommendations are made:

- The proposed 100 mm diameter domestic and 250 mm diameter fire water service connections will support the proposed development.
- The existing 200 mm diameter sanitary service connection will support the proposed development.
- SWM quantity control criteria will be achieved by maintaining the existing SWM Outlet Control Structure, and by a proposed underground storage tank.
- SWM quality control criteria will be achieved by using an Hydroworks Oil Grit Separator - HydroStorm HS-8 sized for 80% TSS removal.
- Erosion control criteria will be achieved by the proposed underground storage tank.
- Infiltration trench will provide a reduction in post-development phosphorus loading.

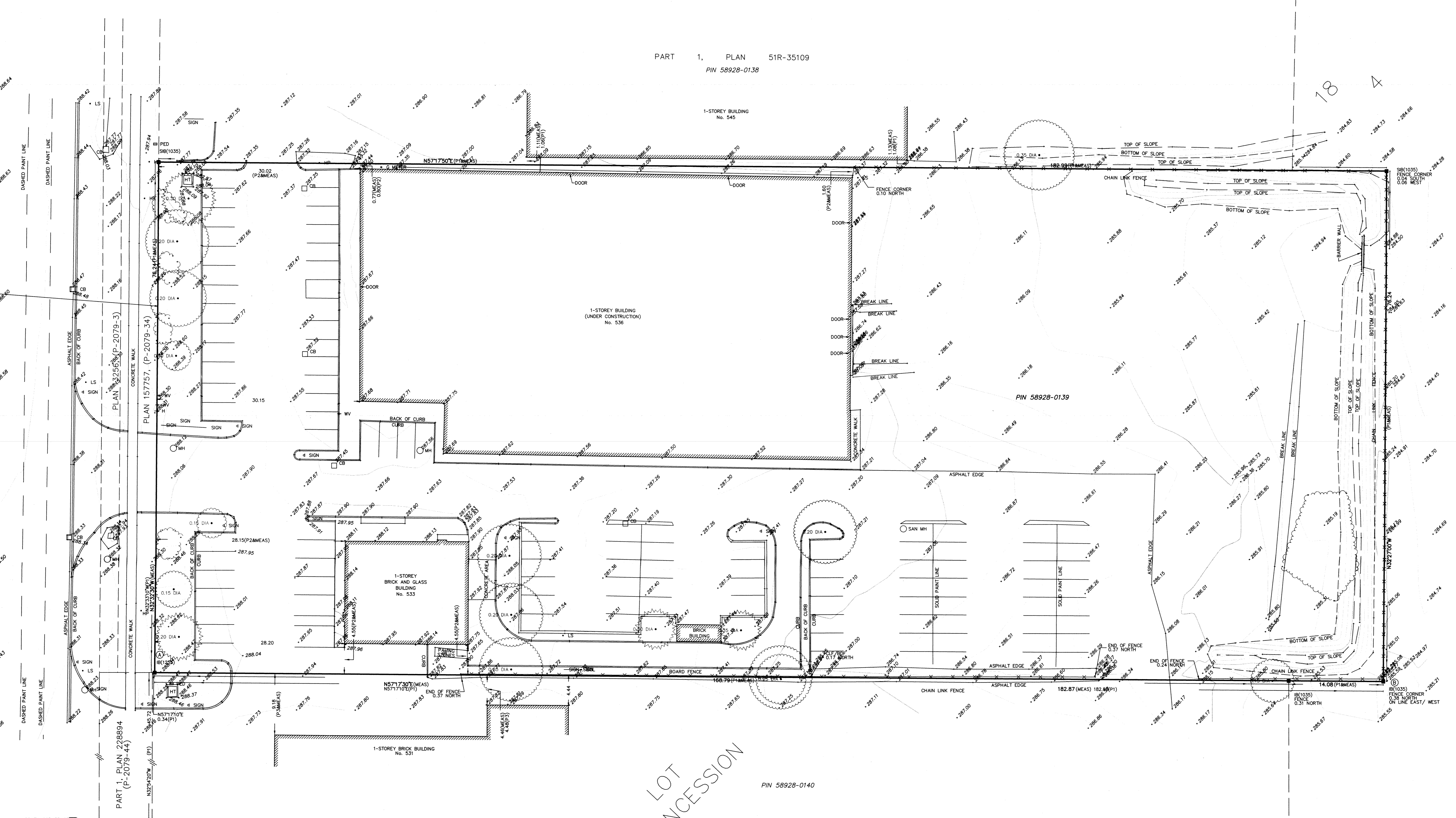
APPENDIX A

BACKGROUND INFORMATION



PART 1, PLAN 51R-35109
PIN 58928-0138

(KNOWN AS) BAYFIELD STREET
ORIGINAL ROAD ALLOWANCE BETWEEN CONCESSIONS 4 AND 5
(KNOWN AS) THE KING'S HIGHWAY No. 26 & 27
BY ORDER IN COUNCIL 85786, INST. FORB404 (PART 1, MTC PLAN P-2079-102)
PIN 58928-0007



PART 2, PLAN 51R-35109
PIN 58928-0138

PLAN OF SURVEY OF
**PART OF LOT 18
CONCESSION 4**
GEOGRAPHIC TOWNSHIP OF VESPRE
NOW IN THE
CITY OF BARRIE
COUNTY OF SIMCOE
SCALE 1 : 250

J.D. BARNES LIMITED
© COPYRIGHT 2021
METRIC DISTANCES AND/OR COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

BENCHMARK
ELEVATIONS SHOWN ON THIS PLAN ARE RELATED TO GEODETIC DATUM AND ARE DERIVED FROM BENCH MARK No. 00312008033 HAVING A PUBLISHED ELEVATION OF 277.889 METRES.

NOTES
BEARINGS ARE UTM GRID, DERIVED FROM OBSERVED REFERENCE POINTS A AND B BY REAL TIME NETWORK (RTN) OBSERVATIONS, UTM ZONE 17, NAD83 (CSRS) (2010.0).
DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.999690.
FOR BEARING COMPARISONS, A ROTATION OF 00'00"50" CLOCKWISE WAS APPLIED TO BEARINGS ON PLAN 51R-35109.
ALL SET SSB AND PB MONUMENTS WERE USED DUE TO LACK OF OVERBURDEN AND/OR PROXIMITY OF UNDERGROUND UTILITIES IN ACCORDANCE WITH SECTION 11 (4) OF O.R.G. 525/91.

INTEGRATION DATA

POINT ID	EASTING	NORTHING
ORP (A)	602 534.74	4 918 768.44
ORP (B)	602 688.56	4 918 867.23

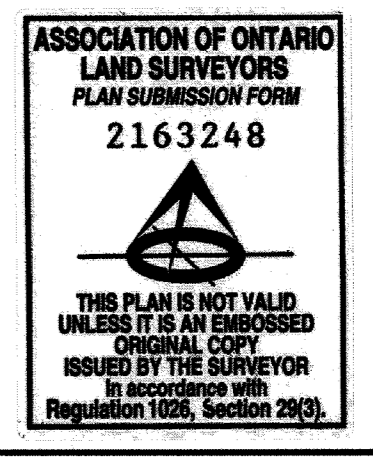
COORDINATES CANNOT, IN THEMSELVES, BE USED TO RE-ESTABLISH CORNERS OR BOUNDARIES SHOWN ON THIS PLAN.

LEGEND

■	DENOTES SURVEY MONUMENT FOUND
□	DENOTES SURVEY MONUMENT SET
SB	DENOTES STANDARD IRON BAR
SSB	DENOTES SHORT STANDARD IRON BAR
IB	DENOTES IRON BAR
PB	DENOTES PLASTIC BAR
WIT	DENOTES WITNESS
MEAS	DENOTES MEASURED
J.D.	DENOTES J.D. BARNES LIMITED
MTO	DENOTES MINISTRY OF TRANSPORTATION ONTARIO
1035	DENOTES R.R. WELSMAN, O.L.S.
1355	DENOTES R.C. RAINES, O.L.S.
P1	DENOTES PLAN 51R-35109
P2	DENOTES PLAN BY EPLETT & WORCESTER SURVEYING LTD. DATED AUG. 18, 2001
P3	DENOTES PLAN BY R.C. RAINES, DATED OCT. 9, 1986, PROJECT No. 1882
CB	DENOTES CATCHBASIN
CSB	DENOTES SINGLE CATCHBASIN
G	DENOTES GAS METER
MH	DENOTES MANHOLE
SAN MH	DENOTES SANITARY MANHOLE
BOL	DENOTES BOLLARD
HP	DENOTES HYDRO POLE
LS	DENOTES LIGHT STANDARD
PED	DENOTES TELEPHONE PEDESTAL
H	DENOTES FIRE HYDRANT
SV	DENOTES SPRINKLER VALVE
WV	DENOTES WATER VALVE

SURVEYOR'S CERTIFICATE
I CERTIFY THAT:
1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT AND THE REGULATIONS MADE UNDER THEM.
2. THE SURVEY WAS COMPLETED ON MARCH 29, 2021

APRIL 14, 2021
DATE
LAURENCE J. KEULLING
ONTOARIO LAND SURVEYOR



J.D. BARNES LIMITED GIS
LAND INFORMATION SPECIALISTS
142 COMMERCIAL PARK DRIVE, UNIT V, BARRIE, ON L4N 8W8
T: (705) 739-6770 F: (705) 739-6771 www.jdbarnes.com

DRAWN BY: MIKE WALDOCK CHECKED BY: LJK REFERENCE NO.: 21-11-872-02
PLOTTED: 4/14/2021 DATED: 04/12/2021

LOT CONCESSION

ONTARIO BUILDING CODE DATA

- 1 PROJECT DESCRIPTION:
NEW MIXED USE BUILDING
BUILDING HEIGHT = 17.20 M (5 STOREYS)
- 2 MAJOR OCCUPANCY:
RESIDENTIAL - GROUP C
- 3 BUILDING AREA:
EXISTING (0.0) + NEW (1,596.20) = TOTAL 1,596.20 SQ.M.
- 4 GROSS AREA:
EXISTING (0.0) + NEW (6,295.20) = TOTAL 6,295.20 SQ.M.
- 5 NUMBER OF STOREYS:
ABOVE GRADE = 4 STOREYS, BELOW GRADE = 0 STOREYS
- 6 NUMBER OF STREETS / FIRE FIGHTER ACCESS:
FACING 1 STREET
- 7 BUILDING CLASSIFICATION:
3.2.2.43A, GROUP C, UP TO 6 STOREYS, SPRINKLERED

- DIV. B PART 3
- B 3.1.2.1(1)
- A 1.4.1.2
- A 1.4.1.2
- B 3.2.1.1 & A 1.4.1.2
- B 3.2.2.10 & B 3.2.5
- B 3.2.2.20 - B 3.2.2.83
- B 3.2.2.20 - B 3.2.2.83

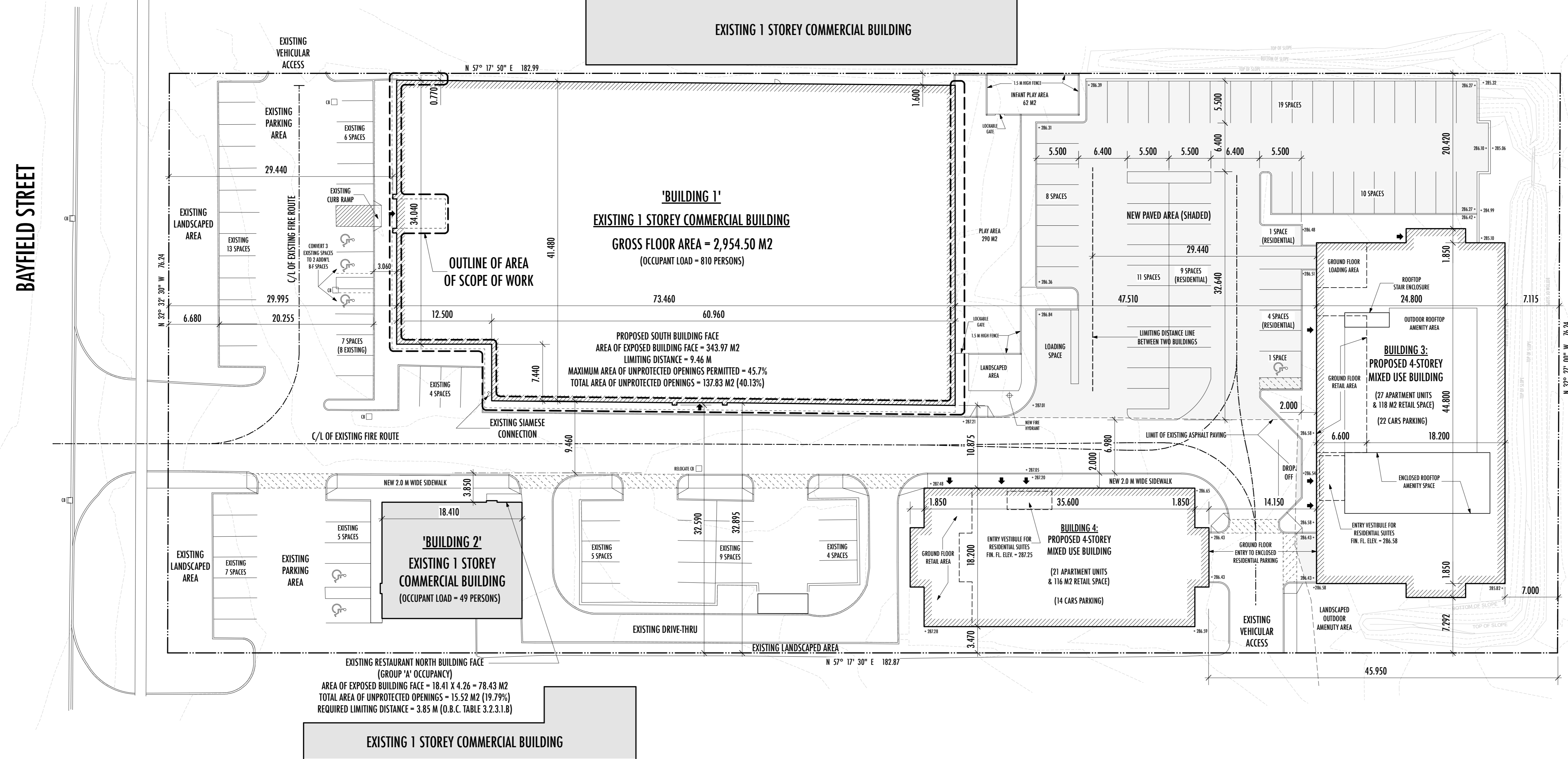
- 8 SPRINKLER SYSTEM PROPOSED:
FULLY SPRINKLERED
- 9 STANDPIPE REQUIRED:
YES
- 10 FIRE ALARM REQUIRED:
YES
- 11 WATER SERVICE / SUPPLY IS ADEQUATE:
YES
- 12 HIGH BUILDING:
NO
- 13 PERMITTED CONSTRUCTION:
COMBUSTIBLE OR NON-COMBUSTIBLE
ACTUAL CONSTRUCTION:
COMBUSTIBLE AND NON-COMBUSTIBLE
- 14 MEZZANINE AREA(S):
TOTAL = 0 SQ.M.
- B 3.2.2.43 & B 3.2.1.5
- B 3.2.9
- B 3.2.4
- B 3.2.5.7
- B 3.2.6
- B 3.2.2.20 - B 3.2.2.83
- B 3.2.1.1(3) - B 3.2.1.1(8)

- 15 OCCUPANT LOAD:
GROUND FLOOR (G): 250 M2 / 3.7 = 68 PERSONS
SECOND FLOOR (F2): 1,086 M2 / 46 = 24 PERSONS
THIRD FLOOR (F3): 2 / BEDROOM = 52 PERSONS
FOURTH FLOOR (F4): 2 / BEDROOM = 52 PERSONS
ROOF (A2): 91 M2 / 1.85 = 50 PERSONS
TOTAL = 298 PERSONS
- 16 BARRIER FREE DESIGN:
YES
- 17 HAZARDOUS SUBSTANCES:
NO
- 18 REQUIRED FIRE-RESISTANCE RATINGS:
SECOND FLOOR ASSEMBLY FRR = 2 HR.
THIRD & FOURTH FLOOR ASSEMBLIES FRR = 1 HR.
ROOF ASSEMBLY FRR = 1 HR.
SECOND FLOOR SUPPORTING MEMBERS FRR = 2 HR.
FLOOR SUPPORTING MEMBERS FRR = 1 HR.
ROOF SUPPORTING MEMBERS FRR = 1 HR.
- B 3.1.16
- B 3.8
- B 3.3.1.2 & B 3.3.1.19
- B 3.2.2.43 & B 3.2.1.4



Key Plan

Issue	Date	Description	By
01	JUN 11/19	OWNER REVIEW	J.M.
02	AUG 21/19	OWNER REVIEW	J.M.
03	OCT 18/19	OWNER REVIEW	J.M.
04	JUL 21/20	OWNER REVIEW	J.M.
05	NOV 25/20	OWNER REVIEW	J.M.
06	APR 21/21	OWNER REVIEW	J.M.
07	SEP 24/21	OWNER REVIEW	J.M.
08	MAR 29/22	OWNER REVIEW & CONSULTATION	J.M.
09	JUL 13/22	REVIEW & CONSULTATION	J.M.
10	OCT 27/22	COORDINATION	J.M.
11	JAN 06/23	COORDINATION	J.M.
12	FEB 24/23	OWNER REVIEW	J.M.



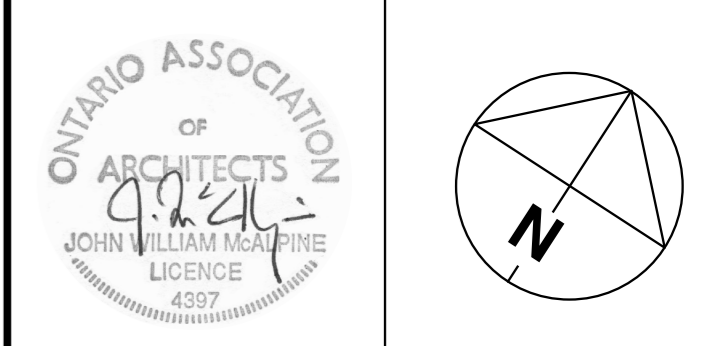
SITE STATISTICS:

	REQUIRED	EXISTING	PROPOSED
OFFICIAL PLAN DESIGNATION:		GENERAL COMMERCIAL	GENERAL COMMERCIAL
ZONING CATEGORY:		GENERAL COMMERCIAL (C4)	GENERAL COMMERCIAL (C4)
ZONING USE:		RETAIL STORE	SHOPPING CENTRE
LOT AREA:	450 M2	13,935.46 M2	13,935.46 M2
LOT FRONTAGE:	15.0 M (MIN.)	76.20 M	76.20 M
BUILDING AREA:		3,236.70 M2	5,053.40 M2
BUILDING 1:		2,954.50 M2	2,954.50 M2
BUILDING 2:		282.20 M2	282.20 M2
BUILDING 3:		0.00 M2	1,139.90 M2
BUILDING 4:		0.00 M2	676.80 M2
LOT COVERAGE:	50% (MAX.)	23.3%	36.3%
BUILDING DENSITY:		2,322.64 M2/HA	7,479.47 M2/HA
GROSS FLOOR AREA:		3,236.70 M2	10,436.10 M2
BUILDING 1:		2,954.50 M2	2,954.50 M2
BUILDING 2:		282.20 M2	282.20 M2
BUILDING 3:		0.00 M2	4,539.60 M2
BUILDING 4:		0.00 M2	2,659.80 M2
FLOOR SPACE INDEX:		0.23	0.74
BUILDING HEIGHTS:	14.0 M (MAX.)		
BUILDING 1:		7.2 M	7.2 M
BUILDING 2:		1 STOREY	1 STOREY
BUILDING 3:			17.2 M
BUILDING 4:			17.2 M

	REQUIRED	EXISTING	PROPOSED
BUILDING 3 SETBACKS:			
FRONT:	6.0 M (MIN.)	N/A	29.440 M
REAR:	7.0 M (MIN.)	N/A	7.000 M
NORTH SIDE:	3.0 M (MIN.)	N/A	20.420 M
SOUTH SIDE:	3.0 M (MIN.)	N/A	7.292 M
BUILDING 4 SETBACKS:			
FRONT:	6.0 M (MIN.)	N/A	25.500 M
REAR:	7.0 M (MIN.)	N/A	45.950 M
NORTH SIDE:	3.0 M (MIN.)	N/A	54.500 M
SOUTH SIDE:	3.0 M (MIN.)	N/A	3.470 M
PARKING AREA:		4,670.86 M2	6,691.56 M2
BUILDINGS 1, 3 & 4:		3,792.17 M2	5,862.87 M2
BUILDING 2:		828.69 M2	828.69 M2
PARKING REQUIRED:		112 SPACES	192 SPACES
BUILDING 1:	2,954.5 M2 @ 1 PER 30 M2	99 SPACES	99 SPACES
BUILDING 2:	1 PER 4 PERSONS	13 SPACES	13 SPACES
BUILDINGS 3&4 (RETAIL):	234 M2 @ 1 PER 30 M2		8 SPACES
BUILDINGS 3&4 (APT/MT.):	48 @ 1.5 PER UNIT		72 SPACES
PARKING PROVIDED:		104 SPACES	158 SPACES
BUILDING 1:		91 SPACES	87 SPACES
BUILDING 2:		13 SPACES	13 SPACES
BUILDINGS 3&4 (RETAIL):			8 SPACES
BUILDINGS 3&4 (APT/MT.):			50 SPACES

NOTE:
INFORMATION ON THIS SITE PLAN
TAKEN FROM:
PLAN OF SURVEY OF
PART OF LOT 18, CONCESSION 4
GEOGRAPHIC TOWNSHIP OF VESPRE
NOW IN THE CITY OF BARRIE
COUNTY OF SIMCOE
BY: J.D. BARNES LIMITED
MARCH 29, 2021

keith loffler mcaine architects
10 ST. MARY STREET, SUITE 402, TORONTO, ONTARIO, M5T 1P7 T (416) 964-1902 F (416) 964-6838

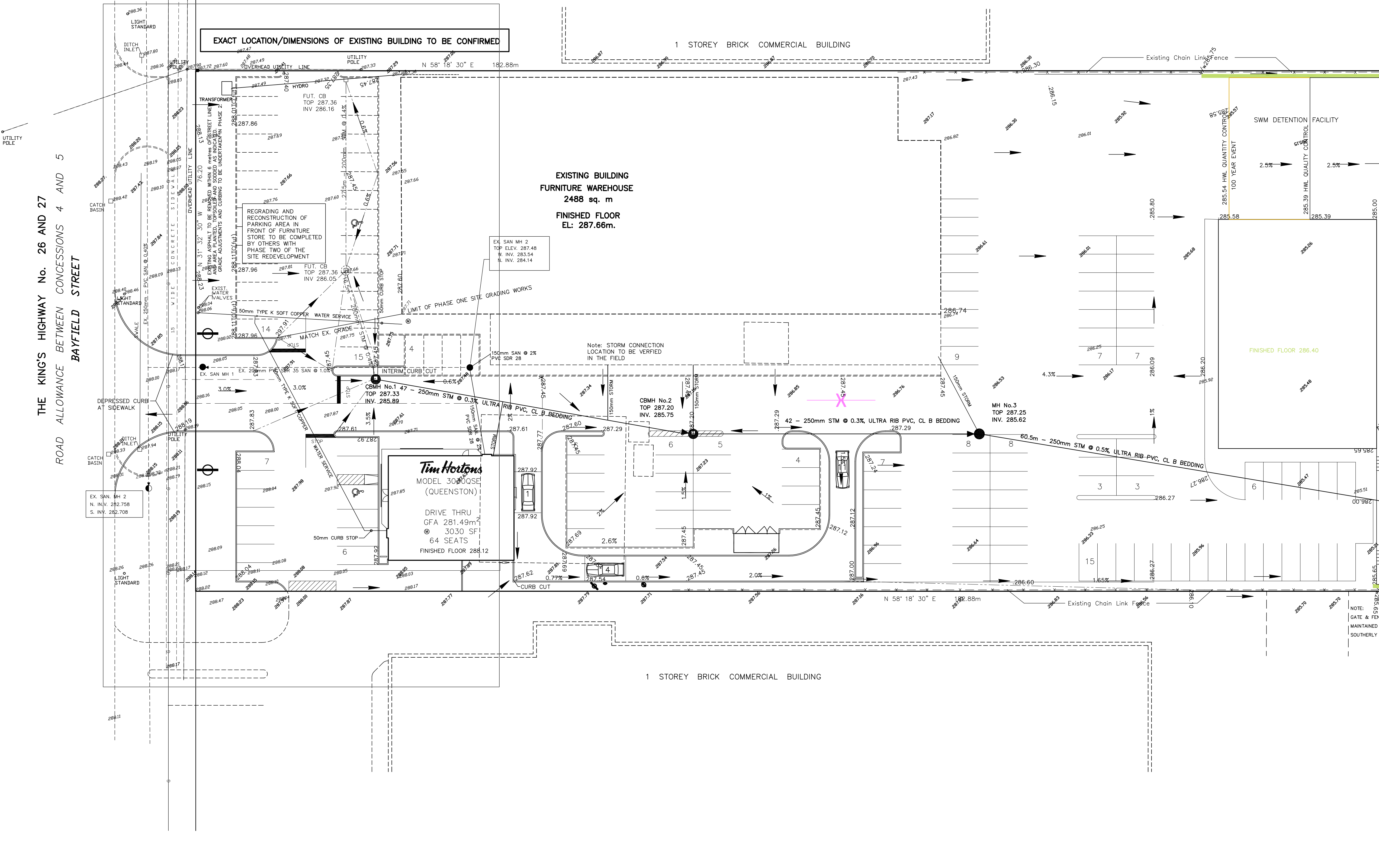
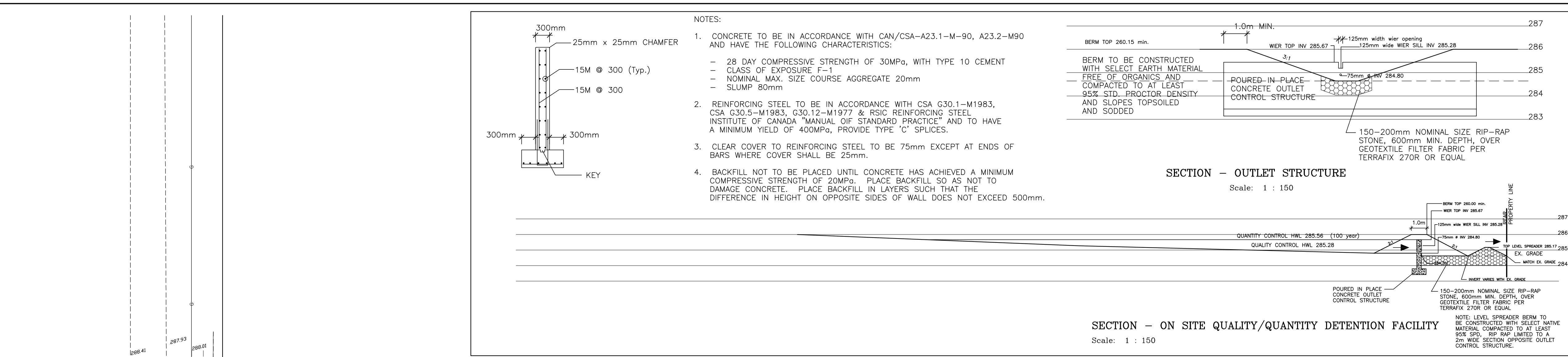


Professional Certification	
OWNER REVIEW	
Issued for:	1 : 300
Issue date:	Scale
FEBRUARY 24, 2023	
1935	J.M.
Project No.	Checked by
	J.M.

**Mixed Use Development
Buildings 3 & 4**
535 Bayfield Street, Barrie, Ontario
OWNER: Petro Gold Ltd.

Architectural Site Plan

Sheet No. **A001**

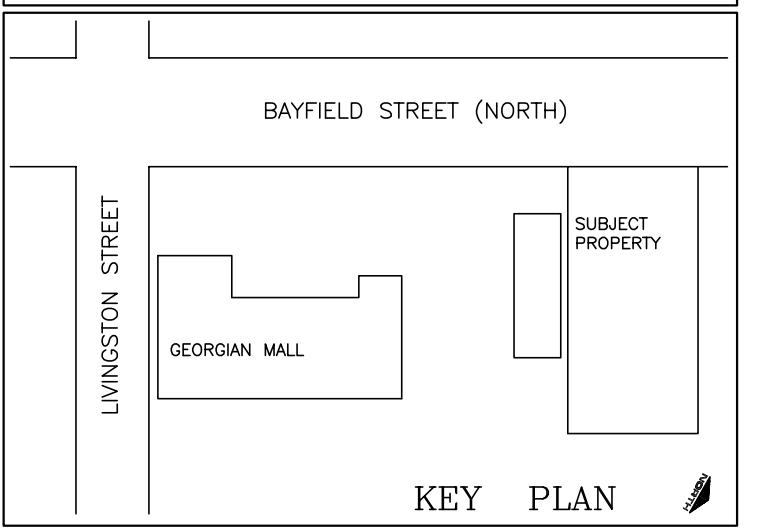


- NOTES:
- CONCRETE TO BE IN ACCORDANCE WITH CAN/CSA-A23.1-M-90, A23.2-M90 AND HAVE THE FOLLOWING CHARACTERISTICS:
 - 28 DAY COMPRESSIVE STRENGTH OF 30MPa, WITH TYPE 10 CEMENT
 - CLASS OF EXPOSURE F-1
 - NOMINAL MAX. SIZE COURSE AGGREGATE 20mm
 - SLUMP 80mm
 - REINFORCING STEEL TO BE IN ACCORDANCE WITH CSA G30.1-M1983, CSA G30.5-M1983, G30.12-M1977 & RSIC REINFORCING STEEL INSTITUTE OF CANADA "MANUAL OF STANDARD PRACTICE" AND TO HAVE A MINIMUM YIELD OF 400MPa, PROVIDE TYPE 'C' SPLICES.
 - CLEAR COVER TO REINFORCING STEEL TO BE 75mm EXCEPT AT ENDS OF BARS WHERE COVER SHALL BE 25mm.
 - BACKFILL NOT TO BE PLACED UNTIL CONCRETE HAS ACHIEVED A MINIMUM COMPRESSIVE STRENGTH OF 20MPa. PLACE BACKFILL SO AS NOT TO DAMAGE CONCRETE. PLACE BACKFILL IN LAYERS SUCH THAT THE DIFFERENCE IN HEIGHT ON OPPOSITE SIDES OF WALL DOES NOT EXCEED 500mm.

Survey Taken From
Topographic & Boundary Survey
Of
PART of LOT 18, CONCESSION 4
Township of Vespra
Now in the City Of Barrie
County Of Simcoe

Scale 1 : 300

Site Plan
1 : 300



This drawing, as an instrument of service, is provided by and is the property of R.T.D.G. (r. thibert design group)

The contractor must verify and accept responsibility for all dimensions and conditions on site and must notify company of any variations from the supplied information.

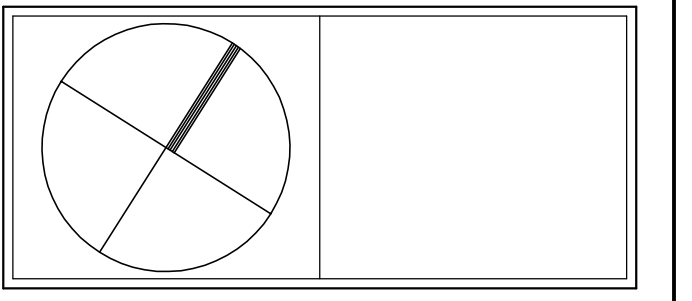
The company is not responsible for the accuracy of survey structural, mechanical, electrical, etc., information shown on this drawing. Refer to the appropriate consultant's drawing.

Construction must conform to all applicable codes and requirements of authorities having jurisdiction.

The contractor working from drawings specifically marked "For Construction" must assume full responsibility and bear costs for any corrections or damage resulting from this work.

No.	Date	Issued / Revision	By
4.			
3.	29/05/01	PARKING & LANDSCAPING	BB
2.	30/04/01	PHASING & TIM HORTON BLDG REVISION	BB
1.	28/10/00	CITY COMMENTS	BB

r. thibert design group
R.T.D.G. 42 Shanty Bay Road
Barrie, Ontario
L4M 1C8
Tel - (705) 726-7517 Fax - (705) 726-7530



PROJECT
Commercial Development
535 Bayfield St. Barrie, Ont.
(HWY. 26 & 27)

DRAWING
GRADE CONTROL & SWM PLAN

DATE	AUG. 2000	SCALE	1:300
DRAWN	RT / BB	CHECKED	
PROJECT NO.		DRAWING NO.	
2006		STM-1	



RE: GEOTECHNICAL INVESTIGATION
PROPOSED MIXED-USE BUILDINGS
535 BAYFIELD STREET
BARRIE, ONTARIO

FOR: 2709557 Ontario Inc.
18 Erica Road
Thornhill, Ontario
L4J 2G1
c/o
Evans Planning

ATTENTION: Mr. Frank Venditti

REPORT NO.: 2023-17792

DATE: April 4, 2023

DISTRIBUTION: PDF Copy: 2709557 Ontario Inc.
Evans Planning
- Mr. Frank Venditti [fvenditti@evansplanning.com]

Original: (File No. 10855A-S0619-GEO)



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April 4, 2023

REPORT NO.: 2023-17792

FILE NO.: 10855A-S0619-GEO

1.0 INTRODUCTION

Sola Engineering Inc. (Sola) was retained by Evans Planning on behalf of 2709557 Ontario Inc. (the Client) to carry out a geotechnical investigation for the proposed mixed-use buildings located at 535 Bayfield Street, Barrie, Ontario (the subject site or site). Authorization to proceed with the investigation was received on January 4, 2023, through the acceptance of Sola's Proposal No. 2022-3264 dated December 15, 2022.

In 2021, Sola conducted a geotechnical investigation at the site. This initial investigation was to support a conversion to a commercial condominium at the subject site as well as expanding the parking lot area. As the result of this investigation, the following report was then submitted in 2021 to the Client: Geotechnical Investigation Report for Proposed Engineering Services, 535 Bayfield Street, Barrie, prepared for 2709557 Ontario Inc., Report No. 2021-15471, dated August 31, 2021.

The Client is presently contemplating to develop the site with two 4-storey mixed-use buildings with no basement and an investigation was conducted to support this concept. This present investigation has been carried out to include additional boreholes to support the new development. As per the scope of services detailed in Sola's proposal, the purpose of this investigation is to collect information on the soil and groundwater conditions at the subject site and, based on the investigation data, provide recommendations to assist with the geotechnical design of the proposed buildings. This report must be read in conjunction with the above-mentioned reports.

This report presents the details of Sola's fieldwork and laboratory testing, outlines the soil and groundwater conditions at the site, and provides comments on the aforementioned items.

In this report, standard site investigation procedures have been adopted. The procedures including those developed by the Ontario Building Code (OBC), Canadian Foundation Engineering Manual (CFEM), American Society for Testing and Materials (ASTM), Ontario Ministry of Transportation (MTO) and Toronto Transit Commission (TTC), are considered by far the most accepted methods by the local geotechnical society for the general engineering purposes. Soil Classification Systems used for developing this report have been in general conformance with those outlined in the above-mentioned procedures, with modifications where appropriate. Where in doubt, this office must be contacted for further interpretation or clarification.

This report has been prepared for the Client, and their nominated engineers and designers. Third-party use or reproduction, in part or in full, of this report, is prohibited without written authorization from Sola. This report is also subject to the *Statement of Limitations* which forms an integral part of this document.



2.0 SITE SETTING

2.1 SITE LOCATION, DESCRIPTION AND PROPOSED DEVELOPMENT

The subject site is located at 535 Bayfield Street in Barrie, Ontario. The site is currently occupied by a single-storey commercial building. The site is bounded to the north and south by commercial properties, to the west by Bayfield Street, and to the east by a vacant property.

It is proposed to develop two 4-storey mixed-use buildings at the subject site. The proposed buildings will be of slab-on-grade construction.

2.2 PUBLISHED GEOLOGY

Based on a review of the existing geological publication for the site area, Ontario Geological Survey (OGS) Map 2645: *“Quaternary Geology, Eastern Half of the Barrie and Elmvale Areas”*, the site surrounding area is underlain by Glaciofluvial Ice-Contact Stratified Sediments: fine- to very coarse-grained sand, gravelly sand and gravel, minor amounts of silt, clay and flow till. According to the OGS Map M2544: *“Bedrock Geology of Ontario – Southern Ontario”*, the superficial geology is underlain by the bedrock of the Middle Ordovician Ottawa Group; Simcoe Group; Shadow Lake Formation, comprising limestone, dolostone, shale, arkose and sandstone.

3.0 GROUND INVESTIGATION

3.1 FIELD INVESTIGATION

3.1.1 Soil Investigation

Prior to undertaking field drilling, Sola obtained clearances of existing public utility services to the site from all applicable agencies and companies. In addition, private utility locates were also carried out.

The geotechnical field program was carried out from February 13 to 14, 2023 and comprised the advancing of nine (9) boreholes. The boreholes were advanced through the existing ground surface to depths ranging from approximately 4.8 m (BH1) to 6.6 m (BH2 and BH9) below the ground surface using a track-mounted drill rig equipped for split spoon sampling. The approximate locations of the boreholes are shown on **Enclosure 1**. Four (4) monitoring wells were installed in the drilled boreholes (in boreholes BH2, BH5, BH8 and BH9).



All drilling and testing equipment were supplied and operated by Terra Firma Environmental Services Ltd. of North York, Ontario, and the field works were completed under the full-time supervision of a qualified Sola Technician.

Standard Penetration Tests (SPTs) split spoon samples were collected in the drilled boreholes using a 50 mm outer diameter and 35 mm inner diameter split barrel sampler driven with a 63.5 kg automatic hammer freely dropping a vertical distance of 760 mm. All soil samples were logged in the field and returned to Sola's laboratory in Vaughan for review and subsequent laboratory testing.

The logs of the boreholes completed are presented on **Enclosures 2 through 10**.

3.1.2 Groundwater Investigation

Groundwater level observations were made during drilling and in the open boreholes upon completion of the drilling of each borehole. In addition, monitoring wells were installed in four (4) boreholes (BH2, BH5, BH8 and BH9) to enable the measurement of groundwater, over a prolonged period of time without interference from surface water. Details of groundwater observations for the boreholes are presented on the borehole logs on **Enclosures 2 through 10**. Further discussion on groundwater is provided in **Section 4.2** of this report.

3.2 GEOTECHNICAL LABORATORY TESTING

All soil samples were submitted to Sola's laboratory for natural moisture content determination. The results of the moisture content testing are presented on the borehole logs on **Enclosures 2 through 10**. In addition, two (2) representable soil samples were selected and submitted for testing of particle size distribution. The results of the laboratory tests are provided in **Enclosures 13 and 14**.

4.0 SUBSURFACE CONDITIONS

Detailed descriptions of the subsurface conditions encountered at each borehole location are given on the Borehole Logs on **Enclosures 2 through 10**.

The borehole data collected by Sola only represents the subsurface conditions at the borehole locations. It should be pointed out that the material boundaries indicated on the Borehole Logs are approximate and based on visual observations and interpolation between successive samples. These boundaries typically represent a transition from one material type to another and should not be regarded as an exact plane of geological change. It should also be noted that the subsurface conditions may vary across the site.



A summary of the characteristics of each unit of subsoil encountered within the borehole depths is given in the following paragraphs.

4.1 SOIL CHARACTERISATION

4.1.1 Topsoil

A layer of topsoil was encountered at borehole locations BH1 through BH5. The thickness of the topsoil at the borehole locations was measured from approximately 100 mm (BH2 through BH5) to 200 mm (BH1).

It is important to note that topsoil thicknesses may vary throughout the site area, depending upon their location. As such, these findings should not be relied upon for any estimation of topsoil quantities to be stripped prior to construction.

4.1.2 Pavement

A layer of asphaltic concrete was encountered at borehole locations BH6 through BH9. The thickness of the asphaltic concrete was measured from approximately 40 mm (BH6 through BH8) to 50 mm (BH9) at the borehole locations. A granular base/subbase layer consisting of sand and gravel was encountered below the asphaltic concrete with thicknesses ranging from approximately 265 mm (BH7 and BH8) to 340 mm (BH6) at the borehole locations.

4.1.3 Fill Materials

Fill materials were encountered at all borehole locations. The thicknesses of the fill materials at the borehole locations vary from approximately 0.5 m (BH7) to 2.2 m (BH3 and BH4). In the boreholes, the fill extended to depths from 0.8 m (BH7) to 2.3 m (BH1, BH3 and BH4) below the existing ground surface.

Fill materials generally consisted of sand, sandy silt to silty sand, clayey silt and sand and gravel (with asphalt fragments in BH3 and BH4). The fill was generally brown with localized grey and dark brown in colour. In-situ resistance testing results ranged from 7 (BH1, BH4 and BH5) to more than 59 (BH3) blows per 300 mm of spoon penetration indicating that the fill was not constructed under engineering control.

In the fill materials, the measured moisture contents of the samples retrieved from the boreholes ranged from 2.7% (BH2) to 18.4% (BH4), indicating a moist to very moist condition.



4.1.4 Silty Sand Till to Sandy Silt Till

Silty sand till and sandy silt till deposits were encountered below the fill materials or cohesionless soils in boreholes BH1, BH3 and BH6 through BH9 at depths ranging from approximately 2.3 m (BH1 and BH6 through BH8) to 3.0 m (BH3 and BH9) below the ground surface and extended to depths ranging from 3.3 m (BH3) to 6.6 m (BH9) below the ground surface. In boreholes BH1 and BH3, the till deposits were found to extend to 4.6 m and 3.3 m below the ground surface, respectively, while boreholes BH6 through BH9 were terminated in these deposits. The presence of cobbles and boulders was inferred in these deposits in borehole BH6. Owing to their mode of formation, the presence of cobbles and boulders should always be anticipated in these deposits.

SPT “N” values for these deposits were recorded from 48 (BH6) to in excess of 97 (BH7) blows per 300 mm of spoon penetration, indicating the deposit is in a dense to very dense condition but generally a very dense condition.

In the till deposits, the measured moisture contents of the samples recovered ranged from approximately 6.5% (BH1 and BH7) to 8.8% (BH9), indicating a moist to very moist condition.

4.1.5 Cohesionless Soils

Cohesionless deposits consisting of sand and silty sand were encountered below the fill materials or till deposits in all the boreholes at depths ranging from approximately 0.8 m (BH7) to 4.6 m (BH1) below the ground surface and extended to the depths ranging from 2.3 m (BH6 through BH8) to the termination depth of 6.6 m (BH2) below the ground surface. Boreholes BH1 through BH5 were terminated in these deposits. The presence of cobbles and boulders was inferred in these deposits in boreholes BH1, BH3 and BH5 through BH7.

SPT “N” values for these deposits were recorded from 14 (BH5) to in excess of 87 (BH4) blows per 300 mm of spoon penetration, indicating the deposit is in a compact to very dense condition.

In these deposits, the measured moisture contents of the samples recovered ranged from approximately 2.3% (BH3) to 18.6% (BH6), indicating a moist to very moist condition.

4.2 GROUNDWATER

The groundwater conditions encountered during the drilling and cave-in depths are presented on the borehole logs on **Enclosures 2 through 10** as well as in **Table 1**.



Table 1: Borehole Water Depth and Cave-in

Borehole Number	Water Depth Upon Drilling Completion (mBGS)	Cave-in Depth Upon Drilling Completion (mBGS)	Groundwater Depth (mBGS) taken by Project Hydrogeologist on February 27, 2023
BH1	Dry	Open	-
BH2	Dry	Open	Dry
BH3	Dry	Open	-
BH4	Dry	Open	-
BH5	Dry	5.7	Dry
BH6	Dry	Open	-
BH7	Dry	Open	-
BH8	Dry	Open	Dry
BH9	Dry	Open	Dry

Note: mBGS = meters below ground surface

It should be noted that water levels can vary in response to seasonal fluctuations and major weather events. In addition, a perched water condition can occur due to the accumulation of surface water in the more pervious soils (e.g., granular pavement fill or cohesionless soils), overlying less pervious deposits (e.g., clayey silt fill or silty sand till to sandy silt till) especially during seasonally wetter periods.

Long-term “stabilized” groundwater level measurements should refer to the project hydrogeological study.

5.0 DISCUSSION AND RECOMMENDATIONS

The investigation and comments should be considered ongoing as new information about the underground conditions will continue to become available. When more specific information is available with respect to the soil conditions, the interpretation and the recommendations of this report must therefore be checked through field inspections carried out by Sola to validate the information for use during construction.

It is proposed to develop two 4-storey mixed-use buildings at the subject site. The proposed buildings will be slab-on-grade construction.

Based on the ground conditions found at the site, our recommendations are presented in the following sections.



5.1 FROST PROTECTION

All footings and structural elements exposed to seasonal freezing conditions must have at least 1.5 metres of permanent soil cover, or equivalent artificial insulation, for frost protection.

5.2 CONVENTIONAL SPREAD OR STRIP FOUNDATIONS

At the time of preparation of this report, design loading requirements have not been made available. The following discussions are provided to assist the design phase of the proposed buildings. For geotechnical design purposes, it is assumed that the footings will be positioned below the frost penetration depth, i.e., at least 1.5 m below the finished grade.

Based on borehole data, the proposed buildings can be supported by spread and strip footings founded on undisturbed native soil and designed for geotechnical reactions at Serviceability Limit States (SLS) and factored geotechnical resistances at Ultimate Limit States (ULS) at the depths as outlined in **Table 2**.

Table 2: Recommended Bearing Resistances and Highest Founding Depths

Borehole Number	SLS (kPa)	ULS (kPa)	Highest Founding Depth (mBGS)	Founding Stratum
BH1	400	600	2.3	Very dense silty sand till
BH2	300	450	1.2*	Very dense sand
	400	600	1.6	Very dense sand
BH3	400	600	2.3	Very dense sand
BH4	400	600	2.3	Very dense sand
BH5	150	225	1.5	Compact sand
	400	600	2.3	Very dense sand
BH6	300	450	1.6	Dense silty sand
	400	600	2.3	Dense to very dense silty sand till
BH7	300	450	1.2*	Compact to dense silty sand
	400	600	2.3	Very dense silty sand till
BH8	150	225	1.5	Compact silty sand
	400	600	2.3	Very dense silty sand till
BH9	200	300	1.5	Compact silty sand
	300	450	2.3	Dense silty sand
	400	600	2.8	Dense to very dense silty sand

Note: The highest founding depth below existing grade is provided assuming grade raising is permitted. Frost protection requirements should always be met as specified in **Section 5.1**.



The design values provided above are based on the presumption that the bearing resistance at SLS is governed by total and differential settlements of 25 mm and 20 mm respectively, and the structures will tolerate an angular distortion of 1 in 300. The configuration of all foundations (e.g., depth, size, etc.) must be checked by Sola to verify that settlements would be within tolerable limits with the proposed bearing resistances in this report.

Where it is necessary to place footings on the soil at different levels, the upper footing must be founded below an imaginary 10 horizontal to 7 vertical line (10H:7V) drawn up from the base of the lower footing. The lower footing must be installed first to minimize the risk of undermining the upper footing. The minimum footing size should be 0.8 m to utilize the recommended bearing resistances. Footings and any foundation wall should be reinforced as per the design to be provided by the Structural Engineer of the project.

The recommended bearing resistances and the corresponding founding elevations would need to be confirmed by geotechnical engineering staff at the site prior to pouring footing concrete.

It should be noted that the recommended bearing resistances have been calculated by Sola from the borehole information for the design stage only. Should higher bearing values be required, this office should be contacted to review this report.

Where construction is undertaken during winter conditions, footing subgrades should be protected from freezing. Foundation walls and columns should be protected against heave due to soil adfreeze.

We recommend that the foundation design should be reviewed by this office.

5.3 EARTHQUAKE CONSIDERATIONS

Using the information provided by the site investigation, the general soil profile comprises “*Stiff Soil – Site Class D*” as defined by Table 4.1.8.4.A “*Site Classification for Seismic Site Response*” of the Ontario Building Code.

For building constructions, cost savings may be achieved if the Site Classification can be upgraded through shear wave velocity testing. This testing can be carried out by a specialist geophysics firm.

5.4 SLAB-ON-GRADE CONSTRUCTION

The floor slab for the proposed buildings can be adequately supported at the exposed native or on approved fill by the Geotechnical engineer. Depending on the design grade and loading conditions, some of the existing geotechnically and environmentally clean fill may be used to raise the grade after stripping. Any fill used to raise the grade to the underside of the underfloor granular layer



should consist of approved, environmentally acceptable on-site excavated sand or imported granular materials, such as Granular 'A' or Granular 'B' materials. After stripping and excavation, if unsuitable soils are encountered, they should also be removed and discarded. Exposed soil subgrade must be proof rolled to detect any soft or unstable areas, which must be removed and replaced with suitably compacted engineered fill. Once the required subgrade has been developed, Sola recommends that the exposed subgrade be evaluated, inspected and approved by the Geotechnical Engineer before the placement of any fill or concrete.

Upon approval, the on-site excavated clean selected material can be used to raise the grade. All the under-floor fill should be placed in layers not exceeding 300 mm in thickness before compaction and compacted to not less than 100% of its SPMDD (Standard Proctor Maximum Dry Density). For normal-duty concrete floor slab, at least a 200 mm thick layer of either OPSS Granular A or 20 mm Crusher-Run Limestone should be used and compacted to at least 100% SPMDD. For heavy-duty or settlement sensitive floor slabs, the granular thickness should be increased to 300 mm. All of these above recommendations need to be adjusted when the details are known. Such an under-floor layer has been proven to be an effective moisture barrier for conventional floor surfaces. However, if special floor coverings such as sheet PVC with heat-sealed seams are considered, either a high-efficiency vapour barrier or venting may be added to the granular layer to prevent moisture from accumulating between the concrete floor and the PVC flooring.

Completed excavations for floor slabs should not be left open before pouring concrete for any period longer than 24 hours, particularly if the floor construction works are being completed during the winter months or wet weather periods. The base of any floor slab excavation that is to be left exposed for longer than 24 hours should be suitably covered and protected from water ponding, and/or protected to prevent degradation of the exposed founding stratum with the construction of a mud mat.

Prior to placing the stone bedding, the final subgrade should be proof-rolled and approved by the Geotechnical Engineer.

The design of the concrete slabs on improved fill or native soils may be made on the basis of a value of modulus of subgrade reaction which is 20 MPa/m on the surface of the granular moisture barrier.

The floor slab should be structurally independent from any load-bearing structural elements.

5.5 PERMANENT DRAINAGE CONSIDERATIONS

The finished exterior ground surface should be sloped away from the proposed building areas at a minimum cross-fall of 2%.



Perimeter drainage should be provided around all floor slab areas where water may accumulate. The perimeter drainage is not required if the interior finish floor elevation is at least 200 mm higher than the exterior elevation. If the interior finish floor elevation is less than 200 mm, this office should be contacted, and drainage details can be provided. Based on the groundwater condition at the site, underfloor drains may probably not be required, however, the need for a subfloor drainage system should be determined by the designer in accordance with the latest Ontario Building Code requirements.

5.6 SITE PREPARATORY WORKS

The site preparation work may include stripping the ground cover and existing fill in order to develop the required construction or engineered fill subgrades. Depending on the final grading plan, stripping depths will likely vary locally and should be adjusted to remove all unsuitable materials.

It is recommended that the Geotechnical Engineer monitor the stripping operations to ensure that unsuitable materials have been fully removed prior to construction works or the placement of engineered fill. Unacceptable areas identified are to be remediated as soon as practicable and, the procedures would be dependent upon the conditions encountered.

5.7 EXCAVATABILITY AND SITE EXCAVATIONS

It is assumed that the general excavations for the proposed buildings and utilities will be open-cut. In order to enable entry into excavations during the construction process, all excavations must comply with the definitions prescribed by the “*Occupational Health and Safety Act*” (OHS), Ontario Regulation 213/91 “*Construction Projects*”.

The borehole data indicate that the fill materials and native cohesionless deposits can be classified as a Type 3 material above the groundwater table and Type 4 below the groundwater table and dense to very dense glacial till deposits can be classified as a Type 2 material above the groundwater table and Type 3 below the groundwater table as defined in the OHS and Regulations for Construction Projects (Part III Excavations, Section 226). Excavations in these materials should be constructed in conformance with the regulations. It is noted that the above classifications have been estimated based on small, discontinuous samples from boreholes. The excavation conditions must be confirmed and/or modified on the basis of field inspections during the construction stage when large-scale observations can be made with ease.

As defined by the OHS, excavation walls within the Type 3 soils will require battering back at slopes no steeper than 1H (horizontal):1V (vertical) and flatter for Type 4 material. Within the fill materials, a flatter than 1:1 side slope may be required even above the water table. As well, the



native sand may require a flatter than 1:1 side slope when dry or when exposed to the elements for a prolonged period of time.

Depending on the construction feasibility the excavation walls can be supported by temporary shoring systems. During excavations, adjacent existing structures if present, must be protected by proper shoring or sloping.

Based on the findings of the investigation, it is considered that excavation of the overburden soils at the site can be carried out using a conventional backhoe excavator.

Cobbles and boulders were inferred in some of the drilled boreholes and should always be expected in glacial till deposits and possibly in fill materials. The contractor carrying out the excavation work should account for removing cobbles and boulders in their site excavation work.

It is important to note that the above discussion about the excavation is for information purposes only. Contractor bidding on the projects must make their own assessment based on the real site conditions.

It is assumed that the groundwater will be lowered to at least 0.8 m below the required excavation depth to enable the construction to be carried out in the 'dry' condition. Based on the groundwater level measurements, the groundwater level may be considered to be lower than the expected excavation depths and the details of the stabilized groundwater table should be determined by a hydrogeologist. It is not likely that for excavations not exceeding 2.5 m below the existing ground surface an aggressive dewatering method may be required for excavations, however, if required, a hydrogeologist and/or a dewatering specialist should be consulted.

5.8 CONSTRUCTION DEWATERING

The borehole data and groundwater measurements have indicated that for excavations extending to about 2.5 m below the existing ground surface, unusual groundwater seepage problems are unlikely to be expected during excavation and 'perched water' can be controlled by conventional sump pumping. However, the construction dewatering requirements should refer to the project hydrogeology study.

5.9 ENGINEERED FILL

On-site excavated, clean inorganic approved earth (native and/or fill) may selectively be reused as engineered fill material, provided that they are environmentally acceptable, and the moisture contents are strictly controlled. On-site excavated sand can be expected to be on the dry side of the optimum and will likely require adjustment of the moisture content.



If imported inorganic mineral soils are used for engineered fill construction, they must also meet the applicable environmental guidelines, and their moisture contents should preferably be close to their respective optimum water content values.

The soil should be placed in thin lifts and suitable compaction equipment should be employed to achieve the specified degree of field density. However, vibrations due to compaction may need to be reduced or curtailed to prevent damage to the existing structures, if any.

Consideration may also be given to backfilling excavations with well-graded, compacted granular soil such as Granular B as it, if thoroughly compacted, would reduce the post-construction settlements to an acceptable level and may also expedite the compaction process.

Fill materials required for replacing locally softened soils or raising grades within the footprint of the structures are to comprise suitably organic-free materials approved for use by a Geotechnical Engineer. Fill materials are to be placed in lifts of a maximum thickness of 300 mm when first placed and compacted, using appropriate compaction equipment, to not less than 100 % of its SPMDD.

Fill located in areas outside of the footprint of the proposed buildings should be compacted to at least 95 % of the material's SPMDD below 1.0 m of the subgrade level, and then to at least 98 % of its SPMDD up to the required grade. In confined areas, backfill should be compacted using hand-held compaction equipment only.

Sola recommends that any and all engineered subgrades beneath the proposed structures including pavements be inspected and proof-rolled prior to construction.

5.10 PAVEMENT

This section can be read, if desired, in conjunction with the 2021 report to delineate the extend and nature of the fill in the previous boreholes.

5.10.1 Pavement Thickness Design

Undisturbed native ground, or the existing fill soils, approved and re-compacted, as required under Sola's supervision, can support the proposed pavements. Any unsuitable soils, such as topsoil/organic mixed soil and other spongy materials, if found, should be sub-excavated and replaced with approved materials and the profiled subgrade compacted to not less than 98% of its SPMDD.



It is anticipated that the final subgrade will comprise predominantly on-site improved fill (by proof-rolling and surface compaction). Accordingly, in view of the frost susceptibility and drainage characteristics of the final subgrade soils, the following pavement designs presented in **Table 3** are recommended. It is assumed that there will be only occasional delivery truck travels allowed for light-duty areas. In the areas where haul routes are expected, the heavy-duty pavement design should be implemented.

Table 3: Recommended Pavement Design

Pavement Layer	Light Duty Thickness (mm)	Heavy Duty Thickness (mm)	Compaction Requirements
Asphaltic Concrete Surface Course (HL-3)	40	40	Minimum of 92.0% of Maximum Relative Density (MRD)
Asphaltic Concrete Binder Course (HL-8)	50	80	
Granular Base (Granular 'A')	150	150	100% SPMDD
Granular Sub-Base (Granular 'B' Type I)	400	450	

The recommended granular base and sub-base materials shall meet the OPSS 1010 requirements. The granular base and subbase should be compacted to at least 100% of their respective SPMDD.

The asphaltic concrete courses are to be hot-mixed and hot-laid in accordance with current OPSS specifications and compacted to a minimum of 92% of Maximum Relative Density (MRD).

The pavement design as presented above assumes that construction will be undertaken under dry weather conditions and that the subgrade is stable and not heaving under construction equipment traffic. However, if the construction conditions are non-ideal, with the final subgrade being wet and/or unstable, additional imported subbase material may become necessary.

The pavement makeup for the entrance driveways/roads should match the respective road pavement design at the road/driveway interface.

Prior to placing the granular subbase, the final subgrade should be proof rolled to identify soft spots, if any, and rectified as required in consultation with the Geotechnical Engineer.



The recommended pavement structure should be considered for preliminary design purposes only. The functional design life of fifteen (15) years has been used to establish pavement recommendations. This represents the number of years to the first rehabilitation, assuming regular maintenance is carried out. If required, a more refined pavement structure design can be performed based on specific design life requirements. Such further analysis will also involve specific laboratory tests to determine the frost susceptibility and strength characteristics of the subgrade soils, as well as specific traffic loading data input from the Client.

Pavement Drainage: The ability of the soils to provide adequate subgrade support is reduced if allowed to become too wet. Therefore, in order to intercept infiltrating water and provide drainage of the subgrade and pavement material, sub-drains of 100 mm diameter sub-drains, wrapped in filter cloth, may be considered along both sides of the roads/driveways; in addition, similar sub-drains may be considered to be installed in four (4) directions from the catch basins and at strategic locations under parking lot pavement. Furthermore, the subgrade should be graded to promote the flow of water toward the subdrains. In the cases where the sub-drains connecting to the municipal sewer system are not preferred, the pavement profile can be adjusted to direct any runoff flow of water to the on-site stormwater management system, e.g., infiltration gallery.

5.10.2 Pavement Construction Considerations

For pavement construction, the subgrade must be compacted to at least 98% SPMDD, for at least the upper 300 mm, unless an alternative is approved by Sola.

The long-term performance of the pavement structure is highly dependent upon the subgrade support conditions. Stringent construction control procedures should be maintained to ensure uniform subgrade moisture and density conditions are achieved.

Additional comments on the construction of pavement areas are as follows:

- The subgrade preparation should include stripping of any objectionable materials, e.g., loose fill with organics. The base should be properly shaped and thoroughly proof-rolled using a piece of suitable equipment. Weak and/or unstable subgrade areas should be further sub-excavated and backfilled to the design subgrade level using an approved material, placed in thin lifts, and compacted to at least 98% of its SPMDD;
- The locations and extent of sub-drainage required within the paved areas should be reviewed by this office in conjunction with the proposed grading. Assuming that satisfactory crossfalls in the order of 3.0% have been provided, subdrains extending from and between catch basins may be satisfactory. In the event that flatter



crossfalls are considered, a more extensive system of sub-drainage may be necessary and should be reviewed by Sola;

- The most severe loading conditions on the pavement areas and subgrade may occur during construction. Consequently, special provisions such as restricted access routes, half-loads during paving, etc., may be required, especially if construction is carried out during unfavourable weather. It should also be pointed out that during the construction if the subgrade is disturbed by the construction traffic (e.g., loaded gravel trucks), then the subgrade will be damaged, causing undulations. This would impede surface drainage of the prepared subgrade. Water collected in the low points of the undulating subgrade surface will cause differential frost heave, leading to damage to the paved surface; and,
- The boreholes show that in general, the existing fill is suitable to support the pavement. For this purpose, we recommend that the top 0.3 m of the subgrade be stripped. The exposed soil after stripping should be inspected, evaluated, and approved. If necessary, shallow test pits can be dug to check the soil below. After approval, the approved subgrade should be rolled with a suitably heavy roller in the presence of Geotechnical personnel. The grade can then be brought up to the pavement subgrade level, using on-site excavated selected material, if approved by the Geotechnical personnel. This layer should be compacted to not less than 98% of SPMDD.

It is recommended that Sola be retained to review the final pavement structure designs and drainage plans prior to construction to ensure that they are consistent with the recommendations in this report.

5.11 SERVICE INSTALLATION CONSIDERATIONS (WHERE APPLICABLE)

5.11.1 General

In general, the native materials are suitable for pipeline support. Localized loose subgrade conditions, if encountered during construction, should be sub-excavated to a depth of at least 300 mm or to a firm base, if shallower, and backfilled with clean, compactable materials and stabilized as per the project specifications. If the invert of the pipes falls within the fill soils, the fill should be removed and replaced with engineered fill, unless otherwise directed by the Geotechnical Engineer.

Prior to the placement of bedding, the exposed subgrade at the bottom of each servicing trench excavation should be inspected by the Geotechnical Engineer to identify any soft, loose, or disturbed base conditions. All disturbed soils resulting from construction activities should be removed and replaced as noted above.



Design and construction considerations for both flexible (PVC) and rigid (concrete) pipes are included in the following sections.

5.11.2 Excavations and Health and Safety Considerations

The same recommendations as given in **Section 5.7** will generally apply to the excavations for laying the underground services. The excavated soils should be placed not closer than the depth of the trenches from the trench edge plus 1 m.

5.11.3 Bedding

The improved fill materials and native subgrade in an undisturbed state will provide adequate support for the proposed service pipes and will allow the use of normal Class B type bedding. The bedding should conform to the current Ontario Provincial Standard Specifications (OPSS 1010) and/or the City of Barrie standards for bedding stone gradation requirements. The pipes should be placed with a minimum bedding thickness in conformance with Ontario Provincial Standard Drawing OPSD 802.010 (for flexible pipes) or OPSD 802.031 (for rigid pipes), though the bedding thickness will be subject to variation and ultimately be based on the proposed pipe diameter, bedding specifications used, etc. It is recommended that clear stone should not be used for bedding and as backfill above the obvert of the pipe, as soil fines from the subgrade may infiltrate into the voids of the clear stone, giving rise to settlements of the surface pipes and the trench surface, after the trenches are backfilled. Depending on the conditions observed during trenching, the use of suitable geotextile may be necessary on the surface of the silty subgrade beside the excavations (to a suitable distance above), as directed by the Geotechnical Engineer.

Where the pipe invert falls within weaker soils, the thickness of the bedding may need to be increased at the discretion of the Geotechnical Engineer.

On completion of the servicing pipe installation, a granular surround of the same bedding material should be placed around the pipe to cover it to at least 300 mm above the pipe obvert.

The backfill above the bedding and cover materials may consist of a clean, compactable fill that possesses similar properties to the existing subgrade soil. Based on the borehole data, it is anticipated that the local soil material may be difficult to reuse as trench backfill, depending on site conditions. Some moisture conditioning of the soil will likely be required to facilitate soil compaction. Dilatation of the subgrade and backfill during compaction must be prevented. In the event that imported soil is used as a trench backfill, it must be ensured that the drainage properties of the subgrade are maintained and that any differential frost



movement is minimized by proper tapering. Trench back-fill should be compacted to at least 95% of the material's SPMDD or the City of Barrie standards, whichever is more stringent. The degree of compaction should be increased to at least 98% within 1.0 m of the finished surface of the paved areas.

5.11.4 Trench Backfill

Backfilling During Dry-Weather Conditions

The excavated fill soils, if approved by the Geotechnical personnel at the time of construction, are considered suitable for re-use as fill to backfill service trenches, provided that suitable compaction equipment can be used to compact the fill material.

The use of heavy compactors in the narrow-confined service trenches may not be feasible. In confined areas, consideration may be also given to backfilling the areas with a well-graded, compacted granular soil such as Granular 'B' material. As such material, if thoroughly compacted, would reduce the post-construction settlements to an acceptable level and may also expedite the compaction process. However, proper tapering should be provided to prevent differential frost heave of the paved surface.

Each lift should be no greater than 300 mm thick when first placed and compacted using an appropriate heavy compaction machine to at least 95 % of the material's SPMDD to within 1.0 m of the top of the subgrade, and then to at least 98 % SPMDD up to the required grade.

Exposed, excavated soil stockpiles that are to be reused as fill on-site should be compacted at the surface or temporarily covered during wet weather to help maintain their original moisture content. Such stockpiles are prone to wet weather exposure and, as such, the increased moisture contents will make these materials too wet to achieve the required levels of compaction.

Conversely, if the excavated soils are too dry to achieve the required levels of compaction (which is a likely scenario), some moisture addition/conditioning by means of water hosing or misting should be expected.

We recommend the subgrade be observed and approved by a Geotechnical Engineer prior to the placement of the bedding material to confirm that the subgrade conditions are consistent with the recommendations given in this report. Where unsuitable subgrade conditions are observed, remedial procedures can be established in the field to avoid construction delays.



Backfilling During Winter Months

Should this project proceed during the winter months or when the ambient temperatures are below freezing, the following additional recommendations will apply in order to avoid any detrimental effects of frost.

In this situation, it is imperative that the excavation and backfilling operations follow simultaneously. This procedure is required to avoid time gaps between the two construction stages, as prolonged exposure to frost may lead to the inclusion of frozen material during backfilling. It is recommended that prior to resuming backfilling over the frozen surface, all frost should be removed to achieve a satisfactory bond between the current and previously laid fills. Also, this procedure would prevent leaving frozen layers of soil which could cause long-term settlements while undergoing slow thawing.

It is further recommended that any accumulation of water or ice in the sheepsfoot compactor footprint overnight or on weekends should be prevented by adequately shaping up and back blading the compacted grades prior to leaving the site.

In order to ensure that no frozen material is being backfilled in the trenches, it is recommended that the backfilling and compaction operations should be supervised and closely monitored by Sola on a continuous basis.

For the construction of the driveway and floor slab, the final subgrade should be prepared during 'dry weather' conditions so as to achieve a satisfactory end product.

5.12 CONSTRUCTION CONSIDERATIONS

Load-bearing soils are susceptible to disturbance from environmental factors (temperature, moisture change, etc.) and construction activity. Therefore, due care should be given to minimizing the trafficking of such areas during periods of excavation and the construction of the floor slab and footings to minimize the disturbance of the bearing soils.

Any excessive disturbances of the load-bearing and underlying soils affected during construction works could influence the long-term settlement of the structures and will therefore require further excavation and replacement of such impacted soils with suitable engineered fill.

During winter seasons, foundations and slab-on-grade construction should be carried out to avoid pouring concrete on frozen soil. Foundations must be adequately protected at all times from cold weather and freezing conditions.



A Geotechnical Engineer should evaluate all subgrade surfaces to confirm that the subgrade and founding conditions are consistent with the recommendations given by this report.

6.0 MATERIAL TESTING AND INSPECTION

It is recommended that Sola be appointed to carry out field inspection and materials testing during construction to ensure that the construction complies with the design recommendations.

7.0 DRAWING REVIEW

Once the final design drawings for this project are prepared, it is recommended that one (1) set of the drawings should be submitted to Sola for review and to make any amendments to our recommendations that may be required, prior to starting construction. The adequacy of the existing subgrade condition should be checked by Sola.

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

The comments given in this report are preliminary and intended only for the guidance of design engineers. Contractors bidding on or undertaking the works should make their own interpretations of the factual borehole results, so that they may draw their own conclusions on how the subsurface conditions may affect them.

The information in this report in no way reflects on the environmental aspects of soil conditions at the site and has not been addressed in this report, since this aspect was beyond the scope and terms of reference.



8.0 CLOSURE

This report is subject to the Statement of Limitations which forms an integral part of this document. The Statement of Limitations is not intended to reduce the level of responsibility accepted by Sola, but rather to ensure that all parties who have been given reliance for this report are aware of the responsibilities each assumes in so doing.

We trust that this report meets your needs. Should you have any queries, please contact the Sola office.

Sincerely,

SOLA ENGINEERING INC.

George Hao P. Eng.



Bill Feng P.Eng.
Chief Engineer

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Enclosures



STATEMENT OF LIMITATIONS

Standard of Care and Basis of this Report

Sola Engineering Inc. ("Sola Engineering") has prepared this report in a manner consistent with generally accepted engineering and/or environmental practices in the jurisdiction in which the specified services were provided. The information and conclusions set out in this report reflects Sola Engineering's best professional judgment in light of the information available to Sola Engineering at the time of preparation. Sola Engineering disclaims any and all warranties, express or implied, including without limitation any warranty of merchantability and/or fitness for a particular purpose, and makes no representations concerning the legal effect, interpretation or significance of this report or the information, conclusions or recommendations contained in it.

The conclusions and recommendations provided in this report have been prepared in relation to the specified site (the "Site") and the proposed project (the "Project"), as described by the Client to Sola Engineering. Given the nature of the work undertaken by Sola Engineering as part of this report, the Client acknowledges that ground conditions may vary over distances and may change over time. Should there arise any changes to the conditions of the Site or the Project (as to purpose or design), Sola Engineering is to be notified within a reasonable period of time, and in any event within 24 hours of the Client's learning of such changes, so as to give Sola Engineering an opportunity to review and revise this report in light of such changes. Sola Engineering accepts no liability or responsibility for any use of this report or reliance on this report following any changes to the conditions of the Site or the Project.

The scope of professional services provided by Sola Engineering for the Project are as set out in this report. Should such services be limited to those of a geotechnical nature, Sola Engineering shall not be held liable or responsible for any environmental services that may be required, nor shall this report be interpreted to reflect any environmental aspects of the Project. Alternatively, should such services be limited to those of an environmental nature, Sola Engineering shall not be held liable or responsible for any geotechnical services that may be required, nor shall this report be interpreted to reflect any geotechnical aspects of the Project.

This report is not intended to provide recommendations for possible future conditions or use of the Site or adjoining properties. Should the need arise for such recommendations Sola Engineering may need to conduct further investigations.

Use of this Report

This report is intended to be read and used in its entirety. No reliance may be made upon any individual portion or section of this report without reference to the entire report as a whole. In preparing this report, Sola Engineering has relied on information, instructions and communications given by the Client to Sola Engineering, the applicability, truth and accuracy of which is the sole responsibility of the Client.

This report with the information, sampling data, analysis, conclusions and recommendations contained in it (if any), has been prepared for and may only be used by the Client and only for the specific purpose as specified by the Client to Sola Engineering in connection with the Project. Without prior written consent from Sola Engineering, use of this report or any portion thereof by any person or entity other than the Client, or for any purpose other than as communicated by the Client to Sola Engineering, is strictly prohibited. Sola Engineering accepts no liability or responsibility for the unauthorized use of this report. This report and all documents that form part of it are the sole property of Sola Engineering. Sola Engineering relies on and retains any and all intellectual property rights it has in this report, including any copyright to which it is entitled. The Client shall not give, lend or sell this report, or any portion thereof, to any entity, person or association without the express prior written consent of Sola Engineering. This report and the information contained herein shall be treated as strictly confidential.

The contents of this report, inclusive of Sola Engineering's conclusions and recommendations in relation to the Project, are intended only for the guidance of the Client in carrying out the specified services for the Project, as described by the Client to Sola Engineering. Accordingly, Sola Engineering does not accept any liability or responsibility for any inaccuracy contained in this report arising as a result of or in any way connected with any exclusion, oversight or falsification of the information provided to Sola Engineering by the Client. This report, including the effect of the subsurface conditions as described in this report, is to be interpreted at the risk and discretion of the Client and any contractors or others bidding on or undertaking contractual work to be performed as part of the Project who may come into possession of or learn of this report or its contents. It is exigent that all contractors bidding or undertaking the work are to rely on their own interpretations of the data contained in this report in addition to their own investigations and conclusions. Sola Engineering shall not be held liable or responsible for any interpretation of or conclusions that may be drawn from the data or information contained in this report.

The information, recommendations and conclusions presented in this report are based on Sola Engineering's interpretation of conditions revealed through the limited investigation conducted within a defined scope of services. In no event will Sola Engineering be held responsible or liable to the Client or any other person or entity for any special, indirect, incidental, punitive or consequential loss or damage (including, loss of use, lost profits or expenses incurred) resulting from or in any way related to the independent interpretations, interpolations, conclusions or decisions of the Client or any other person or entity, based on the information contained in this report. The restriction of liability includes but is not limited to decisions made to develop, purchase or sell land.

Notwithstanding the exclusions of liability contained herein but without in any way limiting their effect or generality, if there is found to be any finding of liability or responsibility whatsoever on the part of Sola Engineering which in any way relates to or arises from this report, or the information, conclusions or recommendations contained in it, such liability and/or responsibility shall cease and forever be extinguished from and after the date which is two (2) years from the date of this report. In no event shall any liability or responsibility of Sola Engineering exceed the fees charged by Sola Engineering to the Client for the preparation of this report (excluding any arms' length disbursements or expenditures made or incurred by Sola Engineering as a result thereof and reimbursed by the Client).

Site Conditions

The material conditions, classifications, conclusions and recommendations contained in this report were based on the site conditions observed or tested by Sola Engineering or otherwise communicated to Sola Engineering by the Client. The description, identification and classification of soils, rocks, chemical contamination and other materials have been made based on limited investigations, sampling and testing of materials performed by Sola Engineering and its qualified representatives in reliance on the use of relevant or applicable equipment, all in accordance with commonly acceptable standards in the geotechnical and/or environmental disciplines. Accordingly, this report may include assumptions of conditions which are based on discrete sample locations and thus some conditions may not have been detected. The Client accepts all liability and risk for the use of this report and the information and data contained in it. Sola Engineering shall not be held liable or responsible for any conditions beyond the scope of tests conducted on samples of the subsurface and soil conditions of the subject property as set out in this report.

For clarity, the Client acknowledges and accepts that unique risks exist whenever engineering or related disciplines are applied to identify subsurface conditions and even a comprehensive sampling and testing program may fail to detect certain conditions. The environmental, geological, geotechnical, geochemical and hydrogeological conditions that Sola Engineering interprets to exist between sampling points may differ from those that actually exist. As a result, the Client acknowledges and accepts that because of the inherent uncertainties in subsurface evaluations, unanticipated underground conditions may occur or become known subsequent to Sola Engineering's investigation that could affect conclusions, recommendations, total Project cost and/or execution.

Indemnification of Risk

Though Sola Engineering adheres to the highest degree of integrity and employs due diligence in limiting the potential release of toxins and hazardous substances, the risk of accidental release of such substances is a possibility when providing geotechnical and environmental services.

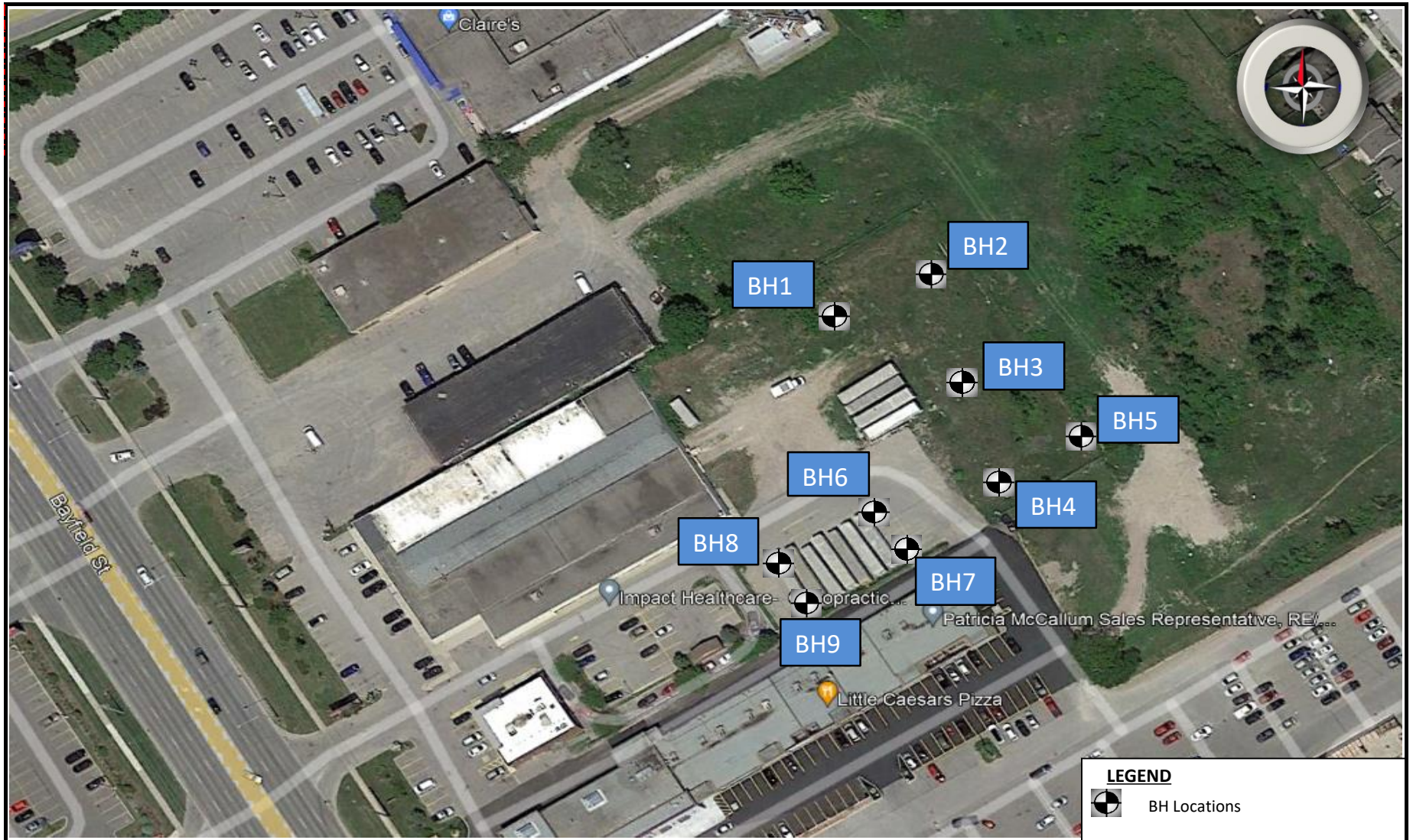
In consideration of the provision of services by Sola Engineering, the Client agrees to defend, indemnify and hold Sola Engineering and its employees and agents harmless from and against any and all claims, liabilities, damages, causes of action, judgments, costs or expenses (including reasonable legal fees and disbursements), resulting from or arising by reason of the death or bodily injury to persons, damage to property, or other loss, whether related to an accidental release of pollutants or hazardous substances occurring as a result of carrying out this Project or otherwise, and whether or not resulting from Sola Engineering's negligent actions or omissions. This indemnification shall include and extend to any and all third party claims brought or threatened against Sola Engineering under any federal or provincial law or statute as a result of Sola Engineering conducting work on the Project. In addition to and notwithstanding the foregoing, the Client further agrees to unconditionally and irrevocably release Sola Engineering from, and not to bring any claims against Sola Engineering in connection with, any of the aforementioned claims or causes.


Subconsultants and Contractor Services


In conjunction with the services provided by Sola Engineering's own employees, external services provided by other persons or entities that are specializing in services other than those offered by Sola Engineering, such as drilling, excavation and laboratory testing, are often employed in order to carry out the defined scope of work. If such external services have been employed for this Project, the Client acknowledges that Sola Engineering is not in any way liable or responsible for any costs, claims or damages in relation to the services rendered by such other persons or entities or payment therefor, nor shall Sola Engineering be liable or responsible for damages for errors, omissions or negligence caused by such other persons or entities while providing such external services.

Work and Job Site Safety

Sola Engineering shall be responsible only for its activities and that of its employees on the Site. Sola Engineering shall not direct any of the fieldwork nor the work of any other person or entity on the Project. The presence of Sola Engineering staff on the Site does not relieve the Client or any contractor on the Site from their responsibilities pertaining to site safety. The Client at all times retains any and all responsibility for the safety of those individuals present on the Site and/or working on the Project, including Sola Engineering's employees.



LEGEND
 BH Locations









	File No.: 10855A-S0476-GEO	BH Location Plan	The figure provided is for the intended purpose of presenting the approximate borehole locations. This figure should not be used for any other purposes including construction, architecture or for accuracy of dimensions and orientation of objects.	Enclosure No.:
	Report Number: 2023-17792	Proposed Mixed-Use Buildings		1
	Date: March 27, 2023	535 Bayfield Street, Barrie, Ontario 2709557 Ontario Inc.		Not to Scale

RECORD OF BOREHOLE No. BH1

1 OF 1

METRIC

PROJECT NUMBER 10855A LOCATION 535 Bayfield Street, Barrie, Ontario ORIGINATED BY TS
 NAME Proposed Mixed-Use Buildings CLIENT 2709557 Ontario Inc. METHOD Soild Stem Augers COMPILED BY TS
 DATUM _____ DATE 2023.02.14 - 2023.02.14 NORTHING _____ EASTING _____ CHECKED BY SM

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa								
0.0	Topsoil TOPSOIL - 200 mm thick		1A	SS	7											
0.2	FILL - sand, trace gravel, brown, very moist		1B													
0.9	FILL - clayey silt, some sand, trace gravel, brown, very moist		2A													
			2B	SS	7											
			3	SS	16											
2.3	SILTY SAND TILL - trace gravel, brownish grey, very dense, moist		4	SS	50/ 13 cm											
																
			5	SS	50/ 13 cm											
4.6	SAND - some gravel, occasionally inferred cobbles and boulders, grey, very dense, moist		6	SS	50/ 10 cm											
4.8	End of Borehole at Targeted Depth; Borehole was Open and Dry upon Completion of Drilling Period.															

+³, X³: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No. BH2

1 OF 1

METRIC

PROJECT NUMBER 10855A LOCATION 535 Bayfield Street, Barrie, Ontario ORIGINATED BY CC
 NAME Proposed Mixed-Use Buildings CLIENT 2709557 Ontario Inc. METHOD Soild Stem Augers COMPILED BY TS
 DATUM DATE 2023.02.13 - 2023.02.13 NORTHING EASTING CHECKED BY SM

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa								
0.0	Topsoil															
0.1	TOPSOIL - 100 mm thick FILL - sand and gravel, grey, moist to very moist		1A	SS	12											
			1B													
			2A	SS	37											
1.1	SAND - trace gravel, brown to grey, dense to very dense, moist to very moist		2B													
			3	SS	70											
	- pockets of sandy silt		4	SS	75/ 25 cm											
			5	SS	68											
			6	SS	63											
			7	SS	65											
6.6	End of Borehole at Targeted Depth; Borehole was Open and Dry upon Completion of Drilling Period.															

+³, X³: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No. BH3

1 OF 1

METRIC

PROJECT NUMBER 10855A LOCATION 535 Bayfield Street, Barrie, Ontario ORIGINATED BY CC
 NAME Proposed Mixed-Use Buildings CLIENT 2709557 Ontario Inc. METHOD Soild Stem Augers COMPILED BY TS
 DATUM _____ DATE 2023.02.13 - 2023.02.13 NORTHING _____ EASTING _____ CHECKED BY SM

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa								
0.0	Topsoil		1A													
0.1	TOPSOIL - 100 mm thick FILL - sandy silt, trace gravel, containing asphalt fragments, brown, moist		1B	SS	12											
0.8	FILL - sand, trace gravel, brown, moist		2	SS	59/ 20 cm											
			3	SS	10											
2.3	SAND - trace gravel, occasionally inferred cobbles and boulders, very dense, moist		4	SS	50/ 13 cm											
3.0	SANDY SILT TILL - trace gravel, trace clay, grey, very dense, moist		5A	SS	50/ 13 cm											
3.3	SAND - trace gravel, occasionally inferred cobbles and boulders, brown, very dense, moist		5B													
			6	SS	50/ 13 cm											
4.9	End of Borehole at Targeted Depth; Borehole was Open and Dry upon Completion of Drilling Period.															

+ 3, X 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No. BH4

1 OF 1

METRIC

PROJECT NUMBER 10855A LOCATION 535 Bayfield Street, Barrie, Ontario ORIGINATED BY CC
 NAME Proposed Mixed-Use Buildings CLIENT 2709557 Ontario Inc. METHOD Soild Stem Augers COMPILED BY TS
 DATUM _____ DATE 2023.02.13 - 2023.02.13 NORTHING _____ EASTING _____ CHECKED BY SM

SOIL PROFILE		STRAT PLOT	SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION		NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa								
0.0	Topsoil		1A													
0.1	TOPSOIL - 100 mm thick		1B	SS	10											
0.8	FILL - sand, brown, moist		2	SS	7											
	- pockets of sandy silt		3	SS	31											
2.3	SAND - trace gravel, brown, very dense, moist		4	SS	87/ 28 cm											
			5	SS	50/ 13 cm											
4.6	SILTY SAND - trace gravel, grey, very dense, very moist		6	SS	50/ 13 cm											
4.9	End of Borehole at Targeted Depth; Borehole was Open and Dry upon Completion of Drilling Period.															

+ 3, X 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No. BH5

1 OF 1

METRIC

PROJECT NUMBER 10855A LOCATION 535 Bayfield Street, Barrie, Ontario ORIGINATED BY CC
 NAME Proposed Mixed-Use Buildings CLIENT 2709557 Ontario Inc. METHOD Soild Stem Augers COMPILED BY TS
 DATUM _____ DATE 2023.02.13 - 2023.02.13 NORTHING _____ EASTING _____ CHECKED BY SM

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	20					
0.0	Topsoil		1A										
0.1	TOPSOIL - 100 mm thick		1B	SS	14								
	FILL - silty sand, trace gravel, brown, moist												
0.8	FILL - sand, trace gravel, brown, moist		2	SS	7								
1.5	SAND - trace to some gravel, brown, compact to very dense, moist		3	SS	14								
	- occasionally inferred cobbles and boulders		4	SS	70								
			5	SS	39								
			6	SS	54/ 28 cm								
			7	SS	61/ 28 cm								
6.5	End of Borehole at Targeted Depth; Borehole Caved at 5.7 m Below Existing Ground Surface and was Dry upon Completion of Drilling Period.												

+ 3, X 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No. BH6

1 OF 1

METRIC

PROJECT NUMBER 10855A LOCATION 535 Bayfield Street, Barrie, Ontario ORIGINATED BY TS
 NAME Proposed Mixed-Use Buildings CLIENT 2709557 Ontario Inc. METHOD Soild Stem Augers COMPILED BY TS
 DATUM _____ DATE 2023.02.14 - 2023.02.14 NORTHING _____ EASTING _____ CHECKED BY SM

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa								
0.0	Asphaltic Concrete			AS												
0.4	ASPHALTIC CONCRETE - 40 mm thick GRANULAR BASE/SUBBASE (sand and gravel) - 340 mm thick FILL - sand, trace gravel, brown, moist		1A	SS	16											
			1B	SS												
			2	SS	9											
1.5	SILTY SAND - brown, dense, very moist		3	SS	30											
2.3	SILTY SAND TILL - trace gravel, occasionally inferred cobbles and boulders, brown, dense to very dense, moist		4	SS	48											
			5	SS	50/ 13 cm											
			6	SS	50/ 13 cm											
4.9	End of Borehole at Targeted Depth; Borehole was Open and Dry upon Completion of Drilling Period.															

+ 3, X 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No. BH7

1 OF 1

METRIC

PROJECT NUMBER 10855A LOCATION 535 Bayfield Street, Barrie, Ontario ORIGINATED BY TS
 NAME Proposed Mixed-Use Buildings CLIENT 2709557 Ontario Inc. METHOD Soild Stem Augers COMPILED BY TS
 DATUM DATE 2023.02.14 - 2023.02.14 NORTHING EASTING CHECKED BY SM

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa								
0.0	Asphaltic Concrete															
0.0	ASPHALTIC CONCRETE - 40 mm thick		1A	AS												
0.3	GRANULAR BASE/SUBBASE (sand and gravel) - 265 mm thick		1B	SS	11											
0.8	FILL - sand, trace gravel, brown, moist		2	SS	23											
	SILTY SAND - trace gravel, trace clay, occasionally inferred cobbles and boulders, brownish grey, compact to dense, moist		3	SS	37											
2.3	SILTY SAND TILL - trace gravel, greyish brown, very dense, moist to very moist		4	SS	97/28 cm											
			5	SS	50/13 cm											
	- trace clay		6	SS	59											
5.0	End of Borehole at Targeted Depth; Borehole was Open and Dry upon Completion of Drilling Period.															

RECORD OF BOREHOLE No. BH8

1 OF 1

METRIC

PROJECT NUMBER 10855A LOCATION 535 Bayfield Street, Barrie, Ontario ORIGINATED BY TS
 NAME Proposed Mixed-Use Buildings CLIENT 2709557 Ontario Inc. METHOD Soild Stem Augers COMPILED BY TS
 DATUM _____ DATE 2023.02.14 - 2023.02.14 NORTHING _____ EASTING _____ CHECKED BY SM

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa					
0.0	Asphaltic Concrete ASPHALTIC CONCRETE - 40 mm thick		1A	AS									
0.3	GRANULAR BASE/SUBBASE (sand and gravel) - 265 mm thick FILL - sand, some gravel, dark brown, moist		1B	SS	32								
			2	SS	13								
1.5	SILTY SAND - trace gravel, brown, compact, moist		3	SS	15								
2.3	SILTY SAND TILL - trace gravel, brown, very dense, moist		4	SS	58								
			5	SS	50/10 cm								
			6	SS	50/13 cm								
6.1	SANDY SILT TILL - trace gravel, trace clay, grey, very dense, moist		7	SS	50/13 cm								
6.4	End of Borehole at Targeted Depth; Borehole was Open and Dry upon Completion of Drilling Period.												

+ 3, X 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No. BH9

1 OF 1

METRIC

PROJECT NUMBER 10855A LOCATION 535 Bayfield Street, Barrie, Ontario ORIGINATED BY TS
 NAME Proposed Mixed-Use Buildings CLIENT 2709557 Ontario Inc. METHOD Soild Stem Augers COMPILED BY TS
 DATUM DATE 2023.02.14 - 2023.02.14 NORTHING EASTING CHECKED BY SM

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa							
0.0	Asphaltic Concrete			AS											
0.4	ASPHALTIC CONCRETE - 50 mm thick		1A	SS	14										
	GRANULAR BASE/SUBBASE (sand and gravel) - 330 mm thick		1B	SS	14										
	FILL - silty sand, trace gravel, brown, moist		2A	SS	14										
1.1	SAND - trace gravel, brown, compact, moist		2B												
1.5	SILTY SAND - trace gravel, trace clay, brown, compact to dense, very moist		3	SS	20										
			4	SS	41										
3.0	SILTY SAND TILL - trace gravel, greyish brown, very dense, moist		5	SS	96/25 cm										
			6	SS	50/15 cm										
			7	SS	77										
6.6	End of Borehole at Targeted Depth; Borehole was Open and Dry upon Completion of Drilling Period.														

+ 3, X 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE









PROJECT NUMBER 10855A

LOCATION 535 Bayfield Street, Barrie, Ontario



PROJECT NAME Proposed Mixed-Use Buildings

CLIENT 2709557 Ontario Inc.






LITHOLOGIC SYMBOLS (Unified Soil Classification System)

	ASPHALT: Asphalt
	FILL: TTC Fill (made ground)
	GRVYSAND: Gravelly Sand
	SL-SN: silty sand
	SL-SN-TL: silty sand till
	SN: sand
	SN-SL-TL: sandy silt till
	TOPSOIL: Topsoil/peat/organics

SAMPLER SYMBOLS

	Auger Sample
	Split Spoon Sample

WELL CONSTRUCTION SYMBOLS

	Bentonite Seal: 1 pipe group, 1 pipe
	Concrete: 1 pipe group, 1 pipe
	Filter Pack: 1 pipe group, 1 pipe
	Slotted Pipe: 1 pipe group, 1 pipe
	Slough at bottom of hole

Notes:

Terms describing RELATIVE DENSITY, based on Standard Penetration Test "N"-Value for COURSE GRAINED soils (major portion retained on No. 200 sieve):

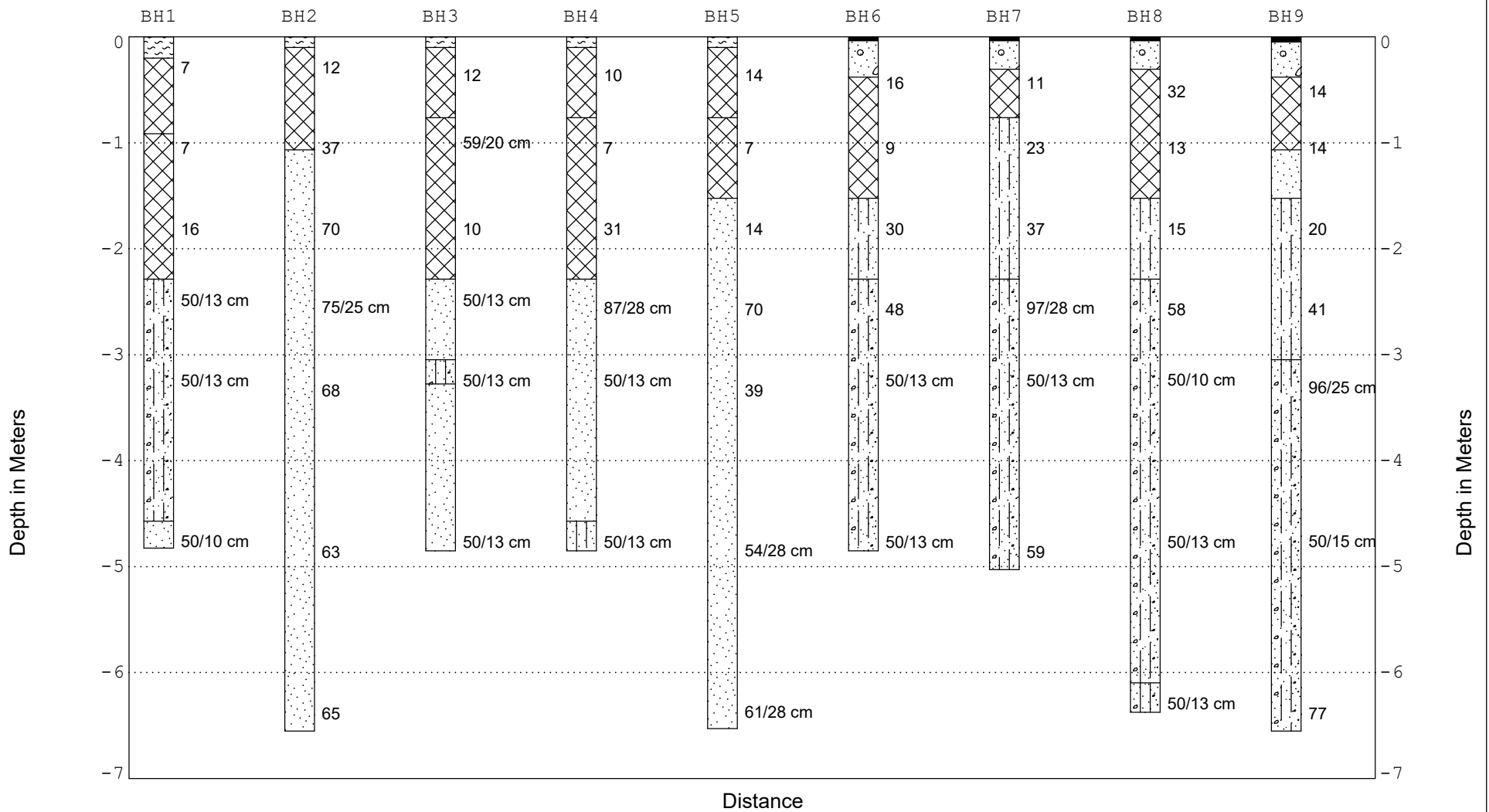
DESCRIPTIVE TERM ["N"-Value (blows/0.3m), Relative Density (%)]

- Very Loose [less than 4, less than 15]
- Loose [4 to 10, 15 to 35]
- Compact or Medium [10 to 30, 35 to 65]
- Dense [30 to 50, 65 to 85]
- Very Dense [greater than 50, greater than 85]

Terms describing CONSISTENCY, based on Standard Penetration Test "N"-Value for FINE GRAINED soils (major portion passing No. 200 sieve):

DESCRIPTIVE TERM [Unconfined Compressive Strength (kPa), "N"-Value (blows/0.3m)]

- Very Soft [less than 25, less than 2]
- Soft [25 to 50, 2 to 4]
- Firm [50 to 100, 4 to 8]
- Stiff [100 to 200, 8 to 15]
- Very Stiff [200 to 400, 15 to 30]
- Hard [greater than 400, greater than 30]



Plan View



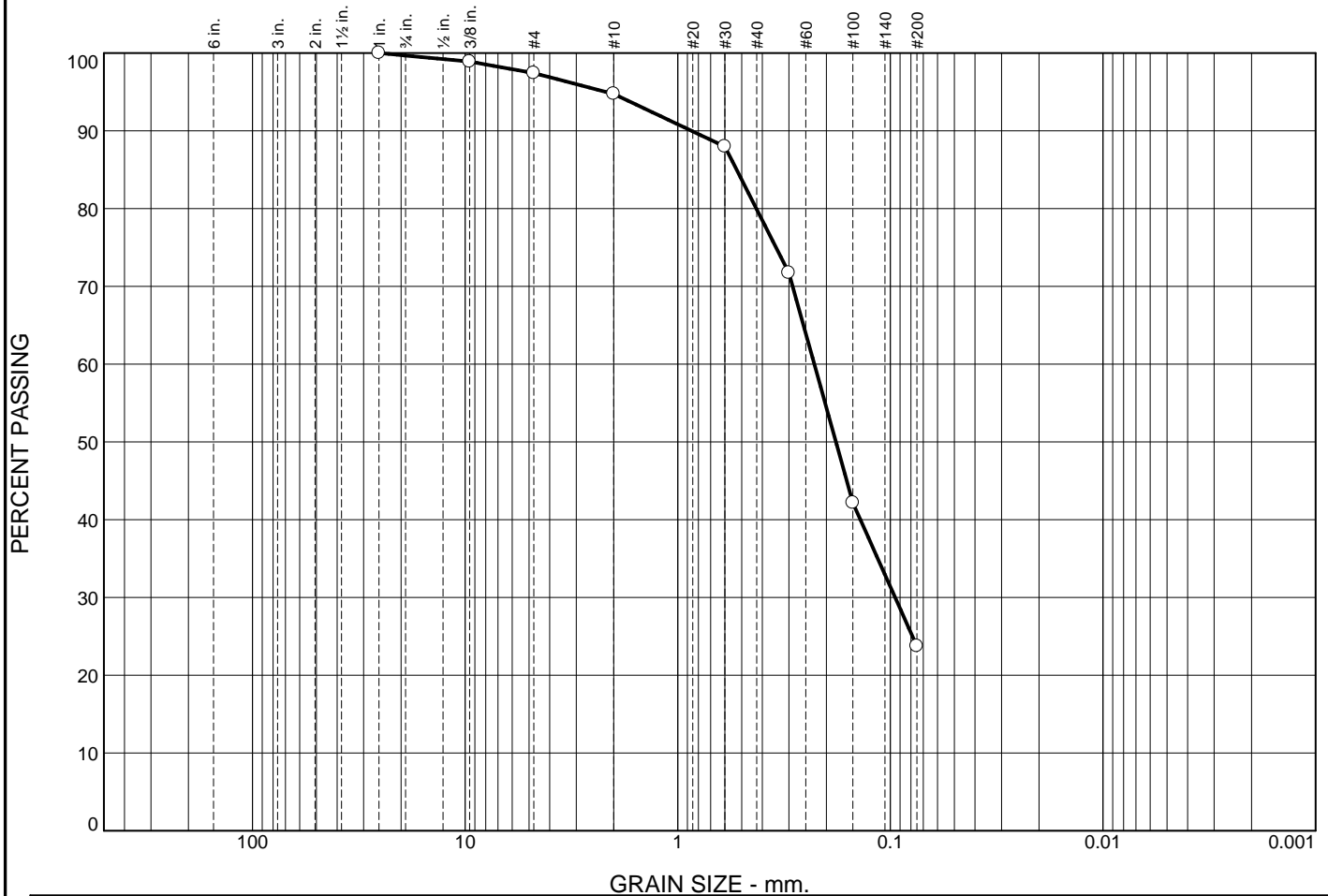
SOLA ENGINEERING INC. CONCEPTUAL SOIL PROFILE

Horizontal Scale:	Drawn By:	
Vertical Scale:	Approved By:	

Proposed Mixed-Use Buildings
535 Bayfield Street, Barrie, Ontario

Project Number: 10855A	Enclosure No.: 12
------------------------	-------------------

Particle Size Distribution Report



% +3"		% Gravel		% Sand			% Fines			
		Coarse	Fine	Coarse	Medium	Fine				
<input type="radio"/>	0	0	3	2	15	56	24			
<input checked="" type="checkbox"/>	LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
<input type="radio"/>			0.5286	0.2279	0.1803	0.0949				

Material Description	USCS	AASHTO
<input type="radio"/> SILTY SAND TILL (VISUAL/MANUAL) SILTY SAND (LAB)		

Project No. 10855A **Client:** 2709557 Ontario Inc. c/o Evans Planning
Project: Proposed Mixed-Use Buildings

 Location: BH1 SS4 **Depth:** 7'6"-9' **Sample Number:** 23-058

Remarks:
 Sampled By: Tripat
 Date: February 14, 2023
 Note: Additional information is available upon request

SOLA ENGINEERING INC.

Particle Size Distribution Report



% +3"		% Gravel		% Sand			% Fines			
		Coarse	Fine	Coarse	Medium	Fine				
<input type="radio"/>	0	3	15	5	15	35	27			
<input checked="" type="checkbox"/>	LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
<input type="radio"/>			6.6565	0.3877	0.2407	0.0914				

Material Description	USCS	AASHTO
<input type="radio"/> SILTY SAND (VISUAL/MANUAL) SILTY SAND WITH GRAVEL (LAB)		

Project No. 10855A Client: 2709557 Ontario Inc. c/o Evans Planning Project: Proposed Mixed-Use Buildings <input type="radio"/> Location: BH9 SS4 Depth: 7'6"-9' Sample Number: 23-058	Remarks: <input type="radio"/> Sampled By: Tripat Date: February 14, 2023 Note: Additional information is available upon request
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SOLA ENGINEERING INC.



125 mm wide rectangular contracted weir on the SWM Outlet Control Structure



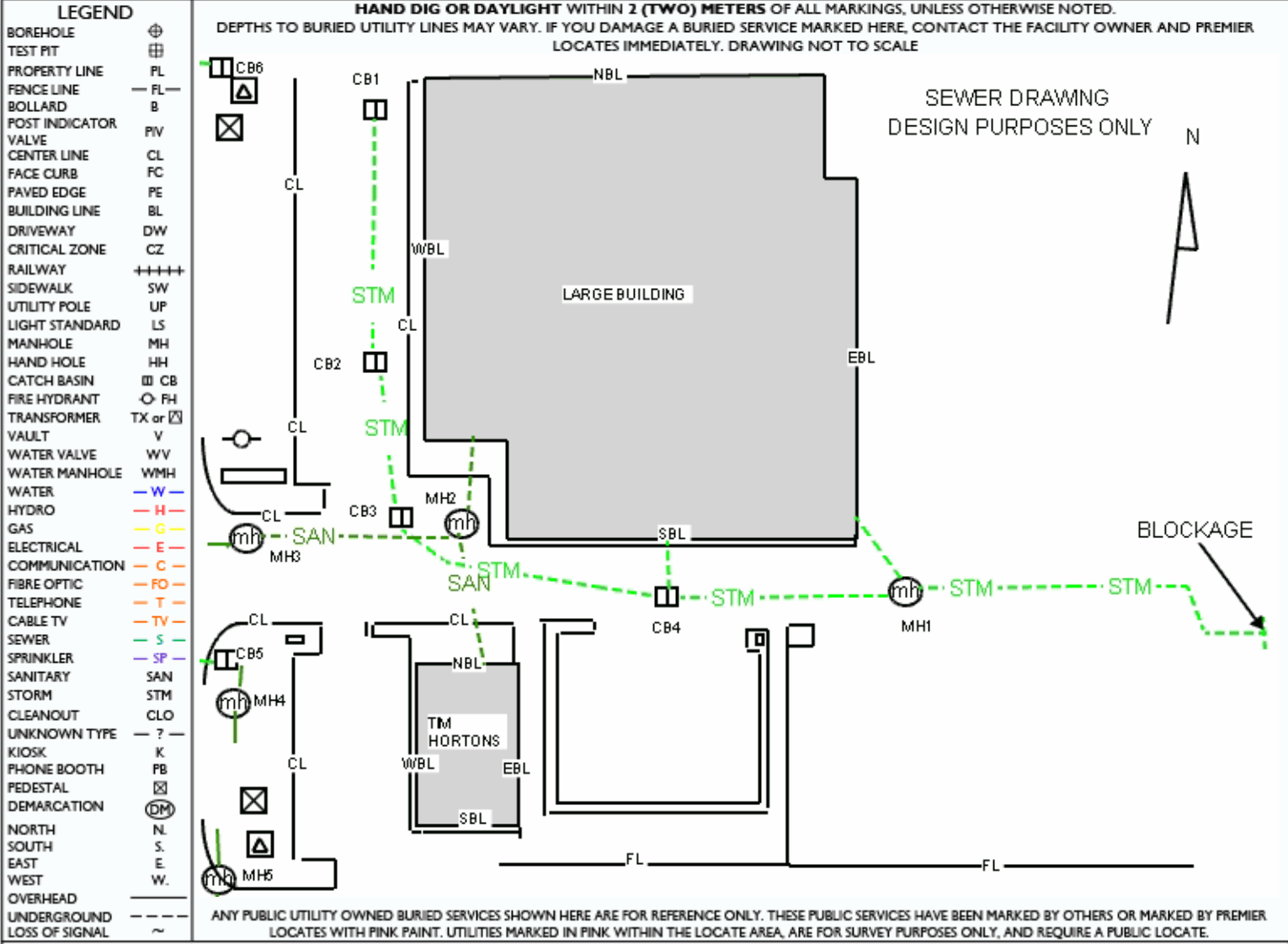
75mm diameter orifice tube on the SWM Outlet Control Structure



Trapezoidal sharp-edge weir on the SWM Outlet Control Structure

UTILITY SERVICES LOCATED:	<input type="checkbox"/> PRIVATELY OWNED	REQUEST / TICKET #:	37560
		VALIDITY:	60 days from this date:
		DATE LOCATED:	06-Jan-2023

LOCATED AREA:	FROM:	TO:
	FROM:	TO:



DOCUMENTS TO BE USED WITH THIS LOCATE:

PRIVATE LOCATE GUIDELINE (OWN YOUR SAFETY, 2021)
 DAMAGE PREVENTION FOR THE PROTECTION OF UNDERGROUN INFRASTRUCTURE, (CSA Z-247-15, AUG 2016)
 GUIDELINE FOR EXCAVATING PROXIMITY OF UNDERGROUND DISTRIBUTION LINES (ESA, FEB 2021)

(If you would like a copy of any of these documents, please contact our office at the number above.)

LOCATE METH-	ODS:
UTILITY LOCATE METHODS USED: <input type="checkbox"/> ACTIVE <input type="checkbox"/> PASSIVE <input type="checkbox"/> INDUCTIVE SWEEP	PRIVATE DETECTABLE SERVICES FOUND: <input type="checkbox"/> AS SHOWN ON DRAWING <input type="checkbox"/> NONE
SEWER LINES: <input type="checkbox"/> TRACED <input type="checkbox"/> NOT TRACED <input type="checkbox"/> MH OR CB INVERTS MARKED WHERE FOUND / VISIBLE	
GEOPHYSICS: <input type="checkbox"/> EXTERIOR 250 MHz GPR LINE SCAN <input type="checkbox"/> EXTERIOR 250 MHz GPR GRID SCAN <input type="checkbox"/> INTERIOR 1,000 MHz GPR LINE SCAN <input type="checkbox"/> INTERIOR 1,000 MHz GPR GRID SCAN	

SITE CONDITIONS / LIMITATIONS:

IF THERE IS A LIMITATION INDICATED HERE, WRITTEN OR CHECKED, THERE IS AN **ELEVATED RISK** OF STRIKING A BURIED FACILITY. THE CLIENT REPRESENTATIVE IS TO NOTIFY ALL INVOLVED WITH THE PROJECT (INCLUDING AND NOT LIMITED TO ALL FIELD STAFF, PROJECT MANAGERS, THEIR CLIENT AND/OR PROPERTY OWNER OF THE SUBJECT PROPERTY IF THE SAME). ANY LIMITATION NOTED TRANSLATES INTO AN INCREASED RISK OF NOT FINDING ALL BURIED FACILITIES WITHIN THE WORK AREA.

AS-BUILT OR UTILITY DRAWINGS REQUESTED FROM: _____

SITE PLAN (SHOWING WORK AREA): Yes No PROPERTY AS-BUILT OR UTILITY DRAWINGS: Yes No SURVEY: Yes No

BUILDING ACCESS: Yes No NA SITE OPERATIONS PERSONNEL INTERVIEWED: Yes No NA

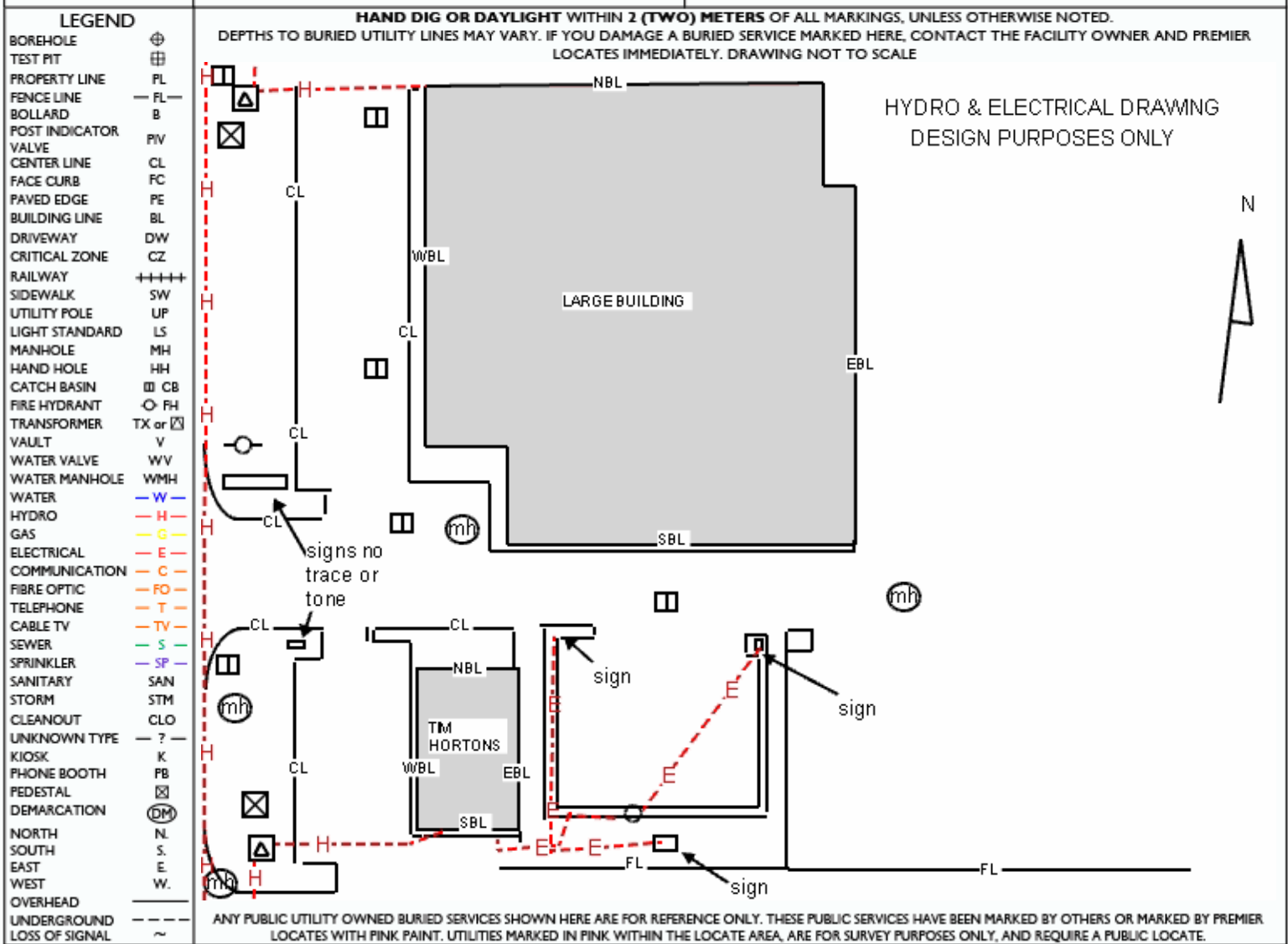
WEATHER: _____ GROUND SNOW COVERED: Yes No

OBSTRUCTIONS: PARKED VEHICLES OVERGROWN VEGETATION PRODUCT STORAGE OTHER (specify): _____

LIST ANY OTHER LIMITATIONS: _____

UTILITY SERVICES LOCATED: <input type="checkbox"/> PRIVATELY OWNED	REQUEST / TICKET #: 37560	VALIDITY: 60 days from this date:	DATE LOCATED: 06-Jan-2023
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LOCATED AREA:	FROM:	TO:
	FROM:	TO:



DOCUMENTS TO BE USED WITH THIS LOCATE:

PRIVATE LOCATE GUIDELINE (OWN YOUR SAFETY, 2021)	(If you would like a copy of any of these documents, please contact our office at the number above.)
DAMAGE PREVENTION FOR THE PROTECTION OF UNDERGROUN INFRASTRUCTURE, (CSA Z-247-15, AUG 2016)	
GUIDELINE FOR EXCAVATING PROXIMITY OF UNDERGROUND DISTRIBUTION LINES (ESA, FEB 2021)	

LOCATE METH-	ODS:
UTILITY LOCATE METHODS USED: <input type="checkbox"/> ACTIVE <input type="checkbox"/> PASSIVE <input type="checkbox"/> INDUCTIVE SWEEP	PRIVATE DETECTABLE SERVICES FOUND: <input type="checkbox"/> AS SHOWN ON DRAWING <input type="checkbox"/> NONE
SEWER LINES: <input type="checkbox"/> TRACED <input type="checkbox"/> NOT TRACED <input type="checkbox"/> MH OR CB INVERTS MARKED WHERE FOUND / VISIBLE	
GEOPHYSICS: <input type="checkbox"/> EXTERIOR 250 MHz GPR LINE SCAN <input type="checkbox"/> EXTERIOR 250 MHz GPR GRID SCAN <input type="checkbox"/> INTERIOR 1,000 MHz GPR LINE SCAN <input type="checkbox"/> INTERIOR 1,000 MHz GPR GRID SCAN	

SITE CONDITIONS / LIMITATIONS:

IF THERE IS A LIMITATION INDICATED HERE, WRITTEN OR CHECKED, THERE IS AN **ELEVATED RISK** OF STRIKING A BURIED FACILITY. THE CLIENT REPRESENTATIVE IS TO NOTIFY ALL INVOLVED WITH THE PROJECT (INCLUDING AND NOT LIMITED TO ALL FIELD STAFF, PROJECT MANAGERS, THEIR CLIENT AND/OR PROPERTY OWNER OF THE SUBJECT PROPERTY IF THE SAME). ANY LIMITATION NOTED TRANSLATES INTO AN INCREASED RISK OF NOT FINDING ALL BURIED FACILITIES WITHIN THE WORK AREA.

AS-BUILT OR UTILITY DRAWINGS REQUESTED FROM: _____

SITE PLAN (SHOWING WORK AREA): Yes No PROPERTY AS-BUILT OR UTILITY DRAWINGS: Yes No SURVEY: Yes No

BUILDING ACCESS: Yes No NA SITE OPERATIONS PERSONNEL INTERVIEWED: Yes No NA

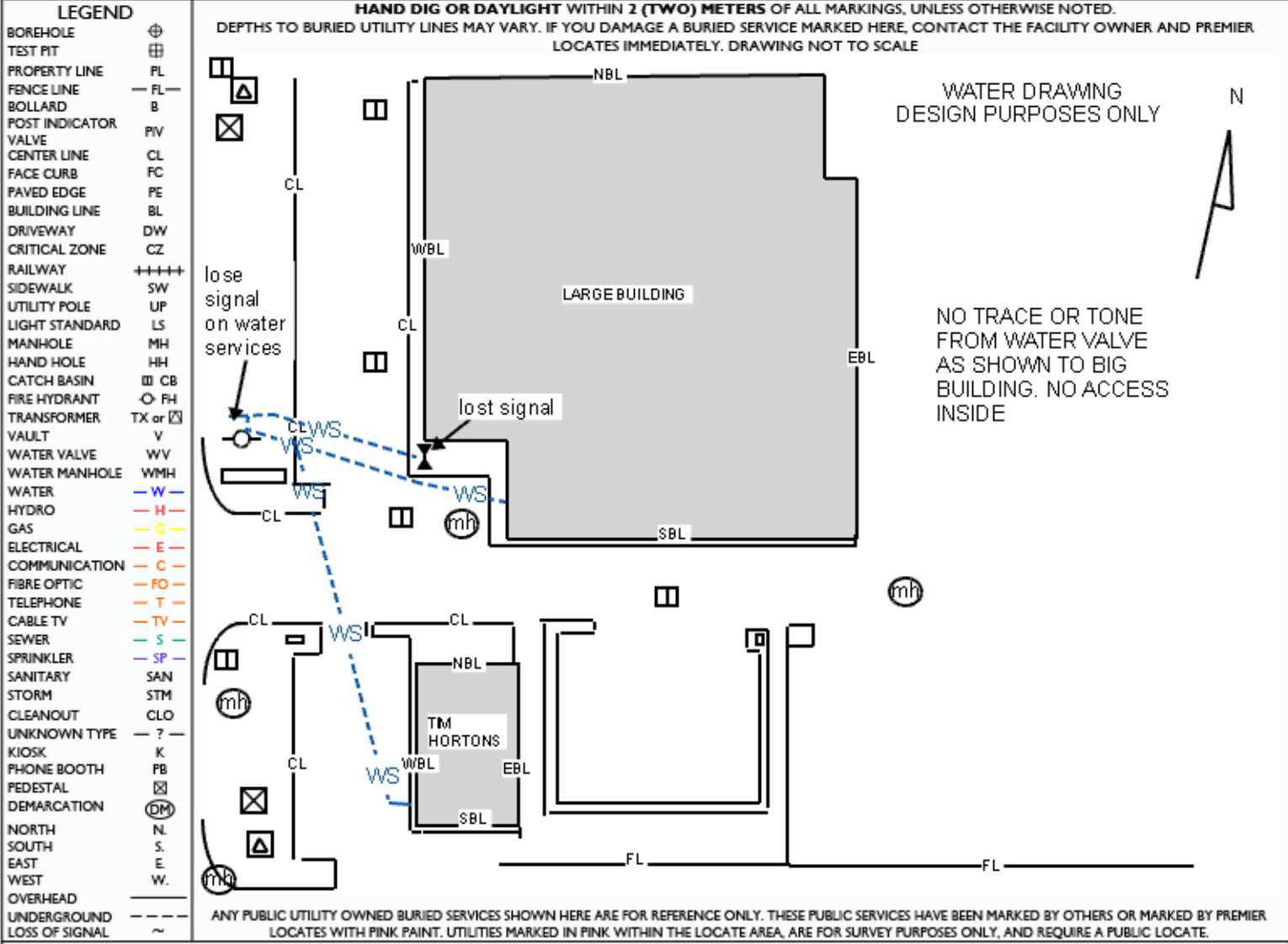
WEATHER: _____ GROUND SNOW COVERED: Yes No

OBSTRUCTIONS: PARKED VEHICLES OVERGROWN VEGETATION PRODUCT STORAGE OTHER (specify): _____

LIST ANY OTHER LIMITATIONS: _____

UTILITY SERVICES LOCATED:	<input type="checkbox"/> PRIVATELY OWNED	REQUEST / TICKET #:	37560
		VALIDITY:	60 days from this date:
		DATE LOCATED:	06-Jan-2023

LOCATED AREA:	FROM:	TO:	TO:



DOCUMENTS TO BE USED WITH THIS LOCATE:

PRIVATE LOCATE GUIDELINE (OWN YOUR SAFETY, 2021) (If you would like a copy of any of these documents, please contact our office at the number above.)

DAMAGE PREVENTION FOR THE PROTECTION OF UNDERGROUN INFRASTRUCTURE, (CSA Z-247-15, AUG 2016)

GUIDELINE FOR EXCAVATING PROXIMITY OF UNDERGROUND DISTRIBUTION LINES (ESA, FEB 2021)

LOCATE METH-	ODS:
UTILITY LOCATE METHODS USED: <input type="checkbox"/> ACTIVE <input type="checkbox"/> PASSIVE <input type="checkbox"/> INDUCTIVE SWEEP	PRIVATE DETECTABLE SERVICES FOUND: <input type="checkbox"/> AS SHOWN ON DRAWING <input type="checkbox"/> NONE
SEWER LINES: <input type="checkbox"/> TRACED <input type="checkbox"/> NOT TRACED <input type="checkbox"/> MH OR CB INVERTS MARKED WHERE FOUND / VISIBLE	
GEOPHYSICS: <input type="checkbox"/> EXTERIOR 250 MHz GPR LINE SCAN <input type="checkbox"/> EXTERIOR 250 MHz GPR GRID SCAN <input type="checkbox"/> INTERIOR 1,000 MHz GPR LINE SCAN <input type="checkbox"/> INTERIOR 1,000 MHz GPR GRID SCAN	

SITE CONDITIONS / LIMITATIONS:

IF THERE IS A LIMITATION INDICATED HERE, WRITTEN OR CHECKED, THERE IS AN **ELEVATED RISK** OF STRIKING A BURIED FACILITY. THE CLIENT REPRESENTATIVE IS TO NOTIFY ALL INVOLVED WITH THE PROJECT (INCLUDING AND NOT LIMITED TO ALL FIELD STAFF, PROJECT MANAGERS, THEIR CLIENT AND/OR PROPERTY OWNER OF THE SUBJECT PROPERTY IF THE SAME). ANY LIMITATION NOTED TRANSLATES INTO AN INCREASED RISK OF NOT FINDING ALL BURIED FACILITIES WITHIN THE WORK AREA.

AS-BUILT OR UTILITY DRAWINGS REQUESTED FROM: _____

SITE PLAN (SHOWING WORK AREA): Yes No PROPERTY AS-BUILT OR UTILITY DRAWINGS: Yes No SURVEY: Yes No

BUILDING ACCESS: Yes No NA SITE OPERATIONS PERSONNEL INTERVIEWED: Yes No NA

WEATHER: _____ GROUND SNOW COVERED: Yes No

OBSTRUCTIONS: PARKED VEHICLES OVERGROWN VEGETATION PRODUCT STORAGE OTHER (specify): _____

LIST ANY OTHER LIMITATIONS: _____



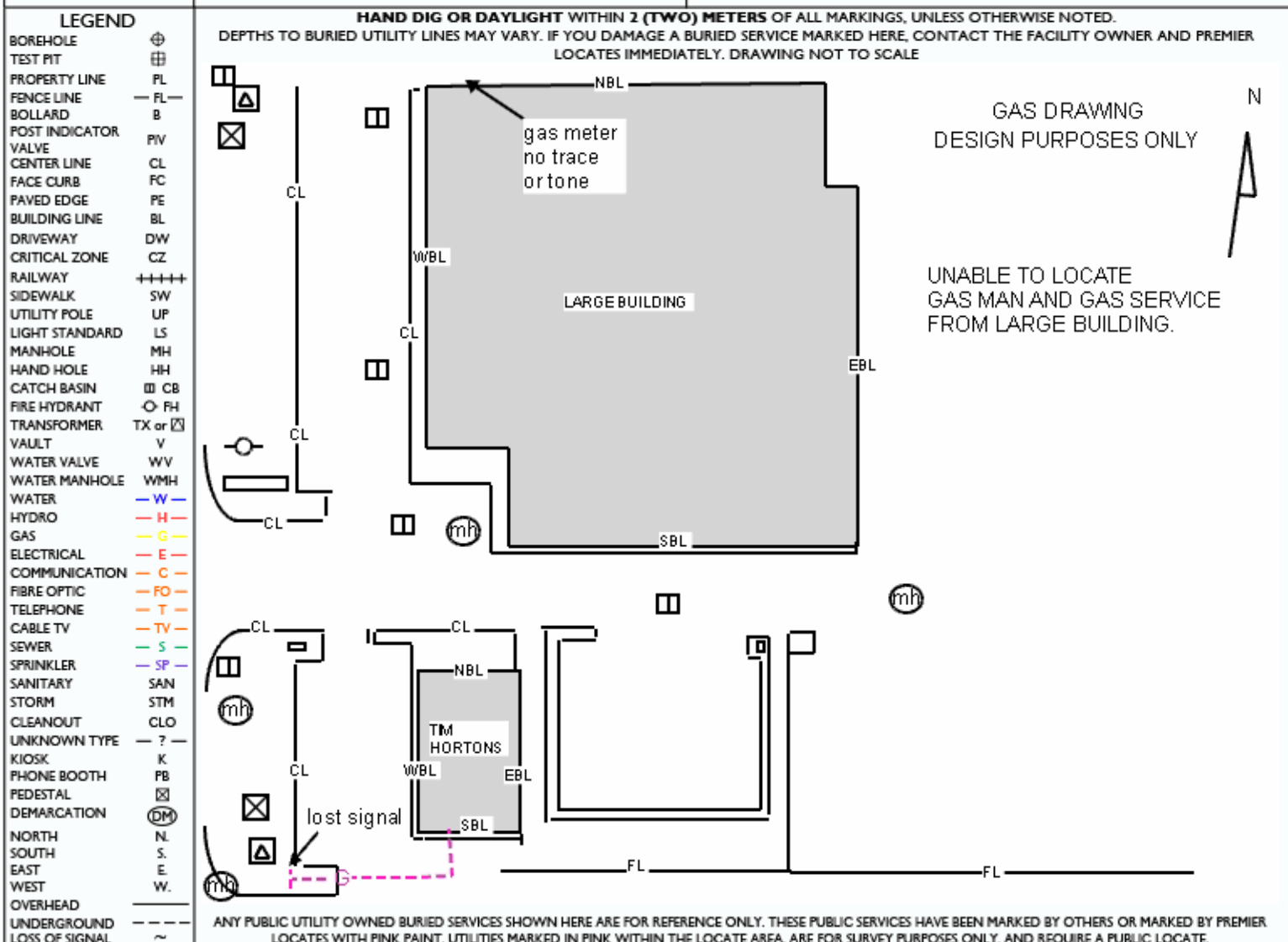
1-800-868-2196, ext. 1
 905-251-5055
 locates@premierlocates.ca
 www.premierlocates.ca

PRIVATELY-OWNED UTILITY AUXILIARY REPORT

(NOT VALID UNLESS ACCOMPANIED BY A PRIMARY LOCATE REPORT)

UTILITY SERVICES LOCATED:	<input type="checkbox"/> PRIVATELY OWNED	REQUEST / TICKET #: 37560	VALIDITY: 60 days from this date:	DATE LOCATED: 06-Jan-2023
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LOCATED AREA:	FROM:	TO:
	FROM:	TO:



DOCUMENTS TO BE USED WITH THIS LOCATE:
 PRIVATE LOCATE GUIDELINE (OWN YOUR SAFETY, 2021)
 DAMAGE PREVENTION FOR THE PROTECTION OF UNDERGROUN INFRASTRUCTURE, (CSA Z-247-15, AUG 2016)
 GUIDELINE FOR EXCAVATING PROXIMITY OF UNDERGROUND DISTRIBUTION LINES (ESA, FEB 2021)

(If you would like a copy of any of these documents, please contact our office at the number above.)

LOCATE METH- UTILITY LOCATE METHODS USED: ACTIVE PASSIVE INDUCTIVE SWEEP PRIVATE DETECTABLE SERVICES FOUND: AS SHOWN ON DRAWING NONE

SEWER LINES: TRACED NOT TRACED MH OR CB INVERTS MARKED WHERE FOUND / VISIBLE

GEOPHYSICS: EXTERIOR 250 MHz GPR LINE SCAN EXTERIOR 250 MHz GPR GRID SCAN INTERIOR 1,000 MHz GPR LINE SCAN INTERIOR 1,000 MHz GPR GRID SCAN

SITE CONDITIONS / LIMITATIONS:
 IF THERE IS A LIMITATION INDICATED HERE, WRITTEN OR CHECKED, THERE IS AN **ELEVATED RISK** OF STRIKING A BURIED FACILITY. THE CLIENT REPRESENTATIVE IS TO NOTIFY ALL INVOLVED WITH THE PROJECT (INCLUDING AND NOT LIMITED TO ALL FIELD STAFF, PROJECT MANAGERS, THEIR CLIENT AND/OR PROPERTY OWNER OF THE SUBJECT PROPERTY IF THE SAME). ANY LIMITATION NOTED TRANSLATES INTO AN INCREASED RISK OF NOT FINDING ALL BURIED FACILITIES WITHIN THE WORK AREA.

AS-BUILT OR UTILITY DRAWINGS REQUESTED FROM: _____

SITE PLAN (SHOWING WORK AREA): Yes No PROPERTY AS-BUILT OR UTILITY DRAWINGS: Yes No SURVEY: Yes No

BUILDING ACCESS: Yes No NA SITE OPERATIONS PERSONNEL INTERVIEWED: Yes No NA

WEATHER: _____ GROUND SNOW COVERED: Yes No

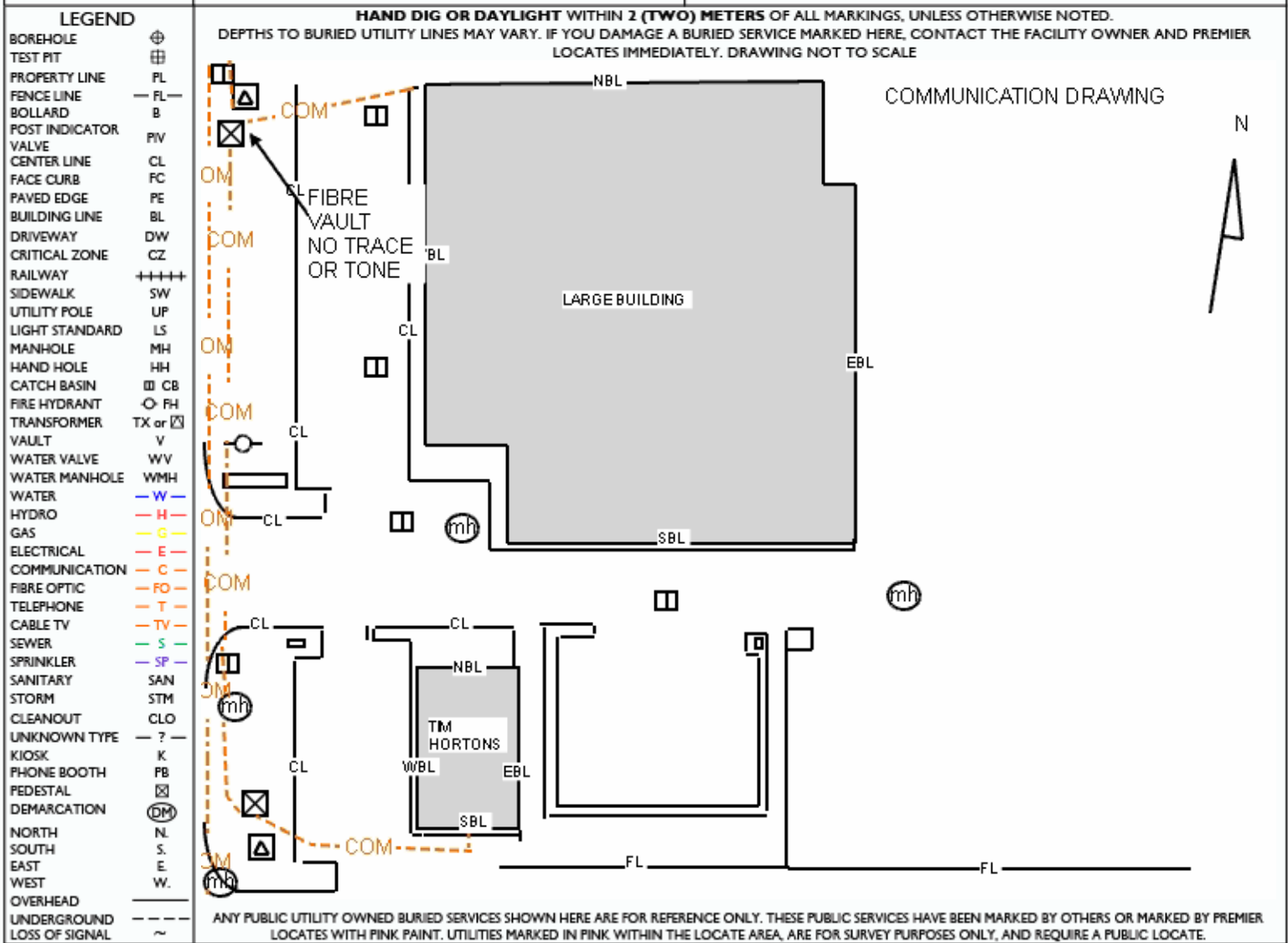
OBSTRUCTIONS: PARKED VEHICLES OVERGROWN VEGETATION PRODUCT STORAGE OTHER (specify): _____

LIST ANY OTHER LIMITATIONS: _____

THE CLIENT HAS BEEN MADE AWARE AND ACKNOWLEDGES THAT ANY **PUBLIC UTILITY OWNED** SERVICES (GAS, TELEPHONE, CABLE TV, HYDRO, WATER, SEWER, ETC.) WITHIN THE LIMITS OF THIS PRIVATE AUXILIARY LOCATE REPORT AND MARKED BY PREMIER LOCATES INC., ARE FOR SURVEY PURPOSES ONLY AND REQUIRE PUBLIC LOCATES THROUGH ONTARIO ONECALL

UTILITY SERVICES LOCATED: <input type="checkbox"/> PRIVATELY OWNED	REQUEST / TICKET #: 37560	VALIDITY: 60 days from this date:	DATE LOCATED: 06-Jan-2023
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LOCATED AREA:	FROM: _____ TO: _____ FROM: _____ TO: _____
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DOCUMENTS TO BE USED WITH THIS LOCATE:

PRIVATE LOCATE GUIDELINE (OWN YOUR SAFETY, 2021) (If you would like a copy of any of these documents, please contact our office at the number above.)
 DAMAGE PREVENTION FOR THE PROTECTION OF UNDERGROUN INFRASTRUCTURE, (CSA Z-247-15, AUG 2016)
 GUIDELINE FOR EXCAVATING PROXIMITY OF UNDERGROUND DISTRIBUTION LINES (ESA, FEB 2021)

LOCATE METH-	ODS:
UTILITY LOCATE METHODS USED: <input type="checkbox"/> ACTIVE <input type="checkbox"/> PASSIVE <input type="checkbox"/> INDUCTIVE SWEEP SEWER LINES: <input type="checkbox"/> TRACED <input type="checkbox"/> NOT TRACED <input type="checkbox"/> MH OR CB INVERTS MARKED WHERE FOUND / VISIBLE	PRIVATE DETECTABLE SERVICES FOUND: <input type="checkbox"/> AS SHOWN ON DRAWING <input type="checkbox"/> NONE
GEOPHYSICS: <input type="checkbox"/> EXTERIOR 250 MHz GPR LINE SCAN <input type="checkbox"/> EXTERIOR 250 MHz GPR GRID SCAN <input type="checkbox"/> INTERIOR 1,000 MHz GPR LINE SCAN <input type="checkbox"/> INTERIOR 1,000 MHz GPR GRID SCAN	

SITE CONDITIONS / LIMITATIONS:

IF THERE IS A LIMITATION INDICATED HERE, WRITTEN OR CHECKED, THERE IS AN **ELEVATED RISK** OF STRIKING A BURIED FACILITY. THE CLIENT REPRESENTATIVE IS TO NOTIFY ALL INVOLVED WITH THE PROJECT (INCLUDING AND NOT LIMITED TO ALL FIELD STAFF, PROJECT MANAGERS, THEIR CLIENT AND/OR PROPERTY OWNER OF THE SUBJECT PROPERTY IF THE SAME). ANY LIMITATION NOTED TRANSLATES INTO AN INCREASED RISK OF NOT FINDING ALL BURIED FACILITIES WITHIN THE WORK AREA.

AS-BUILT OR UTILITY DRAWINGS REQUESTED FROM: _____

SITE PLAN (SHOWING WORK AREA): Yes No PROPERTY AS-BUILT OR UTILITY DRAWINGS: Yes No SURVEY: Yes No

BUILDING ACCESS: Yes No NA SITE OPERATIONS PERSONNEL INTERVIEWED: Yes No NA

WEATHER: _____ GROUND SNOW COVERED: Yes No

OBSTRUCTIONS: PARKED VEHICLES OVERGROWN VEGETATION PRODUCT STORAGE OTHER (specify): _____

LIST ANY OTHER LIMITATIONS: _____

THE CLIENT HAS BEEN MADE AWARE AND ACKNOWLEDGES THAT ANY **PUBLIC UTILITY OWNED** SERVICES (GAS, TELEPHONE, CABLE TV, HYDRO, WATER, SEWER, ETC.) WITHIN THE LIMITS OF THIS PRIVATE AUXILIARY LOCATE REPORT AND MARKED BY PREMIER LOCATES INC., ARE FOR SURVEY PURPOSES ONLY AND REQUIRE PUBLIC LOCATES THROUGH ONTARIO ONECALL

v. 03/21



1-800-868-2196, ext. 1
 905-251-5055
 locates@premierlocates.ca
 www.premierlocates.ca

PRIVATELY-OWNED UTILITY AUXILIARY REPORT

(NOT VALID UNLESS ACCOMPANIED BY A PRIMARY LOCATE REPORT)

UTILITY SERVICES LOCATED: PRIVATELY OWNED REQUEST / TICKET #: 37560 VALIDITY: 60 days from this date: DATE LOCATED: 06-Jan-2023

LOCATED AREA: FROM: TO: FROM: TO:

LEGEND

BOREHOLE	⊕
TEST PIT	⊞
PROPERTY LINE	PL
FENCE LINE	FL
BOLLARD	B
POST INDICATOR	PIV
VALVE	V
CENTER LINE	CL
FACE CURB	FC
PAVED EDGE	PE
BUILDING LINE	BL
DRIVEWAY	DW
CRITICAL ZONE	CZ
RAILWAY	+++++
SIDEWALK	SW
UTILITY POLE	UP
LIGHT STANDARD	LS
MANHOLE	MH
HAND HOLE	HH
CATCH BASIN	CB
FIRE HYDRANT	FH
TRANSFORMER	TX or ☒
VAULT	V
WATER VALVE	WV
WATER MANHOLE	WMH
WATER	W
HYDRO	H
GAS	G
ELECTRICAL	E
COMMUNICATION	C
FIBRE OPTIC	FO
TELEPHONE	T
CABLE TV	TV
SEWER	S
SPRINKLER	SP
SANITARY	SAN
STORM	STM
CLEANOUT	CLO
UNKNOWN TYPE	?
KIOSK	K
PHONE BOOTH	PB
PEDESTAL	☒
DEMARICATION	DM
NORTH	N
SOUTH	S
EAST	E
WEST	W
OVERHEAD	---
UNDERGROUND	---
LOSS OF SIGNAL	~

HAND DIG OR DAYLIGHT WITHIN 2 (TWO) METERS OF ALL MARKINGS, UNLESS OTHERWISE NOTED.
 DEPTHS TO BURIED UTILITY LINES MAY VARY. IF YOU DAMAGE A BURIED SERVICE MARKED HERE, CONTACT THE FACILITY OWNER AND PREMIER LOCATES IMMEDIATELY. DRAWING NOT TO SCALE

ID	INVERT DIRECTION	N	S	E	W	NW	SE
MH 1 	Invert Measured (A) (m)						
	Vertical Offset (B) (1' = 0.305 m)						
	Invert Depth (A + B) (m)			1.66m	1.62m	1.58m	
	Obvert Measured (C) (m)						
	Wheel (D) (0.1 m)						
Pipe Diameter (A - C + D) (m)				250mm	250mm	150mm	
MH 2 	INVERT DIRECTION	NB	SB	E	W	NT	ST
	Invert Measured (A) (m)	NORTH BOTTOM	SOUTH BOTTOM			NORTH TOP	SOUTH TOP
	Vertical Offset (B) (1' = 0.305 m)						
	Invert Depth (A + B) (m)	3.62m	3.60m		3.74m	2.03m	2.00m
	Obvert Measured (C) (m)						
Wheel (D) (0.1 m)							
Pipe Diameter (A - C + D) (m)	200mm	200mm		250mm	150mm	150mm	
MH 3 	INVERT DIRECTION	N	S	E	W		
	Invert Measured (A) (m)						
	Vertical Offset (B) (1' = 0.305 m)						
	Invert Depth (A + B) (m)			4.94m	4.96m		
	Obvert Measured (C) (m)						
Wheel (D) (0.1 m)							
Pipe Diameter (A - C + D) (m)			200mm	200mm			

ANY PUBLIC UTILITY OWNED BURIED SERVICES SHOWN HERE ARE FOR REFERENCE ONLY. THESE PUBLIC SERVICES HAVE BEEN MARKED BY OTHERS OR MARKED BY PREMIER LOCATES WITH PINK PAINT. UTILITIES MARKED IN PINK WITHIN THE LOCATE AREA, ARE FOR SURVEY PURPOSES ONLY, AND REQUIRE A PUBLIC LOCATE.

DOCUMENTS TO BE USED WITH THIS LOCATE: PRIVATE LOCATE GUIDELINE (OWN YOUR SAFETY, 2021) DAMAGE PREVENTION FOR THE PROTECTION OF UNDERGROUN INFRASTRUCTURE, (CSA Z-247-15, AUG 2016) GUIDELINE FOR EXCAVATING PROXIMITY OF UNDERGROUND DISTRIBUTION LINES (ESA, FEB 2021) (If you would like a copy of any of these documents, please contact our office at the number above.)

LOCATE METH- **ODS:**
 UTILITY LOCATE METHODS USED: ACTIVE PASSIVE INDUCTIVE SWEEP PRIVATE DETECTABLE SERVICES FOUND: AS SHOWN ON DRAWING NONE
 SEWER LINES: TRACED NOT TRACED MH OR CB INVERTS MARKED WHERE FOUND / VISIBLE
 GEOPHYSICS: EXTERIOR 250 MHz GPR LINE SCAN EXTERIOR 250 MHz GPR GRID SCAN INTERIOR 1,000 MHz GPR LINE SCAN INTERIOR 1,000 MHz GPR GRID SCAN

SITE CONDITIONS / LIMITATIONS:
 IF THERE IS A LIMITATION INDICATED HERE, WRITTEN OR CHECKED, THERE IS AN **ELEVATED RISK** OF STRIKING A BURIED FACILITY. THE CLIENT REPRESENTATIVE IS TO NOTIFY ALL INVOLVED WITH THE PROJECT (INCLUDING AND NOT LIMITED TO ALL FIELD STAFF, PROJECT MANAGERS, THEIR CLIENT AND/OR PROPERTY OWNER OF THE SUBJECT PROPERTY IF THE SAME). ANY LIMITATION NOTED TRANSLATES INTO AN INCREASED RISK OF NOT FINDING ALL BURIED FACILITIES WITHIN THE WORK AREA.
 AS-BUILT OR UTILITY DRAWINGS REQUESTED FROM: _____
 SITE PLAN (SHOWING WORK AREA): Yes No PROPERTY AS-BUILT OR UTILITY DRAWINGS: Yes No SURVEY: Yes No
 BUILDING ACCESS: Yes No NA SITE OPERATIONS PERSONNEL INTERVIEWED: Yes No NA
 WEATHER: _____ GROUND SNOW COVERED: Yes No
 OBSTRUCTIONS: PARKED VEHICLES OVERGROWN VEGETATION PRODUCT STORAGE OTHER (specify): _____
 LIST ANY OTHER LIMITATIONS: _____

THE CLIENT HAS BEEN MADE AWARE AND ACKNOWLEDGES THAT ANY **PUBLIC UTILITY OWNED** SERVICES (GAS, TELEPHONE, CABLE TV, HYDRO, WATER, SEWER, ETC.) WITHIN THE LIMITS OF THIS PRIVATE AUXILIARY LOCATE REPORT AND MARKED BY PREMIER LOCATES INC., ARE FOR SURVEY PURPOSES ONLY AND REQUIRE PUBLIC LOCATES THROUGH ONTARIO ONECALL

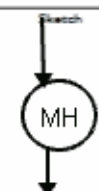
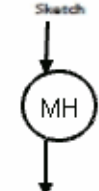

UTILITY SERVICES LOCATED: PRIVATELY OWNED REQUEST / TICKET #: 37560 VALIDITY: 60 days from this date: DATE LOCATED: 06-Jan-2023

LOCATED AREA: FROM: TO: FROM: TO:

LEGEND

BOREHOLE	⊕
TEST PIT	⊞
PROPERTY LINE	PL
FENCE LINE	FL
BOLLARD	B
POST INDICATOR VALVE	PIV
CENTER LINE	CL
FACE CURB	FC
PAVED EDGE	PE
BUILDING LINE	BL
DRIVEWAY	DW
CRITICAL ZONE	CZ
RAILWAY	+++++
SIDEWALK	SW
UTILITY POLE	UP
LIGHT STANDARD	LS
MANHOLE	MH
HAND HOLE	HH
CATCH BASIN	CB
FIRE HYDRANT	FH
TRANSFORMER	TX or ☒
VAULT	V
WATER VALVE	WV
WATER MANHOLE	WMH
WATER	— W —
HYDRO	— H —
GAS	— G —
ELECTRICAL	— E —
COMMUNICATION	— C —
FIBRE OPTIC	— FO —
TELEPHONE	— T —
CABLE TV	— TV —
SEWER	— S —
SPRINKLER	— SP —
SANITARY	SAN
STORM	STM
CLEANOUT	CLO
UNKNOWN TYPE	— ? —
KIOSK	K
PHONE BOOTH	PB
PEDESTAL	☒
DEMARICATION	Ⓞ
NORTH	N.
SOUTH	S.
EAST	E.
WEST	W.
OVERHEAD	— — —
UNDERGROUND	— — —
LOSS OF SIGNAL	~

HAND DIG OR DAYLIGHT WITHIN 2 (TWO) METERS OF ALL MARKINGS, UNLESS OTHERWISE NOTED.
 DEPTHS TO BURIED UTILITY LINES MAY VARY. IF YOU DAMAGE A BURIED SERVICE MARKED HERE, CONTACT THE FACILITY OWNER AND PREMIER LOCATES IMMEDIATELY. DRAWING NOT TO SCALE

ID	INVERT DIRECTION	N	S	E	W		
MH 4 	Invert Measured (A) (m)						
	Vertical Offset (B) (1' = 0.305 m)						
	Invert Depth (A + B) (m)	INVERTS SHOWN. DEPTHS UNKNOWN DUE TO DEEP CHAMBER					
	Obvert Measured (C) (m)						
	Wheel (D) (0.1 m)						
	Pipe Diameter (A - C + D) (m)						
MH 5 	INVERT DIRECTION	N	S	E	W		
	Invert Measured (A) (m)						
	Vertical Offset (B) (1' = 0.305 m)						
	Invert Depth (A + B) (m)	INVERTS SHOWN. DEPTHS UNKNOWN DUE TO DEEP CHAMBER					
	Obvert Measured (C) (m)						
	Wheel (D) (0.1 m)						
CB 1 	INVERT DIRECTION	N	S	E	W		
	Invert Measured (A) (m)						
	Vertical Offset (B) (1' = 0.305 m)			1.14m			
	Invert Depth (A + B) (m)						
	Obvert Measured (C) (m)						
	Wheel (D) (0.1 m)						
Pipe Diameter (A - C + D) (m)			150mm				

ANY PUBLIC UTILITY OWNED BURIED SERVICES SHOWN HERE ARE FOR REFERENCE ONLY. THESE PUBLIC SERVICES HAVE BEEN MARKED BY OTHERS OR MARKED BY PREMIER LOCATES WITH PINK PAINT. UTILITIES MARKED IN PINK WITHIN THE LOCATE AREA, ARE FOR SURVEY PURPOSES ONLY, AND REQUIRE A PUBLIC LOCATE.

DOCUMENTS TO BE USED WITH THIS LOCATE: PRIVATE LOCATE GUIDELINE (OWN YOUR SAFETY, 2021) DAMAGE PREVENTION FOR THE PROTECTION OF UNDERGROUN INFRASTRUCTURE, (CSA Z-247-15, AUG 2016) (If you would like a copy of any of these documents, please contact our office at the number above.)
 GUIDELINE FOR EXCAVATING PROXIMITY OF UNDERGROUND DISTRIBUTION LINES (ESA, FEB 2021)

LOCATE METH- **ODS:**
 UTILITY LOCATE METHODS USED: ACTIVE PASSIVE INDUCTIVE SWEEP PRIVATE DETECTABLE SERVICES FOUND: AS SHOWN ON DRAWING NONE
 SEWER LINES: TRACED NOT TRACED MH OR CB INVERTS MARKED WHERE FOUND / VISIBLE
 GEOPHYSICS: EXTERIOR 250 MHz GPR LINE SCAN EXTERIOR 250 MHz GPR GRID SCAN INTERIOR 1,000 MHz GPR LINE SCAN INTERIOR 1,000 MHz GPR GRID SCAN

SITE CONDITIONS / LIMITATIONS:
 IF THERE IS A LIMITATION INDICATED HERE, WRITTEN OR CHECKED, THERE IS AN **ELEVATED RISK** OF STRIKING A BURIED FACILITY. THE CLIENT REPRESENTATIVE IS TO NOTIFY ALL INVOLVED WITH THE PROJECT (INCLUDING AND NOT LIMITED TO ALL FIELD STAFF, PROJECT MANAGERS, THEIR CLIENT AND/OR PROPERTY OWNER OF THE SUBJECT PROPERTY IF THE SAME). ANY LIMITATION NOTED TRANSLATES INTO AN INCREASED RISK OF NOT FINDING ALL BURIED FACILITIES WITHIN THE WORK AREA.
 AS-BUILT OR UTILITY DRAWINGS REQUESTED FROM: _____
 SITE PLAN (SHOWING WORK AREA): Yes No PROPERTY AS-BUILT OR UTILITY DRAWINGS: Yes No SURVEY: Yes No
 BUILDING ACCESS: Yes No NA SITE OPERATIONS PERSONNEL INTERVIEWED: Yes No NA
 WEATHER: _____ GROUND SNOW COVERED: Yes No
 OBSTRUCTIONS: PARKED VEHICLES OVERGROWN VEGETATION PRODUCT STORAGE OTHER (specify): _____
 LIST ANY OTHER LIMITATIONS: _____

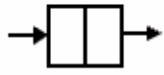
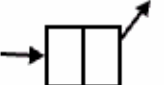
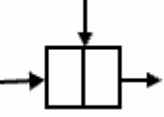
UTILITY SERVICES LOCATED: PRIVATELY OWNED REQUEST / TICKET #: 37560 VALIDITY: 60 days from this date: DATE LOCATED: 06-Jan-2023

LOCATED AREA: FROM: TO: FROM: TO:

LEGEND

BOREHOLE	⊕
TEST PIT	⊞
PROPERTY LINE	PL
FENCE LINE	FL
BOLLARD	B
POST INDICATOR	PIV
VALVE	
CENTER LINE	CL
FACE CURB	FC
PAVED EDGE	PE
BUILDING LINE	BL
DRIVEWAY	DW
CRITICAL ZONE	CZ
RAILWAY	+++++
SIDEWALK	SW
UTILITY POLE	UP
LIGHT STANDARD	LS
MANHOLE	MH
HAND HOLE	HH
CATCH BASIN	CB
FIRE HYDRANT	FH
TRANSFORMER	TX or ☒
VAULT	V
WATER VALVE	WV
WATER MANHOLE	WMH
WATER	W
HYDRO	H
GAS	G
ELECTRICAL	E
COMMUNICATION	C
FIBRE OPTIC	FO
TELEPHONE	T
CABLE TV	TV
SEWER	S
SPRINKLER	SP
SANITARY	SAN
STORM	STM
CLEANOUT	CLO
UNKNOWN TYPE	?
KIOSK	K
PHONE BOOTH	PB
PEDESTAL	☒
DEMARICATION	DM
NORTH	N
SOUTH	S
EAST	E
WEST	W
OVERHEAD	---
UNDERGROUND	---
LOSS OF SIGNAL	~

HAND DIG OR DAYLIGHT WITHIN 2 (TWO) METERS OF ALL MARKINGS, UNLESS OTHERWISE NOTED.
 DEPTHS TO BURIED UTILITY LINES MAY VARY. IF YOU DAMAGE A BURIED SERVICE MARKED HERE, CONTACT THE FACILITY OWNER AND PREMIER LOCATES IMMEDIATELY. DRAWING NOT TO SCALE

ID	INVERT DIRECTION	N	S	E	W			
CB 2 	Invert Measured (A) (m)							
	Vertical Offset (B) (1' = 0.305 m)							
	Invert Depth (A + B) (m)			1.40m	1.32m			
	Obvert Measured (C) (m)							
	Wheel (D) (0.1 m)							
Pipe Diameter (A - C + D) (m)				200mm	200mm			
CB 3 	INVERT DIRECTION	N	S	E	W	NW		
	Invert Measured (A) (m)							
	Vertical Offset (B) (1' = 0.305 m)							
	Invert Depth (A + B) (m)				1.50m	1.55m		
	Obvert Measured (C) (m)							
Wheel (D) (0.1 m)								
Pipe Diameter (A - C + D) (m)					200mm	250mm		
CB 4 	INVERT DIRECTION	N	S	E	W			
	Invert Measured (A) (m)							
	Vertical Offset (B) (1' = 0.305 m)							
	Invert Depth (A + B) (m)	1.32m			1.43m	1.47m		
	Obvert Measured (C) (m)							
Wheel (D) (0.1 m)								
Pipe Diameter (A - C + D) (m)	150mm				250mm	250mm		

ANY PUBLIC UTILITY OWNED BURIED SERVICES SHOWN HERE ARE FOR REFERENCE ONLY. THESE PUBLIC SERVICES HAVE BEEN MARKED BY OTHERS OR MARKED BY PREMIER LOCATES WITH PINK PAINT. UTILITIES MARKED IN PINK WITHIN THE LOCATE AREA, ARE FOR SURVEY PURPOSES ONLY, AND REQUIRE A PUBLIC LOCATE.

DOCUMENTS TO BE USED WITH THIS LOCATE: PRIVATE LOCATE GUIDELINE (OWN YOUR SAFETY, 2021) DAMAGE PREVENTION FOR THE PROTECTION OF UNDERGROUN INFRASTRUCTURE, (CSA Z-247-15, AUG 2016) (If you would like a copy of any of these documents, please contact our office at the number above.)
 GUIDELINE FOR EXCAVATING PROXIMITY OF UNDERGROUND DISTRIBUTION LINES (ESA, FEB 2021)

LOCATE METH- **ODS:**
 UTILITY LOCATE METHODS USED: ACTIVE PASSIVE INDUCTIVE SWEEP PRIVATE DETECTABLE SERVICES FOUND: AS SHOWN ON DRAWING NONE
 SEWER LINES: TRACED NOT TRACED MH OR CB INVERTS MARKED WHERE FOUND / VISIBLE
 GEOPHYSICS: EXTERIOR 250 MHz GPR LINE SCAN EXTERIOR 250 MHz GPR GRID SCAN INTERIOR 1,000 MHz GPR LINE SCAN INTERIOR 1,000 MHz GPR GRID SCAN

SITE CONDITIONS / LIMITATIONS:
 IF THERE IS A LIMITATION INDICATED HERE, WRITTEN OR CHECKED, THERE IS AN **ELEVATED RISK** OF STRIKING A BURIED FACILITY. THE CLIENT REPRESENTATIVE IS TO NOTIFY ALL INVOLVED WITH THE PROJECT (INCLUDING AND NOT LIMITED TO ALL FIELD STAFF, PROJECT MANAGERS, THEIR CLIENT AND/OR PROPERTY OWNER OF THE SUBJECT PROPERTY IF THE SAME). ANY LIMITATION NOTED TRANSLATES INTO AN INCREASED RISK OF NOT FINDING ALL BURIED FACILITIES WITHIN THE WORK AREA.
 AS-BUILT OR UTILITY DRAWINGS REQUESTED FROM: _____
 SITE PLAN (SHOWING WORK AREA): Yes No PROPERTY AS-BUILT OR UTILITY DRAWINGS: Yes No SURVEY: Yes No
 BUILDING ACCESS: Yes No NA SITE OPERATIONS PERSONNEL INTERVIEWED: Yes No NA
 WEATHER: _____ GROUND SNOW COVERED: Yes No
 OBSTRUCTIONS: PARKED VEHICLES OVERGROWN VEGETATION PRODUCT STORAGE OTHER (specify): _____
 LIST ANY OTHER LIMITATIONS: _____

UTILITY SERVICES LOCATED: PRIVATELY OWNED REQUEST / TICKET #: 37560 VALIDITY: 60 days from this date: DATE LOCATED: 06-Jan-2023

LOCATED AREA: FROM: TO: FROM: TO:

LEGEND

BOREHOLE	⊕
TEST PIT	⊞
PROPERTY LINE	PL
FENCE LINE	FL
BOLLARD	B
POST INDICATOR	PIV
VALVE	
CENTER LINE	CL
FACE CURB	FC
PAVED EDGE	PE
BUILDING LINE	BL
DRIVEWAY	DW
CRITICAL ZONE	CZ
RAILWAY	+++++
SIDEWALK	SW
UTILITY POLE	UP
LIGHT STANDARD	LS
MANHOLE	MH
HAND HOLE	HH
CATCH BASIN	CB
FIRE HYDRANT	FH
TRANSFORMER	TX or ☒
VAULT	V
WATER VALVE	WV
WATER MANHOLE	WMH
WATER	— W —
HYDRO	— H —
GAS	— G —
ELECTRICAL	— E —
COMMUNICATION	— C —
FIBRE OPTIC	— FO —
TELEPHONE	— T —
CABLE TV	— TV —
SEWER	— S —
SPRINKLER	— SP —
SANITARY	SAN
STORM	STM
CLEANOUT	CLO
UNKNOWN TYPE	— ? —
KIOSK	K
PHONE BOOTH	PB
PEDESTAL	☒
DEMARICATION	Ⓞ
NORTH	N.
SOUTH	S.
EAST	E.
WEST	W.
OVERHEAD	— — —
UNDERGROUND	— — —
LOSS OF SIGNAL	~

HAND DIG OR DAYLIGHT WITHIN 2 (TWO) METERS OF ALL MARKINGS, UNLESS OTHERWISE NOTED.
 DEPTHS TO BURIED UTILITY LINES MAY VARY. IF YOU DAMAGE A BURIED SERVICE MARKED HERE, CONTACT THE FACILITY OWNER AND PREMIER LOCATES IMMEDIATELY. DRAWING NOT TO SCALE

ID	INVERT DIRECTION	N	S	E	W		
CB 5							
Sketch	Vertical Offset (B) (1" = 0.305 m)						
	Invert Depth (A + B) (m)				1.07m		
	Obvert Measured (C) (m)						
	Wheel (D) (0.1 m)						
	Pipe Diameter (A - C + D) (m)				250mm		
CB 6		N	S	E	W		
Sketch	Vertical Offset (B) (1" = 0.305 m)						
	Invert Depth (A + B) (m)				1.04m		
	Obvert Measured (C) (m)						
	Wheel (D) (0.1 m)						
	Pipe Diameter (A - C + D) (m)				250mm		
ID		N	S	E	W		
Sketch	Vertical Offset (B) (1" = 0.305 m)						
	Invert Depth (A + B) (m)						
	Obvert Measured (C) (m)						
	Wheel (D) (0.1 m)						
	Pipe Diameter (A - C + D) (m)						

ANY PUBLIC UTILITY OWNED BURIED SERVICES SHOWN HERE ARE FOR REFERENCE ONLY. THESE PUBLIC SERVICES HAVE BEEN MARKED BY OTHERS OR MARKED BY PREMIER LOCATES WITH PINK PAINT. UTILITIES MARKED IN PINK WITHIN THE LOCATE AREA, ARE FOR SURVEY PURPOSES ONLY, AND REQUIRE A PUBLIC LOCATE.

DOCUMENTS TO BE USED WITH THIS LOCATE: PRIVATE LOCATE GUIDELINE (OWN YOUR SAFETY, 2021) DAMAGE PREVENTION FOR THE PROTECTION OF UNDERGROUN INFRASTRUCTURE, (CSA Z-247-15, AUG 2016) (If you would like a copy of any of these documents, please contact our office at the number above.)
 GUIDELINE FOR EXCAVATING PROXIMITY OF UNDERGROUND DISTRIBUTION LINES (ESA, FEB 2021)

LOCATE METH- **ODS:**
 UTILITY LOCATE METHODS USED: ACTIVE PASSIVE INDUCTIVE SWEEP PRIVATE DETECTABLE SERVICES FOUND: AS SHOWN ON DRAWING NONE
 SEWER LINES: TRACED NOT TRACED MH OR CB INVERTS MARKED WHERE FOUND / VISIBLE
 GEOPHYSICS: EXTERIOR 250 MHz GPR LINE SCAN EXTERIOR 250 MHz GPR GRID SCAN INTERIOR 1,000 MHz GPR LINE SCAN INTERIOR 1,000 MHz GPR GRID SCAN

SITE CONDITIONS / LIMITATIONS:
 IF THERE IS A LIMITATION INDICATED HERE, WRITTEN OR CHECKED, THERE IS AN **ELEVATED RISK** OF STRIKING A BURIED FACILITY. THE CLIENT REPRESENTATIVE IS TO NOTIFY ALL INVOLVED WITH THE PROJECT (INCLUDING AND NOT LIMITED TO ALL FIELD STAFF, PROJECT MANAGERS, THEIR CLIENT AND/OR PROPERTY OWNER OF THE SUBJECT PROPERTY IF THE SAME). ANY LIMITATION NOTED TRANSLATES INTO AN INCREASED RISK OF NOT FINDING ALL BURIED FACILITIES WITHIN THE WORK AREA.
 AS-BUILT OR UTILITY DRAWINGS REQUESTED FROM: _____
 SITE PLAN (SHOWING WORK AREA): Yes No PROPERTY AS-BUILT OR UTILITY DRAWINGS: Yes No SURVEY: Yes No
 BUILDING ACCESS: Yes No NA SITE OPERATIONS PERSONNEL INTERVIEWED: Yes No NA
 WEATHER: _____ GROUND SNOW COVERED: Yes No
 OBSTRUCTIONS: PARKED VEHICLES OVERGROWN VEGETATION PRODUCT STORAGE OTHER (specify): _____
 LIST ANY OTHER LIMITATIONS: _____

UTILITY SERVICES LOCATED: <input type="checkbox"/> PRIVATELY OWNED	REQUEST / TICKET #: 37560	VALIDITY: 60 days from this date:	DATE LOCATED: 06-Jan-2023
--------------------------------------------------------------------	---------------------------	-----------------------------------	---------------------------

LOCATED AREA:	FROM:	TO:
	FROM:	TO:

LEGEND	
BOREHOLE	⊕
TEST PIT	⊞
PROPERTY LINE	PL
FENCE LINE	— FL —
BOLLARD	B
POST INDICATOR	PIV
VALVE	∩
CENTER LINE	CL
FACE CURB	FC
PAVED EDGE	PE
BUILDING LINE	BL
DRIVEWAY	DW
CRITICAL ZONE	CZ
RAILWAY	+++++
SIDEWALK	SW
UTILITY POLE	UP
LIGHT STANDARD	LS
MANHOLE	MH
HAND HOLE	HH
CATCH BASIN	▣ CB
FIRE HYDRANT	⊙ FH
TRANSFORMER	TX or ☒
VAULT	V
WATER VALVE	WV
WATER MANHOLE	WMH
WATER	— W —
HYDRO	— H —
GAS	— G —
ELECTRICAL	— E —
COMMUNICATION	— C —
FIBRE OPTIC	— FO —
TELEPHONE	— T —
CABLE TV	— TV —
SEWER	— S —
SPRINKLER	— SP —
SANITARY	SAN
STORM	STM
CLEANOUT	CLO
UNKNOWN TYPE	— ? —
KIOSK	K
PHONE BOOTH	PB
PEDESTAL	⊠
DEMARICATION	Ⓞ
NORTH	N.
SOUTH	S.
EAST	E.
WEST	W.
OVERHEAD	— — —
UNDERGROUND	— — —
LOSS OF SIGNAL	~

HAND DIG OR DAYLIGHT WITHIN 2 (TWO) METERS OF ALL MARKINGS, UNLESS OTHERWISE NOTED.
 DEPTHS TO BURIED UTILITY LINES MAY VARY. IF YOU DAMAGE A BURIED SERVICE MARKED HERE, CONTACT THE FACILITY OWNER AND PREMIER LOCATES IMMEDIATELY. DRAWING NOT TO SCALE

****NOTES****

- *NO ACCESS INSIDE MAIN LARGE BUILDING DURING TIME OF LOCATES.
- *UNABLE TO LOCATE GAS MAIN ALONG BAYFIELD ROAD. NO TRACE OR TONE ON GAS SERVICE FOR MAIN LARGE BUILDING. LOST SIGNAL ON GAS SERVICE FROM TIM HORTONS.
- *NO TRACE OR TONE FROM FIBRE OPTIC SERVICES IN VAULT.
- *MULTIPLE MANHOLES ALONG BAYFIELD UNABLE TO VERIFY DEPTHS AND PIPE SIZES DUE TO CHAMBERS AND TOO DEEP TO MEASURE.
- *MULTIPLE SIGNS NO TRACE OR TONE.
- *UNABLE TO VERIFY WATER MAIN ALONG BAYFIELD ROAD. LOST SIGNAL FROM VALVE SHOWN ON DRAWING TO MAIN LARGE BUILDING.
- *MULTIPLE INVERTS IN MANHOLE #2 UNABLE TO TRACE. PIPE SIZES AND DEPTHS GIVEN.
- *BLOCKAGE OBSERVED WHEN TRACING SEWER FROM STORM MANHOLE #1

DOCUMENTS TO BE USED WITH THIS LOCATE: PRIVATE LOCATE GUIDELINE (OWN YOUR SAFETY, 2021) (If you would like a copy of any of these documents, please contact our office at the number above.)
 DAMAGE PREVENTION FOR THE PROTECTION OF UNDERGROUND INFRASTRUCTURE, (CSA Z-247-15, AUG 2016)
 GUIDELINE FOR EXCAVATING PROXIMITY OF UNDERGROUND DISTRIBUTION LINES (ESA, FEB 2021)

LOCATE METH-	ODS:
UTILITY LOCATE METHODS USED: <input type="checkbox"/> ACTIVE <input type="checkbox"/> PASSIVE <input type="checkbox"/> INDUCTIVE SWEEP SEWER LINES: <input type="checkbox"/> TRACED <input type="checkbox"/> NOT TRACED <input type="checkbox"/> MH OR CB INVERTS MARKED WHERE FOUND / VISIBLE	PRIVATE DETECTABLE SERVICES FOUND: <input type="checkbox"/> AS SHOWN ON DRAWING <input type="checkbox"/> NONE
GEOPHYSICS: <input type="checkbox"/> EXTERIOR 250 MHz GPR LINE SCAN <input type="checkbox"/> EXTERIOR 250 MHz GPR GRID SCAN <input type="checkbox"/> INTERIOR 1,000 MHz GPR LINE SCAN <input type="checkbox"/> INTERIOR 1,000 MHz GPR GRID SCAN	

SITE CONDITIONS / LIMITATIONS:
 IF THERE IS A LIMITATION INDICATED HERE, WRITTEN OR CHECKED, THERE IS AN **ELEVATED RISK** OF STRIKING A BURIED FACILITY. THE CLIENT REPRESENTATIVE IS TO NOTIFY ALL INVOLVED WITH THE PROJECT (INCLUDING AND NOT LIMITED TO ALL FIELD STAFF, PROJECT MANAGERS, THEIR CLIENT AND/OR PROPERTY OWNER OF THE SUBJECT PROPERTY IF THE SAME). ANY LIMITATION NOTED TRANSLATES INTO AN INCREASED RISK OF NOT FINDING ALL BURIED FACILITIES WITHIN THE WORK AREA.

AS-BUILT OR UTILITY DRAWINGS REQUESTED FROM: _____

SITE PLAN (SHOWING WORK AREA): Yes No PROPERTY AS-BUILT OR UTILITY DRAWINGS: Yes No SURVEY: Yes No

BUILDING ACCESS: Yes No NA SITE OPERATIONS PERSONNEL INTERVIEWED: Yes No NA

WEATHER: _____ GROUND SNOW COVERED: Yes No

OBSTRUCTIONS: PARKED VEHICLES OVERGROWN VEGETATION PRODUCT STORAGE OTHER (specify): _____

LIST ANY OTHER LIMITATIONS: _____



PREMIER LOCATES

PRIVATELY-OWNED UTILITY LOCATE CLIENT COMPANY ACKNOWLEDGEMENTS

PAGE 11 OF 11

BY SIGNING OR RECEIVING AN EMAILED COPY OF THIS LOCATE REPORT, THE CLIENT HAS READ, ACKNOWLEDGES AND AGREES TO THE FOLLOWING:

EXCAVATOR
AN EXCAVATOR IS ANY PERSON, PARTNERSHIP, CORPORATION, PUBLIC AGENCY, AGENT, OR OTHER ENTITY THAT IS RESPONSIBLE FOR CARRYING OUT A GROUND DISTURBANCE.

GROUND DISTURBANCE / EXCAVATE
GROUND DISTURBANCE OR EXCAVATE MEANS ANY WORK, OPERATION, OR ACTIVITY ON OR UNDER THE EXISTING SURFACE RESULTING IN A DISTURBANCE OR DISPLACEMENT OF THE SOILD OR GROUND COVER. GROUND DISTURBANCE OR EXCAVATE CAN INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING: DIGGING; EXCAVATION; TRENCHING; DITCHING; TUNNELING; BORING/DRILLING/PUSHING; AUGERING; TOPSOIL STRIPPING; LAND LEVELLING/GRADING; FLOWING TO INSTALL UNDERGROUND INFRASTRUCTURE; TREE PLANTING; CLEARING AND STUMP REMOVAL; SUBSOILING; BLASTING/USE OF EXPLOSIVES; QUARRYING; GRINDING AND MILLING OF ASPHALT/CONCRETE; SEISMIC EXPLORATION; DRIVING FENCE POSTS, BARS, RODS, PINS, ANCHORS, OR PILLING; AND, CROSSING OF BURIED PIPELINES OR OTHER UNDERGROUND INFRASTRUCTURE BY HEAVY LOADS OFF THE TRAVELLED PORTION OF A PUBLIC ROADWAY.

LIMIT OF LOCATE
THE EXCAVATOR MUST NOT WORK OUTSIDE THE INDICATED LOCATE AREA WITHOUT FURTHER LOCATES BY PREMIER LOCATES INC. (SUBSEQUENTLY REFERRED TO AS "PLI").

MULTIPLE EXCAVATORS
WHEN A LOCATE IS BEING PROVIDED FOR MORE THAN ONE PARTY WORKING ON THE PROJECT, THE PERSON NAMED ON THIS LOCATE REPORT IS CONSIDERED TO BE ACTING ON BEHALF OF THE EXCAVATOR IN ACCEPTING AND ENSURING THE EXCAVATOR RECEIVES A COPY OF THIS LOCATE.

VALIDITY OF LOCATE
THIS LOCATE IS ONLY VALID FOR 60 DAYS UNLESS STATED OTHERWISE ON THE LOCATE REPORT. A RE-MARK OF SURFICIAL MARKINGS PLACED ON THE SITE BY PLI MUST BE OBTAINED PRIOR TO ANY EXCAVATION IF: THE DATE OF EXCAVATION IS PAST THE VALIDATION PERIOD; MARKINGS BECOME UNCLEAR, DISAPPEAR, ARE DISTURBED OR DISPLACED; THE SKETCH AND SITE MARKINGS DO NOT COINCIDE; THE WORK LOCATION HAS CHANGED; AND, IF ANYTHING OCCURS WHICH MAY INDICATE THAT A NEW, BETTER, OR DIFFERENT LOCATE SERVICE IS NEEDED.

GROUND MARKINGS
IF THE MARKINGS DISAPPEAR OR ARE DISPLACED OR SHOULD SKETCH MARKINGS NOT COINCIDE WITH GROUND MARKINGS. THE PRIVATE LOCATE IS INVALID AND PLI WILL NEED TO BE CONTACTED TO EITHER REFRESH THE MARKINGS OR FIX ANY DISCREPANCY.

LEGAL REQUIREMENTS
YOU ARE REQUIRED BY LAW TO HAVE ALL BURIED PUBLIC AND PRIVATE UTILITIES LOCATED AND MARKED IN THE VICINITY OF ANY WORK BEFORE PERFORMING ANY TYPE OF EXCAVATION OR DRILLING ACTIVITIES. YOU MUST HAVE VALID PUBLIC LOCATES FOR YOUR WORK AREA. FINES AND PENALTIES BY PUBLIC AUTHORITIES CAN BE GIVEN IF WORKING WITH EXPIRED LOCATES.

PUBLIC LOCATES
ANY PUBLIC UTILITY OWNED SERVICES (GAS, TELEPHONE, CABLE TV, HYDRO, WATER, SEWER, ETC.) WITHIN THE LIMITS OF THIS LOCATE AND SHOWN ON THIS LOCATE REPORT, ARE FOR REFERENCE ONLY. THESE PUBLIC UTILITIES HAVE BEEN MARKED BY OTHERS OR MARKED BY PLI WITH PINK PAINT. ANY BURIED UTILITIES MARKED IN PINK WITHIN THE LOCATE AREA, ARE FOR SURVEY PURPOSES ONLY, AND REQUIRE A PUBLIC LOCATE BEFORE EXCAVATING. IT IS THE RESPONSIBILITY OF THE CLIENT TO ENSURE AND VERIFY THAT THE INTENDED WORK ARE COINCIDES WITH THE WORK AREAS DRAWN OR DESCRIBED ON ALL PUBLIC AND PRIVATE UTILITY LOCATE REPORTS.

SCOPE OF WORK
THIS PRIVATE LOCATE REPORT IS BASED ON INFORMATION GIVEN AT THE TIME OF THE LOCATE. ANY CHANGES TO THE LOCATION OR SCOPE OF WORK REQUIRES A NEW LOCATE REPORT.

BUILDING AND/OR SERVICE ROOM ACCESS
SOME CABLES OR PIPES MAY NOT BE DETECTED OR LOCATED IF DIRECT PHYSICAL ACCESS TO BUILDING SERVICE ROOMS ARE NOT PROVIDED AT THE TIME OF THE LOCATE.

PHYSICAL LIMITATIONS
IF THERE ARE ANY PHYSICAL LIMITATIONS AT THE SITE (I.E. SNOW-COVERED GROUND, PARKED CARS, EQUIPMENT OR MATERIALS, ETC. CONGESTING THE AREA TO BE LOCATED), THE CLIENT IS HEREBY MADE AWARE AND ACKNOWLEDGES THAT SOME CABLES OR PIPES MAY NOT BE DETECTED OR LOCATED IF THE LOCATE AREA IS NOT CLEAR OF THESE OBSTRUCTIONS AT THE TIME OF THE LOCATE.

INTERIOR LOCATES
DUE TO BUILDING INTERFERENCES, CONGESTION, AND HIDDEN OR INACCESSIBLE ELECTRICAL CONDUITS OR PIPES, SOME CABLES OR PIPES MAY OR MAY NOT BE DETECTED WITH THE EQUIPMENT EMPLOYED BY PLI. PLI USES GROUND PENETRATING RADAR (GPR) WITH A 1000 MHZ ANTENNA ALONG WITH ELECTROMAGNETIC CABLE LOCATE EQUIPMENT WHILE PERFORMING INTERIOR PRIVATE LOCATES. SEWER LINES INSIDE BUILDINGS MAY NOT BE VISIBLE WITH GPR IF THEY ARE DEEPER THAN 2 FEET OR ARE COMPRISED OF A MATERIAL SUCH AS PLASTIC OR CLAY THAT ARE NOT VISIBLE TO GPR.

SANITARY AND STORM SEWERS
PLI USES A CCTV CAMERA WITH BUILT-IN SONDE TO LOCATE SEWER LINES PROVIDED: SEWER DRAWINGS HAVE BEEN PROVIDED TO PLI FROM THE PRIVATE LANDOWNER; THERE IS SUFFICIENT ACCESS TO THE SEWER LINE THAT DOES NOT REQUIRE CONFINED SPACE ENTRY; AND, THE SEWER LINE IS ON PRIVATE PROPERTY. IF A MANHOLE OR CATCHBASIN IS SHOWN ON A DRAWING OR FOUND DURING THE LOCATE, PLI WILL ATTEMPT TO OPEN THEM, MARK THE INVERT DIRECTION, AND USE A CCTV CAMERA WITH SONDE TO LOCATE THE LINE IF SO REQUESTED BY THE CLIENT. IF PLI IS UNABLE OPEN THE MH OR CB, DETERMINE THE DIRECTION OF THE INVERTS, OR LOCATE THE BURIED LINE, IT WILL BE INDICATED AS A LIMITATION AND NOTED ON THE LOCATE REPORT. THE CLIENT ALSO ACKNOWLEDGES THAT TRUNK SEWER AND WATER MAINS MAY NOT BE DETECTABLE AND REQUIRE A PUBLIC LOCATE IF WITHIN AN EASEMENT ON PRIVATE PROPERTY.

UNDERGROUND STORAGE TANKS AND ASSOCIATED EQUIPMENT
PLI DOES NOT LOCATE UNDERGROUND STORAGE TANKS OR ANY ASSOCIATED EQUIPMENT UNLESS GROUND PENETRATING RADAR AND/OR AN EM61 TIME DOMAIN METAL DETECTOR IS EMPLOYED AT THE TIME OF THE LOCATE. THE CLIENT ALSO HAS BEEN MADE AWARE OF AND ACKNOWLEDGES THAT ANY EXCAVATING OR DRILLING WITHIN PLI DEFINED CRITICAL AREAS (FOUND IN THE MEMBER LOGIN AREA AT WWW.PREMIERLOCATES.CA) AROUND ANY UNDERGROUND PETROLEUM EQUIPMENT AND STRUCTURES SUCH AS UNDERGROUND STORAGE TANKS (USTS) AND FUEL DISPENSERS; AND, WITHIN THE AREA BETWEEN USTS, PUMP DISPENSERS AND FUEL KIOSK, REQUIRES HAND DIGGING OR SOFT DIGGING WITH VACUUM EXCAVATION EQUIPMENT TO EXPOSE THE WORK AREA.

- LIMITATIONS**
- THE TECHNOLOGIES EMPLOYED BY PLI TO TRACE AND MARK BURIED FACILITIES ARE COMPLIANT WITH ACSE STANDARD 38-02 LEVEL B, WHICH ARE ASSIGNED TO HAVE A MODERATE RISK. THESE GEO-PHYSICAL METHODS ARE NOT 100% EFFECTIVE AND CANNOT DETECT ALL BURIED SERVICES SINCE THERE ARE TOO MANY VARIABLES THAT CAN WORK AGAINST THE EQUIPMENT. IT MAY NOT BE POSSIBLE TO ABSOLUTELY "CLEAR" REGARDLESS OF THE SKILL, EFFORT, OR TECHNOLOGIES USED BY PLI. LOCATING METHODS USED BY PLI ONLY HELPS REDUCE RISK OF STRIKING A BURIED UTILITY AND DOES NOT ELIMINATE THE RISK. IF PRECISE HORIZONTAL AND VERTICAL LOCATIONS OF BURIED FACILITIES ARE NEEDED, THEN ACSE STANDARD 38-02 QUALITY LEVEL A METHODS WOULD NEED TO BE EMPLOYED. QUALITY LEVEL A METHODS INVOLVE THE ACTUAL EXPOSURE OF A FACILITY BY MEANS OF EITHER HAND DIGGING OR THE USE OF VACUUM EXCAVATION SYSTEMS.
 - SOME CABLES OR PIPES MAY NOT BE DETECTABLE OR LOCATED ACCURATELY DUE TO DEPTH, LACK OF OR MALFUNCTIONING TRACER WIRES, MATERIAL MAKEUP, CONFINED SPACES, OR INABILITY TO CONNECT PROPERLY. THIS MAY BE COMPOUNDED BY THE LACK OF ACCESS OR ACCESS TOO FAR FROM THE AREA TO BE TRACED.
 - THE LOCATION AND MARKING OF BURIED FACILITIES BY THE PLI LOCATE TECHNICIAN FOR THE CLIENT REPRESENTATIVE IS FOR THE CONVENIENCE OF THAT SAID APPLICANT ONLY AND DOES NOT RELIEVE SAID APPLICANT, OR ANY PERSON OR CORPORATION, FROM LIABILITY FOR DAMAGES OR PERSONAL INJURY INCLUDING DEATH TO ANY PERSON OR FOR PROPERTY DAMAGE CAUSED TO THE SAID PLANT OR TO ANY OTHER PROPERTY. BY REASON OF THE SAID APPLICANT, OR ANY OTHER PERSON OR CORPORATION, HAVING RELIED UPON THE LOCATION AND MARKING OF FACILITIES BY PLI.
 - IF THERE ARE ANY LIMITATIONS NOTED ON THE LOCATE REPORT AND/OR SITE SERVICES CHECKLIST, THE CLIENT ACCEPTING THIS LOCATE REPORT MUST INFORM ALL INVOLVED WITH THE PROJECT OF THE LIMITATION INCLUDING AND NOT LIMITED TO: ALL FIELD STAFF; PROJECT MANAGERS; THEIR CLIENT; AND THE PROPERTY OWNER OF THE SUBJECT PROPERTY. THE PROPERTY OWNER IS ULTIMATELY RESPONSIBLE FOR THEIR BURIED FACILITIES AND SHOULD HAVE THE FINAL DECISION IN HOW TO EXCAVATE NEAR THEIR BURIED FACILITIES IF THEY CANNOT BE ACCURATELY LOCATED AND MARKED. WHOEVER ACCEPTS THE LIMITATION CLAIMS RESPONSIBILITY IF A BURIED FACILITY IS DAMAGED AS A RESULT OF THE LIMITATION.
 - THE PRIVATE UTILITY LOCATE PREPARED BY PLI IS FOR THE USE OF THE CLIENT. IF THE CLIENT'S PROVIDES THE LOCATE REPORT TO A SUB-CONTRACTORS FOR RELIANCE, THE SUB-CONTRACTOR MUST BE GIVEN A COPY OF THE LOCATE REPORT AND NOTIFIED OF ANY LIMITATIONS NOTED WITHIN THE LOCATE REPORT.

THE PERSON ACCEPTING THIS PRIVATE UTILITY LOCATE REPORT, AGREES THAT THEY FULLY UNDERSTAND ALL OF THE INFORMATION PRESENTED IN THE LOCATE REPORT, SITE SERVICES CHECKLIST, AND CLIENT COMPANY ACKNOWLEDGEMENT.

THE CLIENT WARRANTS THAT PLI IS NOT LIABLE FOR ANY CLAIMS FOR DAMAGES TO ANY UNDERGROUND FACILITY WHERE PLI WAS NOT NOTIFIED OF SUCH DAMAGE FORTHWITH, SUCH THAT PLI CAN COMPLETE A DAMAGE INVESTIGATION TO PHYSICALLY VIEW ANY SUCH DAMAGED UNDERGROUND FACILITY WHETHER OR NOT ANY SUCH DAMAGE MAY ATTRIBUTED TO ERRORS OR OMISSIONS COMMITTED BY PLI IN PERFORMING THE WORK.

PLI SHALL NOT BE LIABLE FOR ANY AMOUNT IN EXCESS OF THE FEES PAID BY THE CLIENT TO PLI FOR THE SERVICE ON ACCOUNT OF ANY LOSS, INJURY, DEATH OR DAMAGE WHETHER RESULTING DIRECTLY OR INDIRECTLY TO A PERSON OR PROPERTY IRRESPECTIVE OF THE CAUSE OR ORIGIN OF SUCH LOSS, INJURY, DEATH OR DAMAGE INCLUDING, WITHOUT LIMITATION, LOSS, INJURY, DEATH OR DAMAGE ATTRIBUTABLE TO THE NEGLIGENCE OF PLI, ITS EMPLOYEES AND AGENTS IN THE PERFORMANCE OR NON-PERFORMANCE OF THE SERVICE.

CLIENT COMPANY ACKNOWLEDGEMENTS - GPR & EM61

BY SIGNING OR RECEIVING AN EMAILED COPY OF THIS LOCATE REPORT, THE CLIENT HAS READ, ACKNOWLEDGES AND AGREES TO THE FOLLOWING:

DATA PRESENTATION

THE GEOPHYSICAL DATA WERE ACQUIRED AT THE STATION SPACING AND ON THE DATE AS SHOWN ON THE FRONT OF THIS SHEET.

THE INTERPRETATION OF THE GROUND PENETRATING RADAR (GPR) AND/OR EM61 IS PRESENTED ON THE SKETCH ON THE FRONT OF THIS SHEET AND WITH PAINT MARKS IN THE WORK STUDY AREA.

THE GPR AND EM61 DATA ARE PRESENTED ALONG A SURVEY LINE, DISPLAYED FROM LEFT TO RIGHT. THE GPR DATA IS A REPRESENTATIVE IMAGE OF THE GPR SIGNAL AMPLITUDE AND IS NOT AN IMAGE OF THE SUBSURFACE. THE GPR SIGNAL PENETRATION DEPTH IS NOTED ON THE FRONT OF THIS SHEET. THE STANDARD EM61 CANNOT DETECT SINGLE OBJECTS AND DEPTHS MUCH GREATER THAN 3-4 METERS.

GEOPHYSICAL DATA RECORDED ON-SITE IS RE-EXAMINED AFTER THE COMPLETION OF THE SURVEY AND A SUPPLEMENTAL REPORT WILL BE SENT IF COMPUTER ANALYZED DATA DIFFERS FROM THE FIELD TECHNICIANS INTERPRETATION.

TECHNICAL LIMITATIONS

THE INTERPRETATION OF THE GEOPHYSICAL DATA OBTAINED DURING THE INVESTIGATION IS INTENDED FOR THE GUIDANCE OF THE CLIENT ONLY. SHOULD THIS INTERPRETATION OF THE DATA BE USED DURING ANY SUBSEQUENT PROGRAMS, THE USER MUST BE AWARE OF THE FOLLOWING INTERPRETIVE RESTRICTIONS:

THE CLIENT ACKNOWLEDGES THAT THE LAWS OF FUNDAMENTAL PHYSICS APPLY AND DO NOT ENABLE PREMIER LOCATES INC. (PLI) LOCATING EQUIPMENT TO DETECT ALL UTILITIES, OBJECTS, FEATURES, AND STRUCTURES OR TO PROVIDE ALL COORDINATES OF THE POSITION THEREOF. PIPE, CABLE, CONDUIT, UTILITIES, OBJECTS, FEATURES OR STRUCTURES WHICH ARE NOT DETECTABLE (I.E. NOT "LOCATABLE") BECAUSE OF THE LAWS OF FUNDAMENTAL PHYSICS CANNOT BE LOCATED BY PLI AND ARE NOT THE SUBJECT OF THE PROVISION OF THE "SERVICE" PURSUANT TO THIS CONTRACT.

THE "SERVICE" PROVIDED TO THIS CONTRACT IS THE LOCATION, Laterally and longitudinally, of utilities, objects, features or structures and the subsequent marking of the site according to the standard subsurface utility locating industry practice. The depth and/or size of pipe, cable, conduits, utilities, objects, features and structures is recorded only if the client has requested prior to the start of the survey.

A "DETECTABLE FEATURE" DEFINED BY THIS INVESTIGATION MAY CONSIST OF A CABLE, WIRE, PIPE, CONDUIT, STRUCTURE OR OTHER OBJECT CONTAINED WITHIN THE SUBSURFACE. DIFFERENTIATION BETWEEN THESE TYPES OF FEATURES IS NOT PROMISED NOR GUARANTEED. A FEATURE IS ONLY DETECTABLE IF THE SUBSURFACE ALLOWS THE GPR SIGNAL TO PROPAGATE DEEP ENOUGH TO DEFINE THE FEATURE. GPR PENETRATION INTO THE SUBSURFACE VARIES DEPENDING UPON THE SUBSURFACE CONDITIONS AND IS NOT CONTROLLED BY THE RADAR EQUIPMENT OR THE TECHNICIAN'S ABILITY. LIMITED PENETRATION IS CAUSED BY HIGH-CONDUCTIVITY MATERIALS SUCH AS CLAY AND SILT SOILS AND SOLIDS THAT ARE SALT CONTAMINATED. PERFORMANCE IS ALSO LIMITED BY SIGNAL SCATTERING IN HETEROGENEOUS CONDITIONS (E.G. ROCKY SOILS, LARGE TREE ROOTS, CONSTRUCTION DEBRIS ETC.), SNOW, DISSOLVED SOLIDS, MOISTURE, VOIDS, AND FEATURES HAVING A SIGNIFICANT ELECTROMAGNETIC VARIANCE.

ACCURACY OF INFERRED BURIED DETECTABLE FEATURES WILL VARY DUE TO SUBSURFACE SOIL CONDITIONS AND SURFACE CONDITIONS (I.E. LOOSE DIRT, ICE, SNOW, TALL GRASS, AND WATER).

PLI IS NOT LIABLE FOR DAMAGES, IF ANY, RESULTING FROM PHYSICAL EXPOSURE OF ANY 'DETECTABLE FEATURES' BY THE CLIENT, OR THEIR REPRESENTATIVES, OR THEIR SUB-CONTRACTORS, OR ANY OTHER PERSON, OR CORPORATION, BASED ON THE INFORMATION PROVIDED.

AREAS CONSIDERED TO BE INACCESSIBLE (AN "INACCESSIBLE AREA") FOR THE SERVICE INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING: THOSE OF PHYSICALLY RESTRICTED ACCESS; THOSE COVERED BY A STRUCTURE OR OBJECT (I.E. BUILDING WALLS, VEHICLES, EQUIPMENT, DEBRIS, STOCKPILES OF MATERIAL OR SNOW ETC.); THOSE COVERED BY OPEN WATER; THOSE COVERED BY WOODS OR VEGETATION TOO THICK TO PERMIT EASY WALKING; THOSE WITH SURFACE TERRAIN SLOPES STEEPER THAN 1:3; AND, THOSE WHERE THE SAFETY OF THE TECHNICIAN IS JEOPARDIZED (I.E. UNSTABLE FOOTING, ENVIRONMENTAL HAZARDS, UNCONTROLLED ROADS, ETC.). THE JUDGEMENT OF THE PLI TECHNICIAN WILL PREVAIL ON ACCESSIBILITY DECISIONS.

IT IS THE RESPONSIBILITY OF THE CLIENT TO PROVIDE DIRECT AND SIMPLE ACCESS FREE FROM SURFACE OBJECTS TO ANY AND ALL SURVEY AREAS. PLI ACCEPTS NO RESPONSIBILITY FOR SURVEYING IN ANY AREAS WHERE THE CLIENT DOES NOT PROVIDE ACCESS AND/OR APPROPRIATE WORKPLACE SAFETY MEASURES. AREAS CONSIDERED TO BE INACCESSIBLE FOR SCANNING AND MARKING, ASIDE FROM RESTRICTED ACCESS, INCLUDE THE FOLLOWING, BUT NOT LIMITED TO: WITHIN 1.0 M OF A STRUCTURE OR OBJECT (I.E. WALLS, VEHICLES, EQUIPMENT, DEBRIS, STOCKPILES OF MATERIALS, ETC.).

THE EM61 AND/OR EM31 RESPONSES OF TARGETS MAY BE DETECTED ONLY IF THEY ARE GREATER THAN THE BACKGROUND NOISE LEVELS. GEOPHYSICAL NOISE (NOT SENSOR SENSITIVITY) IS THEREFORE THE LIMITING FACTOR IN DETERMINING THRESHOLDS AND DETECTION DEPTHS.

LIMITS OF PREMIER LOCATES INC. LIABILITY

ANY INFORMATION PROVIDED BY PLI REGARDING THE LOCATION OF UNDERGROUND UTILITIES BY GPR AND/OR EM61 AND/OR EM31, DOES NOT SUBSTITUTE FOR A FULL PRIVATE UTILITY LOCATE PERFORMED BY PLI. THE SERVICE IS PROVIDED TO ASSIST WITH EXCAVATION PLANNING ONLY. THE CLIENT IS ALWAYS RESPONSIBLE FOR OBTAINING SANCTIONED LOCATES FROM THE OWNERS OF UNDERGROUND PLANT SUCH AS ELECTRIC CABLES, NATURAL GAS, ANY TYPE OF PIPELINE, TELECOMMUNICATIONS, CABLE TV, FIBRE-OPTIC CABLES, WATER, SEWER, OIL, STEAM, ETC. THE CLIENT MUST CONTACT THE UTILITY OWNERS DIRECTLY, OR THEIR CALL CENTRE, TO FACILITATE THESE LOCATES.

PLI MARKING OF UNDERGROUND FEATURES IS ONLY FOR THE CONVENIENCE OF THE CLIENT, AND THIS DOES NOT RELIEVE THE CLIENT, OR ANY OTHER PERSON, OR CORPORATION, FROM LIABILITY FOR DAMAGES FOR PERSON INJURY INCLUDING DEATH, OR FOR PROPERTY DAMAGE OR LIABILITY CAUSED TO OR FROM ANY UNDERGROUND UTILITY, WITHIN THE AREA ON THE PROPERTY WHERE THE UNDERGROUND UTILITY AND/OR CLEARANCE WAS MARKED, OR ANY OTHER PROPERTY, BY REASON OF THE CLIENT, ITS REPRESENTATIVES, OR ANY OTHER PERSON, OR CORPORATION HAVING RELIED UPON THE SURFACE MARKING PROVIDED BY PLI.

PLI IS NOT LIABLE FOR DAMAGES RESULTING FROM PHYSICAL EXPOSURE OF ANY UNDERGROUND FEATURES BY THE CLIENT, ITS REPRESENTATIVES, THEIR SUB-CONTRACTORS OR ANY OTHER PERSON OR CORPORATION.

THE SERVICE COMPLETED BY PLI IS BASED ON INFORMATION PROVIDED BY THE CLIENT AT OR PRIOR TO THE EARLIER OF THE TIME WHEN THE SERVICE IS DESCRIBED IN THIS CONTRACT OR THE PERFORMANCE OF THE SERVICE. THE SERVICE PROVIDED BY PLI REGARDING THE LOCATION OF ANY UNDERGROUND UTILITY, OBJECT OR STRUCTURE, IS ON A BEST EFFORT AND BEST PRACTICES BASIS.

A RE-MARK OF SURFICIAL MARKINGS PLACED ON THE SITE BY PLI MUST BE OBTAINED PRIOR TO ANY EXCAVATION IF:

- MARKINGS BECOME UNCLEAR, DISAPPEAR, ARE DISTURBED OR DISPLACED;
- THE SKETCH AND SITE MARKINGS DO NOT COINCIDE;
- THE WORK LOCATION HAS CHANGED;
- IF ANYTHING OCCURS WHICH MAY INDICATE THAT A NEW OR BETTER OR DIFFERENT LOCATE SERVICE IS NEEDED.

IF THE CLIENT EXCAVATES OUTSIDE THE LIMIT OF LOCATE AREA, PLI ACCEPTS NO RESPONSIBILITY.

THE CLIENT WARRANTS THAT PLI IS NOT LIABLE FOR ANY CLAIMS FOR DAMAGES TO ANY UNDERGROUND PLANT WHERE PLI WAS NOT NOTIFIED OF SUCH DAMAGE FORTHWITH SUCH THAT PLI CAN COMPLETE A DAMAGE INVESTIGATION TO PHYSICALLY VIEW ANY SUCH DAMAGED UNDERGROUND PLANT WHETHER OR NOT ANY SUCH DAMAGE MAY BE ATTRIBUTED TO ERRORS OR OMISSIONS COMMITTED BY PLI IN PERFORMING THE WORK.

PLI SHALL NOT BE LIABLE FOR ANY AMOUNT IN EXCESS OF THE FEES PAID BY THE CLIENT TO PLI FOR THE SERVICE ON ACCOUNT OF ANY LOSS, INJURY, DEATH OR DAMAGE WHETHER RESULTING DIRECTLY OR INDIRECTLY TO A PERSON OR PROPERTY IRRESPECTIVE OF THE CAUSE OR ORIGIN OF SUCH LOSS, INJURY, DEATH OR DAMAGE.



Harden Environmental Services Ltd.
4622 Nassagaweya-Puslinch Townline
Moffat, Ontario, L0P 1J0
Phone: (519) 826-0099 Fax: (519) 826-9099

Groundwater Studies
Geochemistry
Phase I / II
Regional Flow Studies
Contaminant Investigations
OMB Hearings
Water Quality Sampling
Monitoring
Groundwater Protection
Studies
Groundwater Modelling
Groundwater Mapping

Our File: 2301
April 13, 2023
2709557 Ontario Inc
18 Erica Rd.
Thornhill ON, L4J 2G1

Attn: Mr. Gil Shcolyar

Re: Hydrogeology Study: 535 Bayfield Road, Barrie

1.0 Background

We are pleased to provide a scoped hydrogeology study for the proposed development at 535 Bayfield Road, Barrie. The proposed site plan is attached and shows that the development will include the addition of Buildings 3 and 4. No basements are proposed therefore the scope of work is limited to identifying the depth to the water table and providing input on Low Impact Development Strategies.

2.0 Monitoring Well Installation

Four groundwater monitoring wells were installed through the geotechnical study conducted by Soil Engineers Ltd on February 13, 2023. Monitoring wells are installed in BH2, BH5, BH8 and BH9 as shown on Figure 1. The monitoring wells are installed to a depth of 6.4 metres below ground surface (m bgs). The borehole logs for the monitoring wells show that the screened portion of the well is completed in a sand or silty sand layer. Each of the wells has a 1.5 m well screen installed at the bottom of the well.

Our observations during the drilling of BH2 are that the site is underlain by an unsaturated silty sand, sand or sand and gravel deposit.

3.0 Groundwater Conditions

When the wells were completed on February 13, 2023, the monitors were dry. Two additional water levels were obtained at the site as summarized in Table 1. The monitors were dry on each occasion.

**Table 1: Groundwater Measurements**

Monitor Location	February 13, 2023	February 26, 2023	April 13, 2023
BH2	Dry @ 6.34 mbgs	Dry @ 6.34 mbgs	Dry @ 6.34 mbgs
BH5	Dry @ 6.02 mbgs	Dry @ 6.02 mbgs	Dry @ 6.02 mbgs
BH8	Dry @ 6.37 mbgs	Dry @ 6.37 mbgs	Dry @ 6.37 mbgs
BH9	Dry @ 6.36 mbgs	Dry @ 6.36 mbgs	Dry @ 6.36 mbgs

mbgs – metres below ground surface

4.0 Groundwater and Source Water Protection

The new buildings will be constructed as slab-on-grade and any excavation at the site will not penetrate more than three metres for utilities. There will be no interaction with groundwater at the site and no aquifer will be disturbed during the excavation. No aquitard will be penetrated by the proposed excavations.

The following information is found on the Source Water Protection atlas.

Zoom in to confirm your location and results

Latitude: **44.41580** Longitude: **-79.71102**
 UTM Zone: **17**
 Easting: **602618.59** Northing: **4918864.57**
 Upper Tier Municipality: **N/A**
 Lower Tier Municipality: **CITY OF BARRIE**
 Township Concession and Lot: **VESPRA CON 4 LOT 18**
 Assessment Parcel Address: **535 BAYFIELD ST**
 Assessment Roll #: **43420210300090000000**
 MECP District: **Barrie**
 MECP Region: **Central Region**

Source Protection Details for Location

Source Protection Area: **Nottawasaga Valley**
[View Source Protection Plan](#)
 Wellhead Protection Area: **No**
 Wellhead Protection Area (WHPA-E): **No**
 Intake Protection Zone: **No**
 Issue Contributing Area: **No**
 Significant Groundwater Recharge Area: **No**
 Highly Vulnerable Aquifer: **No**
 Event Based Area: **No**
 Wellhead Protection Area Q1: **Yes Stress: Low**
 Wellhead Protection Area Q2: **Yes Stress: Low**
 Intake Protection Zone Q: **No**
 Information is current as of: **January 24, 2023**

The site is located in a WHPA-Q1 with a Low Stress designation. As such, recharge policies of the Source Water Protection Plan apply.



5.0 Potential Water Balance Changes

The water balance for the site prior to the proposed development have been determined using the basic formula of

$$P = E + R + I$$

Where;

P – precipitation (mm/year)

E - evapotranspiration (mm/year)

R – runoff (mm/year)

I – infiltration (mm/year)

Detailed calculations of the water balance are found in Appendix A.

Surplus water can either runoff of the Site or infiltrate. The amount of infiltration at the Site was estimated using the MECP Hydrogeological Technical Information Requirements for Land Development Applications. The partition of surplus water into infiltration and runoff is estimated using an infiltration factor. The infiltration factor is based on topography, soil type and vegetation and for this site is determined to be 0.8.

Table 2: Summary of Infiltration Factors

MOE Infiltration Factors			
Topo (Flat)	Open Sandy	Cultivated Cover	Total
0.3	0.4	0.1	0.8

The site plan is attached as Figure 3. Assuming that the gravel surface behind Building 1 is hardpacked and thus considered impervious, there will be a total of 12,300 m² of impervious surfaces post development in comparison with the existing 10,330 m² of hard



packed surfaces presently. For the purposes of this analysis, we are assuming the following breakdown of the annual precipitation (895 mm) for impermeable surfaces;

Evaporation	90 mm/year
Runoff	805 mm/year
Infiltration	0 mm/year

For pervious surfaces the conditions are as follows;

Evaporation	545 mm/year
Runoff	70 mm/year
Infiltration	280 mm/year

Table 3 summarizes the estimated changes to the on-site water balance.

Table 3 Summary of Water Balance Changes

	Existing	Proposed	Difference
Area (ha)	1.3955	1.3955	0
Evapotranspiration / Evaporation (m³)	2902	2000	-902
Runoff (m³)	8572	10028	1456
Infiltration (m³)	1016	461	-554
Roof Water	0	3844	3844

It is estimated that runoff potential from the developed area will increase, and infiltration will decrease. There is a 554 m³ deficit in infiltration that will have to be addressed in order to maintain similar infiltration volumes between pre and post development.

6.0 Infiltration Potential

There is great potential to infiltrate water at this site. The groundwater observations confirm that the water table occurs at a depth greater than six metres below grade. The observations at BH2 are that there are several metres of unsaturated sand and gravel beneath this site. Based on an estimated hydraulic conductivity of the sand at 1×10^{-5} m/s and a safety factor of 2.5, the design infiltration rate is 34 mm/hr (Table 4). The relationship



between saturated hydraulic conductivity and infiltration rate was determined as presented by the *Ontario Ministry of Municipal Affairs and Housing (OMMAH). 1997. Supplementary Guidelines to the Ontario Building Code 1997. SG-6 Percolation Time and Soil Descriptions. Toronto, Ontario.*

Table 4: Infiltration Rate

K Saturation in cm/s	Percolation Rate mm/hour	Safety Factor	Design Infiltration Rate mm/hr
1.00E-03	86	2.5	34

We have discussed infiltration strategy with Aplin Martin Consultants Ltd. and the site storm water system is designed to infiltrate the first 5 mm of rainfall from the entire site. This is a potential infiltration of 2,600 m³. This would more than compensate for the 554 m³ reduction predicted. Even if only roof water were to be infiltrated the annual recharge would be 980 m³/year, again, more recharge than presently occurs.

7.0 Summary and Conclusions

The development at 535 Bayfield Road in Barrie will occur without any intrusion into the water table or any underlying aquifer. Any excavation at the site will not affect underlying aquifer vulnerability.

The water table occurs at a depth greater than six metres below grade and the proposed construction will not require any excavation of greater than three metres depth.

The addition of two buildings at the site will result in an increase in impervious surface area, increasing from 1.03 ha to 1.23 ha. The site is located in a local WHPA-Q1 and is thus subject to recharge policies in the local Source Water Protection Plan.

The greater impervious surface will result in a 554 m³ deficit of groundwater recharge at the site.

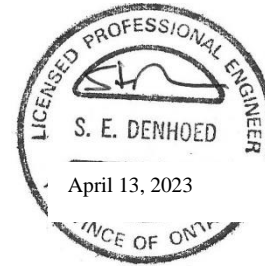
The storm water management system has been designed to infiltrate the first 5 mm of each rainfall event. This amounts to a potential infiltration of 2600 m³/year from the entire site or 980 m³ from only the roof tops. In this way, the potential infiltration deficit will be eliminated.



Respectfully Submitted,
Harden Environmental Services Ltd.

A handwritten signature in black ink, appearing to read 'S. Denhoed', is written over a light blue rectangular background.

Stan Denhoed, P.Eng., M.Sc.



Enclosed:

Site Plans

Borehole Map and Borehole Logs

Water Balance

ONTARIO BUILDING CODE DATA

- 1 PROJECT DESCRIPTION:
NEW MIXED USE BUILDING
BUILDING HEIGHT = 17.20 M (5 STOREYS)
- 2 MAJOR OCCUPANCY:
RESIDENTIAL - GROUP C
- 3 BUILDING AREA:
EXISTING (0.0) + NEW (1,596.20) = TOTAL 1,596.20 SQ.M.
- 4 GROSS AREA:
EXISTING (0.0) + NEW (6,295.20) = TOTAL 6,295.20 SQ.M.
- 5 NUMBER OF STOREYS:
ABOVE GRADE = 4 STOREYS, BELOW GRADE = 0 STOREYS
- 6 NUMBER OF STREETS / FIRE FIGHTER ACCESS:
FACING 1 STREET
- 7 BUILDING CLASSIFICATION:
3.2.2.43A, GROUP C, UP TO 6 STOREYS, SPRINKLERED

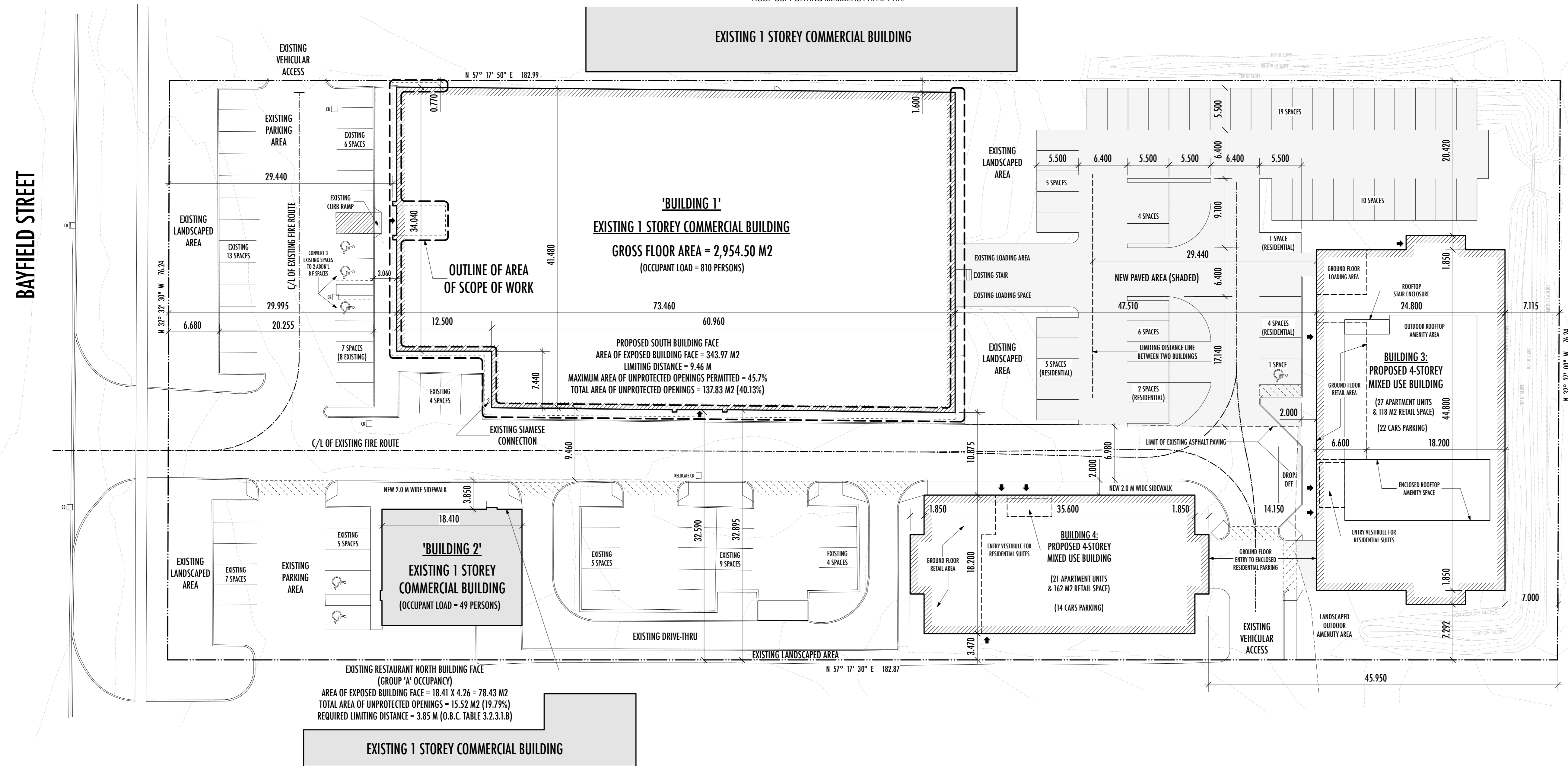
- DIV. B PART 3
- B 3.1.2.1(1)
- A 1.4.1.2
- A 1.4.1.2
- B 3.2.1.1 & A 1.4.1.2
- B 3.2.2.10 & B 3.2.5
- B 3.2.2.20 - B 3.2.2.83
- B 3.2.2.1(3) - B 3.2.1.1(8)

- 8 SPRINKLER SYSTEM PROPOSED:
FULLY SPRINKLERED
- 9 STANDPIPE REQUIRED:
YES
- 10 FIRE ALARM REQUIRED:
YES
- 11 WATER SERVICE / SUPPLY IS ADEQUATE:
YES
- 12 HIGH BUILDING:
NO
- 13 PERMITTED CONSTRUCTION:
COMBUSTIBLE OR NON-COMBUSTIBLE
ACTUAL CONSTRUCTION:
COMBUSTIBLE AND NON-COMBUSTIBLE
- 14 MEZZANINE AREA(S):
TOTAL = 0 SQ.M.
- B 3.2.2.43 & B 3.2.1.5
- B 3.2.9
- B 3.2.4
- B 3.2.5.7
- B 3.2.6
- B 3.2.2.20 - B 3.2.2.83
- B 3.2.1.1(3) - B 3.2.1.1(8)
- 15 OCCUPANT LOAD:
GROUND FLOOR (G): 250 M2 / 3.7 = 68 PERSONS
SECOND FLOOR (F2): 1,086 M2 / 46 = 24 PERSONS
THIRD FLOOR (F3): 2 / BEDROOM = 52 PERSONS
FOURTH FLOOR (F4): 2 / BEDROOM = 52 PERSONS
ROOF (A2): 91 M2 / 1.85 = 50 PERSONS
TOTAL = 298 PERSONS
- 16 BARRIER FREE DESIGN:
YES
- 17 HAZARDOUS SUBSTANCES:
NO
- 18 REQUIRED FIRE-RESISTANCE RATINGS:
SECOND FLOOR ASSEMBLY FRR = 2 HR.
THIRD & FOURTH FLOOR ASSEMBLIES FRR = 1 HR.
ROOF ASSEMBLY FRR = 1 HR.
SECOND FLOOR SUPPORTING MEMBERS FRR = 2 HR.
FLOOR SUPPORTING MEMBERS FRR = 1 HR.
ROOF SUPPORTING MEMBERS FRR = 1 HR.
- B 3.1.16
- B 3.8
- B 3.3.1.2 & B 3.3.1.19
- B 3.2.2.43 & B 3.2.1.4



Key Plan

Issue	Date	Description	By
01	JUN 11/19	OWNER REVIEW	J.M.
02	AUG 21/19	OWNER REVIEW	J.M.
03	OCT 18/19	OWNER REVIEW	J.M.
04	JUL 21/20	OWNER REVIEW	J.M.
05	NOV 25/20	OWNER REVIEW	J.M.
06	APR 21/21	OWNER REVIEW	J.M.
07	SEP 24/21	OWNER REVIEW	J.M.
08	MAR 29/22	OWNER REVIEW & CONSULTATION	J.M.
09	JUL 13/22	REVIEW & CONSULTATION	J.M.
10	OCT 27/22	COORDINATION	J.M.



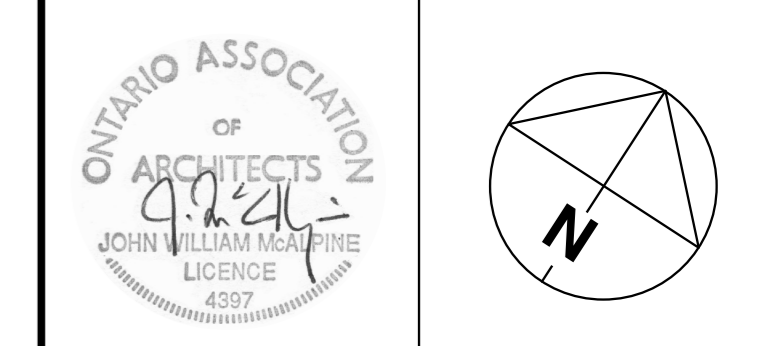
SITE STATISTICS:

	REQUIRED	EXISTING	PROPOSED
OFFICIAL PLAN DESIGNATION:		GENERAL COMMERCIAL	GENERAL COMMERCIAL
ZONING CATEGORY:		GENERAL COMMERCIAL (C4)	GENERAL COMMERCIAL (C4)
ZONING USE:		RETAIL STORE	SHOPPING CENTRE
LOT AREA:	450 M2	13,935.46 M2	13,935.46 M2
LOT FRONTAGE:	15.0 M (MIN.)	76.20 M	76.20 M
BUILDING AREA:		3,236.70 M2	5,053.40 M2
BUILDING 1:		2,954.50 M2	2,954.50 M2
BUILDING 2:		282.20 M2	282.20 M2
BUILDING 3:		0.00 M2	1,139.90 M2
BUILDING 4:		0.00 M2	676.80 M2
LOT COVERAGE:	50% (MAX.)	23.3%	36.3%
BUILDING DENSITY:		2,322.64 M2/HA	7,419.56 M2/HA
GROSS FLOOR AREA:		3,236.70 M2	10,339.50 M2
BUILDING 1:		2,954.50 M2	2,954.50 M2
BUILDING 2:		282.20 M2	282.20 M2
BUILDING 3:		0.00 M2	4,539.60 M2
BUILDING 4:		0.00 M2	2,563.20 M2
FLOOR SPACE INDEX:		0.23	0.74
BUILDING HEIGHTS:	14.0 M (MAX.)		
BUILDING 1:		7.2 M	7.2 M
BUILDING 2:		1 STOREY	1 STOREY
BUILDING 3:			17.2 M
BUILDING 4:			17.2 M

	REQUIRED	EXISTING	PROPOSED
BUILDING 3 SETBACKS:			
FRONT:	6.0 M (MIN.)	N/A	29.440 M
REAR:	7.0 M (MIN.)	N/A	7.000 M
NORTH SIDE:	3.0 M (MIN.)	N/A	20.420 M
SOUTH SIDE:	3.0 M (MIN.)	N/A	7.292 M
BUILDING 4 SETBACKS:			
FRONT:	6.0 M (MIN.)	N/A	25.500 M
REAR:	7.0 M (MIN.)	N/A	45.950 M
NORTH SIDE:	3.0 M (MIN.)	N/A	54.500 M
SOUTH SIDE:	3.0 M (MIN.)	N/A	3.470 M
PARKING AREA:		4,670.86 M2	6,691.56 M2
BUILDINGS 1, 3 & 4:		3,792.17 M2	5,862.87 M2
BUILDING 2:		828.69 M2	828.69 M2
PARKING REQUIRED:		112 SPACES	194 SPACES
BUILDING 1:	2,954.5 M2 @ 1 PER 30 M2	99 SPACES	99 SPACES
BUILDING 2:	1 PER 4 PERSONS	13 SPACES	13 SPACES
BUILDINGS 3&4 (RETAIL):	280 M2 @ 1 PER 30 M2	10 SPACES	10 SPACES
BUILDINGS 3&4 (APT/MT.):	48 @ 1.5 PER UNIT	72 SPACES	72 SPACES
PARKING PROVIDED:		104 SPACES	154 SPACES
BUILDING 1:		91 SPACES	87 SPACES
BUILDING 2:		13 SPACES	13 SPACES
BUILDINGS 3&4 (RETAIL):		6 SPACES	6 SPACES
BUILDINGS 3&4 (APT/MT.):		13 SPACES	48 SPACES

NOTE:
INFORMATION ON THIS SITE PLAN
TAKEN FROM:
PLAN OF SURVEY OF
PART OF LOT 18, CONCESSION 4
GEOGRAPHIC TOWNSHIP OF VESPRE
COUNTY OF SIMCOE
BY: J.D. BARNES LIMITED
MARCH 29, 2021

keith loffler mc Alpine architects
10 ST. MARY STREET, SUITE 402, TORONTO, ONTARIO, M5T 1P7 T (416) 964-1100 F (416) 964-6400



Professional Certification

COORDINATION

Issued by: **OCTOBER 27, 2022**

Scale: **1 : 300**

Issue date: **1935**

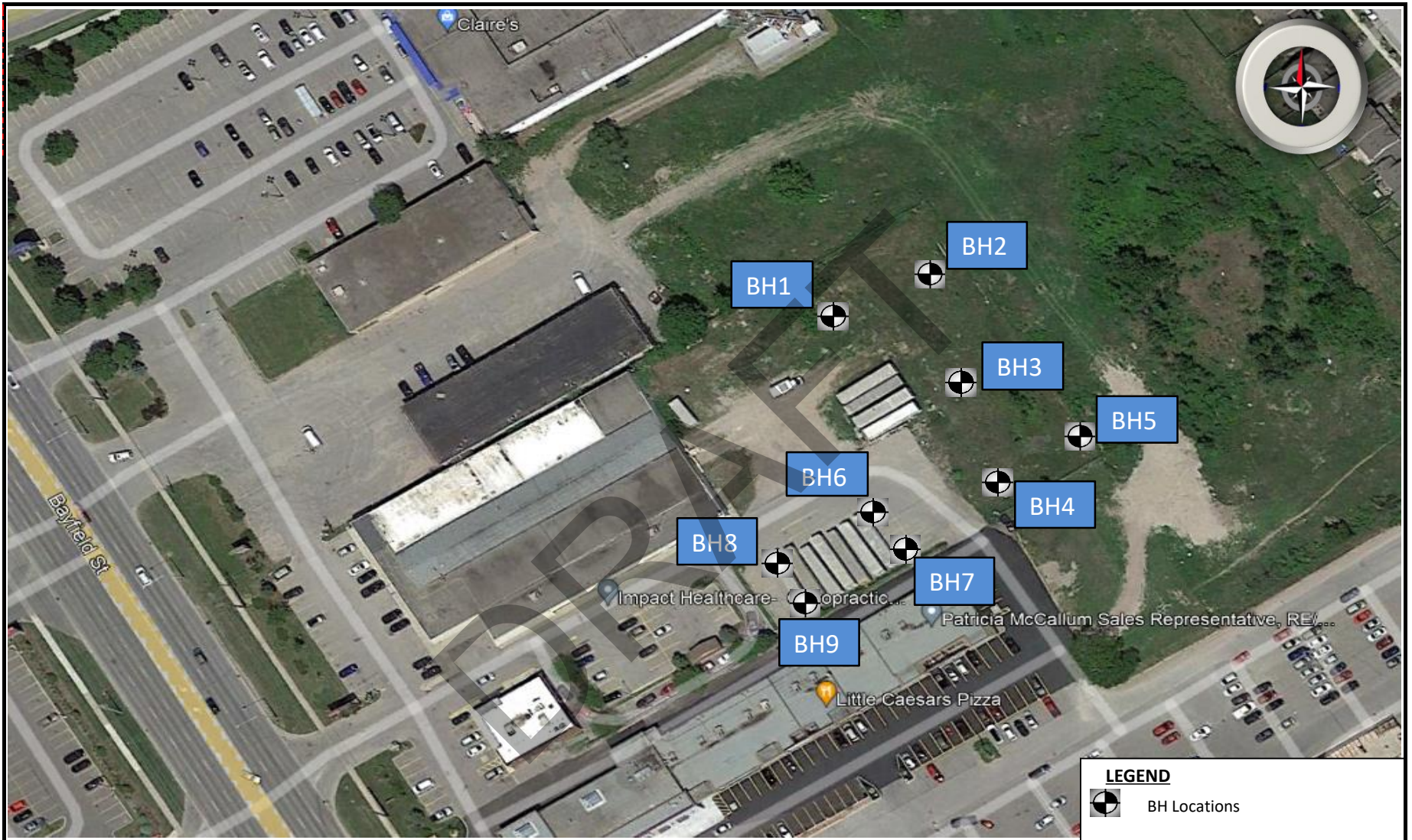
Project no.: **J.M.** (Drawn by) **J.M.** (Checked by)

Mixed Use Building Building 3


535 Bayfield Street, Barrie, Ontario


OWNER: Petro Gold Ltd.

Architectural Site Plan



LEGEND

 BH Locations

	File No.: 10855A-S0476-GEO	BH Location Plan	The figure provided is for the intended purpose of presenting the approximate borehole locations. This figure should not be used for any other purposes including construction, architecture or for accuracy of dimensions and orientation of objects.	Enclosure No.:
	Report Number: 2023-17792	Proposed Mixed-Use Buildings		1
	Date: March 27, 2023	535 Bayfield Street, Barrie, Ontario 2709557 Ontario Inc.		Not to Scale

RECORD OF BOREHOLE No. BH1

1 OF 1

METRIC

PROJECT NUMBER 10855A LOCATION 535 Bayfield Street, Barrie, Ontario ORIGINATED BY TS
 NAME Proposed Mixed-Use Buildings CLIENT 2709557 Ontario Inc. METHOD Soild Stem Augers COMPILED BY TS
 DATUM DATE 2023.02.14 - 2023.02.14 NORTHING EASTING CHECKED BY SM

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa								
0.0	Topsoil TOPSOIL - 200 mm thick		1A	SS	7											
0.2	FILL - sand, trace gravel, brown, very moist		1B													
0.9	FILL - clayey silt, some sand, trace gravel, brown, very moist		2A	SS	7											
			2B													
2.3	SILTY SAND TILL - trace gravel, brownish grey, very dense, moist		3	SS	16											
			4			SS	50/ 13 cm									
4.6	SAND - some gravel, occasionally inferred cobbles and boulders, grey, very dense, moist		5	SS	50/ 13 cm											
			6			SS	50/ 10 cm									
4.8	End of Borehole at Targeted Depth; Borehole was Open and Dry upon Completion of Drilling Period.															

+³, X³: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No. BH2

1 OF 1

METRIC

PROJECT NUMBER 10855A LOCATION 535 Bayfield Street, Barrie, Ontario ORIGINATED BY CC
 NAME Proposed Mixed-Use Buildings CLIENT 2709557 Ontario Inc. METHOD Soild Stem Augers COMPILED BY TS
 DATUM DATE 2023.02.13 - 2023.02.13 NORTHING EASTING CHECKED BY SM

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	20						40
0.0	Topsoil													
0.1	TOPSOIL - 100 mm thick FILL - sand and gravel, grey, moist to very moist		1A	SS	12									
			1B											
			2A	SS	37									
1.1	SAND - trace gravel, brown to grey, dense to very dense, moist to very moist		2B											
	- pockets of sandy silt		3	SS	70									
			4	SS	75/ 25 cm									
			5	SS	68									
			6	SS	63									
			7	SS	65									
6.6	End of Borehole at Targeted Depth; Borehole was Open and Dry upon Completion of Drilling Period.													

+ 3, X 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No. BH3

1 OF 1

METRIC

PROJECT NUMBER 10855A LOCATION 535 Bayfield Street, Barrie, Ontario ORIGINATED BY CC
 NAME Proposed Mixed-Use Buildings CLIENT 2709557 Ontario Inc. METHOD Soild Stem Augers COMPILED BY TS
 DATUM _____ DATE 2023.02.13 - 2023.02.13 NORTHING _____ EASTING _____ CHECKED BY SM

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa								
0.0	Topsoil		1A													
0.1	TOPSOIL - 100 mm thick FILL - sandy silt, trace gravel, containing asphalt fragments, brown, moist		1B	SS	12											
0.8	FILL - sand, trace gravel, brown, moist		2	SS	59/ 20 cm											
			3	SS	10											
2.3	SAND - trace gravel, occasionally inferred cobbles and boulders, very dense, moist		4	SS	50/ 13 cm											
3.0	SANDY SILT TILL - trace gravel, trace clay, grey, very dense, moist		5	SS	50/ 13 cm											
3.3	SAND - trace gravel, occasionally inferred cobbles and boulders, brown, very dense, moist		6	SS	50/ 13 cm											
4.9	End of Borehole at Targeted Depth; Borehole was Open and Dry upon Completion of Drilling Period.															




+ 3, X 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No. BH4

1 OF 1

METRIC

PROJECT NUMBER 10855A LOCATION 535 Bayfield Street, Barrie, Ontario ORIGINATED BY CC
 NAME Proposed Mixed-Use Buildings CLIENT 2709557 Ontario Inc. METHOD Soild Stem Augers COMPILED BY TS
 DATUM _____ DATE 2023.02.13 - 2023.02.13 NORTHING _____ EASTING _____ CHECKED BY SM

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa									
0.0	Topsoil		1A														
0.1	TOPSOIL - 100 mm thick FILL - sandy silt, trace gravel, containing asphalt fragments, dark brown, moist		1B	SS	10												
0.8	FILL - sand, brown, moist - pockets of sandy silt		2	SS	7												
			3	SS	31												
2.3	SAND - trace gravel, brown, very dense, moist		4	SS	87/ 28 cm												
			5	SS	50/ 13 cm												
4.6	SILTY SAND - trace gravel, grey, very dense, very moist		6	SS	50/ 13 cm												
4.9	End of Borehole at Targeted Depth; Borehole was Open and Dry upon Completion of Drilling Period.																

+ 3, X 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No. BH5

1 OF 1

METRIC

PROJECT NUMBER 10855A LOCATION 535 Bayfield Street, Barrie, Ontario ORIGINATED BY CC
 NAME Proposed Mixed-Use Buildings CLIENT 2709557 Ontario Inc. METHOD Soild Stem Augers COMPILED BY TS
 DATUM _____ DATE 2023.02.13 - 2023.02.13 NORTHING _____ EASTING _____ CHECKED BY SM

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	20					
0.0	Topsoil		1A										
0.1	TOPSOIL - 100 mm thick		1B	SS	14								
0.8	FILL - silty sand, trace gravel, brown, moist		2	SS	7								
1.5	FILL - sand, trace gravel, brown, moist		3	SS	14								
	SAND - trace to some gravel, brown, compact to very dense, moist		4	SS	70								
	- occasionally inferred cobbles and boulders		5	SS	39								
			6	SS	54/ 28 cm								
			7	SS	61/ 28 cm								
6.5	End of Borehole at Targeted Depth; Borehole Caved at 5.7 m Below Existing Ground Surface and was Dry upon Completion of Drilling Period.												

+ 3, X 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No. BH6

1 OF 1

METRIC

PROJECT NUMBER 10855A LOCATION 535 Bayfield Street, Barrie, Ontario ORIGINATED BY TS
 NAME Proposed Mixed-Use Buildings CLIENT 2709557 Ontario Inc. METHOD Soild Stem Augers COMPILED BY TS
 DATUM _____ DATE 2023.02.14 - 2023.02.14 NORTHING _____ EASTING _____ CHECKED BY SM

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa					
0.0	Asphaltic Concrete			AS									
0.4	ASPHALTIC CONCRETE - 40 mm thick		1A	SS	16								
	GRANULAR BASE/SUBBASE (sand and gravel) - 340 mm thick		1B	SS									
	FILL - sand, trace gravel, brown, moist		2	SS	9								
1.5	SILTY SAND - brown, dense, very moist		3	SS	30								
2.3	SILTY SAND TILL - trace gravel, occasionally inferred cobbles and boulders, brown, dense to very dense, moist		4	SS	48								
			5	SS	50/13 cm								
			6	SS	50/13 cm								
4.9	End of Borehole at Targeted Depth; Borehole was Open and Dry upon Completion of Drilling Period.												

+ 3, X 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No. BH7

1 OF 1

METRIC

PROJECT NUMBER 10855A LOCATION 535 Bayfield Street, Barrie, Ontario ORIGINATED BY TS
 NAME Proposed Mixed-Use Buildings CLIENT 2709557 Ontario Inc. METHOD Soild Stem Augers COMPILED BY TS
 DATUM _____ DATE 2023.02.14 - 2023.02.14 NORTHING _____ EASTING _____ CHECKED BY SM

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa					
0.0	Asphaltic Concrete			AS									
0.0 - 0.3	ASPHALTIC CONCRETE - 40 mm thick		1A	SS	11								
0.3 - 0.8	GRANULAR BASE/SUBBASE (sand and gravel) - 265 mm thick		1B	SS	11								
0.8 - 2.3	FILL - sand, trace gravel, brown, moist SILTY SAND - trace gravel, trace clay, occasionally inferred cobbles and boulders, brownish grey, compact to dense, moist		2	SS	23								
			3	SS	37								
2.3 - 5.0	SILTY SAND TILL - trace gravel, greyish brown, very dense, moist to very moist - trace clay		4	SS	97/28 cm								
			5	SS	50/13 cm								
			6	SS	59								
5.0	End of Borehole at Targeted Depth; Borehole was Open and Dry upon Completion of Drilling Period.												

+³, X³: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No. BH8

1 OF 1

METRIC

PROJECT NUMBER 10855A LOCATION 535 Bayfield Street, Barrie, Ontario ORIGINATED BY TS
 NAME Proposed Mixed-Use Buildings CLIENT 2709557 Ontario Inc. METHOD Soild Stem Augers COMPILED BY TS
 DATUM _____ DATE 2023.02.14 - 2023.02.14 NORTHING _____ EASTING _____ CHECKED BY SM

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa					
0.0	Asphaltic Concrete ASPHALTIC CONCRETE - 40 mm thick		1A	AS									
0.3	GRANULAR BASE/SUBBASE (sand and gravel) - 265 mm thick FILL - sand, some gravel, dark brown, moist		1B	SS	32								
			2	SS	13								
1.5	SILTY SAND - trace gravel, brown, compact, moist		3	SS	15								
2.3	SILTY SAND TILL - trace gravel, brown, very dense, moist		4	SS	58								
			5	SS	50/10 cm								
			6	SS	50/13 cm								
6.1	SANDY SILT TILL - trace gravel, trace clay, grey, very dense, moist		7	SS	50/13 cm								
6.4	End of Borehole at Targeted Depth; Borehole was Open and Dry upon Completion of Drilling Period.												

+³, ×³: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

RECORD OF BOREHOLE No. BH9

1 OF 1

METRIC

PROJECT NUMBER 10855A LOCATION 535 Bayfield Street, Barrie, Ontario ORIGINATED BY TS
 NAME Proposed Mixed-Use Buildings CLIENT 2709557 Ontario Inc. METHOD Soild Stem Augers COMPILED BY TS
 DATUM _____ DATE 2023.02.14 - 2023.02.14 NORTHING _____ EASTING _____ CHECKED BY SM

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa					
0.0	Asphaltic Concrete												
0.0	ASPHALTIC CONCRETE - 50 mm thick		1A	AS									
0.4	GRANULAR BASE/SUBBASE (sand and gravel) - 330 mm thick		1B	SS	14								
	FILL - silty sand, trace gravel, brown, moist		2A	SS	14								
1.1	SAND - trace gravel, brown, compact, moist		2B										
1.5	SILTY SAND - trace gravel, trace clay, brown, compact to dense, very moist		3	SS	20								
			4	SS	41								
3.0	SILTY SAND TILL - trace gravel, greyish brown, very dense, moist		5	SS	96/25 cm								
			6	SS	50/15 cm								
			7	SS	77								
6.6	End of Borehole at Targeted Depth; Borehole was Open and Dry upon Completion of Drilling Period.												

+ 3, X 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE









PROJECT NUMBER 10855A

LOCATION 535 Bayfield Street, Barrie, Ontario



PROJECT NAME Proposed Mixed-Use Buildings

CLIENT 2709557 Ontario Inc.






LITHOLOGIC SYMBOLS (Unified Soil Classification System)

	ASPHALT: Asphalt
	FILL: TTC Fill (made ground)
	GRVYSAND: Gravelly Sand
	SL-SN: silty sand
	SL-SN-TL: silty sand till
	SN: sand
	SN-SL-TL: sandy silt till
	TOPSOIL: Topsoil/peat/organics

SAMPLER SYMBOLS

	Auger Sample
	Split Spoon Sample

WELL CONSTRUCTION SYMBOLS

	Bentonite Seal: 1 pipe group, 1 pipe
	Concrete: 1 pipe group, 1 pipe
	Filter Pack: 1 pipe group, 1 pipe
	Slotted Pipe: 1 pipe group, 1 pipe
	Slough at bottom of hole

Notes:

Terms describing RELATIVE DENSITY, based on Standard Penetration Test "N"-Value for COURSE GRAINED soils (major portion retained on No. 200 sieve):

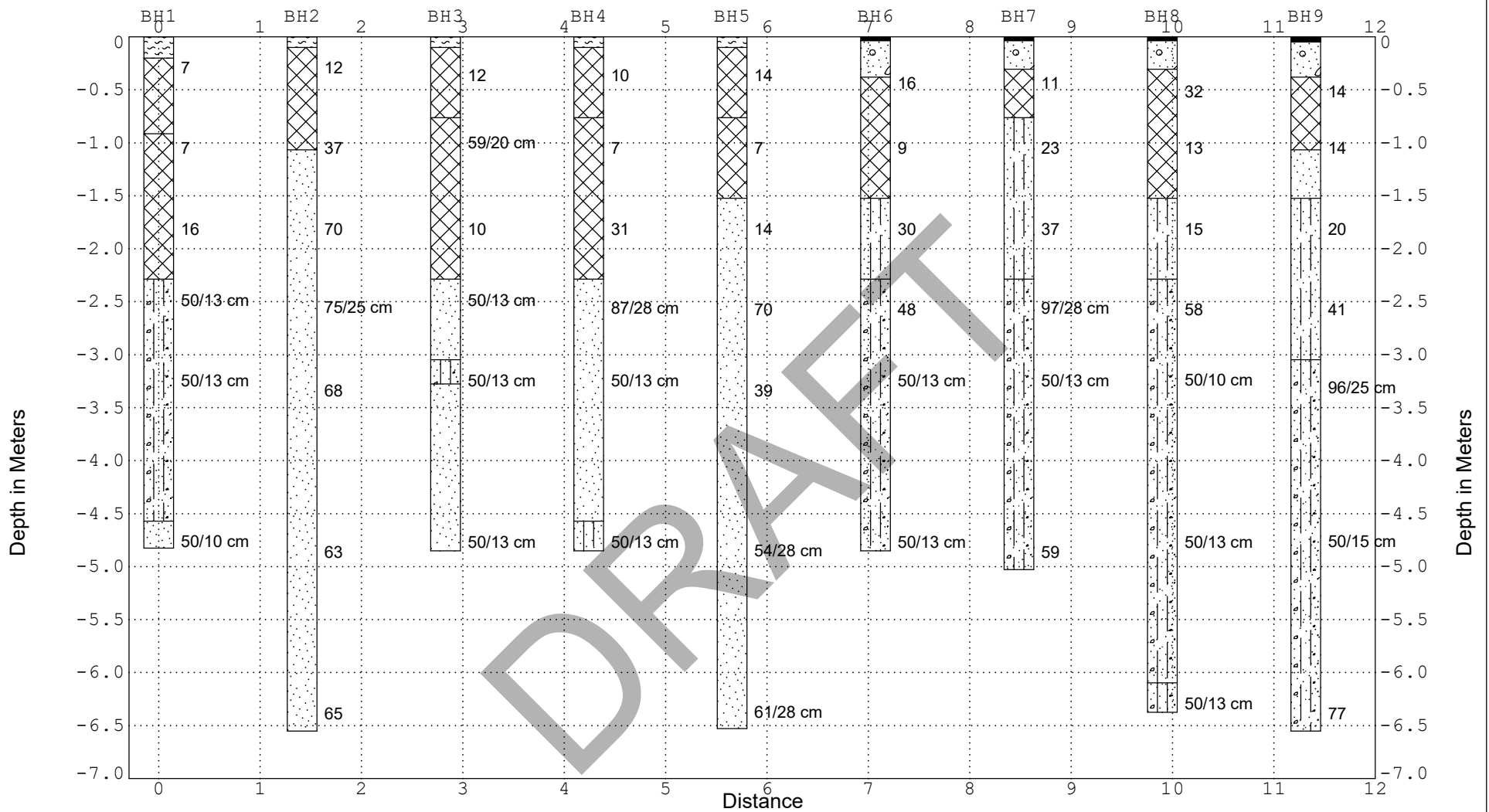
DESCRIPTIVE TERM ["N"-Value (blows/0.3m), Relative Density (%)]

- Very Loose [less than 4, less than 15]
- Loose [4 to 10, 15 to 35]
- Compact or Medium [10 to 30, 35 to 65]
- Dense [30 to 50, 65 to 85]
- Very Dense [greater than 50, greater than 85]

Terms describing CONSISTENCY, based on Standard Penetration Test "N"-Value for FINE GRAINED soils (major portion passing No. 200 sieve):

DESCRIPTIVE TERM [Unconfined Compressive Strength (kPa), "N"-Value (blows/0.3m)]

- Very Soft [less than 25, less than 2]
- Soft [25 to 50, 2 to 4]
- Firm [50 to 100, 4 to 8]
- Stiff [100 to 200, 8 to 15]
- Very Stiff [200 to 400, 15 to 30]
- Hard [greater than 400, greater than 30]



Plan View



SOLA ENGINEERING INC. CONCEPTUAL SOIL PROFILE

Horizontal Scale:

Drawn By:

Vertical Scale:

Approved By:

Proposed Mixed-Use Buildings
535 Bayfield Street, Barrie, Ontario

Project Number: 10855A

Enclosure No.: 12

535 Bayfield Road Barrie

Water Balance Summary - Site

Precipitation (P) = Evapotranspiration (ET) + Direct Runoff (RO) + Infiltration (I)

Description	Flat	Open Sandy	Cultivated	Total
	MOE Infiltration Factors			
	Topo	Soil	Cover	
Site	0.3	0.4	0.1	0.8

Feature	Description	Factor
Cover	Cultivated	0.1
Cover	Woodland	0.2
Soil	Medium	0.2
Soil	Open Sandy	0.4
Soil	Tight	0.1
Topo	Flat	0.3
Topo	Hilly	0.1
Topo	Rolling	0.2

Evapotranspiration from Impervious	10	%
Infiltration from Impervious	0	%
Roofwater Available for Infiltration	85	%

	Pervious	Impervious
(P) Precipitation	895 mm/year	895 mm/year
(ET) Evapotranspiration	545 mm/year	89.5 mm/year
(S) = (P)-(ET) Surplus	350 mm/year	805.5 mm/year
(If) Infiltration Factor	0.8	0
(I) = (S) * If Infiltration	280 mm/year	0 mm/year
(R)=(S) - (I) Runoff	70 mm/year	805.5 mm/year

Total Site Area	1.3955	ha	
Pre Development Impervious	74.0	%	1.033 ha
Pre Development Open Space	26.0	%	0.3628 ha
Post Development Impervious	88.190	%	1.23066 ha
Post Development Open Space	11.81	%	0.165 ha
Roof Area			0.5053 ha

Existing Conditions

Pervious Area

Area (ha)	Precipitation		Evapotranspiration / Evaporation (m3)		Direct Runoff		Infiltration	
	(mm)	(m ³)	(mm)	(m ³)	(mm)	(m ³)	(mm)	(m ³)
0.3628196	895	3247	545	1977	70	254	280	1016

Impervious Areas (assume 10% evaporation)

Impervious Area (ha)	Precipitation		Evapotranspiration / Evaporation (m3)		Direct Runoff		Infiltration	
	(mm)	(m ³)	(mm)	(m ³)	(mm)	(m ³)	(mm)	(m ³)
1.0326	895	9242	90	924	806	8318	0	0

Proposed Conditions

Impervious Areas (assume 10% evaporation)

Impervious Area (ha)	Precipitation		Evapotranspiration / Evaporation (m3)		Direct Runoff		Infiltration	
	(mm)	(m ³)	(mm)	(m ³)	(mm)	(m ³)	(mm)	(m ³)
1.2307	895	11014	90	1101	806	9913	0	0

Pervious Areas

Pervious Area (ha)	Precipitation		Evapotranspiration / Evaporation (m3)		Direct Runoff		Infiltration	
	(mm)	(m ³)	(mm)	(m ³)	(mm)	(m ³)	(mm)	(m ³)
0.1648	895	1475	545	898	70	115	280	461

Site Area Summary

	Existing	Proposed	Difference
Area (ha)	1.3955	1.3955	0
Evapotranspiration / Evaporation (m ³)	2902	2000	-902
Runoff (m ³)	8572	10028	1456
Infiltration (m ³)	1016	461	-554
Roof Water	0	3844	3844



APPENDIX B

WATER SUPPLY DESIGN

AM Proj # 21-7026
 Project Title: Shopping Centre Redevelopment
 Project Location: 535 Bayfield St, Barrie
 Developer: Petro Gold Ltd

Commercial Water Demand

Average Day Consumption ^[1]	28	m ³ /ha/day
----------------------------------------	----	------------------------

Residential Water Demand

Population	1.67	ppu
------------	------	-----

Total Units Proposed 48 units

Total Population 80.16 people

Residential Flow	225	L/capita/day
------------------	-----	--------------

18036 L/day

Site Statistics			Water Demand	
Bldg	Land Use	Area (m ²)	L/day	L/s
Bldg 1 - Retail Existing	Commercial	2955	8272.60	0.10
Bldg 2 - Restaurant Existing	Commercial	282	790.16	0.01
Proposed	Commercial	280	784.00	0.01
TOTAL			9846.76	0.11
Proposed	Residential		18036.00	0.21
TOTAL			18036.00	0.21

Peaking Factors ^[1]		
Land Use	Maximum Day	Peak Hour
Commercial	2.73	4.13
Residential	2.75	4.13

Commercial

Peak Flows	
Factors	L/s
Maximum Day	0.31
Peak Hour	0.47

Residential

Peak Flows	
Factors	L/s
Maximum Day	0.57
Peak Hour	0.86

TOTAL

Peak Flows	
Factors	L/s
Maximum Day	0.88
Peak Hour	1.33

[1] City of Barrie Design Criteria for Water Distribution Systems.



Fire Flow Estimate

Date: 14-Mar-23
 By: SB
 Checked: CAB
 A&M File No.: 21-7026

Commercial Development
535 Bayfield St, Barrie

Development Type: **Commercial - Building 1 (Shopping centre)**

Fire Area Considered:

Type of Construction: Ordinary C = **1.0**

Area Calculation: Total of all floor areas

Commercial Units
 Floor 1 2954.50

Total Applicable Floor Area: 2954.50 m²

Fire Flow From Formula (a): $220C(A^{1/2}) = 220 \times 1 \times (2954.5^{1/2}) = 11958.1688$ L/min
 Round off to the nearest 1,000 L/min = **12000** L/min

Occupancy:	<u>Commercial</u>	Add/Sub:	<u>-15</u> %		<u>-1800</u>
					Subtotal(b) 10200 L/min
Automatic Sprinklers:	<u>Yes</u>	Subtract:	<u>30</u> % x (b) =		<u>-3060</u>
					Subtotal 7140 L/min

Exposures:

	Direction	Separation (Minimum)	Charge Limit <small>(i.e. Charge not to Exceed)</small>		Applied Charge	
Front	S	10.9	15	Add	15	%
Side 1	E	45.0	5	Add	0	%
Side 2	W	130.0	0	Add	0	%
Rear	N	2.0	25	Add	22	%
				Total	37	%
				Use	37	% x b = +
						<u>3774.00</u>
						Total 10914.00 L/min
						Fire Flow Required 11000 L/min

$$\frac{11000 \text{ L/min}}{60 \text{ s}} = 183.33 \frac{\text{L}}{\text{s}}$$

Notes:

1. Fire flow calculation template is based on Fire Underwriter's Survey 1999
2. Building information provided by KLM Architects.



Fire Flow Estimate

Date: 14-Mar-23
 By: SB
 Checked: CAB
 A&M File No.: 21-7026

Commercial Development
535 Bayfield St, Barrie

Development Type: **Commercial - Building 2 (Tim Hortons)**

Fire Area Considered:

Type of Construction: Ordinary C = **1.0**

Area Calculation: Total of all floor areas

Commercial Units
 Floor 1 282.20

Total Applicable Floor Area: 282.20 m²

Fire Flow From Formula (a): $220C(A^{1/2}) = 220 \times 1 \times (282.2^{1/2}) = 3695.7381$ L/min
 Round off to the nearest 1,000 L/min = **4000** L/min

Occupancy:	<u>Commercial</u>	Add/Sub:	<u>0.00</u> %		<u>0</u>
					Subtotal(b) 4000 L/min
Automatic Sprinklers:	<u>Yes</u>	Subtract:	<u>30</u> % x (b) =		<u>-1200</u>
					Subtotal 2800 L/min

Exposures:

	Direction	Separation (Minimum)	Charge Limit <small>(i.e. Charge not to Exceed)</small>
Front	S	9.7	20
Side 1	E	220.0	0
Side 2	W	130.0	0
Rear	N	12.9	15

	Applied Charge			
Add	15	%		
Add	0	%		
Add	0	%		
Add	14	%		
Total	29	%		
Use	29	% x b = +		1160.00
		Total		3960.00 L/min
		Fire Flow Required		4000 L/min

$$\frac{4000 \text{ L/min}}{60 \text{ s}} = 66.67 \frac{\text{L}}{\text{s}}$$

Notes:

1. Fire flow calculation template is based on Fire Underwriter's Survey 1999
2. Building information provided by KLM Architects.



Fire Flow Estimate

Date: 14-Mar-23

By: SB

Checked: CAB

A&M File No.: 21-7026

Commercial Development

535 Bayfield St, Barrie

Development Type: **Mixed Use - Proposed Building 1**

Fire Area Considered:

Type of Construction: Ordinary C = **1.0**

Area Calculation: Total of all floor areas

Residential Units	
Floor 1	1139.90
Floor 2	1077.50
Floor 3	1077.50
Floor 4	1077.50
Roof	167.20
Total Applicable Floor Area:	4539.60 m ²

Fire Flow From Formula (a): $220C(A^{1/2}) = 220 \times 1 \times (4539.6^{1/2}) = 14822.8418$ L/min
 Round off to the nearest 1,000 L/min = **15000** L/min

Occupancy: <u>Residential</u>	Add/Sub: <u>-25.00</u> %	<u>-3750</u>
		Subtotal(b) 11250 L/min
Automatic Sprinklers: <u>Yes</u>	Subtract: <u>30</u> % x (b) =	<u>-3375</u>
		Subtotal 7875 L/min

Exposures:

	Direction	Separation (Minimum)	Charge Limit <small>(i.e. Charge not to Exceed)</small>
Front	S	14.2	15
Side 1	E	200.0	0
Side 2	W	200.0	0
Rear	N	200.0	0

	Applied Charge		
Add	13	%	
Add	0	%	
Add	0	%	
Add	0	%	
Total	13	%	
Use	13	% x b = +	1462.50
		Total	9337.50 L/min
		Fire Flow Required	9000 L/min

$$\frac{9000 \text{ L/min}}{60 \text{ s}} = 150.00 \frac{\text{L}}{\text{s}}$$

Notes:

1. Fire flow calculation template is based on Fire Underwriter's Survey 1999
2. Building information provided by KLM Architects.



Fire Flow Estimate

Date: 14-Mar-23

By: SB

Checked: CAB

A&M File No.: 21-7026

Commercial Development

535 Bayfield St, Barrie

Development Type: **Mixed Use - Proposed Building 2**

Fire Area Considered:

Type of Construction: Ordinary C = **1.0**

Area Calculation: Total of all floor areas

Residential Units	
Floor 1	676.70
Floor 2	625.10
Floor 3	625.10
Floor 4	625.10
Roof	107.80
Total Applicable Floor Area:	2659.80 m ²

Fire Flow From Formula (a): $220C(A^{1/2}) = 220 \times 1 \times (2659.8)^{1/2} = 11346.1148$ L/min
 Round off to the nearest 1,000 L/min = **11000** L/min

Occupancy: <u>Commercial</u>	Add/Sub: <u>-25.00</u> %	<u>-2750</u>
		Subtotal(b) 8250 L/min
Automatic Sprinklers: <u>Yes</u>	Subtract: <u>30</u> % x (b) =	<u>-2475</u>
		Subtotal 5775 L/min

Exposures:

	Direction	Separation (Minimum)	Charge Limit <small>(i.e. Charge not to Exceed)</small>
Front	S	10.9	15
Side 1	E	14.2	15
Side 2	W	51.0	0
Rear	N	200.0	0

	Applied Charge	
Add	15	%
Add	13	%
Add	0	%
Add	0	%
Total	28	%
Use	28	% x b = +
		2310.00
		Total 8085.00 L/min
		Fire Flow Required 8000 L/min

$$\frac{8000 \text{ L/min}}{60 \text{ s}} = 133.33 \frac{\text{L}}{\text{s}}$$

Notes:

1. Fire flow calculation template is based on Fire Underwriter's Survey 1999
2. Building information provided by KLM Architects.

FLOW TEST RESULTS

DATE : JUNE 16, 2021 TIME : 12:30 PM

LOCATION : 535 BAYFIELD ST.

CITY OF BARRIE

ONTARIO

TEST BY : VIPOND FIRE PROTECTION AND LOCAL PUC



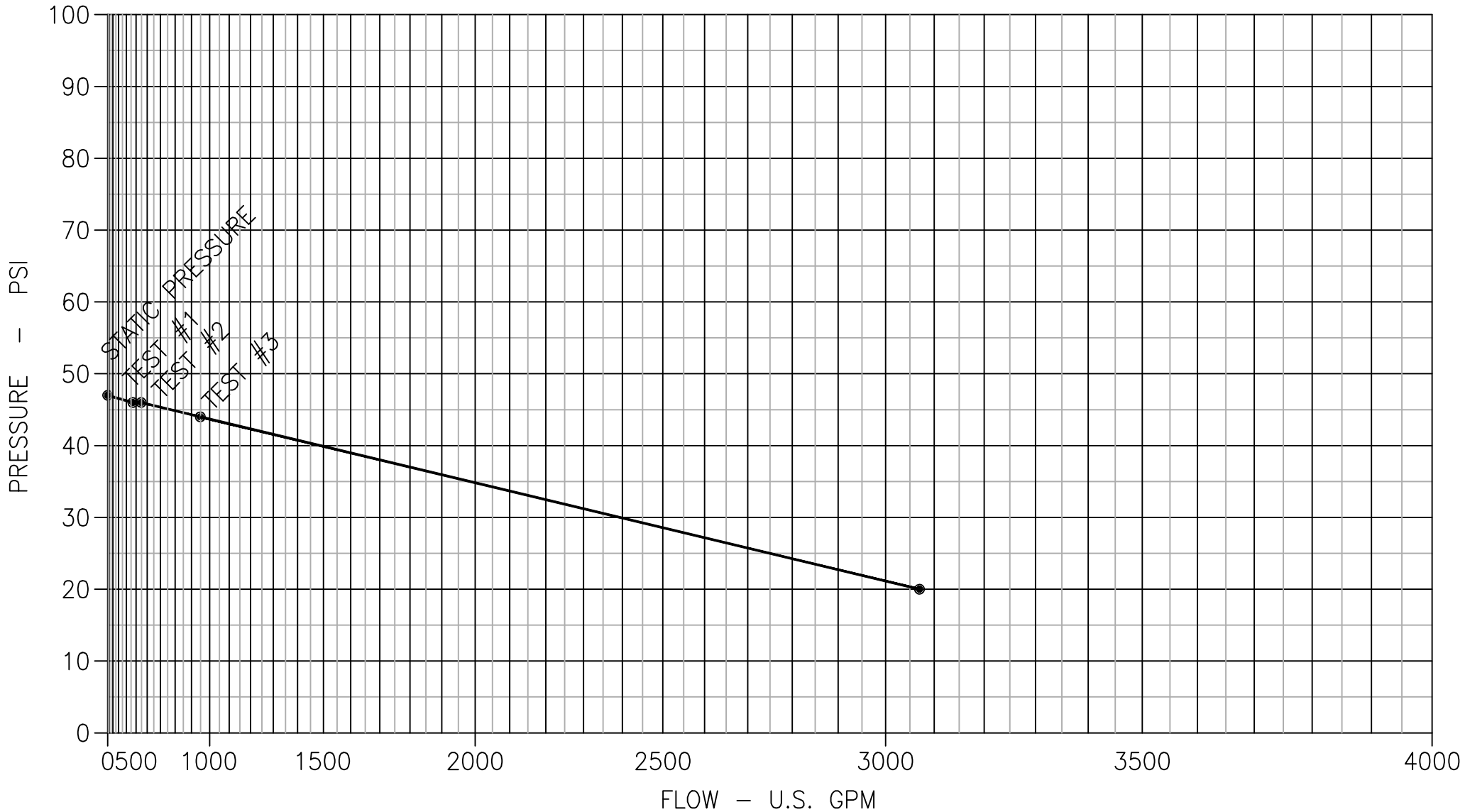
STATIC PRESSURE : 47 PSI

TEST NO.	NO. OF NOZZLES	NOZZLE DIAMETER (INCHES)	DISCHARGE CO-EFFICIENT	RESIDUAL PRESSURE (PSI)	PITOT PRESSURE (PSI)	DISCHARGE (U.S.GPM)
1	1	1-3/4	0.995	46	28	469
2	1	2-1/2	0.90	46	10	531
3	2	2-1/2	0.90	44	8	949



535 BAYFIELD ST.	BY : LEN K./RILEY P.
CITY OF BARRIE	OFFICE : BARRIE
ONTARIO	TEST BY : VIPOND & PUC
	DATE : JUNE 16, 2021

STATIC:	RESIDUAL:	FLOW:
<u>47</u> PSI	TEST#1 <u>46</u> PSI	@ <u>469</u> GPM
	TEST#2 <u>46</u> PSI	@ <u>531</u> GPM
	TEST#3 <u>44</u> PSI	@ <u>949</u> GPM



Onsite Water Analysis

Source: Water Service Connection on Lane

Total Head	319.32	m	ELEVATION OF HYDRANT +THE RESIDUAL PRESSURE FROM HYDRANT FLOW TEST
Elev. Head	288.38	m	ELEVATION OF HYDRANT
Pressure Head	30.9	m	

Fire Flows: MDD + FF

MDD	0.88	L/s	REFER TO WATER DEMAND CALCS
FF	183.33	L/s	REFER TO FUS CALCS
Total Fire Flow	184.21	L/s	

Dynamic Losses

Elevation Loss:	Elev. @ Hydrant - Elevation @ Service Connection		
Elev. @ Hydrant	288.38	m	
Elev. @ Service Connection	286.46	m	
Elev. Loss	1.92	m	

Loss through Pipes	Flowrate (l/s)	Haz-Wil Coeff.	Diam. (mm)	Area (sq.m.)	Length (m)	Velocity (m/s)	Head (m)	Loss (psi)
Pipe I.D.								
P1 (200ø)	184.21	110	250	0.0491	18.165	3.75	1.20	1.71
P2 (200ø)	184.21	110	250	0.0491	18.247	3.75	1.21	1.72
P3 (200ø)	184.21	110	250	0.0491	115	3.75	7.61	10.81

Total Loss	8.1	m	
Pressure @ Hydrant	22.8	m	
Allowance	22.8	> 14m (Allow)	

APPENDIX C

SANITARY DESIGN

AM Proj # 21-7026
 Project Title: Mixed-Use Development
 Project Location: 535 Bayfield Street
Barrie, ON

Page: 1 of 1
 Designed by: SB
 Checked by: CAB

Commercial

Commercial Area	3237 m ²
Commercial Area	0.32 Ha
Average Commercial Flow	28000 L/floor area (ha)/day
Average Commercial Flow	9063 L/day
Average Commercial Flow	0.10 L/s
Peak Commercial Flow	0.21 L/s
Gross Drainage Area	0.76 Ha
Infiltration Flows	0.08 L/s
Commercial Design Flow	0.29 L/s

Average Commercial 28 m³/ha/day

Commercial Peaking Factor 2

Infiltration 0.1 L/sec/ha

Existing Gross Drainage Area = Total Site Area (1.34 Ha) - Developed Area (0.58 Ha)

Total Peak Design Flow	0.29 L/s
------------------------	----------

AM Proj # 21-7026
 Project Title: Mixed-Use Development
 Project Location: 535 Bayfield Street
Barrie, ON

Page: 1 of 1
 Designed by: SB
 Checked by: CAB

Residential

Total Unit Count	48 units
High Density	1.67 persons/unit
Medium Density	2.34 persons/unit
Low Density	3.13 persons/unit
Gross Drainage Area	0.58 ha
Population	80 people
Average Flow	0.42 L/s
Peaking Factor	4.00
Peak Residential Flow	1.67 L/s
Infiltration Flow	0.06 L/s
Residential Design Flow (A)	1.73 L/s

Average Residential = 450 L/person/day

Peaking Factor = Harmon Equation

$$PF = 1 + \frac{14}{4 + (P/1000)^{0.5}}$$

P = Population in thosands

Infiltration= 0.1 L/sec/ha

Commercial

Commercial Area	234 m ²
Average Commercial Flow	28000 L/floor area (ha)/day
Average Commercial Flow	655 L/day
	0.01 L/s
Peak Commercial Flow	0.02 L/s
Commercial Design Flow (B)	0.02 L/s

Average Commercial 28 m³/ha/day

Commercial Peaking Factor 2

Total Peak Design Flow (A+B)	1.74 L/s
------------------------------	----------

SANITARY SYSTEM ANALYSIS - CALCULATION SHEET - PRE DEVELOPMENT FLOWS

Project Title: Mixed Use Development
 Project Location: 535 Bayfield Street
Barrie, ON
 Developer: Petro Gold Ltd.

AVERAGE DAILY FLOW
 Proposed Residential 225 L/cap/day
 Proposed Commercial 28 m³/ha/day
 Inflow and Infiltration 0.1 L/s/ha
 MANNINGS "n" 0.013

Residential Peaking Factor: Harmon or Babbitt peaking factor where; M ≥ 2), the greater of the two is used in the spreadsheet.

Commercial Peaking Factor: 2.00



Consultant: APLIN MARTIN
 A&M Proj # 21-7026
 Page: 1 of 2
 Designed by: SB
 Checked by: CAB
 Date: 4/6/2023

Locations			General				Flow Calculations							Pipe Parameters					Results				
Street	Manhole		Area	Land Usage	Cum. Commercial Area*	Design flow	Residential		Commercial		Total			Sewer Design					Flow Ratio	Partial Velocity	Full Flow Velocity Check	HGL from Surface	Depth of Flow
	From	To					Avg Flow	Peaking Factor	Cum. Peak Res Flow	Peaking Factor	Commercial Design Flow	Inflow & Infiltration	Total Design Flow	S	DIA	L	V _{cap}	Q _{cap}					
			(ha)	(L/s)	P _f	PDWF (L/s)	Q _{CD} (L/s)	I&I (L/s)	Q (L/s)	%	mm	m	m/s	(L/s)	Q/Q _{cap} %	V _{act} (m/s)	V _{act} ≥ 0.60 (m/s)	HGL m	d/D %				
Bayfield Street	SANMH16041	SANMH16040	11.11	Commercial	11	0.32				2.00	3.56	1.11	8.22	0.30	300	92	0.75	52.97	16%	0.54	OK	5.4	27%
Bayfield Street	SANMH16040	SANMH16039	12.04	Commercial	23	0.32				2.00	7.41	2.32	17.13	0.30	300	95	0.75	52.97	32%	0.67	OK	5.7	39%
Bayfield Street	SANMH16039	SANMH16038	5.20	Commercial	28	0.32				2.00	9.07	2.84	20.98	0.30	300	73	0.75	52.97	40%	0.71	OK	7.8	44%
Bayfield Street	SANMH16009	SANMH16008	4.47	Commercial	4	0.32				2.00	1.43	0.45	3.31	0.43	250	95	0.79	39.00	8%	0.48	OK	5.7	20%
Bayfield Street	SANMH16008	SANMH16007	13.61	Commercial	18	0.32				2.00	5.79	1.81	13.38	0.41	250	90	0.78	38.08	35%	0.71	OK	6.0	41%
Bayfield Street	SANMH16007	SANMH16005		Commercial	18	0.32				2.00	5.79	1.81	13.38	0.43	250	80	0.79	39.00	34%	0.72	OK	5.5	40%
Bayfield Street	SANMH16005	SANMH16037		Commercial	18	0.32				2.00	5.79	1.81	13.38	0.23	250	13	0.58	28.52	47%	0.57	<.60 m/s	5.3	48%
Bayfield Street	SANMH16037	SANMH16038		Commercial	18	0.32				2.00	5.79	1.81	13.38	3.00	300	7	2.37	167.49	8%	1.42	OK	7.8	19%
Bayfield Street	SANMH16038	SANMH16042	6.81	Commercial	53	0.32				2.00	17.04	5.32	39.40	0.30	300	37	0.75	52.97	74%	0.82	OK	8.1	64%
Priority Plaza	SANMH16042	SANMH16043		Commercial	53	0.32				2.00	17.04	5.32	39.40	0.30	300	82	0.75	52.97	74%	0.82	OK	7.3	64%
Priority Plaza	SANMH16043	SANMH16044		Commercial	53	0.32				2.00	17.04	5.32	39.40	0.30	300	82	0.75	52.97	74%	0.82	OK	6.9	64%
Priority Plaza	SANMH16044	SANMH16045		Commercial	53	0.32				2.00	17.04	5.32	39.40	0.30	300	66	0.75	52.97	74%	0.82	OK	5.7	64%
Priority Plaza	SANMH16045	SANMH16045A		Commercial	53	0.32				2.00	17.04	5.32	39.40	0.30	300	25	0.75	52.97	74%	0.82	OK	6.0	64%
Priority Plaza	SANMH16045A	SANMH15085		Commercial	53	0.32				2.00	17.04	5.32	39.40	4.40	300	108	2.87	202.84	19%	2.22	OK	2.8	30%
Priority Plaza	SANMH15085	SANMH15084		Commercial	53	0.32				2.00	17.04	5.32	39.40	3.70	300	74	2.63	186.01	21%	2.09	OK	3.7	31%
Priority Plaza	SANMH15084	SANMH15083		Commercial	53	0.32				2.00	17.04	5.32	39.40	0.82	300	120	1.24	87.57	45%	1.21	OK	2.3	47%
Priority Plaza	SANMH15083	EXSANMH15082		Commercial	53	0.32				2.00	17.04	5.32	39.40	0.33	300	102	0.79	55.55	71%	0.85	OK	2.7	62%

SANITARY SYSTEM ANALYSIS - CALCULATION SHEET - POST DEVELOPMENT FLOWS

Project Title: Mixed Use Development
 Project Location: 535 Bayfield Street
Barrie, ON
 Developer: Petro Gold Ltd.

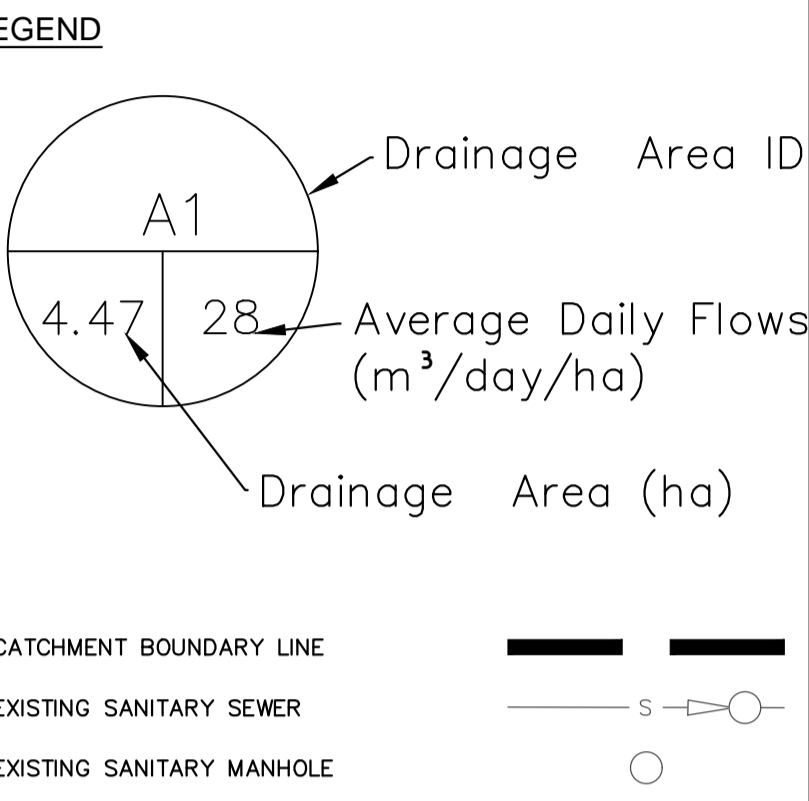
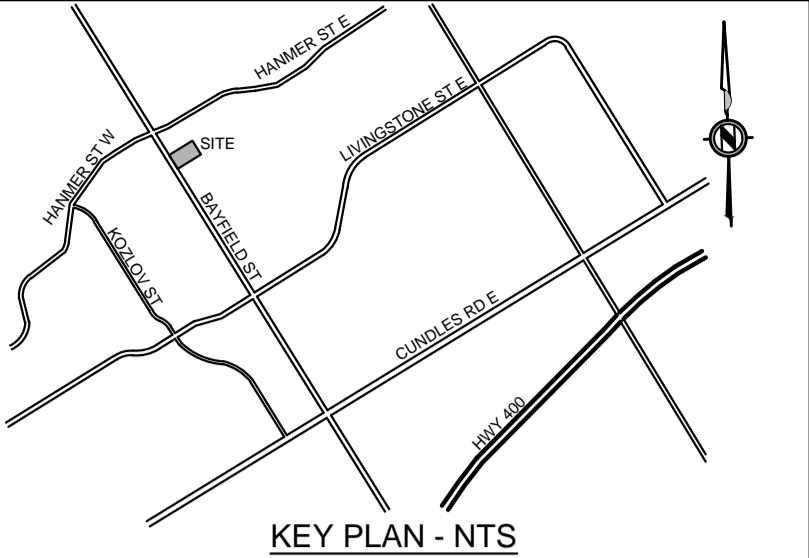
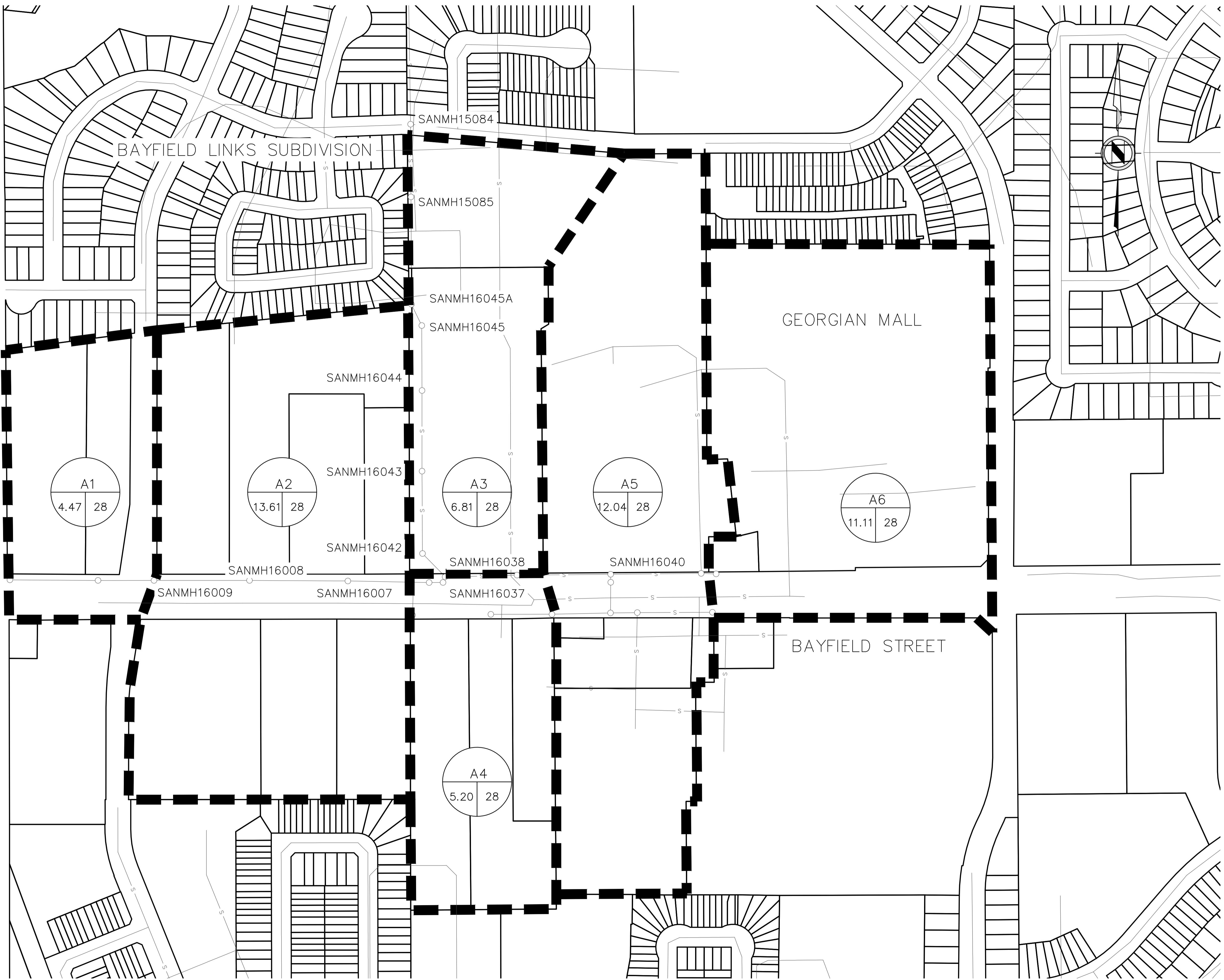
AVERAGE DAILY FLOW
 Proposed Residential: 225 L/cap/day
 Proposed Commercial: 28 m³/ha/day
 Inflow and Infiltration: 0.1 L/s/ha
 MANNINGS "n": 0.013
 Residential Peaking Factor: Harmon or Babbitt peaking factor where; M ≥ 2), the greater of the two is used in the spreadsheet.
 Commercial Peaking Factor: 2.00



A&M Proj #: 21-7026
 Page: 2 of 2
 Consultant: APLIN MARTIN
 Designed by: SB
 Checked by: CAB
 Date: 4/6/2023

Locations			General				Flow Calculations							Pipe Parameters					Results				
Street	Manhole		Area (ha)	Land Usage	Cum. Commercial Area*	Design flow L/s/ha	Residential			Commercial		Total		Sewer Design					Flow Ratio %	Partial Velocity (m/s)	Full Flow Velocity Check V _{act} ≥ 0.60 (m/s)	HGL from Surface (m)	Depth of Flow %
	From	To					Avg Flow (L/s)	Peaking Factor P _r	Cum. Peak Res Flow (L/s)	Peaking Factor	Commercial Design Flow (L/s)	Inflow & Infiltration (L/s)	Total Design Flow (L/s)	S %	DIA mm	L m	V _{cap} m/s	Q _{cap} (L/s)					
Bayfield Street	SANMH16041	SANMH16040	11.11	Commercial	11	0.32				2.00	3.56	1.11	8.22	0.30	300	92	0.75	52.97	16%	0.54	OK	5.4	27%
Bayfield Street	SANMH16040	SANMH16039	12.04	Commercial	23	0.32				2.00	7.41	2.32	17.13	0.30	300	95	0.75	52.97	32%	0.67	OK	5.7	39%
Bayfield Street	SANMH16039	SANMH16038	5.20	Commercial	28	0.32				2.00	9.07	2.84	20.98	0.30	300	73	0.75	52.97	40%	0.71	OK	7.8	44%
Bayfield Street	SANMH16009	SANMH16008	4.47	Commercial	4	0.32				2.00	1.43	0.45	3.31	0.43	250	95	0.79	39.00	8%	0.48	OK	5.7	20%
Bayfield Street (1)	SANMH16008	SANMH16007	13.61	Mixed Use	17	0.32			2.03	2.00	5.60	1.75	14.97	0.41	250	90	0.78	38.08	39%	0.73	OK	6.0	44%
Bayfield Street (1)	SANMH16007	SANMH16005	13.61	Commercial		0.32				2.00	5.60	1.75	14.97	0.43	250	80	0.79	39.00	38%	0.74	OK	5.5	43%
Bayfield Street (1)	SANMH16005	SANMH16037	13.61	Commercial		0.32				2.00	5.60	1.75	14.97	0.25	250	13	0.61	29.73	50%	0.61	OK	5.3	50%
Bayfield Street (1)	SANMH16037	SANMH16038	13.61	Commercial		0.32				2.00	5.60	1.75	14.97	3.00	300	7	2.37	167.49	9%	1.47	OK	7.8	20%
Bayfield Street (1)	SANMH16038	SANMH16042	6.81	Commercial	53	0.32				2.00	16.85	5.27	40.99	0.30	300	37	0.75	52.97	77%	0.83	OK	8.1	66%
Priority Plaza (1)	SANMH16042	SANMH16043	6.81	Commercial		0.32				2.00	16.85	5.27	40.99	0.30	300	82	0.75	52.97	77%	0.83	OK	7.3	66%
Priority Plaza (1)	SANMH16043	SANMH16044	6.81	Commercial		0.32				2.00	16.85	5.27	40.99	0.30	300	82	0.75	52.97	77%	0.83	OK	6.9	66%
Priority Plaza (1)	SANMH16044	SANMH16045	6.81	Commercial		0.32				2.00	16.85	5.27	40.99	0.30	300	66	0.75	52.97	77%	0.83	OK	5.7	66%
Priority Plaza (1)	SANMH16045	SANMH16045A	6.81	Commercial		0.32				2.00	16.85	5.27	40.99	0.30	300	25	0.75	52.97	77%	0.83	OK	6.0	66%
Priority Plaza (1)	SANMH16045A	SANMH15085	6.81	Commercial		0.32				2.00	16.85	5.27	40.99	4.40	300	108	2.87	202.84	20%	2.25	OK	2.8	30%
Priority Plaza (1)	SANMH15085	SANMH15084	6.81	Commercial		0.32				2.00	16.85	5.27	40.99	3.70	300	74	2.63	186.01	22%	2.11	OK	3.7	32%
Priority Plaza (1)	SANMH15084	SANMH15083	6.81	Commercial		0.32				2.00	16.85	5.27	40.99	0.82	300	120	1.24	87.57	47%	1.22	OK	2.3	48%
Priority Plaza (1)	SANMH15083	EXSANMH15082	6.81	Commercial		0.32				2.00	16.85	5.27	40.99	0.33	300	102	0.79	55.55	74%	0.86	OK	2.7	64%

_(1) Proposed development sanitary Flows of 2.03 L/s included in total design flow. Refer to Appendix C for proposed development sanitary flows generated.



REV	DATE	DESCRIPTION	BY	APP
1	03/30/2023	ISSUED FOR SITE PLAN APPLICATION	SB	CAB

PART OF LOT 18 CONCESSION 4 GEOGRAPHIC TOWNSHIP OF VESPREA NOW IN THE CITY OF BARRIE COUNTY OF SIMCOE

LEGAL DESCRIPTION

ELEVATIONS SHOWN ON THIS PLAN ARE RELATED TO GEODETIC DATUM AND ARE DERIVED FROM BENCH MARK No 003120080033 HAVING A PUBLISHED ELEVATION OF 277.869 METRES.

ENGINEER STAMP BENCHMARK



Aplin & Martin Consultants Ltd.
405 - 55 St. Clair Ave. West, O.N. Canada M4V 2Y7
Tel: (416) 644-1900, Fax: (416) 644-1889, Email: general@aplinmartin.com

CLIENT

PETRO GOLD LTD.
281 ARNOLD AVE
VAUGHAN, ON L4J 1C3

PROJECT

MIXED-USE DEVELOPMENT
535 BAYFIELD STREET
BARRIE, ONTARIO

DRAWING TITLE

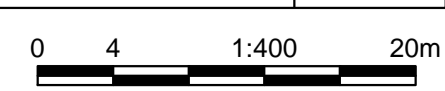
FIG-07-PRE SAN DAP

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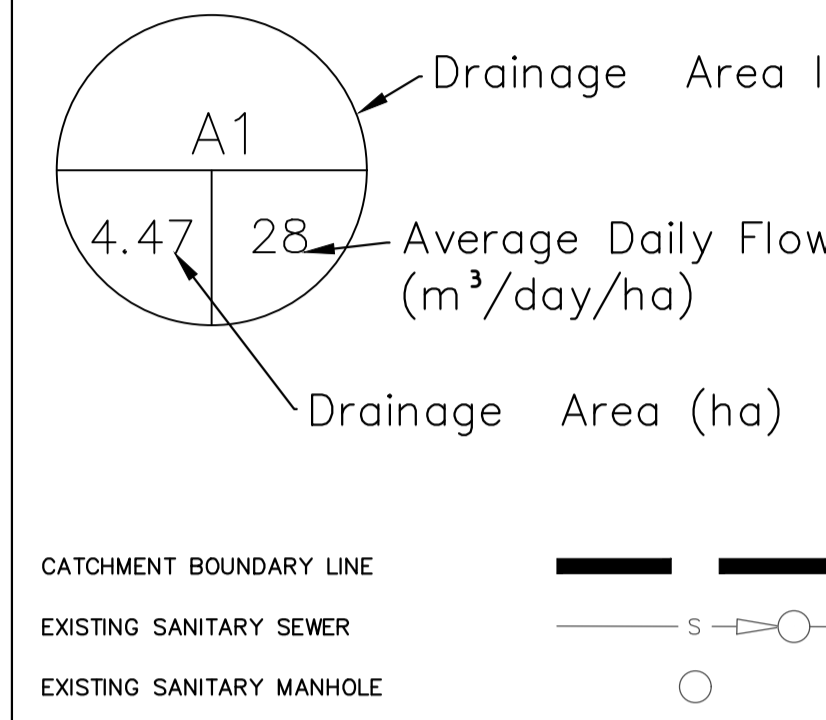
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DESIGN	DATE	SCALE
CB	APRIL, 2023	1:2000
DRAWN	PROJECT NO.	
BL	21-7026	
CHECKED	DRAWING NO.	REV.
CAB	----	1
APPROVED		
CAB		



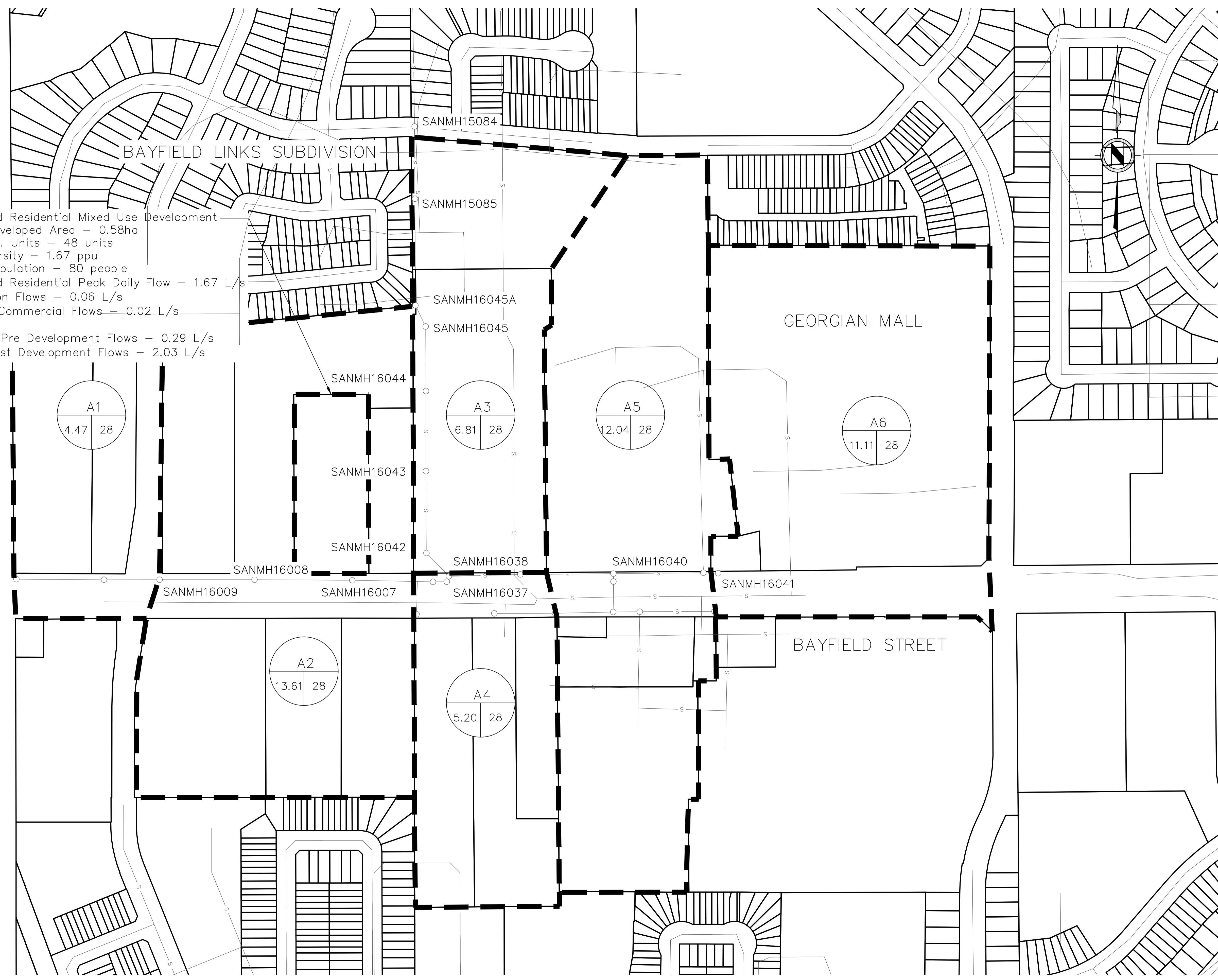


LEGEND



Proposed Residential Mixed Use Development
 Total Developed Area – 0.58ha
 Total No. Units – 48 units
 High Density – 1.67 ppu
 Total Population – 80 people
 Proposed Residential Peak Daily Flow – 1.67 L/s
 Infiltration Flows – 0.06 L/s
 Peaked Commercial Flows – 0.02 L/s

Existing Pre Development Flows – 0.29 L/s
 Total Post Development Flows – 2.03 L/s



1	03/30/2023	ISSUED FOR SITE PLAN APPLICATION	SB	CAB
---	------------	----------------------------------	----	-----

REV	DATE	DESCRIPTION	BY	APP
1	03/30/2023	ISSUED FOR SITE PLAN APPLICATION	SB	CAB

PART OF LOT 18 CONCESSION 4
 GEOGRAPHIC TOWNSHIP OF
 VESPREA NOW IN THE
 CITY OF BARRIE
 COUNTY OF SIMCOE

LEGAL DESCRIPTION

ELEVATIONS SHOWN ON THIS PLAN
 ARE RELATED TO GEODETIC DATUM
 AND ARE DERIVED FROM BENCH
 MARK No 003120080033 HAVING A
 PUBLISHED ELEVATION OF 277.869
 METRES.

ENGINEER STAMP BENCHMARK



Aplin & Martin Consultants Ltd.
 405 - 55 St. Clair Ave. West, O.N. Canada M4V 2Y7
 Tel: (416) 644-1900, Fax: (416) 644-1889, Email: general@aplinmartin.com

CLIENT

PETRO GOLD LTD.
 261 ARNOLD AVE
 VAUGHAN, ON L4J 1C3

PROJECT

MIXED-USE DEVELOPMENT
 535 BAYFIELD STREET
 BARRIE, ONTARIO

DRAWING TITLE

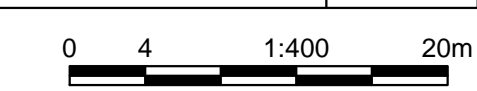
FIG-08 - POST SAN DAP

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NOTICE TO CONTRACTOR
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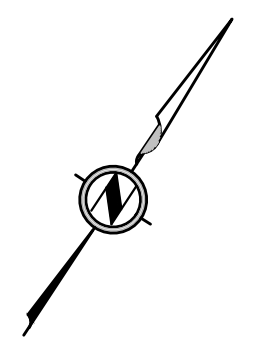
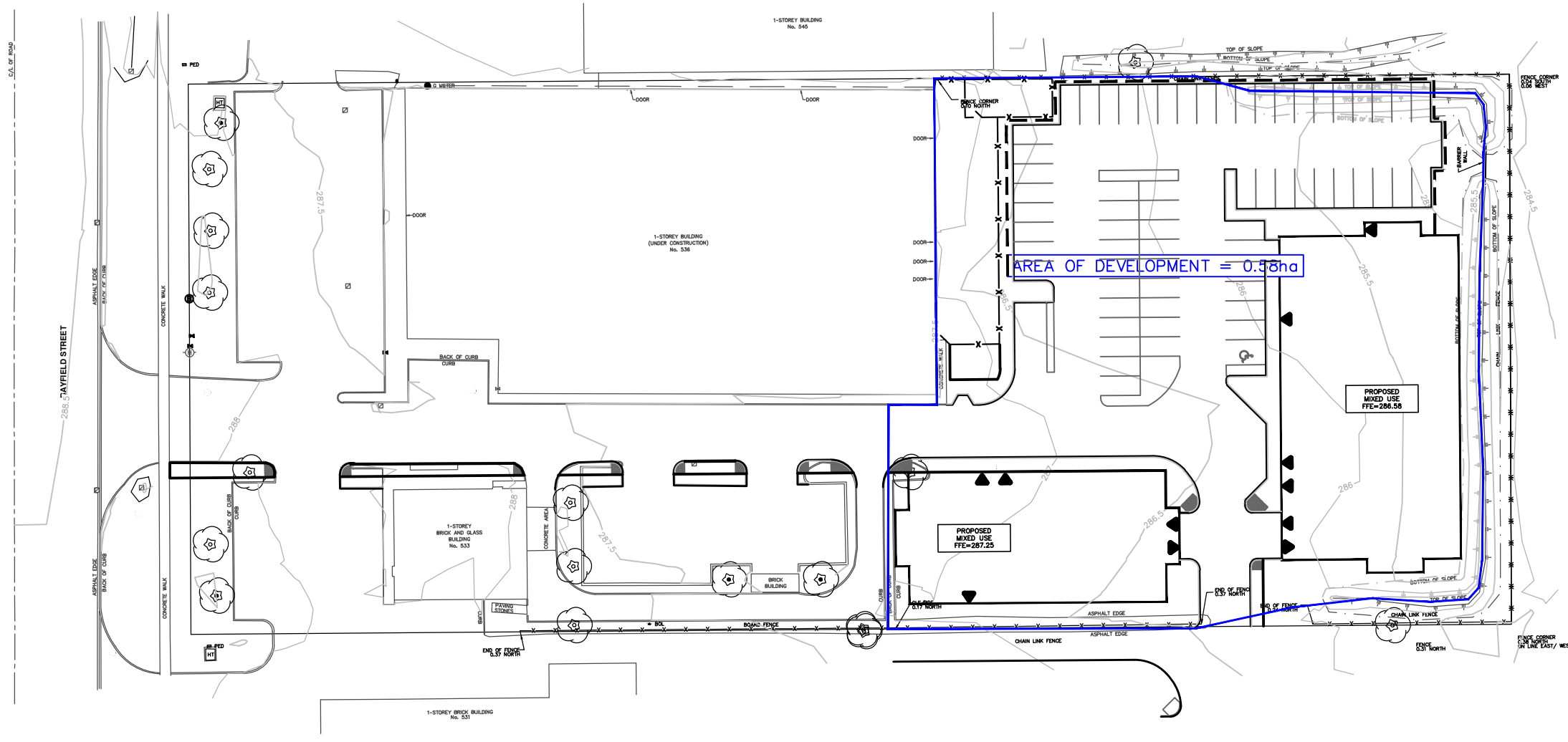
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DESIGN	DATE	SCALE
CB	APRIL, 2023	1:2000
DRAWN	PROJECT NO.	
BL	21-7026	
CHECKED	DRAWING NO.	REV.
CAB	----	1
APPROVED		
CAB		



APPENDIX D

STORMWATER MANAGEMENT DESIGN



Aplin & Martin Consultants Ltd.
 405 - 55 St. Clair Ave. West, O.N. Canada M4V 2Y7
 Tel: (416) 644-1900, Fax: (416) 644-1889, Email: general@aplinmartin.com

CLIENT:
PETRO GOLD LTD.
 261 ARNOLD AVE, VAUGHAN, ON L4J 1C3

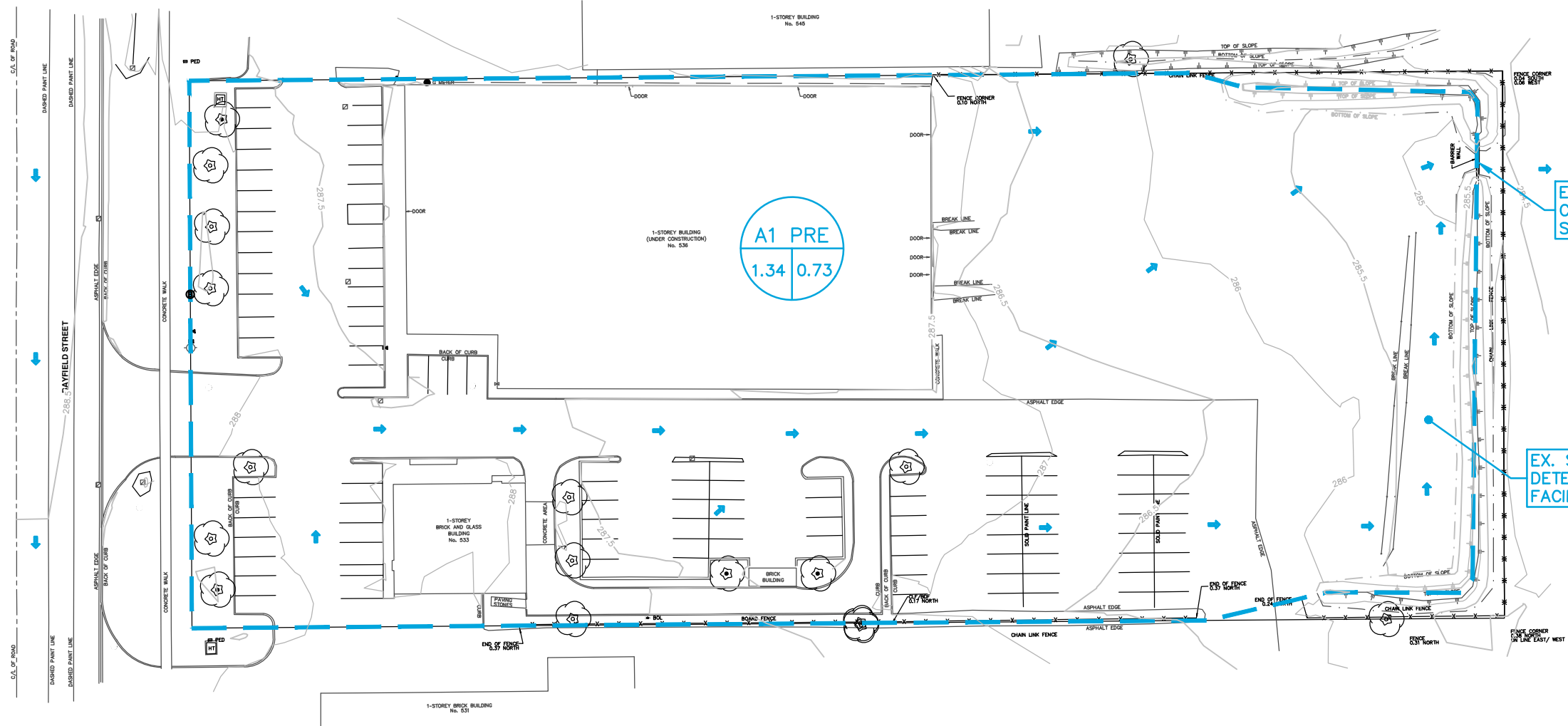
PROJECT:
COMMERCIAL DEVELOPMENT
 535 BAYFIELD STREET, BARRIE, ONTARIO

LEGEND:

- DEVELOPABLE AREA
- BUILDING OUTLINE
- - - - BUILDING OVERHANG
- PROPOSED PROPERTY LINE

TITLE:
AREA OF DEVELOPMENT

PROJECT NO. 21-7026	DRAWING DATE: MARCH 2023
FIGURE NO. FIG-01	SCALE : 1:750



EX. SWM CONTROL OUTLET STRUCTURE

EX. STORM DETENTION FACILITY

A1 PRE
1.34 0.73



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PROJECT:
COMMERCIAL DEVELOPMENT
535 BAYFIELD STREET, BARRIE, ONTARIO

- LEGEND:
- EXISTING PROPERTY LINE
 - PRE-DEVELOPMENT DRAINAGE AREA
 - OVERLAND FLOW AAROW

A1 PRE
0.06 0.90

- DRAINAGE AREA ID
- RUNOFF COEFFICIENT
- DRAINAGE AREA (ha)

TITLE:
PRE-DEVELOPMENT DRAINAGE AREA PLAN

PROJECT NO.
21-7026

FIGURE NO.
FIG-02

DRAWING DATE:
MARCH 2023

SCALE :
1:750

INLET CONTROL For Outlet Pipe

	Orifice 1
Diameter	75
Area (m ²)	0.004416
Orifice Coefficient	0.63
Invert	284.80

Orifice Equation

$Q = C \times A \times (2gH)^{0.5}$
 $Q = \text{flow rate (cms)}$
 $C = \text{constant}$
 $A = \text{area of opening(sq. m)}$
 $H = \text{net head on the orifice}$
 $g = \text{Acceleration due to gravity}$

WEIR CONTROL

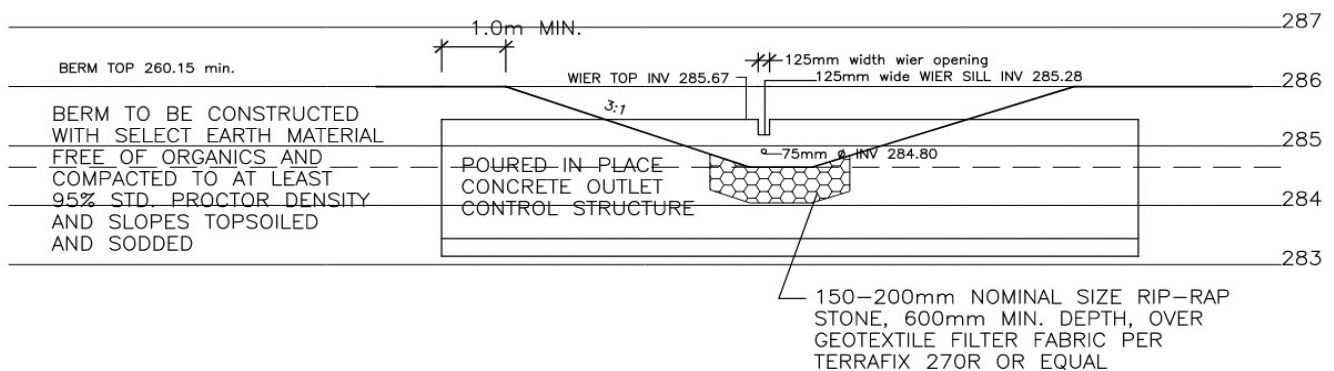
	Weir 1
Length of Weir (m)	0.125
Weir Sill (m)	285.28

Weir Equation (Formula in feet)

(Rectangular Contracted Weir)
 $Q = 3.247 * L * (H^{1.48}) - ((0.566 * L^{1.9}) / (1 + 2 * L^{1.87})) * H^{1.9}$
 $Q = \text{flow rate (cms)}$
 $L = \text{Length of Weir}$
 $H = \text{Head on Weir}$

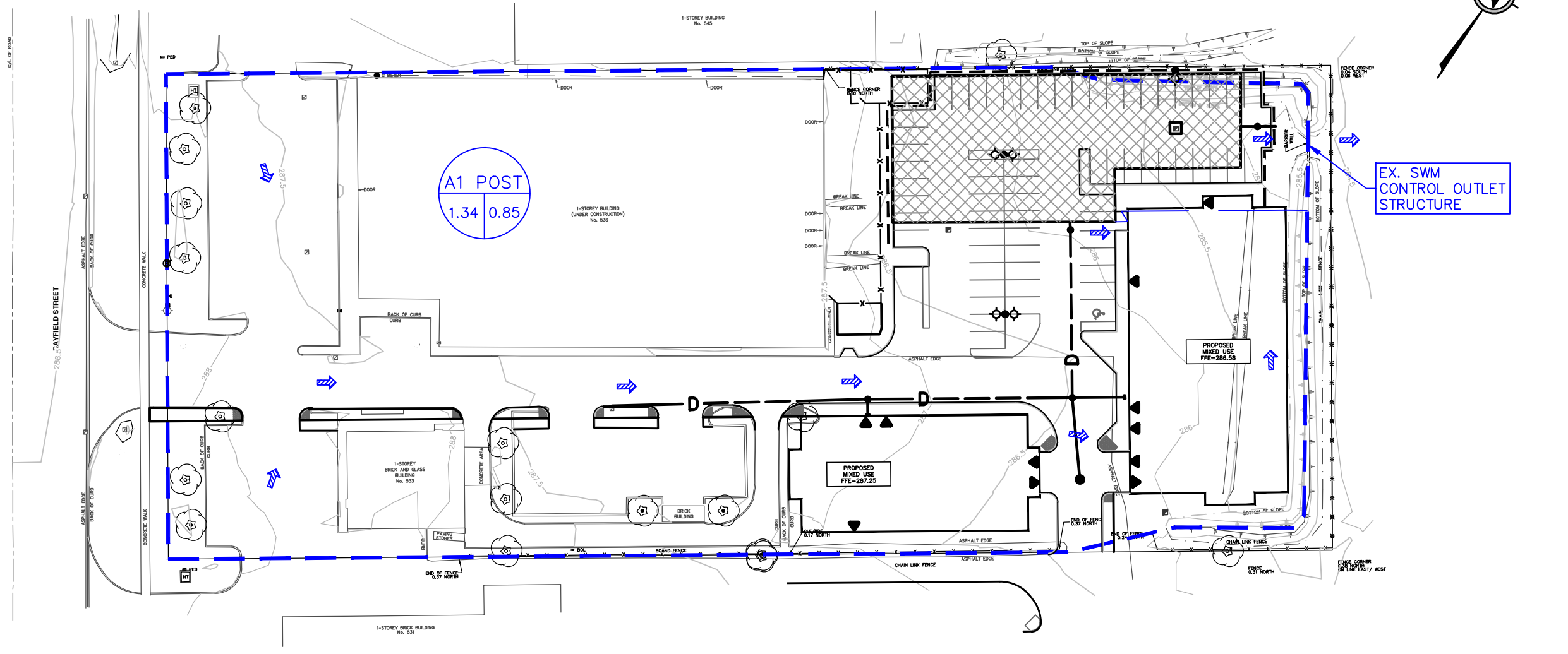
CONTROL STRUCTURE CONFIGURATION

Water Level	Orifice Discharge			Weir Discharge			Total Discharge	
	Head	Discharge		Head	Discharge		(cms)	(L/s)
(m)	(m)	(cms)	(L/s)	(ft)	(cms)	(L/s)		
284.80	0	0.000	0.0	0.00	0.00	0.0	0.00	0.0
285.00	0.20	0.006	5.5	0.00	0.00	0.0	0.01	5.5
285.20	0.40	0.008	7.8	0.00	0.00	0.0	0.01	7.8
285.28	0.48	0.009	8.5	0.00	0.00	0.0	0.01	8.5
285.40	0.60	0.010	9.5	0.39	0.01	9.1	0.02	18.7
100-yr HWL	285.56	0.76	10.7	0.92	0.03	31.4	0.04	42.2



SECTION – OUTLET STRUCTURE

*Section from STM-1 by R.Thibert Design Group (2000) found in Appendix A

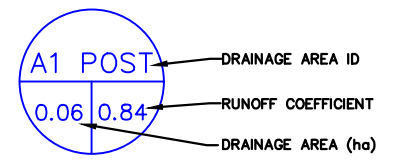


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PROJECT:
COMMERCIAL DEVELOPMENT
 535 BAYFIELD STREET, BARRIE, ONTARIO

- LEGEND:
- POST-DEVELOPMENT DRAINAGE AREA
 - OVERLAND FLOW ROUTE
 - PROPOSED STORM SEWER
 - BUILDING OVERHANG
 - PROPOSED PROPERTY LINE



TITLE: POST-DEVELOPMENT DRAINAGE AREA PLAN	
PROJECT NO. 21-7026	DRAWING DATE: MARCH 2023
FIGURE NO. FIG-03	SCALE : 1:750



APLIN MARTIN

ENGINEERING ARCHITECTURE PLANNING SURVEYING

AM Proj # 21-7026
Project Title: Commercial Development
Project Location: 535 Bayfield St, Barrie, Ontario

Post-Development Runoff Coefficient - City of Barrie

2-YR to 10-YR Storms			25-yr to 100-yr Storms		
A1 Post					
	Area (ha)	C (2-10 YR)	Return Period	Adjustment Factor	Adjusted Runoff Coefficient
Pervious	0.17	0.20	25 YR	1.1	0.94
Impervious	1.17	0.95	50 YR	1.2	1.00
Total Area	1.34	0.85	100 YR	1.25	1.00

100 Year Peak Flow Calculations - Rational Method

Storage Volume Required (Modified Rational Method)

<p>Uncontrolled Catchment</p> <p>Area 0.00 ha</p> <p>Runoff Coefficient 0.00</p> <p>AC 0.00</p> <p>Uncontrolled Release Rate 0.00 m³/s</p>		<p>Roof Catchment</p> <p>Area 0.13 ha</p> <p>Runoff Coefficient 0.95</p> <p>AC 0.13</p> <p>Allowable Roof Release Rate 5.6 L/s</p> <p>Roof Release Rate 12.4 L/s</p> <p>Allowable Ponding Depth 150 mm</p> <p>Max. Ponding Depth 125 mm</p> <p>Storage Provided 0.01 m³</p> <p>Ponding Area 0.13 ha</p> <p>42 L/s/ha*</p> <p>*Roof Drain - Watts RD-200-BED</p>		<p>Controlled - A1 Post</p> <p>Area 1.34 ha</p> <p>Runoff Coefficient 1.00</p> <p>AC 1.34</p> <p>Controlled Target Release Rate 0.042 m³/s</p> <p>Controlled Release Rate 0.042 m³/s</p> <p>Max Storage Required 672.3 m³</p> <p>Storage Provided 691.7 m³</p>	
<p>Existing Buildings - to Outlet</p> <p>Area 0.13 ha</p> <p>Runoff Coefficient 0.95</p> <p>Roof Discharge Rate 42 L/s/ha</p> <p>Roof Release Rate 0.01 m³/s</p>		<p>0</p>			

Town's IDF Data		Controlled - Watts RD-200-BED, Rooftop Storage						Controlled			
Rainfall Duration Tr	Rainfall Intensity I	Storm Runoff	Runoff Volume	Released Volume	Storage	Depth of Ponding	Release Rate	Storm Runoff	Runoff Volume	Released Volume	Required Storage
min	mm/hour	cms	cm	cm	cm	m	cms	cms	cm	cm	cm
10	180.4	0.1	38.2	3.4	34.8	0.08	0.008	0.67	402.98	25.31	377.67
15	145.1	0.1	46.1	5.1	41.0	0.09	0.009	0.54	486.01	37.96	448.05
20	122.5	0.0	51.9	6.7	45.2	0.10	0.010	0.46	547.27	50.62	496.65
25	106.7	0.0	56.5	8.4	48.1	0.11	0.011	0.40	595.94	63.27	532.67
30	95.0	0.0	60.4	10.1	50.2	0.11	0.011	0.35	636.44	75.92	560.51
35	85.9	0.0	63.7	11.8	51.9	0.12	0.012	0.32	671.22	88.58	582.64
40	78.6	0.0	66.6	13.5	53.1	0.12	0.012	0.29	701.78	101.23	600.55
45	72.5	0.0	69.1	15.2	54.0	0.12	0.012	0.27	729.10	113.89	615.21
50	67.5	0.0	71.5	16.9	54.6	0.12	0.012	0.25	753.83	126.54	627.29
55	63.2	0.0	73.6	18.5	55.1	0.12	0.012	0.24	776.48	139.20	637.28
60	59.5	0.0	75.6	20.2	55.4	0.12	0.012	0.22	797.38	151.85	645.53
65	56.3	0.0	77.5	21.9	55.6	0.12	0.012	0.21	816.82	164.50	652.32
70	53.4	0.0	79.2	23.6	55.6	0.12	0.012	0.20	835.01	177.16	657.85
75	50.9	0.0	80.8	25.3	55.5	0.12	0.012	0.19	852.11	189.81	662.29
80	48.6	0.0	82.3	27.0	55.4	0.12	0.012	0.18	868.25	202.47	665.79
85	46.5	0.0	83.8	28.7	55.1	0.12	0.012	0.17	883.57	215.12	668.44
90	44.7	0.0	85.2	30.3	54.8	0.12	0.012	0.17	898.13	227.77	670.36
95	43.0	0.0	86.5	32.0	54.5	0.12	0.012	0.16	912.03	240.43	671.60
100	41.4	0.0	87.8	33.7	54.0	0.12	0.012	0.15	925.32	253.08	672.24
105	40.0	0.0	89.0	35.4	53.6	0.12	0.012	0.15	938.07	265.74	672.33
110	38.7	0.0	90.1	37.1	53.0	0.12	0.012	0.14	950.32	278.39	671.93
115	37.5	0.0	91.2	38.8	52.5	0.12	0.012	0.14	962.12	291.05	671.07
120	36.3	0.0	92.3	40.5	51.9	0.12	0.012	0.14	973.49	303.70	669.79
125	35.3	0.0	93.4	42.1	51.2	0.11	0.011	0.13	984.48	316.35	668.13
130	34.3	0.0	94.4	43.8	50.6	0.11	0.011	0.13	995.12	329.01	666.11
135	33.3	0.0	95.3	45.5	49.8	0.11	0.011	0.12	1005.42	341.66	663.76
140	32.5	0.0	96.3	47.2	49.1	0.11	0.011	0.12	1015.42	354.32	661.10
145	31.7	0.0	97.2	48.9	48.3	0.11	0.011	0.12	1025.12	366.97	658.15
150	30.9	0.0	98.1	50.6	47.5	0.11	0.011	0.11	1034.56	379.62	654.93
155	30.2	0.0	99.0	52.2	46.7	0.10	0.010	0.11	1043.74	392.28	651.46
160	29.5	0.0	99.8	53.9	45.9	0.10	0.010	0.11	1052.69	404.93	647.75
165	28.8	0.0	100.7	55.6	45.0	0.10	0.010	0.11	1061.41	417.59	643.82
170	28.2	0.0	101.5	57.3	44.2	0.10	0.010	0.10	1069.91	430.24	639.67
175	27.6	0.0	102.3	59.0	43.3	0.10	0.010	0.10	1078.22	442.90	635.33
180	27.0	0.0	103.0	60.7	42.3	0.09	0.009	0.10	1086.34	455.55	630.79



Volume Calculation

Customer:		Project:
Name:	Petro Gold Ltd.	Mixed Use Development
Location:	535 Bayfield Street	
Post Code:		
Tel.:		
Fax.:		
E-Mail:		

Module EcoBloc Inspect smart

Length:	43.20	m
Width:	24.00	m
Height:	0.700	m
Side Backfill:	0.50	m

Excavation

Footprint Tank:	1036.80	m ²
Footprint Excavation:	1105.00	m ²

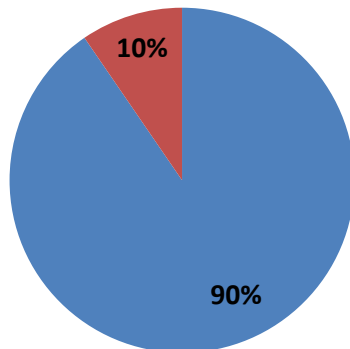
Stone

Leveling Bed:	0.10	m
Top Backfill:	0.10	m
Compacted Fill:	0.40	m
Stone Porosity:	30.00	%

Results: Capacity

Module Storage Volume:	694.63	m ³
Stone Storage Volume:	73.29	m ³
Total Storage Volume:	767.92	m ³

(Estimations include 10 % for scrap and overlap)



■ Module Storage Volume
■ Stone Storage Volume



Volume Calculation

Customer:		Project:
Name:	Petro Gold Ltd.	Mixed Use Development
Location:	535 Bayfield Street	
Post Code		
Tel.:		
Fax.:		
E-Mail:		

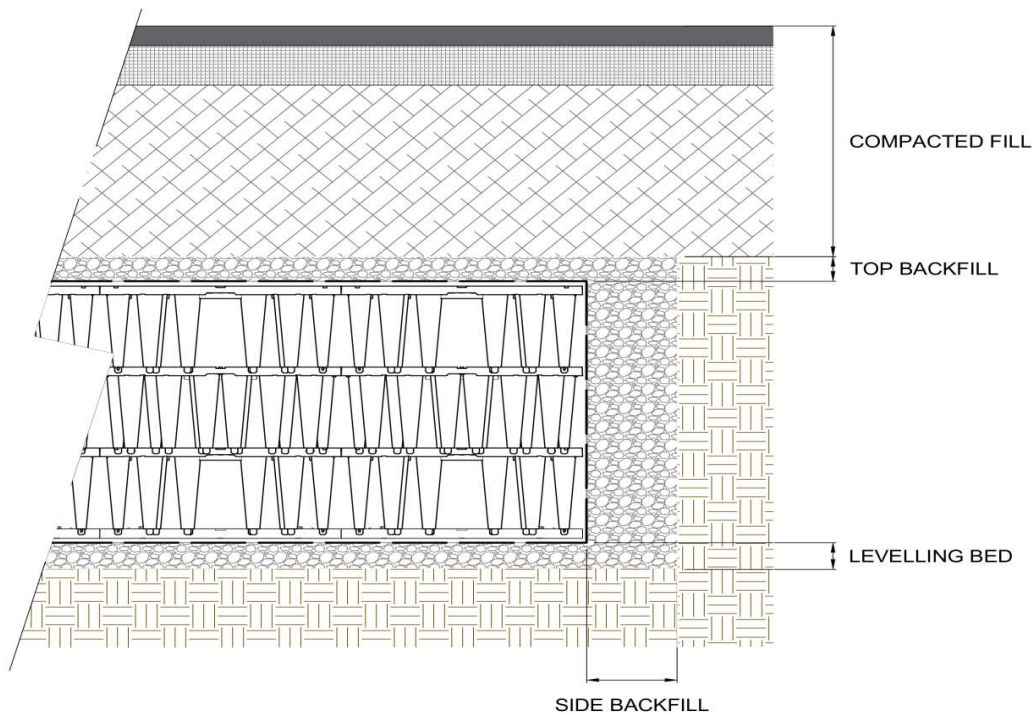
Results: Quantities

Required Excavation:	1436.50	m ³
Required Stone:	268.74	m ³
Estimated Geotextile:	2744.00	m ²
Estimated Liner	2744.00	m ²

Results: Component Quantities

Modules:	3240	pcs.
Base Plates:	1620	pcs.
Side Plates (Set 2 units):	168	pcs.
Connectors:	9468	pcs.

Cross Section





AM Proj # 21-7026
 Project Title: Commercial Development
 Project Location: 535 Bayfield St, Barrie, Ontario

Annual Hydrologic Budget

PRE-DEV			
Existing Landuse	Commercial		
Infiltration Factor	0.8		
Topography	Hilly - 0.1		
Soils	Medium - 0.2		
Cover	Cultivated Land - 0.1		
	Pervious	Impervious	Total
Area (ha)	0.32	1.02	1.34
Precipitation (mm/year)	895	895	
ET (mm/year)	545	89.5	
Surplus (mm/year)	350	805.5	
Infiltration (mm/year)	280	0	
Runoff (mm/year)	70	805.5	
Volumes			
ET (m ³)	1740	917	2657
Infiltration (m ³)	894	0	894
Runoff(m ³)	224	8252	8476

Per Hydrogeological Assessment
(Harden Environmental Services Ltd.)

POST-DEV			
Proposed Landuse	Urban Lawns		
Hydrologic Soil Group (HSG)	B		
Infiltration Factor	0.8		
Topography	Flat Land, average slope < 0.6 m/km - 0.3		
Soils	Open Sandy Loam - 0.4		
Cover	Cultivated Land - 0.1		
	Pervious	Impervious	Total
Area (ha)	0.17	1.17	1.34
Precipitation (mm)	895	895	
ET (mm)	545	89.5	
Surplus (mm)	350	805.5	
Infiltration (mm)	280	0	
Runoff (mm)	70	805.5	
Volumes			
ET (m ³)	927	1047	1974
Infiltration (m ³)	476	0	476
Runoff(m ³)	119	9424	9543

POST-DEV WITH MITIGATION			
	Pervious	Impervious	Total
Area (ha)	0.17	1.17	1.34
Precipitation (mm)	895	895	
ET (mm)	545	89.5	
Surplus (mm)	350	805.5	
Infiltration (mm/year)	280	40	
Runoff (mm)	70	765.5	
Volumes			
ET (m ³)	927	1047	1974
Infiltration (m ³)	476	468	944
Runoff(m ³)	119	8956	9075

SUMMARY			
Scenario	ET	Infiltration	Runoff
Pre-Development (1) (m ³)	2657	894	8476
Post-Development (2) (m ³)	1974	476	9543
Post-Development w Mitigation (3) (m ³)	1974	944	9075
Percent Difference (1 and 3)	-26%	6%	7%

* Sheet assumes 10% evapotranspiration on impervious surfaces

King Smoke Tree - Normal Data

Storm Depth (mm)	Number of Days						
	Apr	May	Jun	Jul	Aug	Sept	Oct
0.2	12.20	12.90	11.40	11.10	11.80	13.30	15.60
5	4.20	5.80	4.40	4.70	5.10	5.40	5.70
10	1.70	2.70	2.90	2.50	3.40	3.00	2.00
25	0.31	0.36	0.73	0.62	0.81	0.73	0.19

Storm Depth (mm)	Total # of days/year	Incremental Precipitation (mm/year)	Cumulative Precipitation (mm/year)
0.2	88.30	17.66	17.7
5	35.30	176.50	194.2
10	18.20	182.00	376.2
25	3.75	93.75	469.9

Target Infiltration **40** mm/year
 Contributing Area **1.00**
 Runoff Coefficient
 Design Precipitation **40.00** mm/year
 Retention Depth **0.68** mm
 Retention Volume **7.90** m³



AM Proj # 21-7026
Project Title: Commercial Development
Project Location: 535 Bayfield St, Barrie, Ontario

Erosion Control Requirement

As per [Section 4.2](#) of the FSRSWM Report, the 5 mm event must be captured and retained on-site. [Fig. 5 in Appendix D](#) delineates the area of proposed development draining to the underground storage tank which will allow for infiltration into the ground, which provides sufficient storage for retainment. A voidage factor of 0.4 has been used to determine the storage offered.

LID	Area of Prop. Development Draining to LID (m ²)	Depth (mm)	Required Volume to be Infiltrated (m ³)	Provided Storage (m ³)
Underground Storage Tank	13400	5	67.0	82.9



AM Proj # 21-7026
 Project Title: Commercial Development
 Project Location: 535 Bayfield St, Barrie, Ontario

Test Pit Location	Soil Type	K Saturation* (cm/s)	Infiltration Rate (mm/hour)	Safety Factor **	Design Infiltration Rate (mm/hour)
BH6	Silty Sand	20	86	2.5	34.40

*From Hydrogeological Report prepared by Harden Environmental Services Ltd.

**From NVCA Stormwater Technical Guide, Table 7.2

Infiltration Facility - Required					Infiltration Facility - Provided			
Volume (V)	67.0		m ³	$A = \frac{1000V}{PnT}$	Area	1037		m ²
Design Infiltration Rate (P)	34.40		mm/hr		Depth (d)	0.20		m
Porosity (n)	0.4				Volume (V)	82.9		m ³
Drawdown (T)	48.0		hr		Drawdown (T)	5.8		hr
Required Area (A)	101.4		m ²					
Max. Storage Reservoir Depth (d)	4.1		m					

Development Export Summary

Development :535 Bayfield Street

Pre-Development Phosphorus Export

DEVELOPMENT : 535 Bayfield Street

Landuse	Area (ha)	P coeff (kg/ha)	Pload (kg/yr)
Urban			
Commercial	1.34	0.20	1.29
Urban Land use Class Total :		1.34	1.29
Development Total :		1.34	1.29

Cropland Site Sediment & Phosphorus Pre-Development Export

DEVELOPMENT : 535 Bayfield Street

COLOUR KEY :	Site Specific Input	Constant / Lookup	Calculation
--------------	---------------------	-------------------	-------------

SubArea :

Slope Area (ha)	R (rainfall / runoff for Lake Simcoe)
Surface Slope Gradient (%)	K (soil erodability factor)
Length of Slope (m)	NN (determined by slope)
Cropt Type Factor	LS (slope length gradient factor)
Tillage Type Factor	C (crop management factor)
	P (prevention + capture)
	Soil Loss (kg/year)
	Phosphorus export (kg/ha/yr)
	Phosphorus load (kg/yr)

PRE Developed Area (ha) :
 Phosphorus export (kg/ha/yr) :
 Phosphorus load (kg/yr) :

Post-Development Phosphorus Export

DEVELOPMENT : 535 Bayfield Street

Landuse	Area (ha)	P coeff (kg/ha)	Pload (kg/yr)
Urban			
Commercial	0.76	0.20	0.85
Residential	0.58	0.41	1.20
Urban Land use Class Total :		1.34	2.05
Development Total :		1.34	2.05

Cropland Site Sediment & Phosphorus Post-Development Export

DEVELOPMENT : 535 Bayfield Street

COLOUR KEY :	Site Specific Input	Constant / Lookup	Calculation
--------------	---------------------	-------------------	-------------

SubArea :

Slope Area (ha)	R (rainfall / runoff for Lake Simcoe)
Surface Slope Gradient (%)	K (soil errodability factor)
Length of Slope (m)	NN (determined by slope)
Cropt Type Factor)	LS (slope length gradient factor)
Tillage Type Factor	C (crop management factor)
	P (prevention + capture)
	Soil Loss (kg/year)
	Phosphorus export (kg/ha/yr)
	Phosphorus load (kg/yr)

PRE Developed Area (ha) :
 Phosphorus export (kg/ha/yr) :
 Phosphorus load (kg/yr) :

Post Dev BMP

Area (ha)	Treated Area %	P coefficient	P coefficient	P Load Reduction (kg/yr)	Rationale
Best Management Practices (BMP) Applied (and Rationale)					
Residential					
1.34	100	0.41	60 %	0.33	
Soakaways - Infiltration Trenches					

Development Area P and BMP Summary

Total PreDevelopment Area (ha):	1.34
PreDevelopment Area excluding Wetlands (ha):	1.34
Total PostDevelopment Area (ha):	1.34
Total Area treated by BMP's (ha):	1.34
Treated Area total:	1.34
Total PreDevelopment Load (kg/yr):	1.29
Total PostDevelopment Load (kg/yr):	2.05
Total P Load Reduction with BMP's (kg/yr):	0.33
Minimum P Load Reduction Required:	0.76
Total PostDevelopment Load with BMP's (kg/yr)	1.72
Conclusion :	Net increase in P load, additional reduction is required.

Post Dev Construction

Sediment Control Measures - Filtration Controls

Storm Drain Inlet Protection

Sediment Control Measures - Perimeter Controls

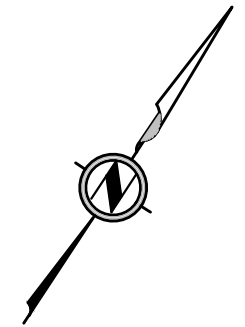
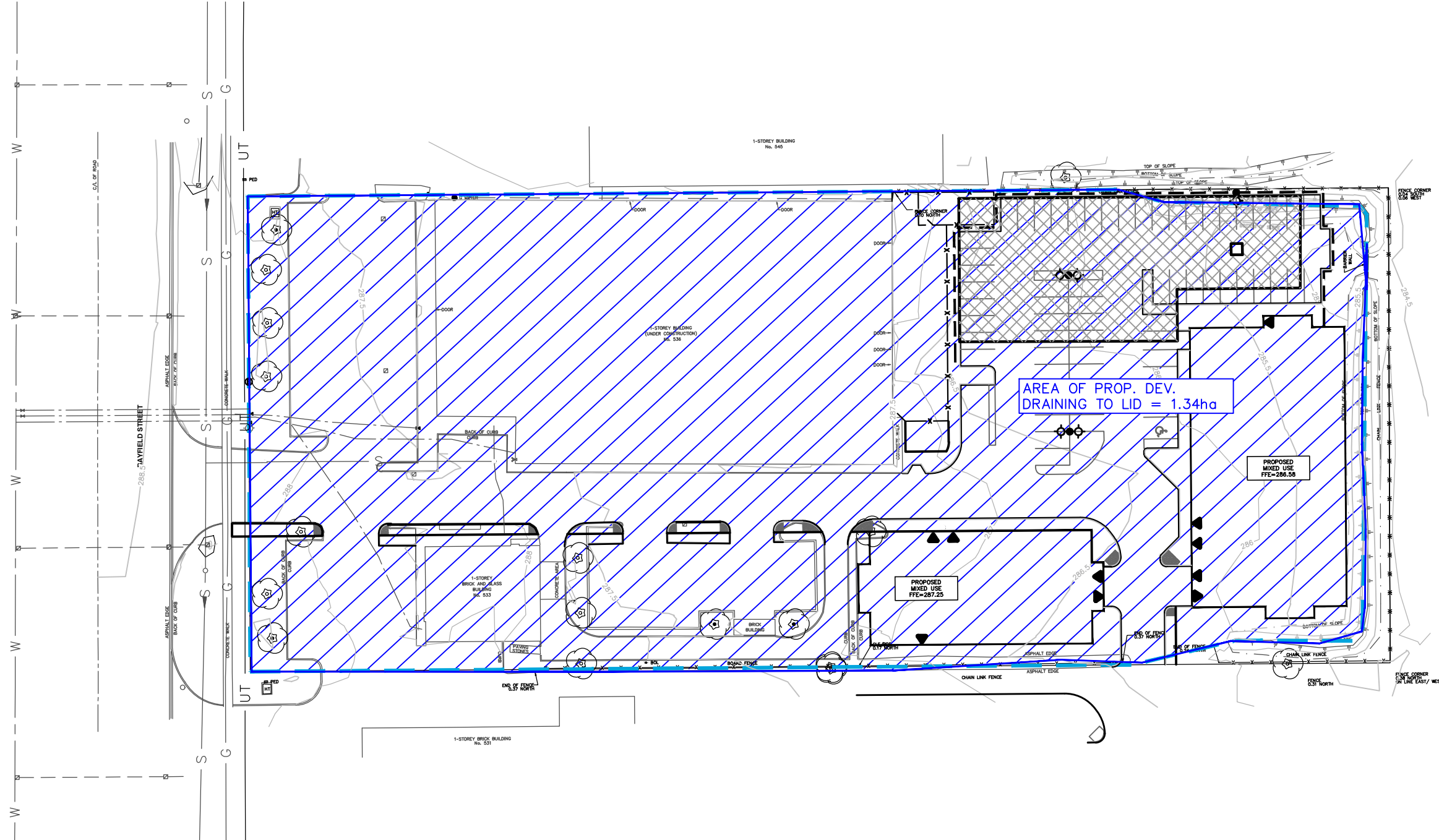
Vehicle Tracking Control/Mud Mat

Interceptor Swale/Dike

Sediment Control Measures - Settling Controls

Ditch/Swale Sediment Trap

Rock Check Dam



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PROJECT:
COMMERCIAL DEVELOPMENT
 535 BAYFIELD STREET, BARRIE, ONTARIO

LEGEND:

	TOTAL DRAINAGE AREA TO LID
	IMPERVIOUS DRAINAGE AREA TO LID
	BUILDING OUTLINE
	BUILDING OVERHANG
	PROPOSED PROPERTY LINE

TITLE:
QUALITY CONTROL & EROSION CONTROL

PROJECT NO.
21-7026

FIGURE NO.
FIG-05

DRAWING DATE:
MARCH 2023

SCALE :
1:750

DRAINAGE SYSTEM DESIGN - RATIONAL METHOD CALCULATION SHEET

Project Title: Commercial Development
 Location: 535 Bayfield St., Barrie
 Project No: 21-7026

Storm Sewer Design Criteria
 Design Return Period: **15YEAR / 100 YEAR**
 MANNINGS "n" **0.013**
 Q10/100=RAIN **N=0.00278**

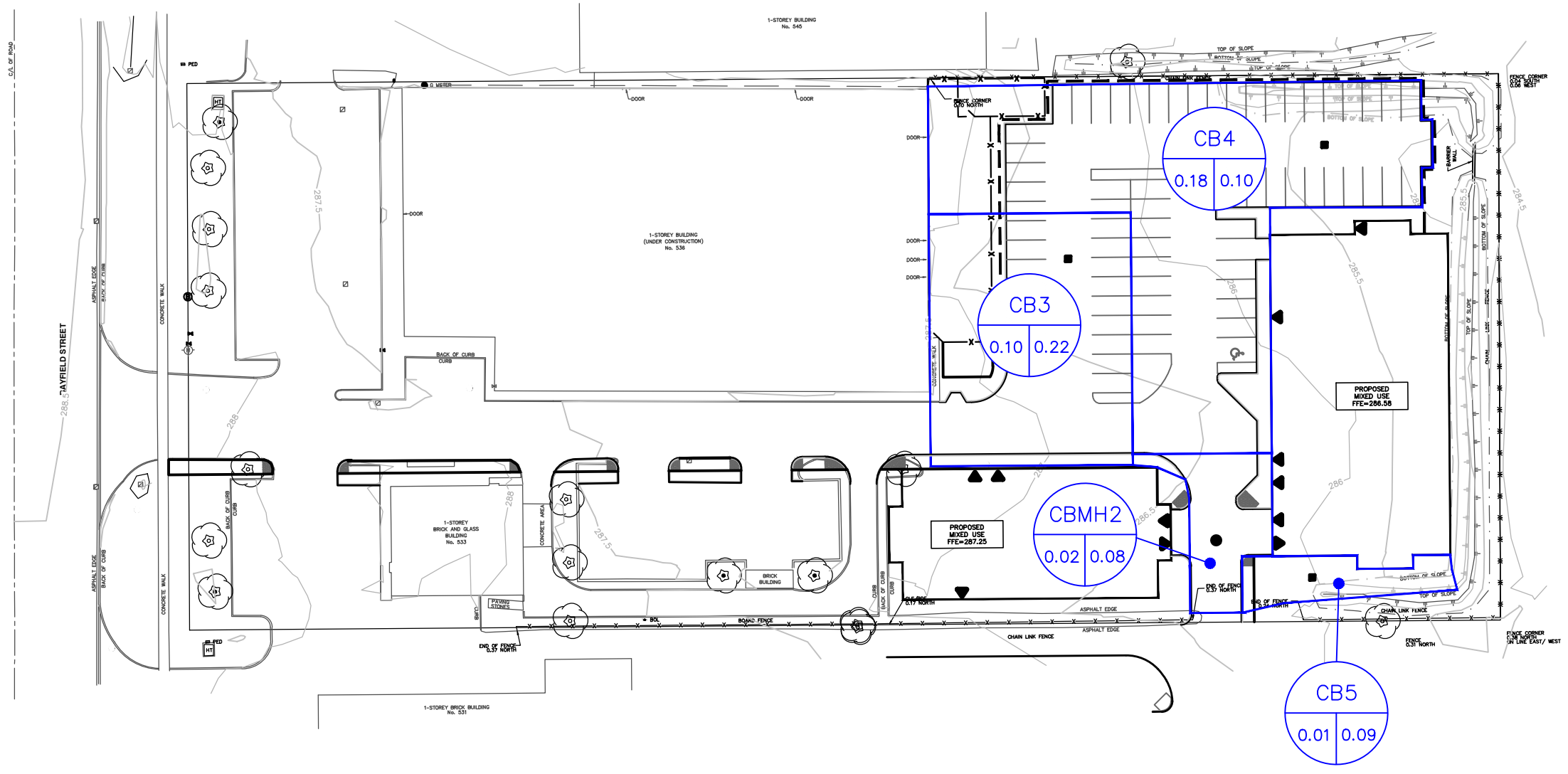
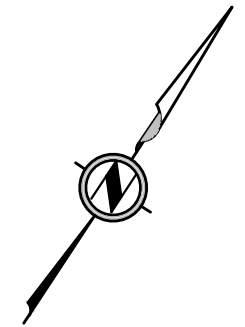
Consultant: APLIN MARTIN

A&M Proj # **21-7026**
 Page: **1 of 1**
 Designed by: **SB**
 Checked by: **CAB**
 Date: **Mar-23**



CITY OF BARRIE - RAINFALL INTENSITY

Locations			Sub-Catchments					Flow Calculations		Pipe Parameters										Comments	
Street	Maintenance Hole		Sub-Catchment No.	Tributary Area			SUM AxR (ha)	Time of Concentration		Rain Fall Int. "I" (mm/hr)	Q ₅ / Q ₁₀₀ (L/s)	Sewer Design					Travel Time (min)	Flow Ratios		Hydraulic Slope Q ₁₀₀ %	Remarks
	From	To		A (ha)	R	AxR (ha)		Inlet (min)	Total (min)			S %	DIA mm	L m	V _{cap} m/s	Q _{cap} (L/s)		Q ₅ /Q _{cap} %	Q ₁₀₀ /Q _{cap} %		
-	CBMH1	MH1	A1 POST	0.72	0.90	0.64	0.64	10.0	10.0	109.1	195.6	0.41	525	40.2	1.27	275.4	0.5	71%	131%	0.70%	IN PIPE
					1.00	0.72	0.72			180.4	359.4										
-	MH1	MH2		0.20	0.90	0.18	0.83	10.5	11.0	109.1	251.3	0.38	525	32.1	1.22	265.1	0.4	95%	174%	1.15%	IN PIPE
					1.00	0.20	0.92			180.4	461.7										
-	MH2	MH3		0.41	0.90	0.37	1.20	11.0	11.3	109.1	363.2	0.50	600	26.4	1.54	434.2	0.3	84%	154%	1.18%	IN PIPE
					1.00	0.41	1.33			180.4	667.4										
-	MH3	TANK			0.90		1.20	11.3	11.3	109.1	363.2	0.85	600	1.2	2.00	566.1	0.0	64%	118%	1.18%	IN PIPE
					1.00		1.33			180.4	667.4										



Aplin & Martin Consultants Ltd.
 405 - 55 St. Clair Ave. West, O.N. Canada M4V 2Y7
 Tel: (416) 644-1900, Fax: (416) 644-1889, Email: general@aplinmartin.com

CLIENT:
PETRO GOLD LTD.
 261 ARNOLD AVE, VAUGHAN, ON L4J 1C3

PROJECT:
COMMERCIAL DEVELOPMENT
 535 BAYFIELD STREET, BARRIE, ONTARIO

LEGEND:

- CATCHBASIN CATCHMENT AREA
- OVERLAND FLOW ROUTE
- BUILDING OUTLINE
- BUILDING OVERHANG
- PROPOSED PROPERTY LINE

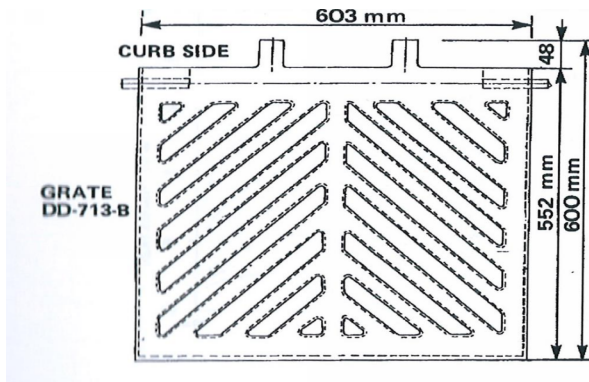
Legend for Catchment Area CB5:

- CATCHBASIN ID
- PONDING DEPTH (m)
- CATCHMENT AREA (ha)

TITLE:
CB CATCHMENT AREA PLAN

PROJECT NO. 21-7026	DRAWING DATE: MARCH 2023
FIGURE NO. FIG-06	SCALE : 1:750

Grate DD-713B Inlet Capacity Evaluation



Inlet Capture Rate (m³/s) for Grate DD-713B inlet (on Sag) and Curb and Gutter Type B

Depth of Ponding (m)	Inlet Capacity (m ³ /s)	50% blockage
0	0	0.0000
0.01	0.0004	0.0002
0.02	0.0017	0.0009
0.03	0.0040	0.0020
0.04	0.0070	0.0035
0.05	0.0110	0.0055
0.06	0.0171	0.0086
0.07	0.0250	0.0125
0.08	0.0347	0.0174
0.09	0.0464	0.0232
0.1	0.0600	0.0300
0.11	0.0726	0.0363
0.12	0.0853	0.0427
0.13	0.0971	0.0486
0.14	0.1082	0.0541
0.15	0.1184	0.0592
0.2	0.1569	0.0785
0.25	0.1811	0.0906
0.3	0.2027	0.1014
0.35	0.2260	0.1130
0.4	0.2434	0.1217
0.45	0.2589	0.1294
0.5	0.2726	0.1363
0.55	0.2851	0.1426
0.6	0.2965	0.1482
0.65	0.3070	0.1535
0.7	0.3166	0.1583
0.75	0.3257	0.1628
0.8	0.3341	0.1671
0.85	0.3420	0.1710
0.9	0.3495	0.1748
0.95	0.3566	0.1783
1	0.3633	0.1817

Drainage Area for CB3

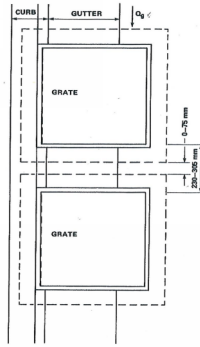
Area	1000 m ²
RC	0.95
100-Year Intensity	180.44 mm/hour
Flow	0.0477 m ³ /s

Provided Catchbasin Capacity 0.08 m³/s

Number of CBs 1.00

Total Capacity 0.08 m³/s

Therefore the proposed catch basin can capture all runoff from the drainage area accounting for 50% blockage



Inlet Capture Rate (m³/s) for Grate Twin Honeycomb inlet (on Sag) and Curb and Gutter Type B

Depth of Ponding (m)	Inlet Capacity (m ³ /s)	50% blockage
0	0	0.0000
0.01	0.0108	0.0054
0.02	0.0167	0.0084
0.03	0.0233	0.0116
0.04	0.0402	0.0201
0.05	0.0576	0.0288
0.06	0.0789	0.0394
0.07	0.0970	0.0485
0.08	0.1239	0.0620
0.09	0.1479	0.0740
0.1	0.1716	0.0858
0.11	0.1951	0.0976
0.12	0.2195	0.1097
0.13	0.2449	0.1225
0.14	0.2687	0.1344
0.15	0.2961	0.1480
0.2	0.4987	0.2494
0.25	0.8029	0.4015
0.3	0.9674	0.4837
0.35	1.0076	0.5038
0.4	1.1095	0.5547
0.45	1.1995	0.5998
0.5	1.2802	0.6401
0.55	1.3533	0.6766
0.6	1.4201	0.7100
0.65	1.4816	0.7408
0.7	1.5385	0.7693
0.75	1.5916	0.7958
0.8	1.6412	0.8206
0.85	1.6879	0.8439
0.9	1.7319	0.8659
0.95	1.7735	0.8868
1	1.8130	0.9065

Drainage Area for CB4

Area	1800 m ²
RC	0.95
100-Year Intensity	180.44 mm/hour
Flow	0.0858 m ³ /s

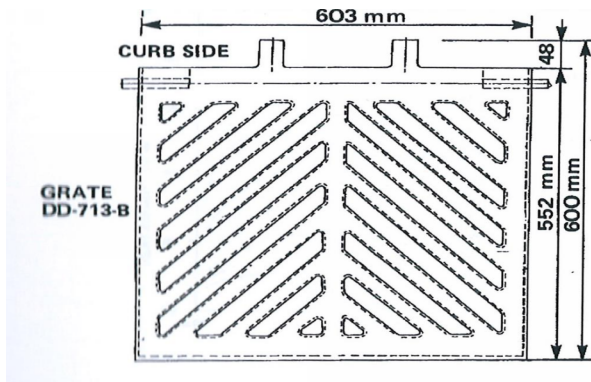
Provided Catchbasin Capacity 0.09 m³/s

Number of CBs 1.00

Total Capacity 0.09 m³/s

Therefore the proposed catch basin can capture all runoff from the drainage area accounting for 50% blockage

Grate DD-713B Inlet Capacity Evaluation



Inlet Capture Rate (m³/s) for Grate DD-713B inlet (on Sag) and Curb and Gutter Type B

Depth of Ponding (m)	Inlet Capacity (m ³ /s)	50% blockage
0	0	0.0000
0.01	0.0004	0.0002
0.02	0.0017	0.0009
0.03	0.0040	0.0020
0.04	0.0070	0.0035
0.05	0.0110	0.0055
0.06	0.0171	0.0086
0.07	0.0250	0.0125
0.08	0.0347	0.0174
0.09	0.0464	0.0232
0.1	0.0600	0.0300
0.11	0.0726	0.0363
0.12	0.0853	0.0427
0.13	0.0971	0.0486
0.14	0.1082	0.0541
0.15	0.1184	0.0592
0.2	0.1569	0.0785
0.25	0.1811	0.0906
0.3	0.2027	0.1014
0.35	0.2260	0.1130
0.4	0.2434	0.1217
0.45	0.2589	0.1294
0.5	0.2726	0.1363
0.55	0.2851	0.1426
0.6	0.2965	0.1482
0.65	0.3070	0.1535
0.7	0.3166	0.1583
0.75	0.3257	0.1628
0.8	0.3341	0.1671
0.85	0.3420	0.1710
0.9	0.3495	0.1748
0.95	0.3566	0.1783
1	0.3633	0.1817

Drainage Area for CB5

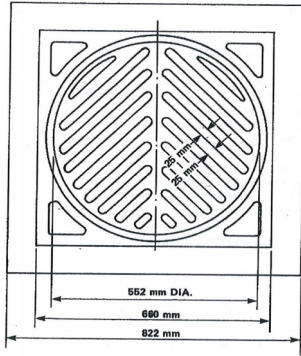
Area	100 m ²
RC	0.95
100-Year Intensity	180.44 mm/hour
Flow	0.0048 m ³ /s

Provided Catchbasin Capacity 0.02 m³/s

Number of CBs 1.00

Total Capacity 0.02 m³/s

Therefore the proposed catch basin can capture all runoff from the drainage area accounting for 50% blockage



Inlet Capture Rate (m³/s) for Grate Round Frame inlet (on Sag) and Curb and Gutter Type B

Depth of Ponding (m)	Inlet Capacity (m ³ /s)	50% blockage
0	0	0.0000
0.01	0.0004	0.0002
0.02	0.0016	0.0008
0.03	0.0038	0.0019
0.04	0.0066	0.0033
0.05	0.0103	0.0052
0.06	0.0161	0.0080
0.07	0.0235	0.0118
0.08	0.0326	0.0163
0.09	0.0436	0.0218
0.1	0.0564	0.0282
0.11	0.0682	0.0341
0.12	0.0802	0.0401
0.13	0.0913	0.0456
0.14	0.1017	0.0509
0.15	0.1113	0.0556
0.2	0.1475	0.0737
0.25	0.1702	0.0851
0.3	0.1905	0.0953
0.35	0.2124	0.1062
0.4	0.2288	0.1144
0.45	0.2433	0.1217
0.5	0.2563	0.1281
0.55	0.2680	0.1340
0.6	0.2787	0.1393
0.65	0.2885	0.1443
0.7	0.2976	0.1488
0.75	0.3061	0.1531
0.8	0.3141	0.1570
0.85	0.3215	0.1608
0.9	0.3285	0.1643
0.95	0.3352	0.1676
1	0.3415	0.1708

Drainage Area for CBMH2

Area	200 m ²
RC	0.95
100-Year Intensity	180.44 mm/hour
Flow	0.0095 m ³ /s

Provided Catchbasin Capacity 0.02 m³/s

Number of CBs 1.00

Total Capacity 0.02 m³/s

Therefore the proposed catch basin can capture all runoff from the drainage area accounting for 50% blockage



Hydroworks Sizing Summary

535 Bayfield

Barrie, ON

01-31-2023

Recommended Size: HydroStorm HS 8

A HydroStorm HS 8 is recommended to provide 80 % annual TSS removal based on a drainage area of 1.34 (ha) with an imperviousness of 91 % and Barrie WPCC, Ontario rainfall for the 20 um to 2000 um particle size distribution.

The recommended HydroStorm HS 8 treats 92 % of the annual runoff and provides 81 % annual TSS removal for the Barrie WPCC rainfall records and 20 um to 2000 um particle size distribution.

The HydroStorm has a headloss coefficient (K) of 1.04. Since a peak flow was not specified, headloss was calculated using the full pipe flow of .06 (m³/s) for the given 375 (mm) pipe diameter at .1% slope. The headloss was calculated to be 13 (mm) based on a flow depth of 375 (mm) (full pipe flow).

This summary report provides the main parameters that were used for sizing. These parameters are shown on the summary tables and graphs provided in this report.

If you have any questions regarding this sizing summary please do not hesitate to contact Hydroworks at 888-290-7900 or email us at support@hydroworks.com.

The sizing program is for sizing purposes only and does not address any site specific parameters such as hydraulic gradeline, tailwater submergence, groundwater, soils bearing capacity, etc. Headloss calculations are not a hydraulic gradeline calculation since this requires a starting water level and an analysis of the entire system downstream of the HydroStorm .

TSS Removal Sizing Summary

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

File Product Units CAD Video Help

General Dimensions Rainfall Site TSS PSD TSS Loading Quantity Storage By-Pass Custom CAD Video Other

Site Parameters
 Area (ha)
 Imperviousness (%)

Units
 U.S.
 Metric

Rainfall Station
 Barrie WPCC Ontario
 1968 To 2007 Rainfall Timestep = 60 min.

Project Title
 (2 lines)

ETV Lab Testing Results Post Treatment Recharge

Outlet Pipe
 Diam. (mm) Peak Design Flow (m3/s)
 Slope (%)

HydroStorm Annual Sizing Results

Model #	Qlow (m3/s)	Qtot (m3/s)	Flow Capture (%)	TSS Removal (%)
Unavailable	.017	.055	77 %	54 %
HS 4	.028	.055	85 %	63 %
HS 5	.034	.055	87 %	71 %
HS 6	.041	.055	89 %	76 %
Unavailable	.052	.055	92 %	79 %
HS 8	.055	.055	92 %	81 %
HS 10	.055	.055	92 %	86 %
HS 12	.055	.055	92 %	90 %

Particle Size Distribution

Size (um)	%	SG
20	20	2.65
60	20	2.65
150	20	2.65
400	20	2.65
2000	20	2.65

Note: Results vary significantly based on particle size distribution

TSS Particle Size Distribution

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

File Product Units CAD Video Help

General Dimensions Rainfall Site TSS PSD TSS Loading Quantity Storage By-Pass Custom CAD Video Other

TSS Particle Size Distribution

Size (um)	%	SG
▶ 20	20	2.65
60	20	2.65
150	20	2.65
400	20	2.65
2000	20	2.65
*		

Notes:

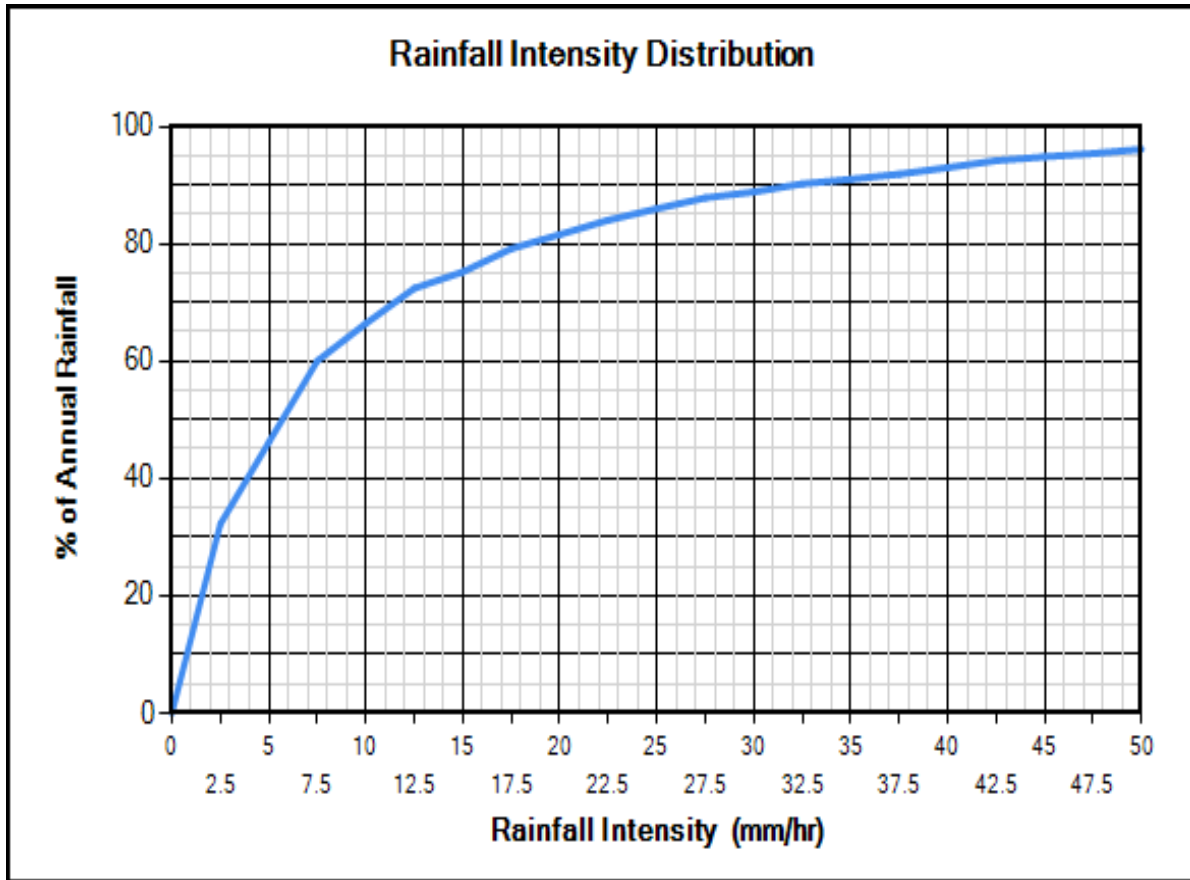
- To change data just click a cell and type in the new value(s)
- To add a row just go to the bottom of the table and start typing.
- To delete a row, select the row by clicking on the first pointer column, then press delete
- To sort the table click on one of the column headings

TSS Distributions

ETV Canada / NJDEP
 Standard HDS Design
 Alden Laboratory
 OK110
 Toronto
 Ontario Fine
 Calgary Forebay
 Kitchener
 User Defined

You must select a particle size distribution for TSS to simulate TSS removal

Water Temp (C)



Site Physical Characteristics

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

File Product Units CAD Video Help

General Dimensions Rainfall Site TSS PSD TSS Loading Quantity Storage By-Pass Custom CAD Video Other

Catchment Parameters

Width (m) Imperv. Mannings n Maintenance Frequency (months)

Perv Mannings n

Slope (%) Imp. Depress. Storage (mm)

Perv. Depress. Storage (mm)

Daily Evaporation (mm/day)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	2.54	2.54	3.81	3.81	3.81	2.54	2.54	0	0

Infiltration

Max. Infiltration Rate (mm/hr)

Min. Infiltration Rate (mm/hr)

Infiltration Decay Rate (1/s)

Infiltration Regen. Rate (1/s)

Catch Basins

of Catch basins

Controlled Roof Runoff

Roof Runoff (m3/s)

Dimensions And Capacities

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

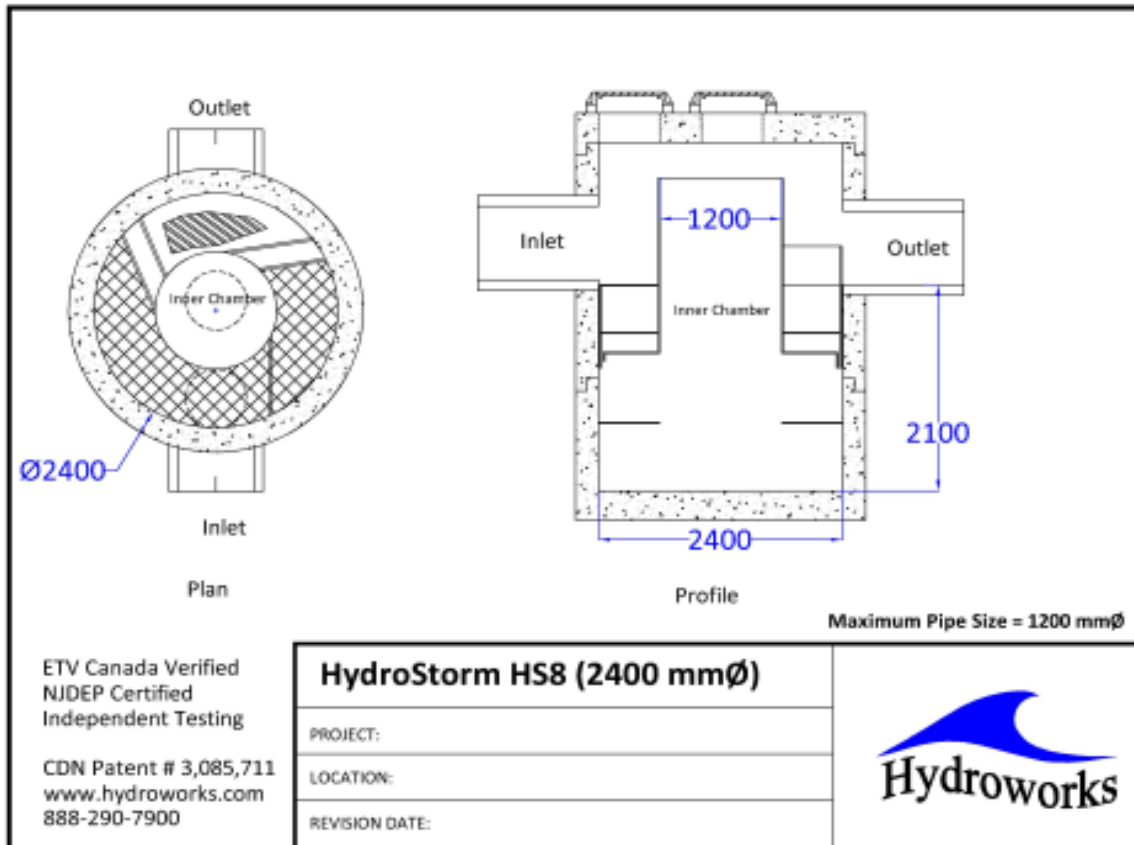
File Product Units CAD Video Help

General Dimensions Rainfall Site TSS PSD TSS Loading Quantity Storage By-Pass Custom CAD Video Other

Dimensions and Capacities					
Model	Diam. (m)	Depth (m)	Float. Vol. (L)	Sediment Vol. (m3)	Total Vol. (m3)
HS 3	0.91	1.07	185	0.4	0.7
HS 4	1.22	1.22	381	0.9	1.4
HS 5	1.52	1.52	642	1.8	2.8
HS 6	1.83	1.83	1041	3.2	4.8
HS 7	2.13	1.98	1575	4.6	7.1
HS 8	2.44	2.13	2354	6.3	10
HS 10	3.05	2.74	4327	13.2	20
HS 12	3.66	3.35	7164	23.8	35.2

Depth = Depth from outlet invert to inside bottom of tank

Generic HS 8 CAD Drawing



TSS Buildup And Washoff

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

File Product Units CAD Video Help

General | Dimensions | Rainfall | Site | TSS PSD | TSS Loading | Quantity Storage | By-Pass | Custom | CAD | Video | Other

TSS Buildup

Power Linear
 Exponential
 Michaelis-Menton

TSS Washoff

Power-Exponential
 Rating Curve (no upper limit)
 Rating Curve (limited to buildup)

Street Sweeping

Efficiency (%)
 Start Month
 Stop Month
 Frequency (days)
 Available Fraction

Soil Erosion

Add Erosion to TSS

Reset to Default Values

TSS Buildup Parameters

Limit (kg/ha)
 Coeff (kg/ha)
 Exponent

TSS Washoff Parameters

Coefficient
 Exponent

TSS Buildup

Based on Area
 Based on Curb Length

Upstream Quantity Storage

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

File Product Units CAD Video Help

General | Dimensions | Rainfall | Site | TSS PSD | TSS Loading | Quantity Storage | By-Pass | Custom | CAD | Video | Other

Quantity Control Storage

	Storage (m3)	Discharge (m3/s)
▶	0	0
*		

Notes:

1. To change data just click a cell and type in the new value (s)
2. To add a row just go to the bottom of the table and start typing.
3. To delete a row, select the row by clicking on the first pointer column, then press delete
4. To sort the table click on one of the column headings

Clear

Other Parameters

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

File Product Units CAD Video Help

General Dimensions Rainfall Site TSS PSD TSS Loading Quantity Storage By-Pass Custom CAD Video Other

Scaling Law

- Peclet Scaling based on diameter x depth
- Peclet Scaling based on surface area (diameter x diameter)

TSS Removal Extrapolation

- Extrapolate TSS Removal for flows lower than tested
- No TSS Removal extrapolation for flows lower than tested
- No TSS Removal extrapolation for lower flows or inter-event periods

Lab Testing

- Use NJDEP Lab Testing Results
- Use ETV Canada Lab Testing Results

Oil / Sediment Storage

- Oil Spill Storage in Pretreatment Area
- Sediment Storage in Pretreatment Area
- 50% Oil Spill / 50% Sediment Storage in Pretreatment Area

TSS Removal Results

- Required TSS Removal
- Choose Model #

TSS Removal Required

TSS Removal (%) Enter required TSS Removal (%)

Flagged Issues

None

Hydroworks Sizing Program - Version 5.7

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1-800-290-7900

www.hydroworks.com

AM Proj # 21-7026
 Project Title: Commercial Development
 Project Location: 535 Bayfield St, Barrie, Ontario

Sediment Trap Sizing

Drainage Area **1.34** (ha)
 Storage Volume **125.0** (m³/ha)

Required Storage	168.0
------------------	--------------

Trap Dimensions

Top Length **20.0** m
 Top Width **12.0** m
 A1 **240.0**
 Depth **2.0** m
 Bottom Length **1.0**
 Bottom Width **10.0**
 A2 **10.0**

Provided Volume 177.2 m³

Design Outcome **OKAY**

VERIFICATION STATEMENT

GLOBE Performance Solutions

Verifies the performance of

Hydroworks® HydroStorm (HS) Hydrodynamic Separator

Developed by Hydroworks, LLC
Clark, NJ, USA

In accordance with

ISO 14034:2016

Environmental management — Environmental technology verification (ETV)



John D. Wiebe, PhD
Executive Chairman
GLOBE Performance Solutions

May 15, 2018
Vancouver, BC, Canada



Verification Body
GLOBE Performance Solutions
404 – 999 Canada Place | Vancouver, B.C | Canada |V6C 3E2

Technology description and application

The Hydroworks® HydroStorm (HS) Hydrodynamic Separator is a concrete cylindrical device with an annular pre-treatment channel, an inner chamber, and lower collection sump. A schematic of the HS 4 test unit is shown in Figure 1. The pre-treatment channel extends below the outlet pipe invert and contains three intermediate low-flow weirs (flush with the outlet invert), and two downstream higher bypass weirs that extend above the outlet invert. The higher weirs bypass high flows to prevent oil and solids from being scoured out of the separator.

As water enters the unit through one or more inlets, coarser solids immediately start to settle below a horizontal grate extending from the inlet to two sets of lower weirs near the outlet pipe. The grating is positioned over the pre-treatment channel to help displace the inflow turbulence and protect the captured sediment from scour. Openings are located on the horizontal plate upstream of each weir to allow the flow to be conveyed into the inner chamber and lower sump. The weirs are positioned to create a counter clockwise rotation of water in the inner chamber to minimize turbulence and maximize settling. After water spirals down the inner chamber to the main settling chamber towards the floor of the separator where it deposits suspended sediments, it flows upwards between the wall of the unit and the outer edge of the disk extended from the inner chamber and through an arced opening at the bottom of the pre-treatment disk, downstream of the bypass weirs, where it is conveyed into the outlet pipe. An annular secondary horizontal plate with 32% of open-perforations is located within the lower sump to protect the collected sediment from scour. Oil and light liquids enter the inner chamber through the holes, reaching the bottom of the pre-treatment area and rises to the top of the water level where they are trapped.

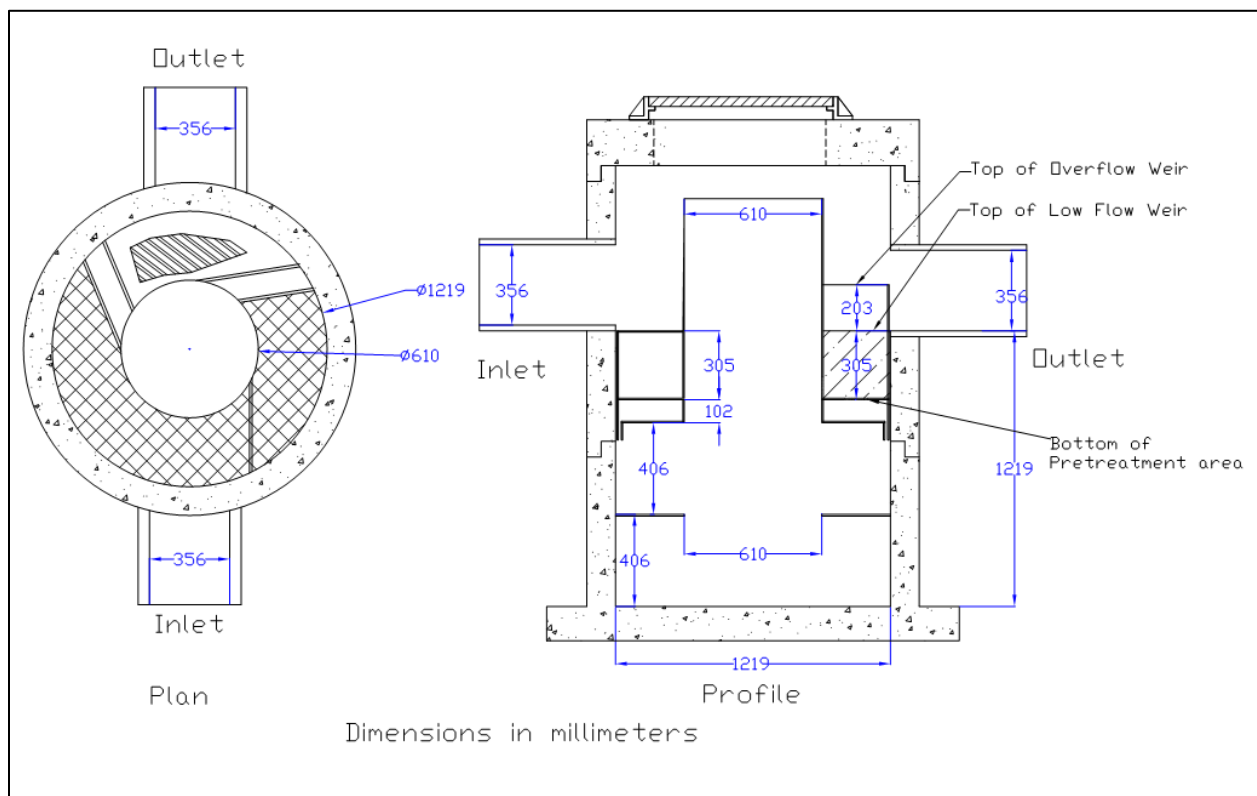


Figure 1: Schematic of the Hydroworks® HS4 Hydrodynamic Separator treatment unit tested as part of this verification.

Performance conditions

The data and results published in this Technology Fact Sheet were obtained from the testing program conducted on the Hydroworks® HS4 Hydrodynamic Separator, in accordance with the *Procedure for Laboratory Testing of Oil-Grit Separators (Version 3.0, June 2014)*. The Procedure was prepared by the Toronto and Region Conservation Authority (TRCA) for the Canadian Environmental Technology Verification Program. A copy of the Procedure may be accessed on the Canadian ETV website at www.etvcanada.ca.

Performance claim(s)

Capture test¹:

During the capture test, the Hydroworks® HS Hydrodynamic Separator, with a false floor set to 50% of the manufacturer's recommended maximum sediment storage depth and a constant influent test sediment concentration of 200 mg/L, removes 69, 64, 60, 56, 46, 41, and 36 percent of influent sediment by mass at surface loading rates of 40, 80, 200, 400, 600, 1000, and 1400 L/min/m², respectively.

Scour test¹:

During the scour test, the Hydroworks® HS Hydrodynamic Separator, with 10.2 cm (4 inches) of test sediment pre-loaded onto a false floor reaching 50% of the manufacturer's recommended maximum sediment sump storage depth and sediment loaded onto the pre-treatment channel emulating depositional pattern of the 40 L/min/m² capture test, generate corrected effluent concentrations of 22.4, 28.5, 20.0, 19.1, and 24.4 mg/L at 5-minute duration surface loading rates of 200, 800, 1400, 2000, and 2600 L/min/m², respectively.

Light liquid re-entrainment test¹:

During the light liquid re-entrainment test, the Hydroworks® HS Hydrodynamic Separator with surrogate low-density polyethylene beads preloaded within the inner chamber, representing a floating light liquid volume equal to a depth of 50.8 mm over the sedimentation area, retains 100, 99.9, 95.4, 95.7, and 97.5 percent of loaded beads by mass during the 5-minute duration surface loading rates of 200, 800, 1400, 2000, and 2600 L/min/m², respectively.

Performance results

The test sediment consisted of ground silica (1 – 1000 micron) with a specific gravity of 2.65, uniformly mixed to meet the particle size distribution specified in the testing procedure. The *Procedure for Laboratory Testing of Oil Grit Separators* requires that the three sample average of the test sediment particle size distribution (PSD) meet the specified PSD percent less than values within a boundary threshold of 6%. The comparison of the average test sediment PSD to the CETV specified PSD in Figure 2 indicates that the test sediment used for the capture and scour tests met this condition.

¹ The claim can be applied to other units smaller or larger than the tested unit as long as the untested units meet the scaling rule specified in the Procedure for Laboratory of Testing of Oil Grit Separators (Version 3.0, June 2014)

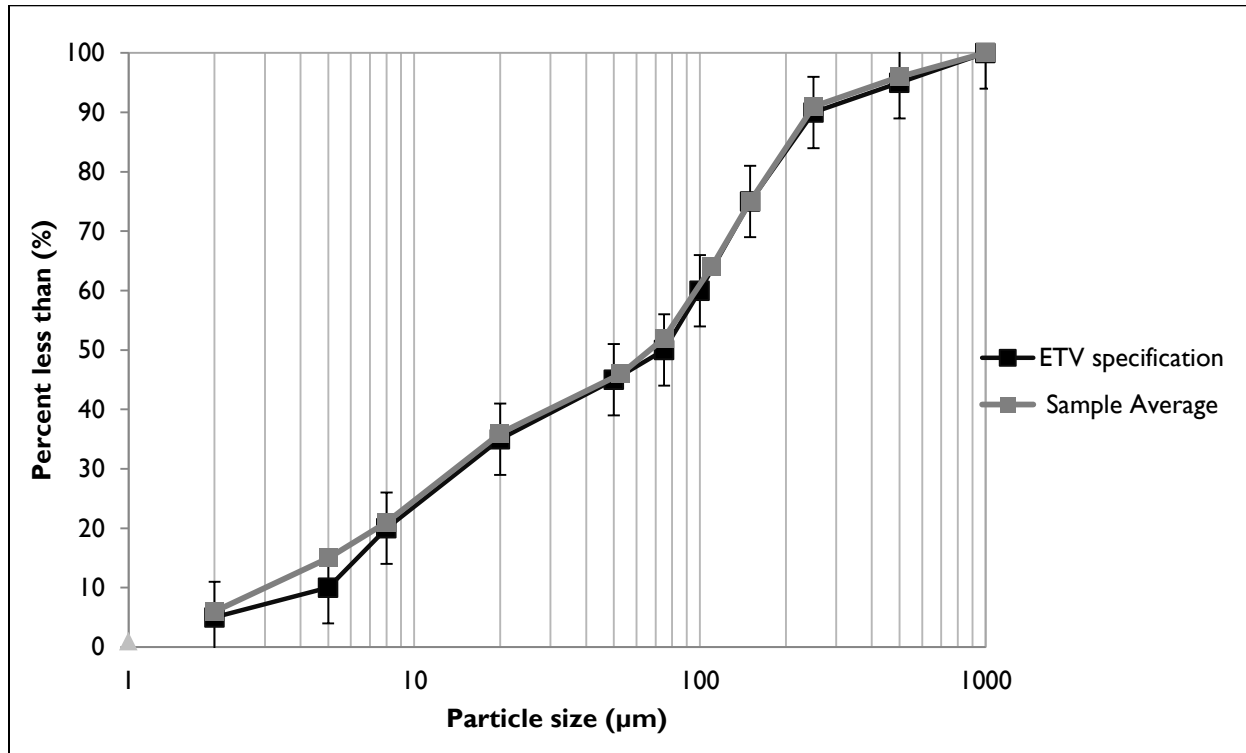


Figure 2. The three sample average particle size distribution (PSD) of the test sediment used for the capture and scour test compared to the specified PSD.

The capacity of the device to retain sediment was determined at seven surface loading rates using the modified mass balance method. This method involved measuring the mass and particle size distribution of the injected and retained sediment for each test run. Performance was evaluated with a false floor at 0.15 m from the bottom, simulating the technology filled to 50% of the manufacturer’s recommended maximum sediment storage depth. The test was carried out with clean water that maintained a sediment concentration below 20 mg/L. Based on these conditions, removal efficiencies for individual particle size classes and for the test sediment as a whole were determined for each of the tested surface loading rates (Table 1).

In some instances, the removal efficiencies were above 100% for certain particle size fractions. These discrepancies are not unique to any one test laboratory and may be attributed to errors relating to the blending of sediment, collection of representative samples for laboratory submission, and laboratory analysis of PSD. Due to these errors, caution should be exercised in applying the removal efficiencies by particle size fraction for the purposes of sizing the tested device (see [Bulletin # CETV 2016-11-0001](#)). The results for “all particle sizes by mass balance” (see Table 1 and 2) are based on measurements of the total injected and retained sediment mass, and are therefore not subject to blending, sampling or PSD analysis errors.

Table I. Removal efficiencies (%) of the HS4 unit at specified surface loading rates.

Particle size fraction (µm)	Surface loading rate (L/min/m ²)						
	40	80	200	400	600	1000	1400
>500	73	100*	98	67	100*	100*	26
250 - 500	100	100*	92	64	100*	98	48
150 - 250	100*	75	89	72	89	60	69
105 - 150	94	100*	100*	100*	78	99	91
75 - 105	96	76	79	95	68	54	46
53 - 75	87	100*	100*	100*	56	69	65
20 - 53	71	54	46	44	19	14	10
8 - 20	38	23	15	8	2	2	2
5 - 8	13	6	1	1	0	0	0
<5	8	0	0	0	0	0	0
All particle sizes by mass balance	68.6	64.0	60.0	56.1	46.1	41.2	35.7

*Removal efficiencies were calculated to be above 100%. Calculated values ranged between 103 and 194% (average 128%). See text and [Bulletin # CETV 2016-11-0001](#) for more information.

Figure 3 compares the particle size distribution (PSD) of the three sample average of the test sediment to the PSD of the sediment retained by the HS4 unit at each of the tested surface loading rates. As expected, the capture efficiency for fine particles in the unit was generally found to decrease as surface loading rates increased.

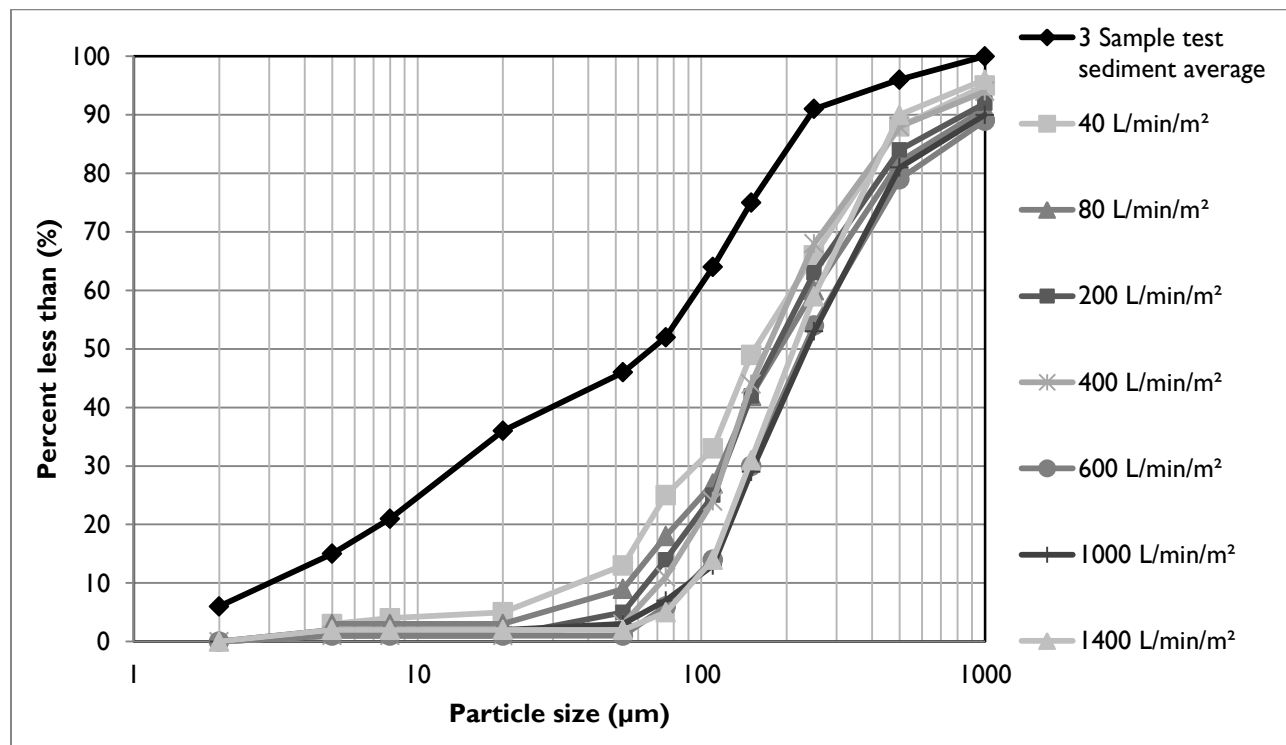


Figure 3. Particle size distribution of sediment retained in the HS4 unit in relation to the injected test sediment average.

For the sediment scour and re-suspension test, two tests were conducted. The first test was conducted with the secondary plate used in the capture tests. The second used a perforated secondary plate. Since sediment during the capture tests was found to settle in the pre-treatment channel, and in roughly the same quantities on the secondary plate and collection sump, all three of these surfaces were preloaded with sediment during the first test. The pre-treatment channel only captures coarse sediment. Therefore, this area was pre-loaded with sediment having a PSD similar to the PSD of the sediment that settled in this area during the 40 L/min/m² SLR sediment capture test. The pre-loaded sediment in the pre-treatment channel was shaped and leveled to correspond with sedimentation patterns and depths observed by the laboratory technician during the 40 L/min/m² SLR capture test. It should be noted that the actual sediment preloaded in this area was finer than the PSD of sediment captured in the same area during the 40 L/min/m² SLR capture test, particularly for particle sizes less than the median size. Both the sump and secondary plate were pre-loaded with the 1-1000 µm sediment mix to a depth of 10.2 cm. The preloaded sediment in the lower sump was placed on a false floor to mimic a device filled to 50% of the manufacturer's maximum recommended sediment storage depth.

After pre-loading the sediment, clean water was run through the device at five SLRs over a 25 minute period. At each SLR, five effluent samples were collected over a four minute interval (one per minute) with the first sample collected at the beginning of each flow rate, and the last collected just prior to the one minute transition to the next flow rate or end of the test. Effluent samples were analyzed for Suspended Sediment Concentration (SSC) and PSD by methods prescribed in the *Procedure*. The effluent samples were subsequently adjusted based on the background concentration of the influent water and the smallest 5% of particles captured during the 40 L/min/m² sediment capture test (7 µm), as per the method described in [Bulletin # CETV 2016-09-0001](#).

Measurements of sediment depths in the sump after the first test showed that most of the sediment from the secondary plate was carried into the lower sump. During this process, the fine sediment was likely re-suspended and carried out of the unit with the flow. The average adjusted effluent suspended sediment concentrations for each SLR ranged from 11.3 mg/L at the 200 L/min/m² SLR to 196.7 mg/L at the 1400 L/min/m² SLR. Effluent SSCs declined after the 1400 L/min/m² SLR because the unit begins to bypass flow at this rate. It should be noted that this was a very conservative test as sediment was preloaded in three areas, rather than in the lower sump alone, and the preloaded sediment on the pre-treatment channel and secondary plate had a finer PSD than the sediment found to settle in these areas during the lowest SLR capture test.

The second sediment scour test was conducted on an identical unit but with a 32% open-area perforated secondary plate of the same size and orientation as the solid plate used in the first test. The perforated plate was intended to allow most of the sediment to settle in the lower sump, while still protecting against sediment scour, and not affecting the capacity of the unit to capture sediment. A second capture test was run at the 600 L/min/m² SLR to confirm that the perforated plate would have the same flow characteristics and removal efficiencies as the solid plate. Results of this comparison presented in Table 2 show that removal efficiencies were not affected and that the collection sump was receiving the majority of sediment transported into the lower chamber. Based on the observed sediment deposition zones, the second repeat test with the perforated plate had sediment preloaded in the pre-treatment channel and the lower collection sump only (i.e. the major deposition zones). The collection sump was preloaded with 10.2 cm of the 1- 1000 µm test sediment mix, as in the first test, and the pre-treatment channel was preloaded in much the same way as the first test, but with a sediment PSD that more closely mimicked the PSD of sediment observed to settle in this area during the 40 L/min/m² sediment capture test.

Table 2: Injected mass captured at the 600 L/min/m² SLR for two different configurations of the secondary plate

Secondary Plate type	Target Surface Loading Rate (L/min/m ²)	Tested Flow Rate (L/min)	Removal Efficiency (%)	Pre-treatment Channel (%)	Secondary Plate (%)	Outlet Dispersion Plate (%)	Collection Sump (%)
Solid Plate	600	736.2	46.1	24.7	8.5	3.1	9.9
Perforated Plate	600	740.9	45.9	25.8	2.7	3.0	14.5

Results of the second test are presented in Table 3. Background concentrations were maintained below 10.5 mg/L. The average adjusted effluent suspended sediment concentrations ranged from 19.1 to 28.5 mg/L. Since the commercially available unit will have a perforated secondary plate, these concentrations are the appropriate values to consider for approvals. The verifier acknowledges that the sediment capture removal efficiencies were not all tested with the perforated plate (see variance notes below), but that the repeat test results at the 600 L/min/m² SLR and a statement from the independent test laboratory were sufficient to provide reasonable confidence that the added perforations in the secondary plate would have negligible influence on sediment removal efficiencies.

Table 3. Scour test adjusted effluent sediment concentrations

Run	Surface loading rate (L/min/m ²)	Run time (min)	Background sample concentration (mg/L) ^a	Average adjusted effluent suspended sediment concentration (mg/L) ^b
1	200	5	3.6	22.4
2	800	5	8.9	28.5
3	1400	5	7.6	20.0
4	2000	5	10.4	19.1
5	2600	5	6.0	24.4

^a Background concentrations shown here are approximate values based on graphical interpolation

^b The adjusted effluent suspended sediment concentration represents the actual measured effluent concentration minus the background concentration. For more information see [Bulletin # CETV 2016-09-0001](#). Adjusted concentrations were only calculated for the average of the five samples collected per surface loading rate.

The results of the light liquid re-entrainment test used to evaluate the unit’s capacity to prevent re-entrainment of light liquids are reported in Table 4. The test involved preloading 58.3 L (corresponding to a 5 cm depth over the collection sump area of 1.17m²) of surrogate low-density polyethylene beads (Dow Chemical Dowlex™ 2517) within the inner chamber and running clean water through the device continuously at five surface loading rates (200, 800, 1400, 2000, and 2600 L/min/m²). Each flow rate was maintained for 5 minutes with approximately 1 minute transition time between flow rates (30 minutes total). The effluent flow was screened to capture all re-entrained pellets throughout the test. Results showed maximum re-entrainment of 4.6% at 1400 L/min/m², which is the highest SLR without bypass. Re-entrainment decreased at subsequent SLRs as bypass volumes increased.

Table 4. Light liquid re-entrainment test results for the HS4

Surface Loading Rate (L/min/m ²)	Time Stamp (min)	Amount of Beads Re-entrained			
		Mass (g)	Volume (L)	% of Pre-loaded Mass Re-entrained	% of Pre-loaded Mass Retained
200	1:00 – 6:00	0	0	0.00	100
800	7:00 – 12:00	49	0.1	0.1	99.9
1400	13:00 – 18:00	1523	2.7	4.6	95.4
2000	19:00 – 24:00	1445	2.5	4.3	95.7
2600	25:00 – 30:00	847	1.5	2.5	97.5
Interim Collection Net		39	0.1	0.1	99.9
Total Re-entrained		3902	6.8	11.7	--
Total Retained		29,497	51.5	--	88.3
Total Loaded		33,399	58.3	--	--

Variations from testing Procedure

The following deviations from the *Procedure for Laboratory Testing of Oil-Grit Separators* (Version 3.0, June 2014) have been noted:

1. The Procedure stipulates that the tested device “must be a full scale, commercially available device with the same configuration and components that would be typical for an actual installation.” As noted above, the sediment capture tests were conducted with a solid secondary plate. The solid secondary plate was later modified to a 32% open area perforated plate to reduce sediment settling on the plate, while continuing to provide scour prevention. As described above, the scour test was repeated with the perforated secondary plate, but the sediment capture test was only repeated at the 600 L/min/m² SLR (i.e. one of seven tested SLRs). Removal efficiency results for the repeat test showed very close correspondence with the earlier test using the solid plate and much of the sediment that previously settled on the secondary plate was deposited in the lower collection sump (see Table 2). The independent laboratory provided the following statement regarding the potential for the added perforations to affect sediment removal efficiencies: “Taking into account the close proximity of the plate to the collection sump, as well as our knowledge of sediment transport, it is expected that the deposited sediment would have settled in the lower sump, with no impact on removal efficiency, if the plate was removed.” While the verifier acknowledges that stronger evidence would have been provided by additional repeat testing at a lower and higher SLR, the close correlation between the original and repeat test, combined with the statement from the lab were sufficient to provide reasonable confidence that adding the perforations would not likely have changed the capture test results significantly.
2. The repeat test at the 600 L/min/m² SLR had background concentrations exceeding the 20 mg/L threshold during the last half of the test. The exceedances occurred in 4 of the 8 samples collected, reaching a maximum of 28.4 mg/L. The experimental apparatus is a closed loop system. Therefore, the sediment in the background samples consists of fine particles not captured by the device, and would therefore not likely bias the mass balance results.

3. It was necessary to change flow meters during the sediment scour and light liquid re-entrainment test, as the required flows exceeded the minimum and/or maximum range of any single meter. When the flow capacity of the selected meter was reached, the flow was shut down over a period of approximately 10 seconds and all flow data saved. The next data acquisition file was executed and flow increased at a rate that corresponded to reaching each previous target flow after a period of 1-minute. This procedure was approved by CETV prior to testing, in recognition that most particles susceptible to scour at low flows would not be in the sump at higher flows. Similarly, re-entrainment of the oil beads was not expected to be significantly affected by the flow meter change.
4. As part of the capture test, evaluation of the 40 and 80 L/min/m² surface loading rate was split into 3 and 2 parts, respectively, due to the long duration needed to feed the required minimum of 11.3 kg of test sediment into the unit. At the end of the first and second parts of the test, the flow rates were gradually shutdown to prevent capture of particles that would have been washed out under normal circumstances. The amended procedure was reviewed and approved by the verifier prior to testing.

Verification

The verification was completed by the Verification Expert, Toronto and Region Conservation Authority, contracted by GLOBE Performance Solutions, using the International Standard **ISO 14034:2016 Environmental management – Environmental technology verification (ETV)**. Data and information provided by Hydroworks, LLC to support the performance claim included the following: Performance test report prepared by Alden Research Laboratory, Inc., and dated February 2018. This report is based on testing completed in accordance with the *Procedure for Laboratory Testing of Oil-Grit Separators* (Version 3.0, June 2014).

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

ISO 14034:2016 specifies principles, procedures and requirements for environmental technology verification (ETV), and was developed and published by the *International Organization for Standardization (ISO)*. The objective of ETV is to provide credible, reliable and independent verification of the performance of environmental technologies. An environmental technology is a technology that either results in an environmental added value or measures parameters that indicate an environmental impact. Such technologies have an increasingly important role in addressing environmental challenges and achieving sustainable development.

**For more information on the Hydroworks®
HS Hydrodynamic Separator please contact:**

Hydroworks, LLC
136 Central Ave., 2nd FL
Clark, NJ
07066 USA
Tel: 888-290-7900
Email: info@hydroworks.com
www.hydroworks.com

**For more information on ISO 14034:2016 / ETV
please contact:**

GLOBE Performance Solutions
404 – 999 Canada Place
Vancouver, BC
V6C 3E2 Canada
Tel: 604-695-5018 / Toll Free: 1-855-695-5018
etv@globepformance.com
www.globepformance.com

Limitation of verification

GLOBE Performance Solutions and the Verification Expert provide the verification services solely on the basis of the information supplied by the applicant or vendor and assume no liability thereafter. The responsibility for the information supplied remains solely with the applicant or vendor and the liability for the purchase, installation, and operation (whether consequential or otherwise) is not transferred to any other party as a result of the verification.

REV 1



celebrating
50 years

Object address:

535 Bayfield Street
Barrie
Canada

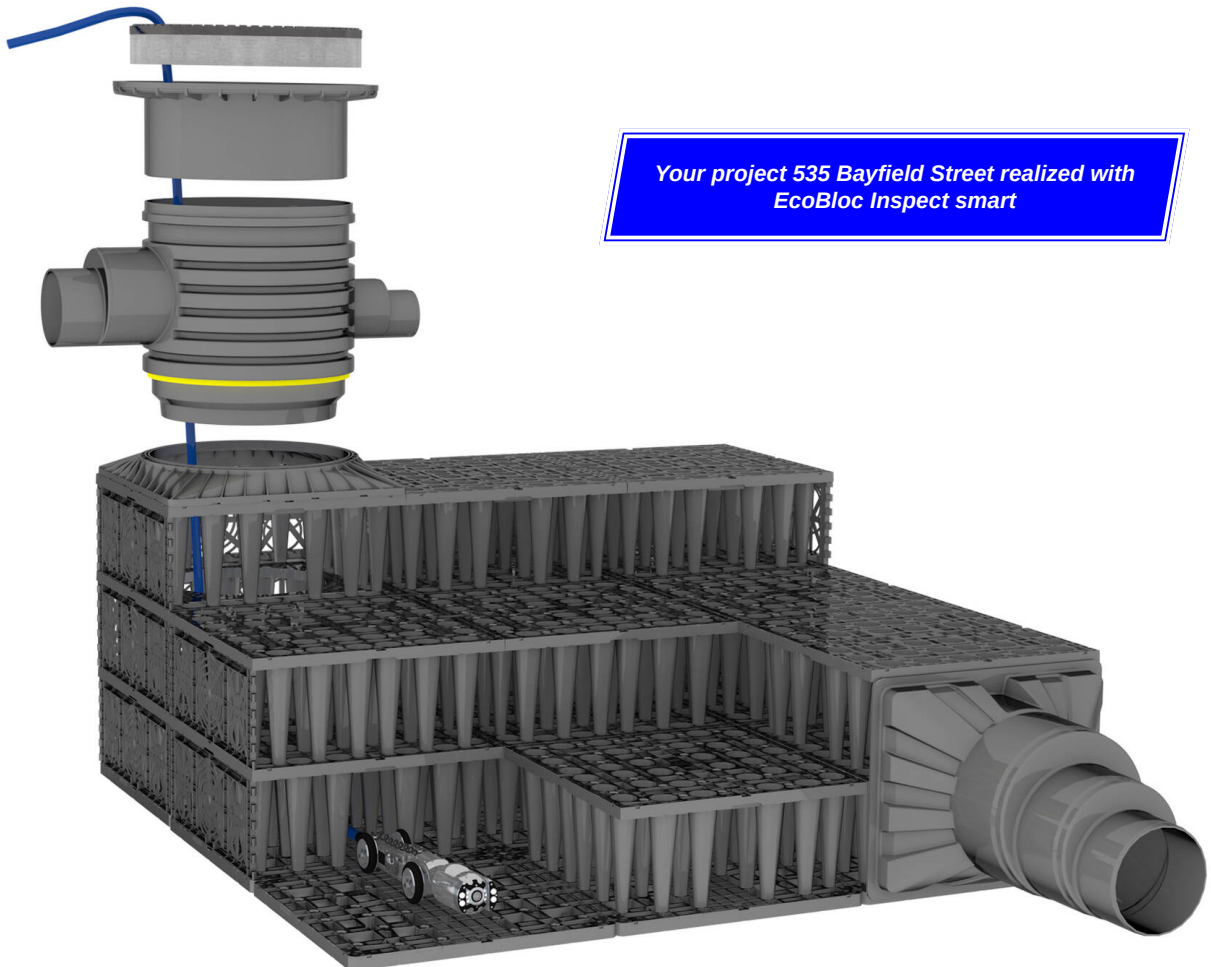
Provided:

BARR Plastics Inc.
31192 S Fraser Way A
BC V2T 6L5 Abbotsford
Canada

E-Mail: robin.gill@barrplastics.com

Data

<p>Application Attenuation</p> <p>Loading 40 t / HS-20</p> <p>Installation parameters Earth covering: 0.50 - 2.25 m</p> <p>Outflow TBC</p>	<p>Product selection EcoBloc Inspect smart</p> <p>Tank sizes Width: <i>Irregular Shape - See Attached</i> Length: <i>Irregular Shape - See Attached</i> Height: 0,70 m Area: 1036.80 m² Layers: 2</p> <p>Tank volume Gross: 722,52 m³ Net: 691,74 m³</p>	<p>Inspection and cleaning QTY 5 SMART SHAFTS - SEE ATTACHED DETAIL ON HOW TO INSTALL</p> <p>Inlet DN 600 / 24" : 1 DN 250 / 10" : 1</p> <p>Outlet DN 375 / 18" : 1</p>
----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------



Your project 535 Bayfield Street realized with EcoBloc Inspect smart

Please note that this is an automatically generated document. The information contained, such as product descriptions, sample calculations and project sketches, are for information purposes only and are not binding. The document is not part of a contract or an intended contract with the customer. In particular, the customer is responsible for having technical recommendations checked by specialists (e.g. engineers / architects) for the specific application. Our general terms of delivery and payment apply to all of our deliveries and services. Further information can be found in the general terms and conditions, which can be found at www.graf-water.com.

Bestätigung



Confirmation · Conformité · Conformidad

Hereby GRAF Company confirms that the GRAF EcoBloc Inspect smart can be used to construct an underground infiltration structure. This confirmation is subject to the relevant and national authorities of the country of installation.

Due to its chemical passivity and its high consistency regarding environmental influences, the material is especially suitable as storage for rainwater attenuation and infiltration.

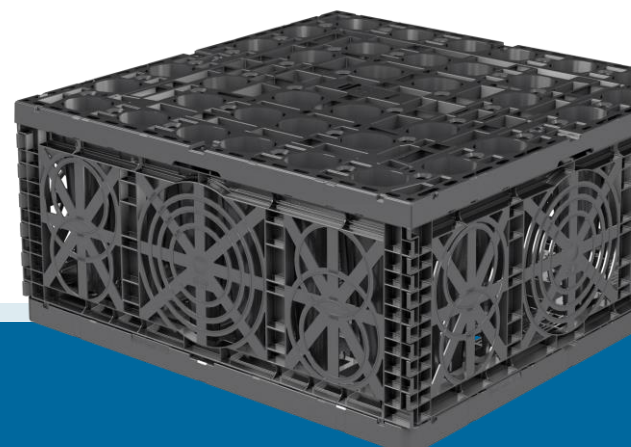
The installation window of the EcoBloc Inspect smart applies as follows:

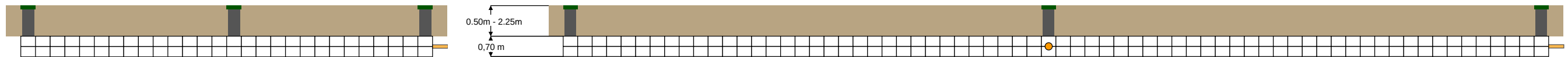
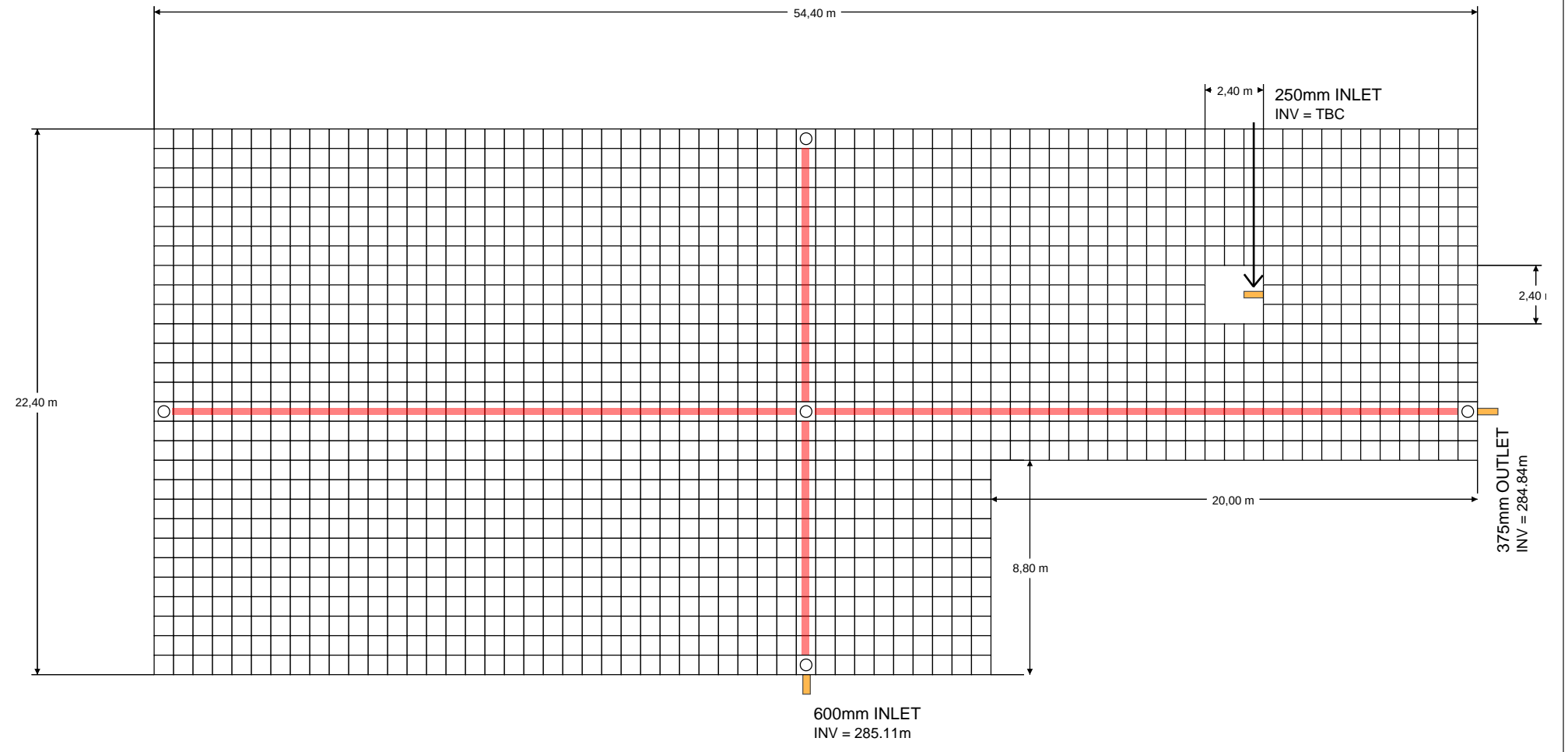
Class	HS-20 (AASHTO)	HS-25 (AASHTO)
min. earth covering	1' 7.7" (500 mm)	2' 7.5" (800 mm)
max. earth covering	7' 4.5" (2250 mm)	6' 6.7" (2000 mm)
max. installation depth	16' 4.8" (5000 mm)	16' 4.8" (5000 mm)

GRAF Infiltration modules are used in hundred-thousands of installations for the last 15 years without any complaints worldwide.

Teningen, October 2020

Oliver Eichkorn
Chief Eng. Stormwater management





Please note that this is an automatically generated draft drawing.
The document is not part of a contract or an intended contract with the customer.

The installation conditions must be checked by a local expert before installation!
The respective installation regulations according to our installation instructions must be observed.
No liability can be assumed for unknown geographic conditions and pipelines.

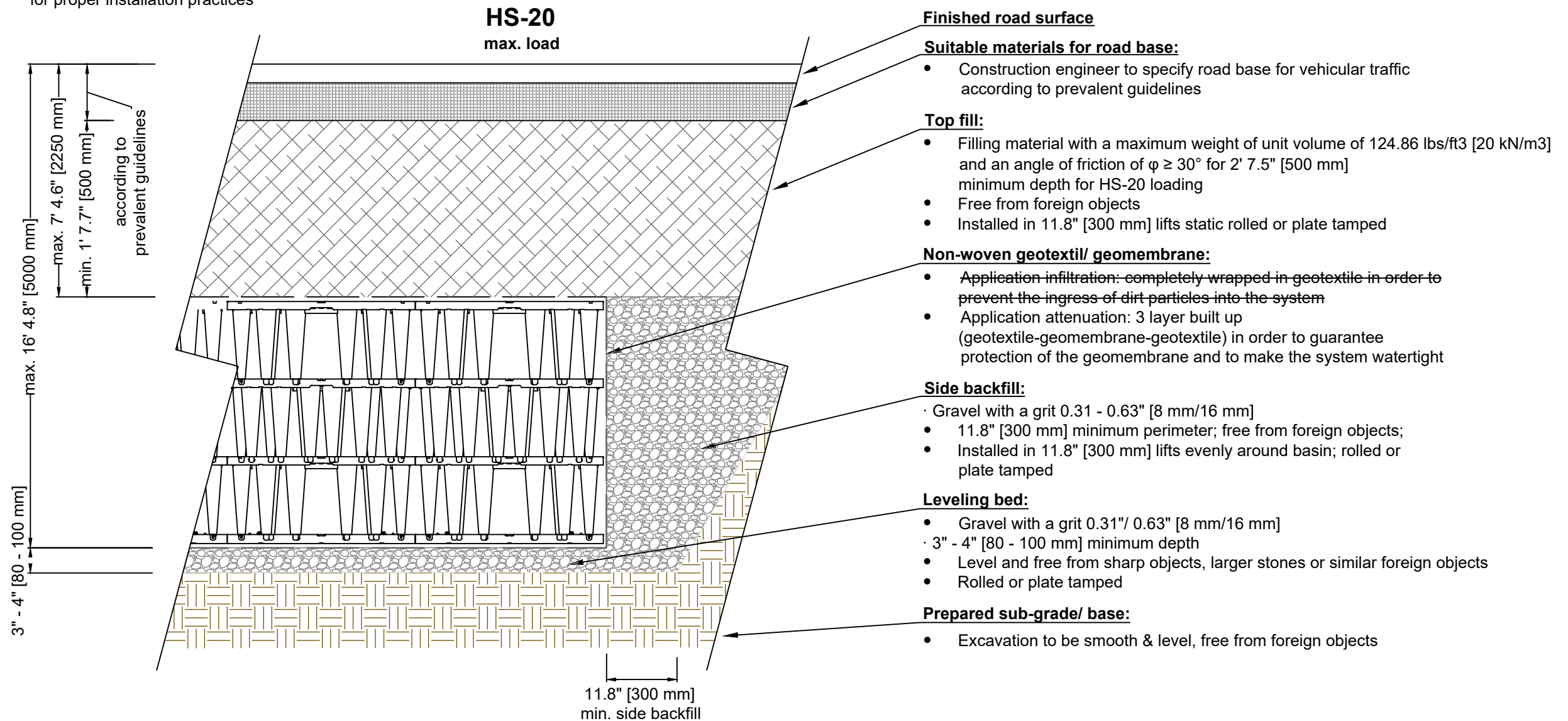
Emergency overflows and vents may be undersized.
Please also check the height of the drawn emergency overflows for any backwater in the supply line.

535 Bayfield Street Proj. No. 3659 - EcoBloc Inspect smart			
-;-;Barrie;CAN		Page 1/1 Seite	
drawn gezeichnet	generated automatically automatisch generiert	Application Anwendung	
Date Datum	2023.02.10	Volume Gross/Brutto Volumen Netto/Net	722.52 m³ 691.74 m³
		Unit Einheit	m
			Otto Graf GmbH Carl-Zeiss-Str. 2-6 DE-79331 Teningen cosma@graf.info www.graf.info

Attenuation (Detention) tank with EcoBloc Inspect smart

Note:

Reference current installation instructions for proper installation practices



Note:

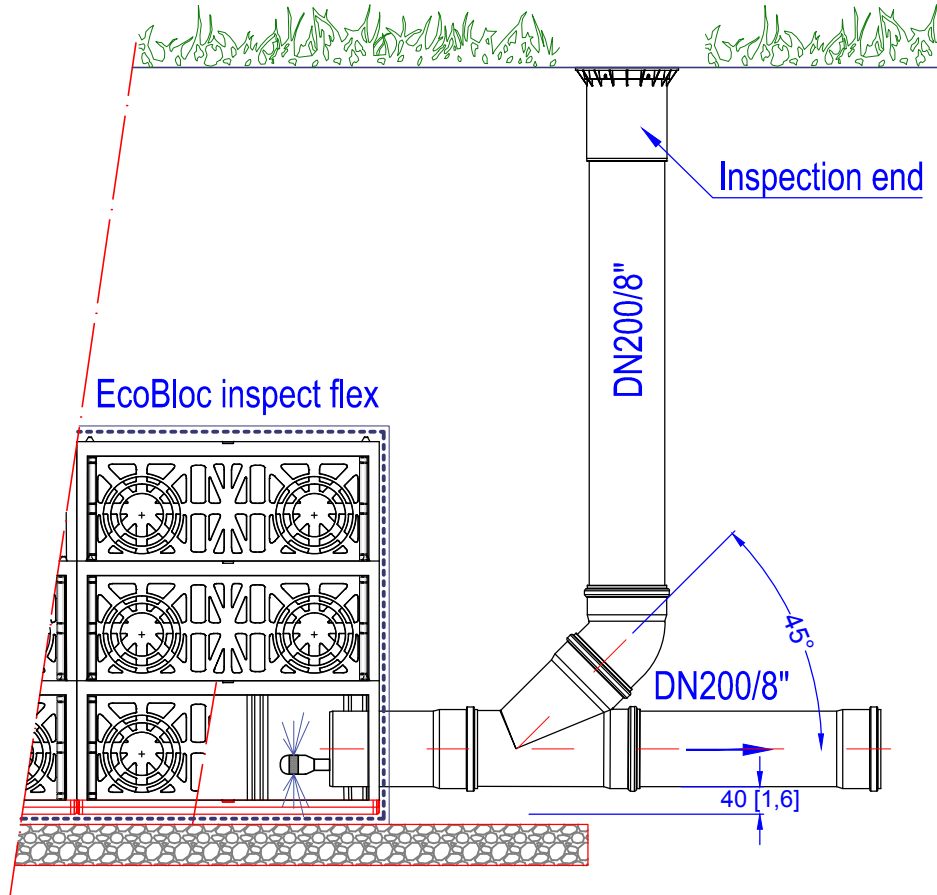
Utilization of compression equipment with activated vibration motor is not permitted.

Note:

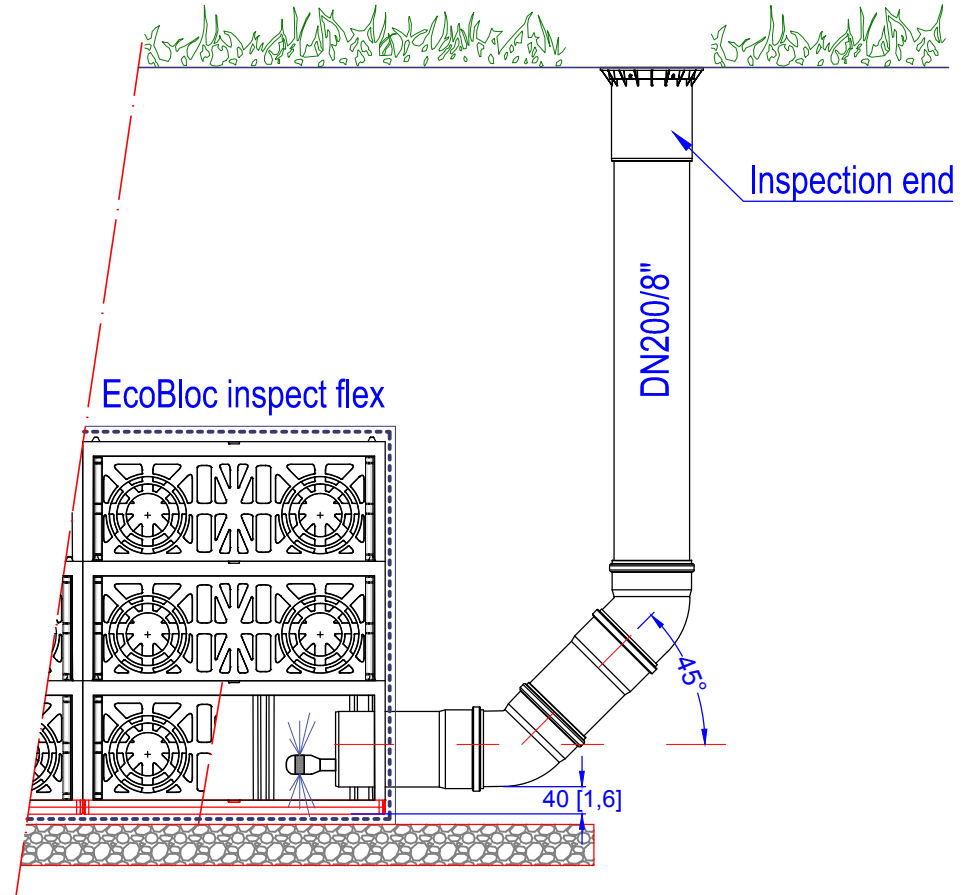
The excavation bed must always be prepared as a horizontal, level pit with load bearing capacity.

INSPECTION/ CLEANOUT ACCESS OPTION - OPTION#2


PLEASE REFER TO CIVIL DWGS FOR PIPE SIZE



variant 1

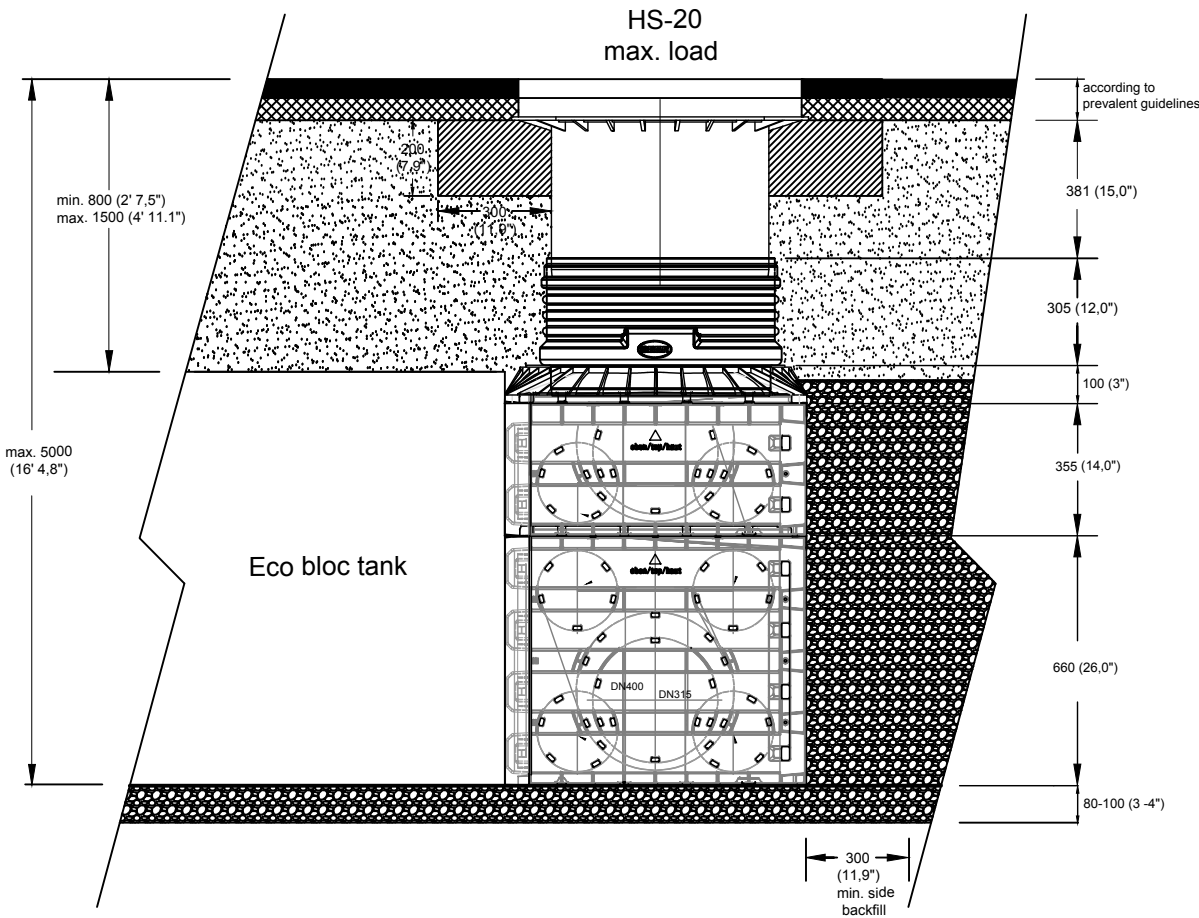


variant 2

D		Inspektionsschacht DN200			Artikel-Nr. product no. article no. artículo no.	
GB		Inspection DN200			Otto Graf GmbH Carl-Zeiss-Str. 2-6 DE-79331 Teningen mail@graf.info www.graf.info	
gezeichnet, drawn	ISC	Gewicht, weight	revision			
Datum, date	2016.06.02	Toleranz, tolerance	Maßstab, scale	Einheiten, units		
		+/- 3%	M 1:20	mm [inch] gal. = US gal.		

VARIO SHAFT + DOME SHAFT INSTALLATION DETAIL

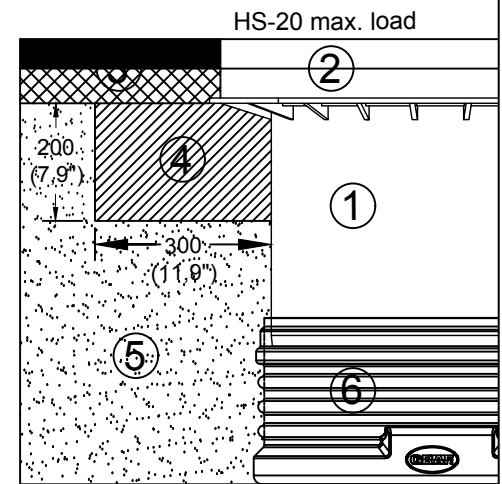
INSPECTION/ CLEANOUT OPTION#1 - VARIO SHAFT ASSY. (RECOMMENDED)



TELE. DOME SHAFT

INSTALL DETAIL

1. Telescopic-dome shaft
2. Shaft cover & compensating ring
3. Road surface
4. Concrete layer
5. Gravel
6. 12" Extension

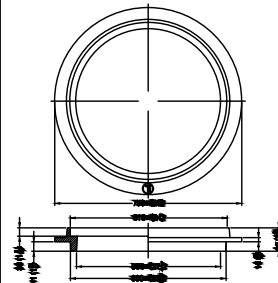


Note:

A concrete pad surrounding the telescoping shaft, supporting the shaft flange is required - 8" thick x a min. 12" wide all around the shaft. To be reviewed and designed by project Engineer.

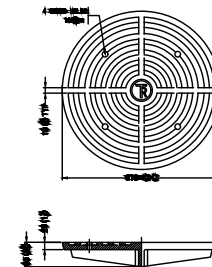
SHAFT COVER & COMPENSATING RING DETAIL

TR26B - FRAME



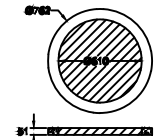
NOTES:
 MAT'L: ASTM A36 CLASS 300B GREY IRON
 FINISH: HOT-DIP GALVANIZED
 LOADS: HIGHWAY LOADS
 FRAME TO BE USED WITH TR26E GRATE AND TR26E COVER
 FOR 400mm SHALE EMB
 CONCRETE CB BARRER
 PRODUCT & DWG SOURCE: WESTVIEW SALES LTD

TR26E - COVER



NOTES:
 MAT'L: ASTM A36 CLASS 300B GREY IRON
 FINISH: HOT-DIP GALVANIZED
 LOADS: HIGHWAY LOADS
 FITS 400mm CONCRETE CB BARRER
 PRODUCT & DWG SOURCE: WESTVIEW SALES LTD

TR26B - CONC. RING



NOTES:
 ALL GRADE RINGS ARE MANUFACTURED TO ASTM C 478 SPECIFICATION.
 ALL GRADE RINGS SHOWN ARE 51 MM THICK RISER RINGS ARE STACKABLE
 MINIMUM CONCRETE STRENGTH: 27.6 MPa
 ALL DIMENSIONS ARE IN MILLIMETERS
 PROD. & DWG SOURCE: LANGLEY CONCRETE

ALL INFORMATION CONTAINED IN THIS DRAWING IS STRICTLY CONFIDENTIAL AND PROPERTY OF BARR PLASTICS INC. NO PART SHALL BE COPIED OR REPRODUCED WITHOUT THE WRITTEN CONSENT OF BARR PLASTICS INC.

Customer Drawing Approval

Customer _____
 Barr Plastic Inc. _____



PROJECT: _____
 CLIENT: _____
 DRAWING REF: _____
 DATE: 16 JAN 2019
 SCALE: M 1:10
 REV: _____

DRAWING TITLE:
 TELESCOPIC-DOME SHAFT
 INSTALLATION
 ALL DIMENSIONS IN MM (IN)

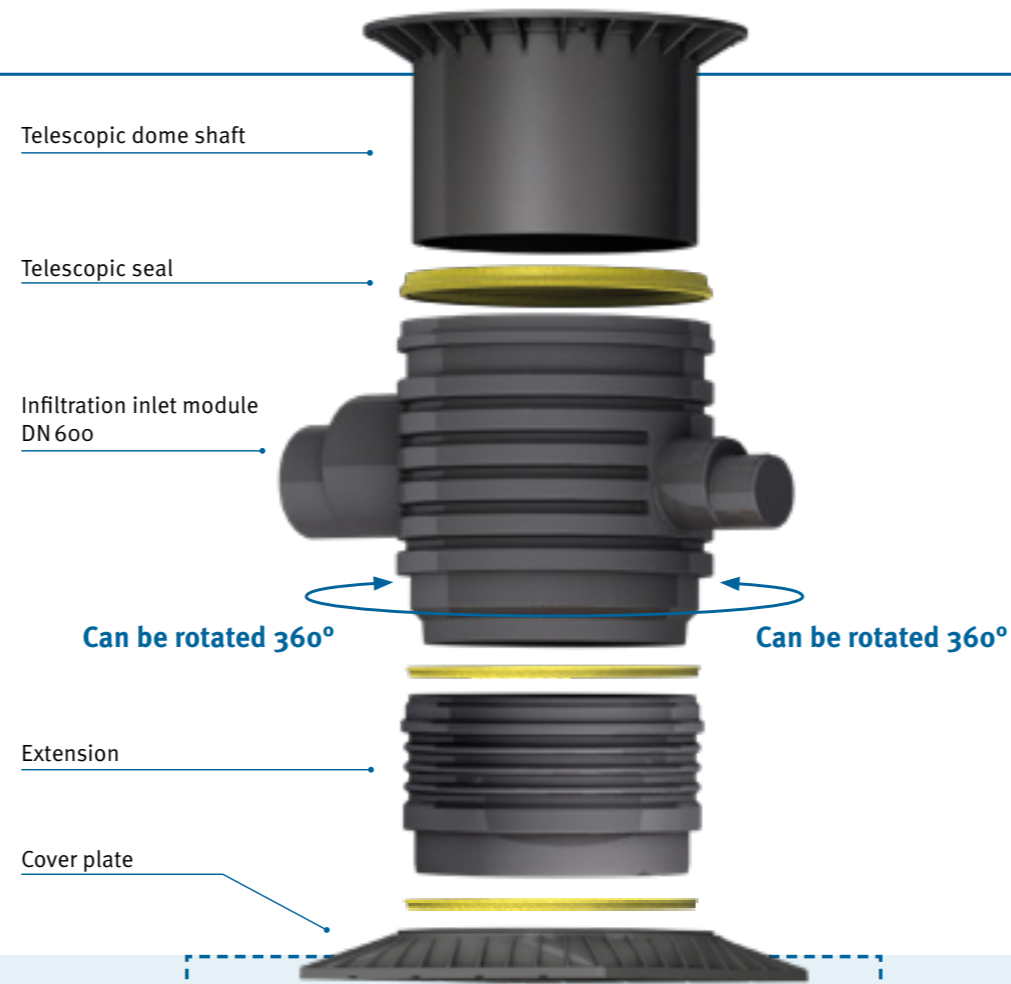
Shaft system

EcoBloc Inspect smart plus shaft and Vario 800 flex shaft



- ✓ Can be positioned in any location
- ✓ No additional excavation
- ✓ Flexible use as filter-, inlet- and inspection shaft
- ✓ Visible service direction on the base plate

SHAFT ACCESSORIES
PAGE 20



	EcoBloc Inspect smart plus shaft	Vario 800 flex shaft
Connection surfaces	up to DN 250 ¹⁾	up to DN 400
Clear width	400 mm	600 mm
Inspection crossways possible		✓
Fully integrated shaft system	✓	✓
Compatibility	smart plus	smart plus ultra
Usable as choke drain shaft		✓

¹⁾ Via inflow module up to DN 300 and with an adapter plate possible up to DN 600

EcoBloc Inspect smart plus shaft cover plate

Universal component that forms the top connection to all EcoBloc Inspect smart plus shafts.



Item	Weight [kg]	Colour	Item no.
EcoBloc Inspect smart shaft cover plate	5	black	450160

EcoBloc Inspect smart plus shaft

The reinforced module for implementing large storage volumes with shallow earth coverings or deep installation depths.



Volume [litres]	Length [mm]	Width [mm]	Height [mm]	Weight [kg]	Colour	Item no.
211	800	800	330	8.5	black	450151

EcoBloc Inspect smart sides

The sides of an EcoBloc Inspect smart system are closed using end plates. Additional DN 100/125/150/200/250 connections.



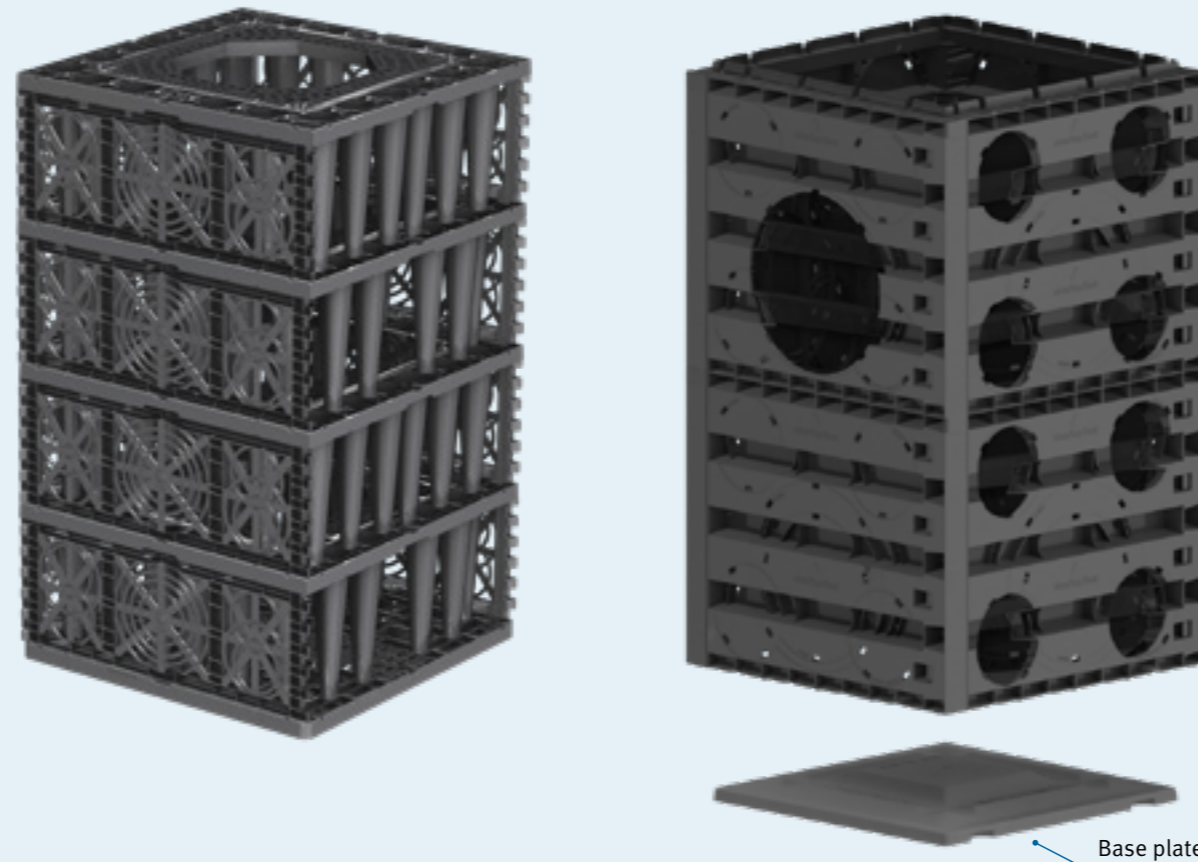
Item	Colour	Item no.
EcoBloc Inspect smart end plates (set of 2)	black	402503

EcoBloc Inspect smart base plate

Base plate for constructing a system using the EcoBloc Inspect smart family.



Volume [litres]	Length [mm]	Width [mm]	Height [mm]	Weight [kg]	Colour	Item no.
24	800	800	40	4	black	402501



Vario 800 flex, type 1

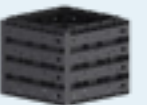
shaft body for one or more layer of EcoBloc system



Volume [litres]	Length [mm]	Width [mm]	Height [mm]	Weight [kg]	Colour	Item no.
230	800	800	355	16	grey	450050

Vario 800 flex, type 2

shaft body for two or more layer of EcoBloc system



Volume [litres]	Length [mm]	Width [mm]	Height [mm]	Weight [kg]	Colour	Item no.
420	800	800	660	27	grey	450051

Vario 800 flex, base/cover plate set

base- and cover plate for Vario 800 flex shaft



Item	Colour	Item no.
Set consisting out of Vario base- and cover plate	grey	450052



FIG#1: INSPECTION/ VENT PORTS



FIG#2: PIPE BOOT TO SEAL LINER AND PIPE STUB



FIG#3: PIPE ADAPTER INSTALLATION



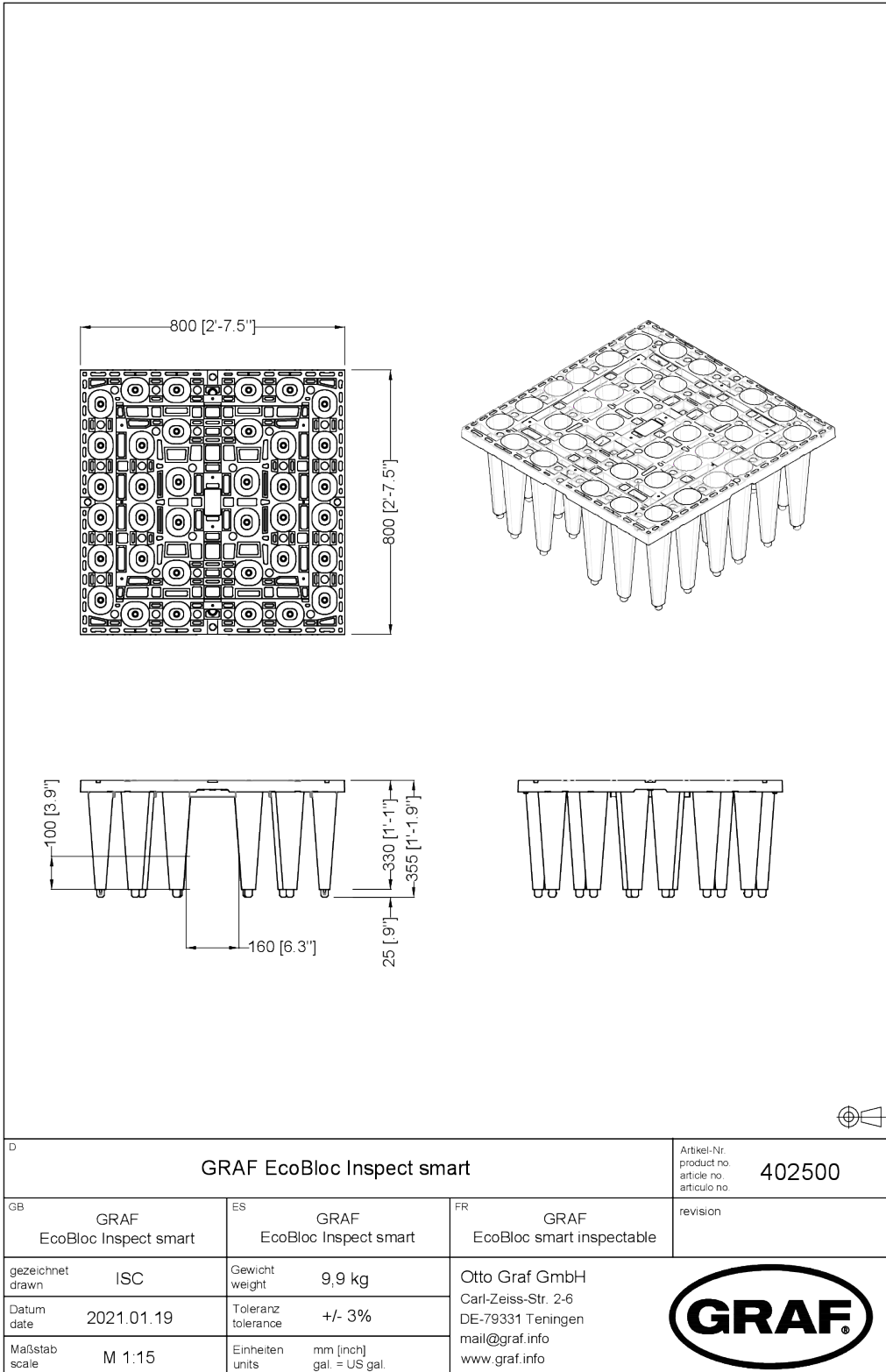
FIG#4: PIPE ADAPTER PLATE



EcoBloc Inspect smart Configurator COSMA

Attachments

Multi-Residential Dev



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EcoBloc Inspect smart Configurator COSMA

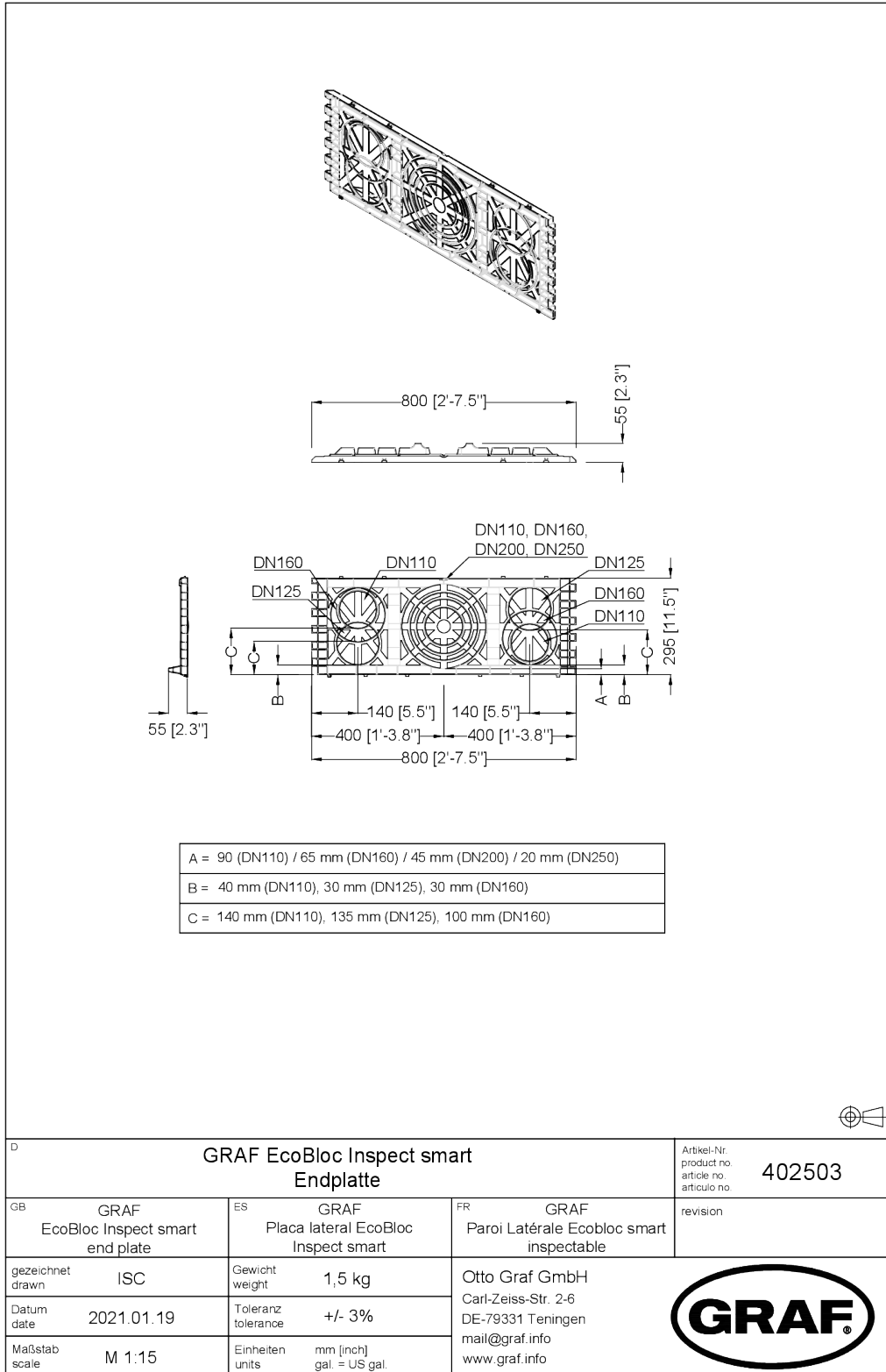
Attachments

Multi-Residential Dev

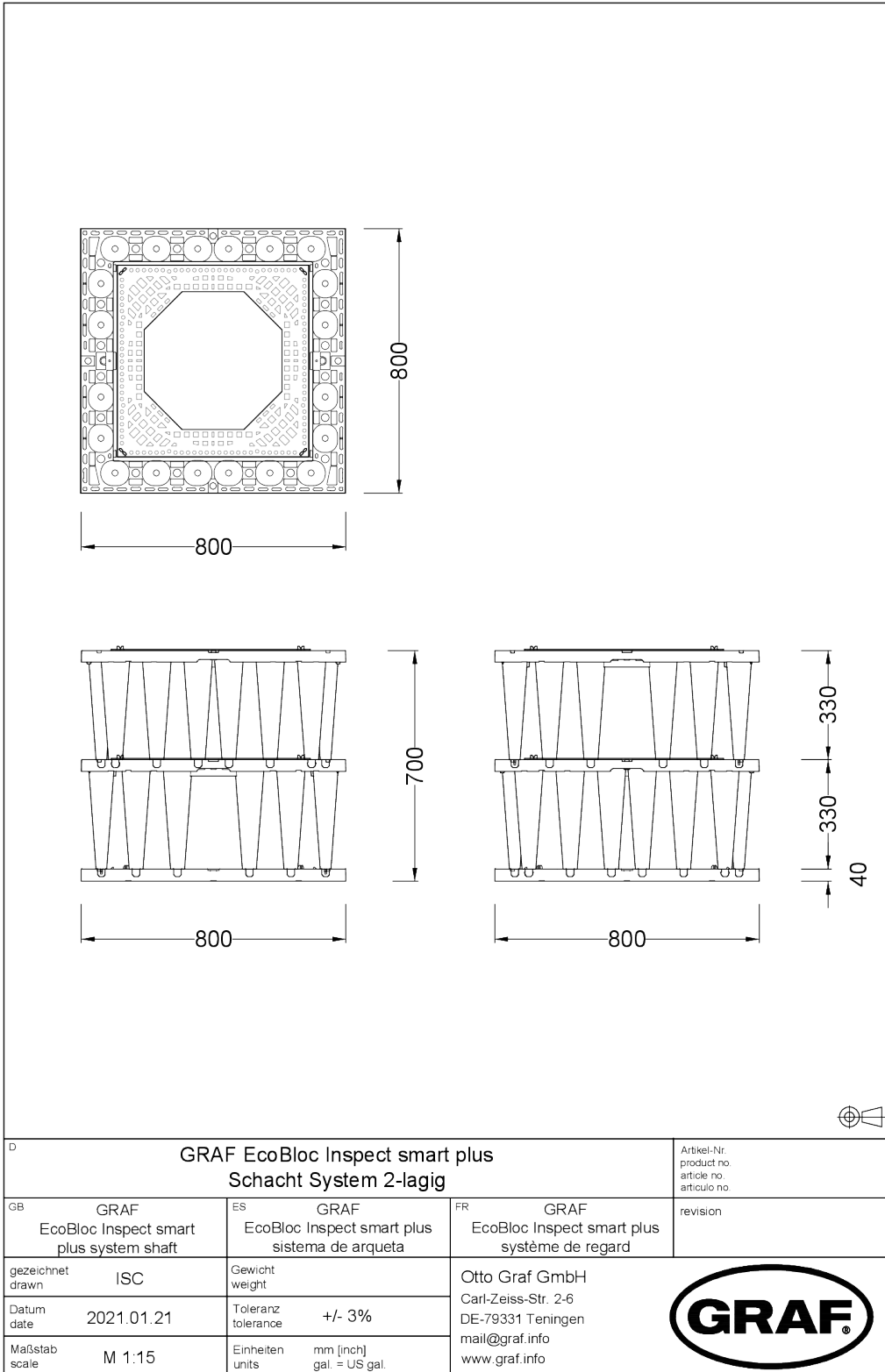
D			GRAF EcoBloc Inspect smart Bodenplatte	Artikel-Nr. product no. article no. articulo no.	402501
GB	GRAF EcoBloc Inspect smart baseplate	ES	GRAF Base EcoBloc Inspect smart	FR	GRAF Plaque de fond EcoBloc Smart
gezeichnet drawn	NSE	Gewicht weight	4,2 kg	Otto Graf GmbH Carl-Zeiss-Str. 2-6 DE-79331 Teningen mail@graf.info www.graf.info	
Datum date	2021.01.19	Toleranz tolerance	+/- 3%		
Maßstab scale	M 1:15	Einheiten units	mm [inch] gal. = US gal.		



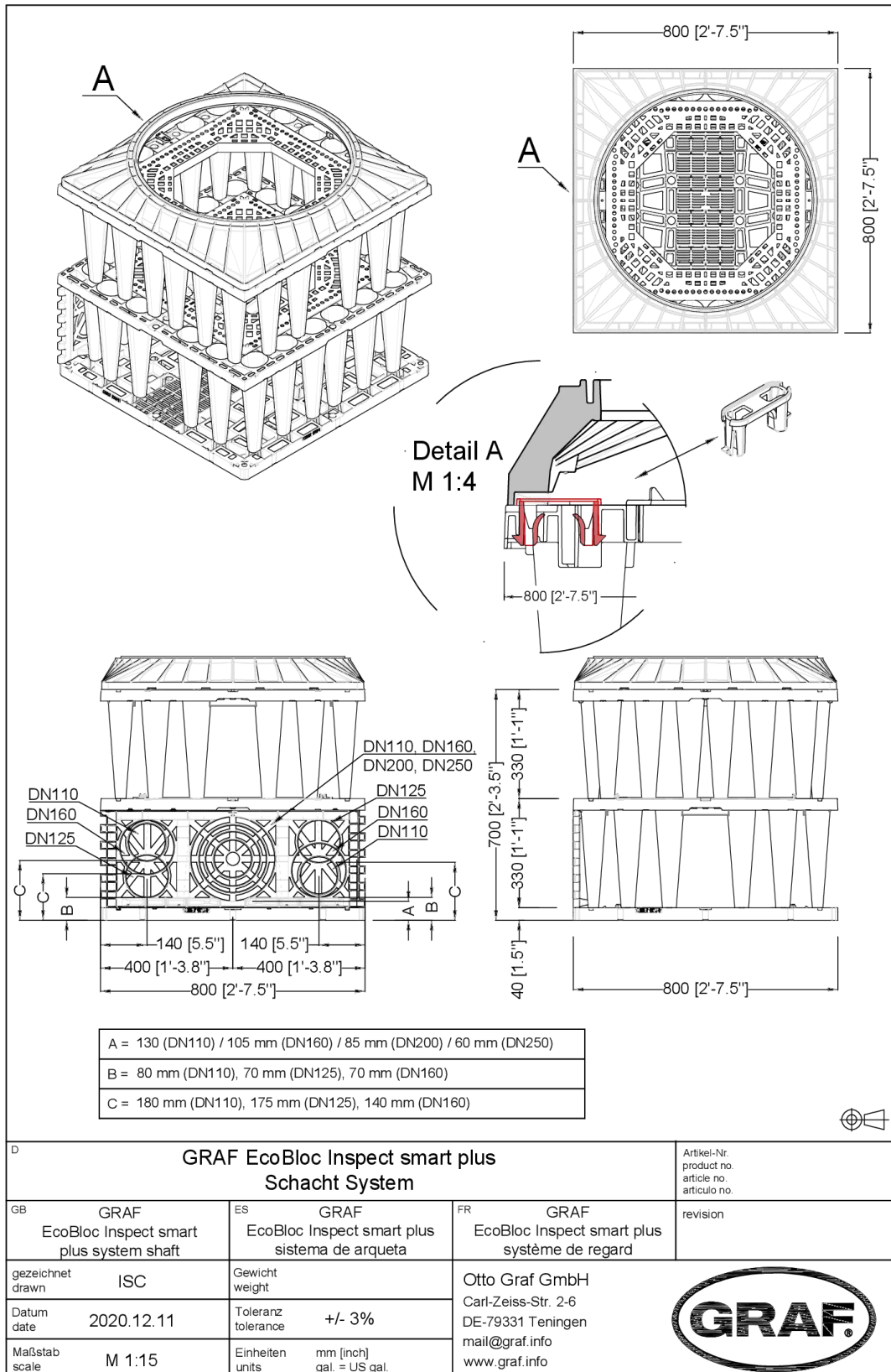
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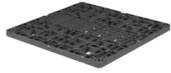
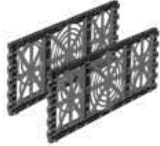


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EcoBloc Inspect smart Configurator COSMA

Article overview: Blocks and accessories

535 Bayfield Street





	Pos.	Description	Article No.	Pieces
	1	EcoBloc Inspect smart	402500	3230 pcs.
	4	EcoBloc Inspect smart base plate	402501	1620 pcs.
	5	EcoBloc Inspect smart end plates (Set 2 pcs.)	402503	202 pcs.
	6	EcoBloc connectors		9414 pcs.
	602	EcoBloc connectors (Set 25pcs.)	402018	1 pcs.
	604	EcoBloc connectors (Set 200 pcs.)	402025	47 pcs.

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EcoBloc Inspect smart Configurator COSMA

Article overview: Shafts & accessories

535 Bayfield Street

	Pos.	Description	Article No.	Pieces
	10	EcoBloc Inspect smart plus shaft	450151	10 pcs.
	11	EcoBloc Inspect smart cover	450160	5 pcs.
	32	Extension module 1000 DN 630	371015	5 pcs.
	37	Telescopic dome shaft truck	371021	5 pcs.

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Pos.	Description	Article No.	Pieces
48	GRAFTex geotextile	231002	1177 rm
	Roll width 5 m Geotextile surface: 5882 m ²		
51	EcoBloc adapter plate DN250	EPA10	1 pcs.
52	EcoBloc Inspect adapter plate DN375	EPA15-PVC	1 pcs.
52	EcoBloc Inspect adapter plate DN600	EPA24-PVC	1 pcs.



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Article overview: Optional / on site

535 Bayfield Street

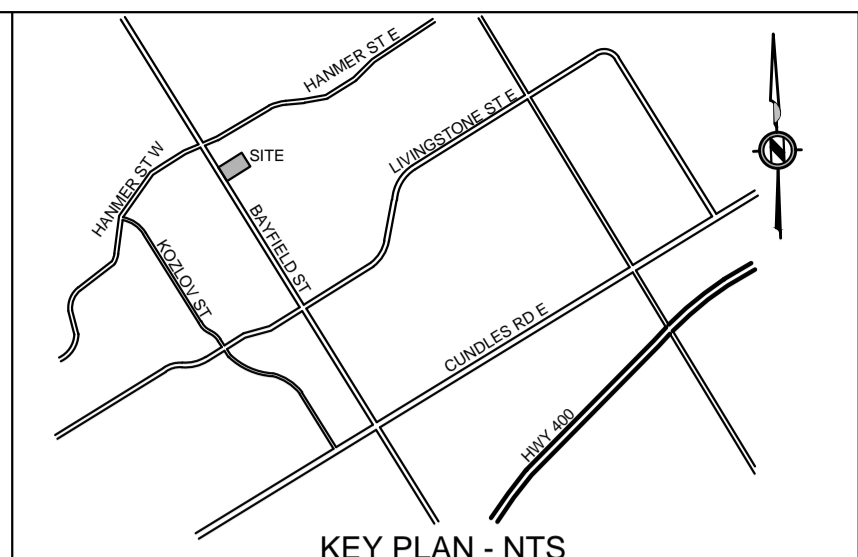
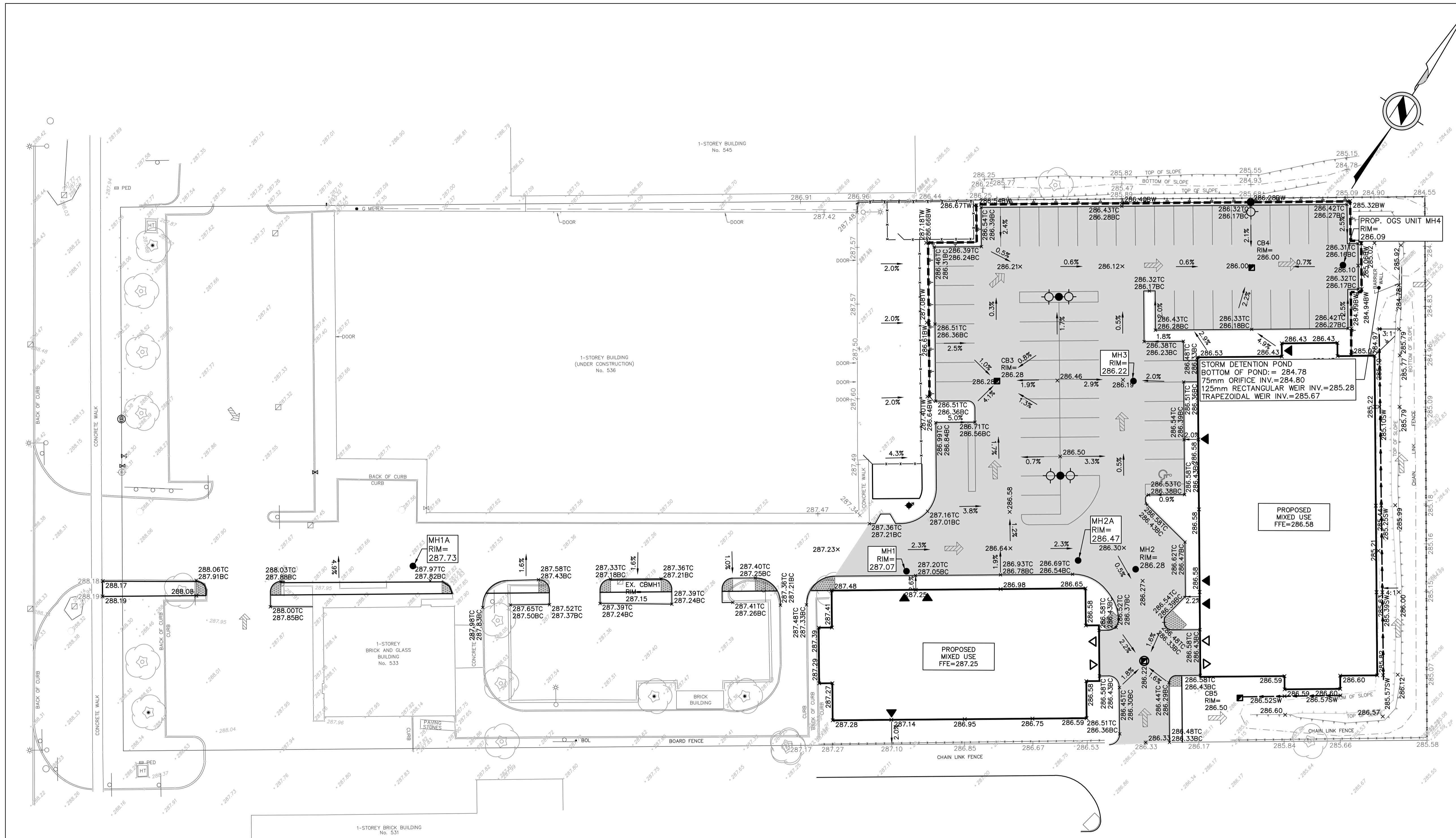
Pos.	Description	Article No.	Pieces
49	Geomembrane		2941 m ²



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APPENDIX E

ENGINEERING PLANS



LEGEND

PROPERTY LINE	---
EXISTING RETAINING WALL	---
PROPOSED SWALE	---
PROPOSED RETAINING WALL AS PER OPSD 3120.100	---
PROPOSED TOP OF BANK	---
PROPOSED BOTTOM OF BANK	---
PROPOSED EDGE OF ASPHALT	---
LIMIT OF CONSTRUCTION	---
PROPOSED INFILTRATION TRENCH	---
EXISTING GROUND CONTOUR	---
EXISTING/PROPOSED ELEVATION	× 252.76 / × 252.76
TOP/BOTTOM OF WALL ELEVATION	× 274.78 TW/BW
GRADE	2.0%
EXISTING/PROPOSED OVERLAND FLOW ROUTE	---
BUILDING ENTRANCE	---
OVERHEAD DOOR ENTRANCE	---
EXISTING/PROPOSED CATCH BASIN	---
EXISTING/PROPOSED CATCH BASIN MANHOLE	---
EXISTING/PROPOSED MANHOLE	---
EXISTING/PROPOSED FIRE HYDRANT	---
PROPOSED LIGHT POLE AND STANDARD	---

1	04/13/2023	ISSUED FOR SITE PLAN APPLICATION	SB	CAB
REV	DATE	DESCRIPTION	BY	APP

ENGINEER STAMP

C. A. BLAHUT
100516699
2023-04-13
PROVINCE OF ONTARIO

BENCHMARK

PART OF LOT 18 CONCESSION 4
GEOGRAPHIC TOWNSHIP OF
VESPREA NOW IN THE
CITY OF BARRIE
COUNTY OF SIMCOE

LEGAL DESCRIPTION

ELEVATIONS SHOWN ON THIS PLAN
ARE RELATED TO GEODETIC DATUM
AND ARE DERIVED FROM BENCH
MARK No 003120080033 HAVING A
PUBLISHED ELEVATION OF 277.889
METRES.

APLIN MARTIN
ENGINEERING ARCHITECTURE PLANNING SURVEYING

Aplin & Martin Consultants Ltd.
405 - 55 St. Clair Ave. West, O.N. Canada M4V 2Y7
Tel: (416) 644-1900, Fax: (416) 644-1889, Email: general@aplinmartin.com

CLIENT

PETRO GOLD LTD.
261 ARNOLD AVE
VAUGHAN, ON L4J 1C3

PROJECT

MIXED-USE DEVELOPMENT
535 BAYFIELD STREET
BARRIE, ONTARIO

DRAWING TITLE

SITE GRADING PLAN

DESIGN	DATE	SCALE
CB	APRIL, 2023	1:300
DRAWN	PROJECT NO.	
BL	21-7026	
CHECKED	DRAWING NO.	REV.
CAB	C01	1
APPROVED		
CAB		

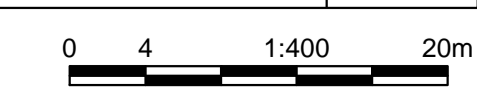
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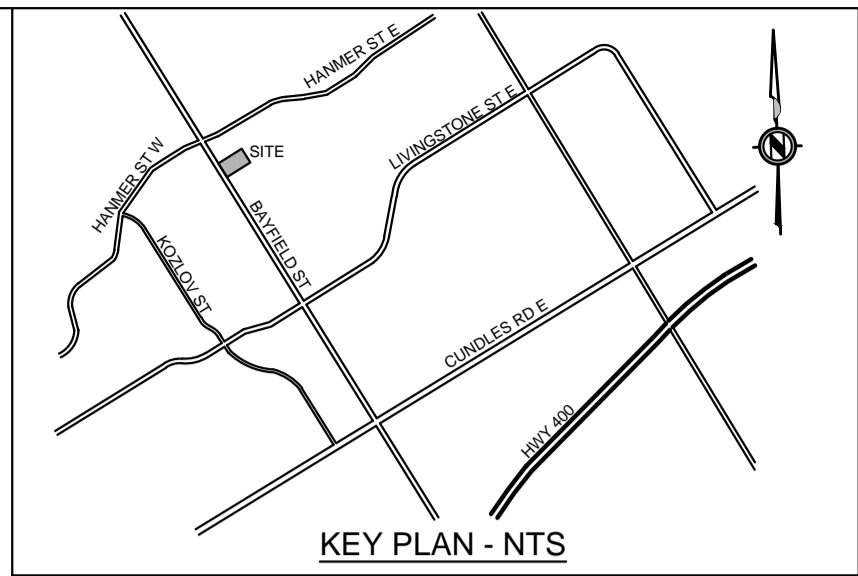
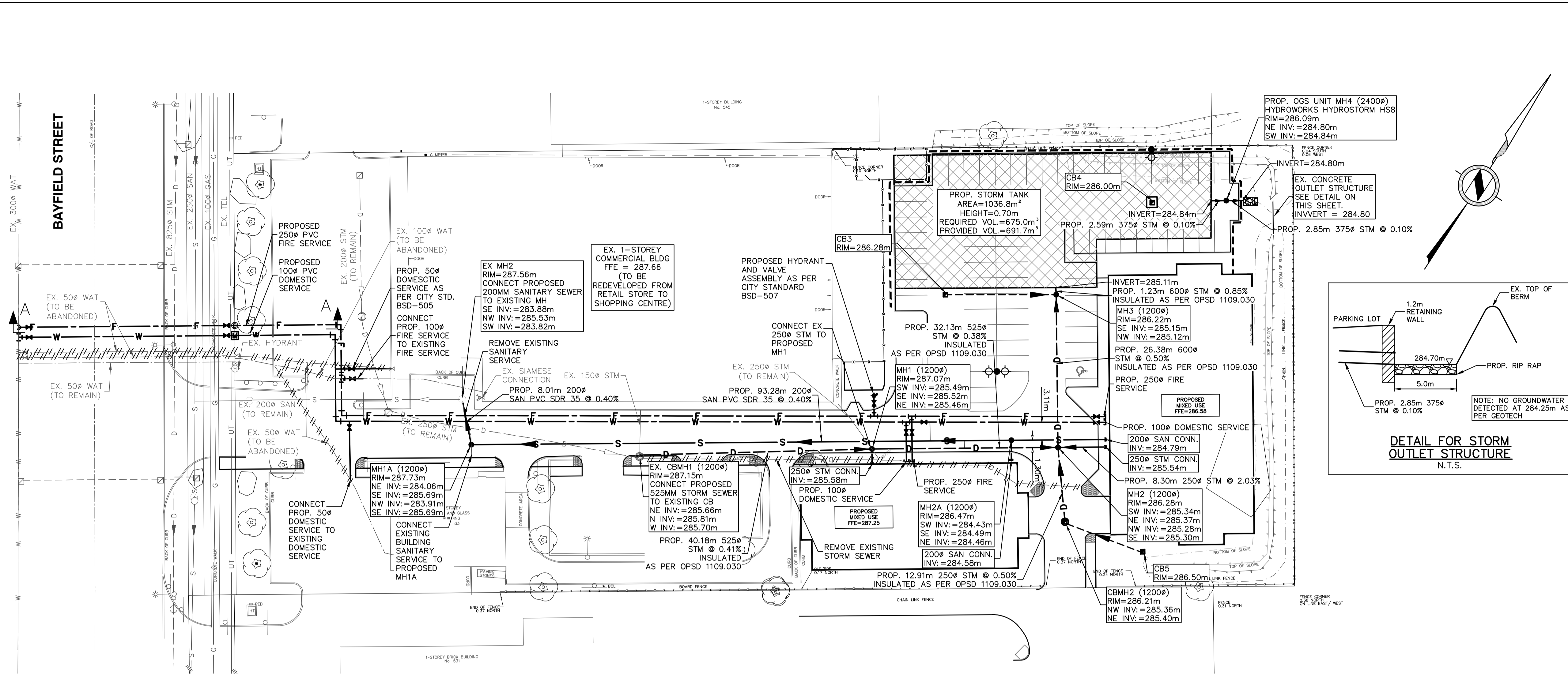
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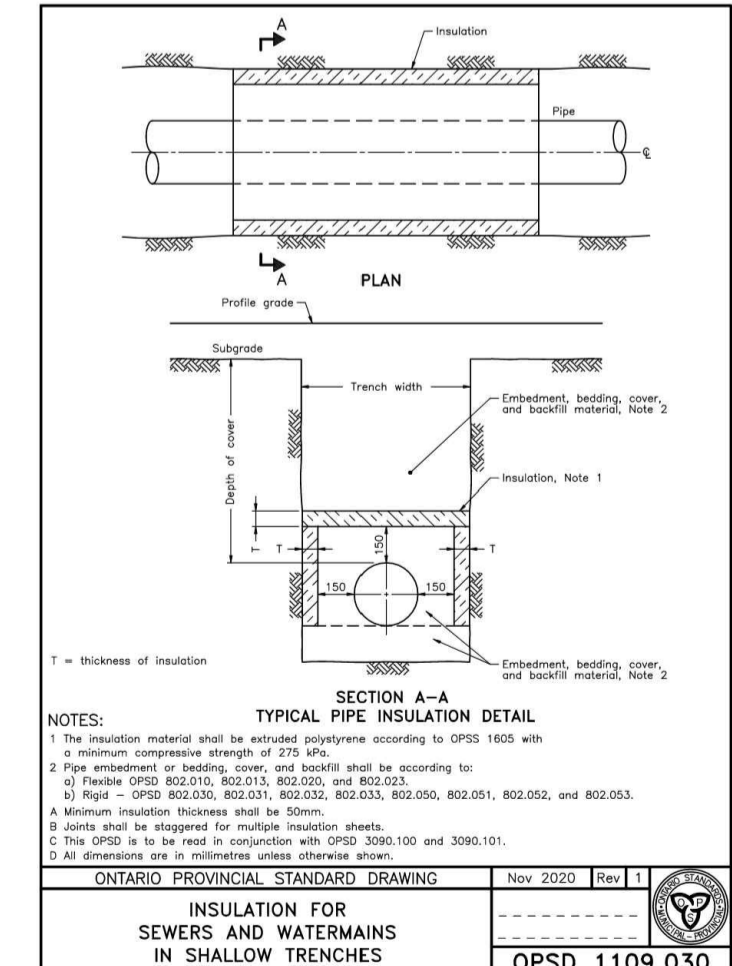
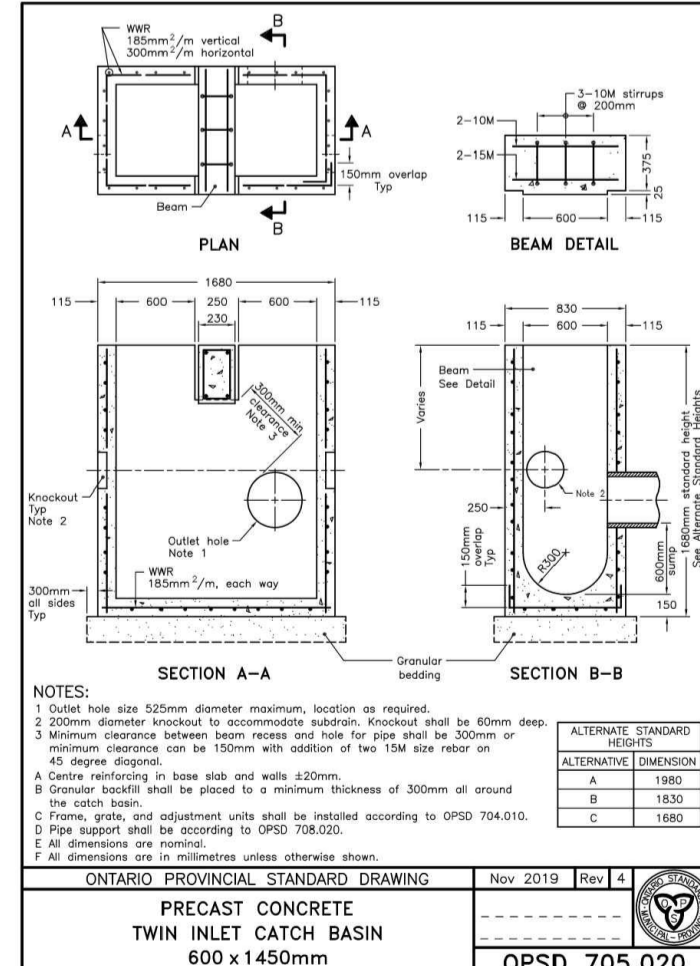
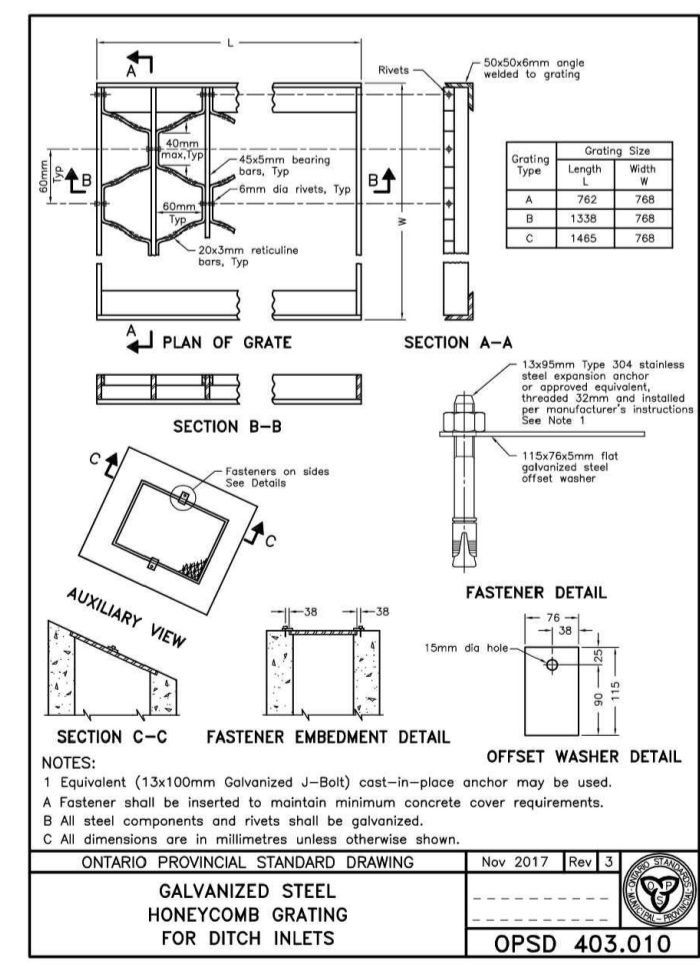
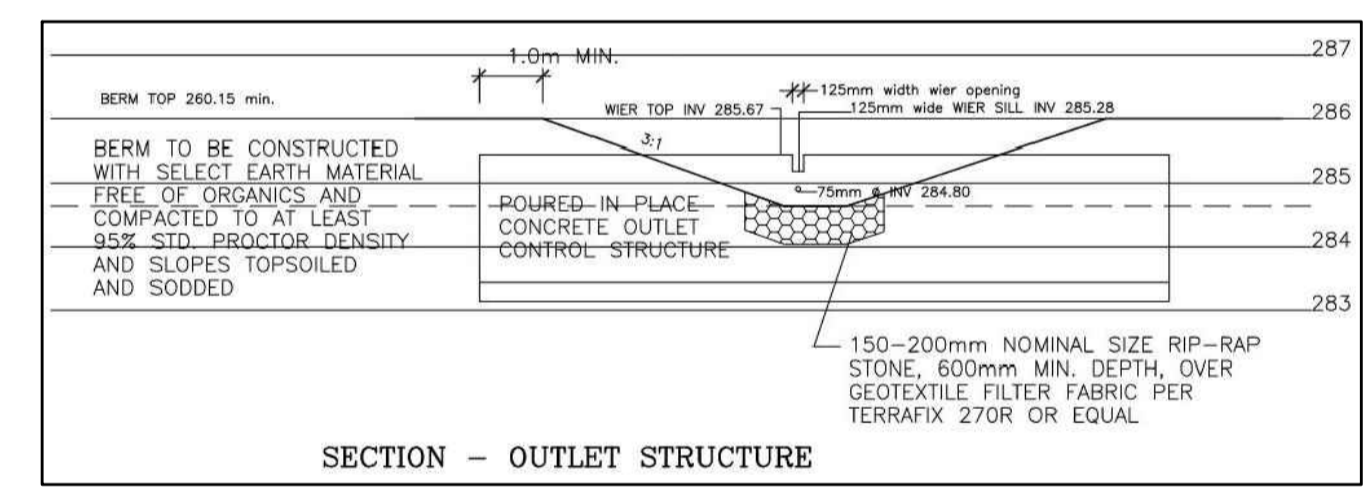
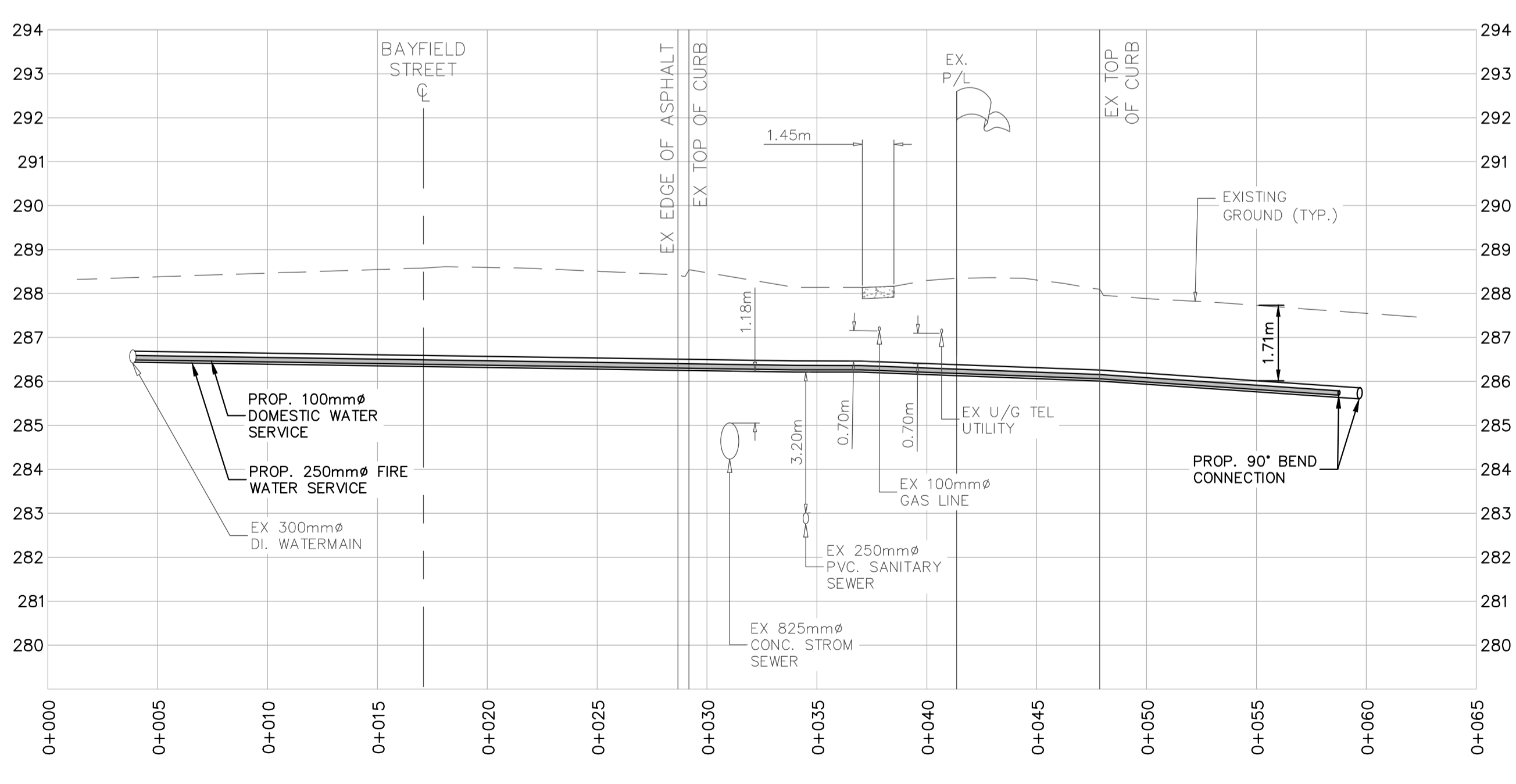
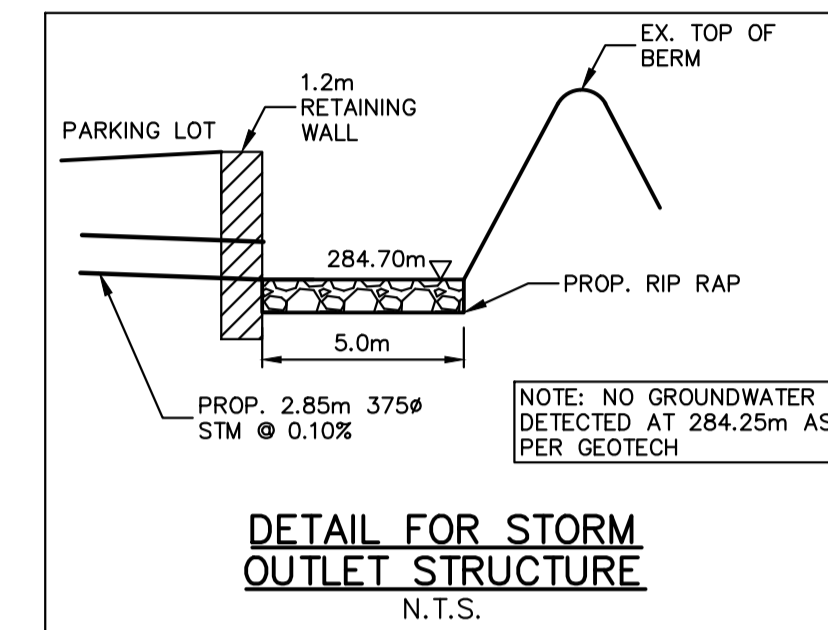
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LEGEND

PROPERTY LINE	---
EXISTING SANITARY SEWER	---
EXISTING STORM SEWER	---
EXISTING WATERMAIN	---
EXISTING GAS	---
EXISTING TELECOMMUNICATION	---
PROPOSED CATCH BASIN LEAD	---
PROPOSED RETAINING WALL	---
PROPOSED EDGE OF ASPHALT	---
PROPOSED PIPE INSULATION	---
PROPOSED INFILTRATION TRENCH	---
LIMIT OF CONSTRUCTION	---
EXISTING CONCRETE SIDEWALK REMOVALS	---
EXISTING HYDRO POLE	---
EXISTING FIRE HYDRANT	---
EXISTING/PROPOSED CATCH BASIN	---
EXISTING/PROPOSED CATCH BASIN MANHOLE	---
EXISTING/PROPOSED MANHOLE	---
PROPOSED BULK METER IN CHAMBER	---
PROPOSED BACKFLOW PREVENTION VALVE IN MANHOLE	---
PROPOSED GATE VALVE	---
PROPOSED SIAMESE CONNECTION	---
OVERHEAD DOOR ENTRANCE	---
BUILDING ENTRANCE	---
PROPOSED RIP RAP	---
PROPOSED SANITARY SEWER	---
PROPOSED STORM SEWER	---
PROPOSED WATERMAIN DOMESTIC	---
PROPOSED WATERMAIN FIRE	---



1	04/13/2023	ISSUED FOR SITE PLAN APPLICATION	SB	CAB
REV	DATE	DESCRIPTION	BY	APP

ENGINEER STAMP
C. A. BLAHUT
 100516699
 2023-04-13
 PROVINCE OF ONTARIO

PART OF LOT 18 CONCESSION 4
 GEOGRAPHIC TOWNSHIP OF VESPRE NOW IN THE CITY OF BARRIE
 COUNTY OF SIMCOE

LEGAL DESCRIPTION
 ELEVATIONS SHOWN ON THIS PLAN ARE RELATED TO GEODETIC DATUM AND ARE DERIVED FROM BENCH MARK No 003120080033 HAVING A PUBLISHED ELEVATION OF 277.889 METRES.
 BENCHMARK



Aplin & Martin Consultants Ltd.
 405 - 55 St. Clair Ave. West, O.N. Canada M4V 2Y7
 Tel: (416) 644-1900, Fax: (416) 644-1889, Email: general@aplinmartin.com

CLIENT
PETRO GOLD LTD.
 261 ARNOLD AVE
 VAUGHAN, ON L4J 1C3

PROJECT
MIXED-USE DEVELOPMENT
 535 BAYFIELD STREET
 BARRIE, ONTARIO

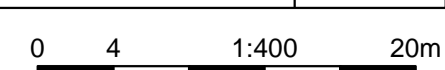
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SITE SERVICING PLAN

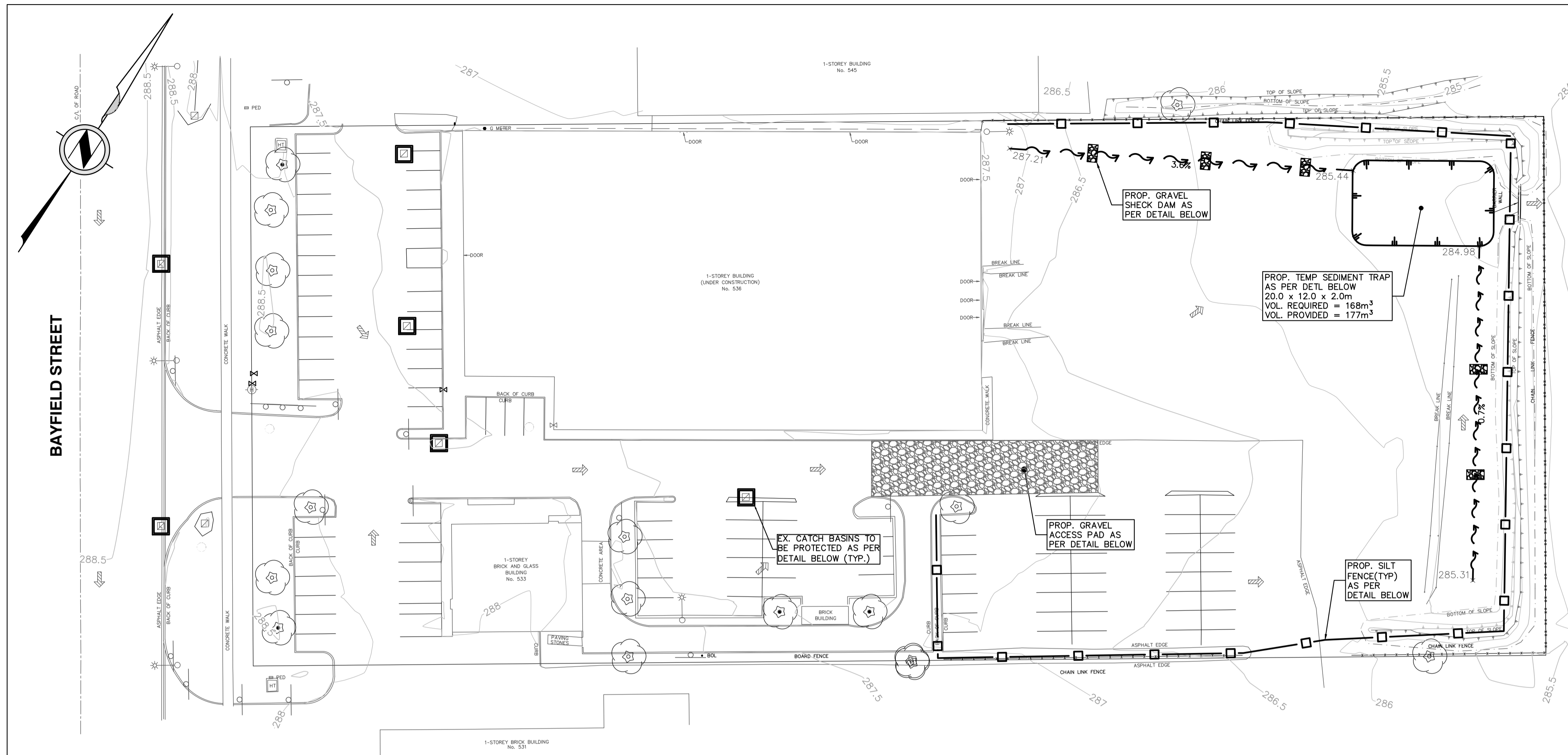
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DRAWN	PROJECT NO.	
BL	21-7026	
CHECKED	DRAWING NO.	REV.
CAB		
APPROVED		
CAB		

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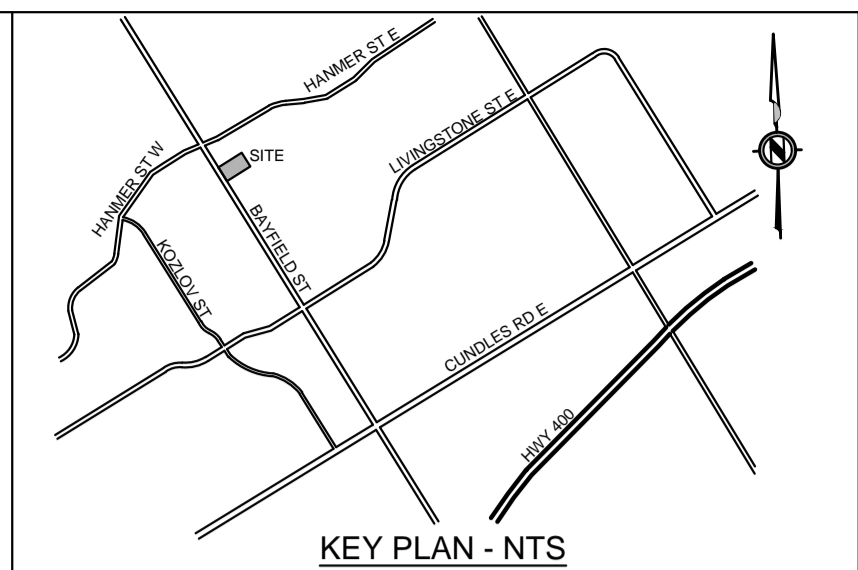
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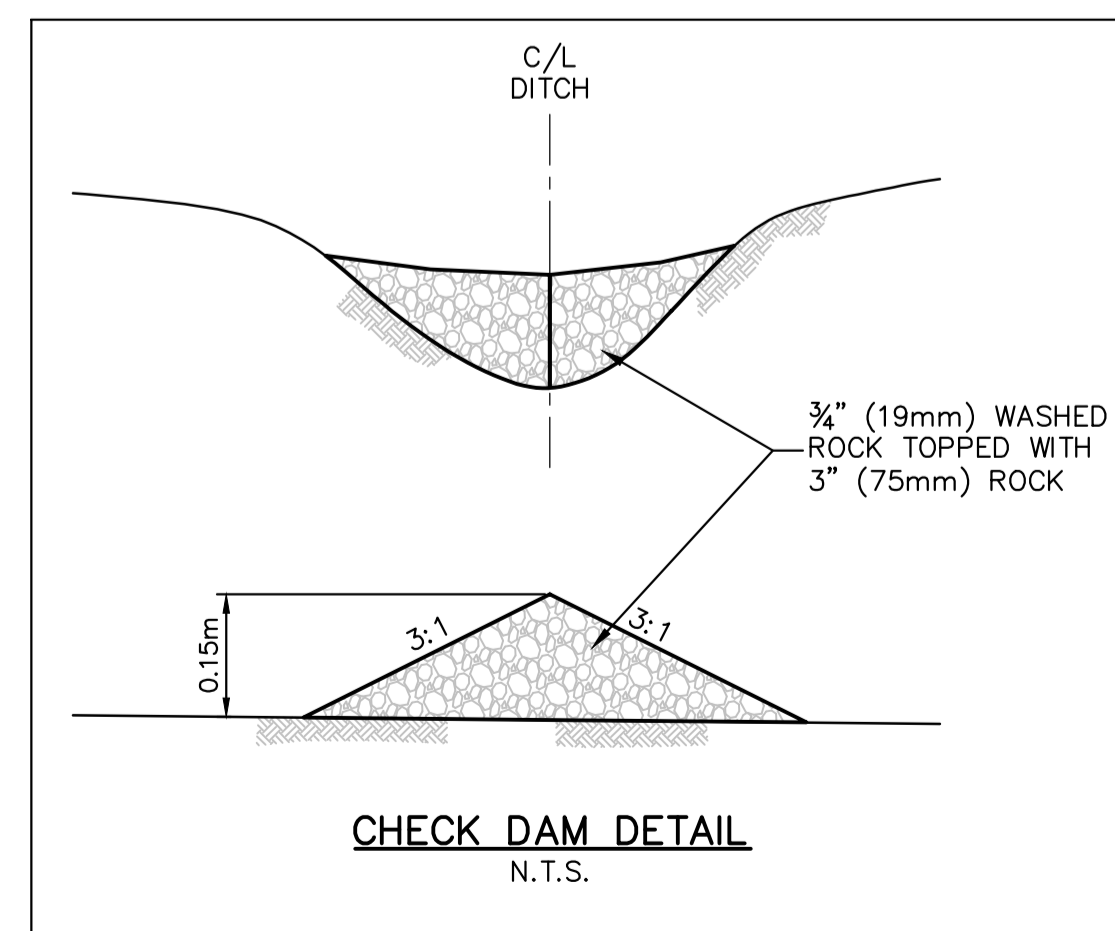
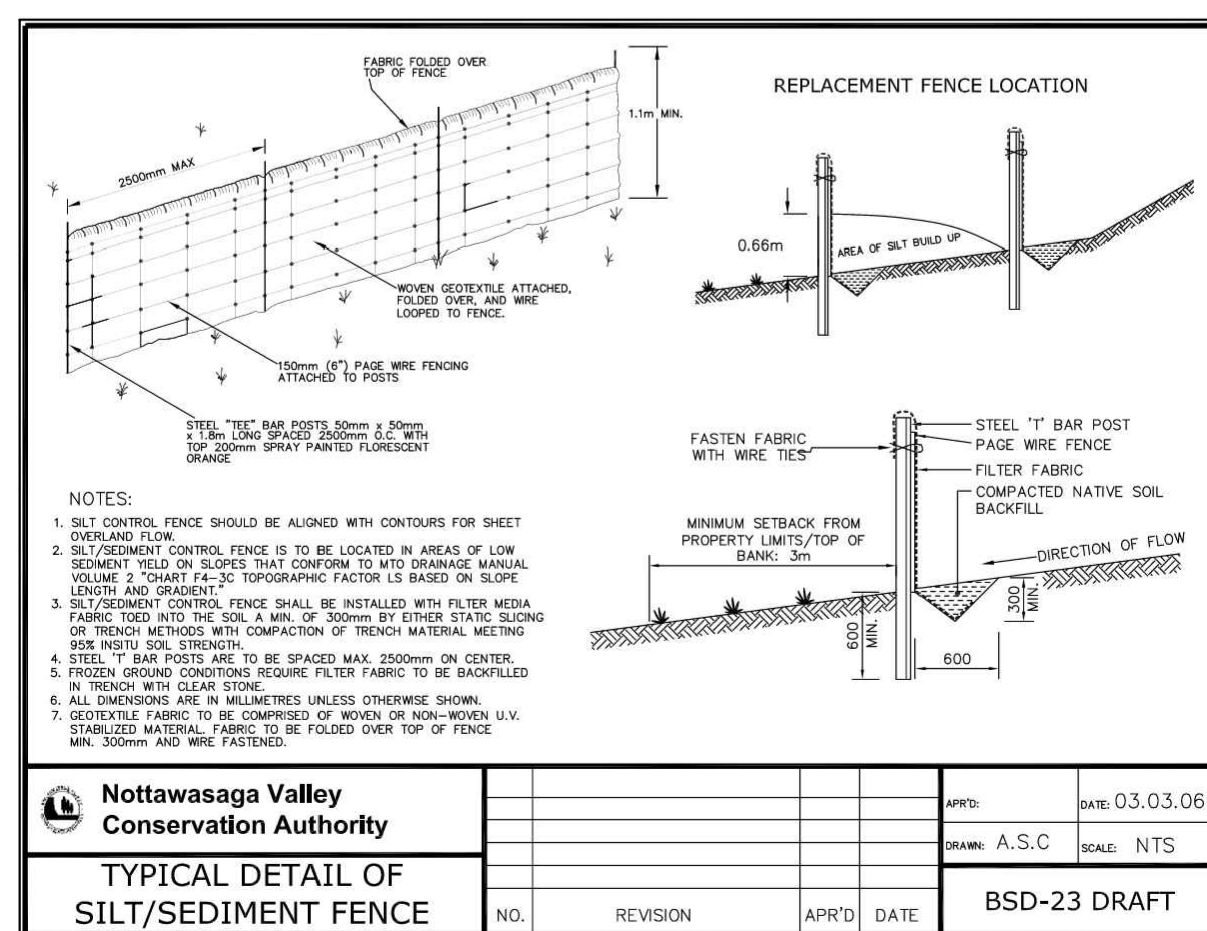
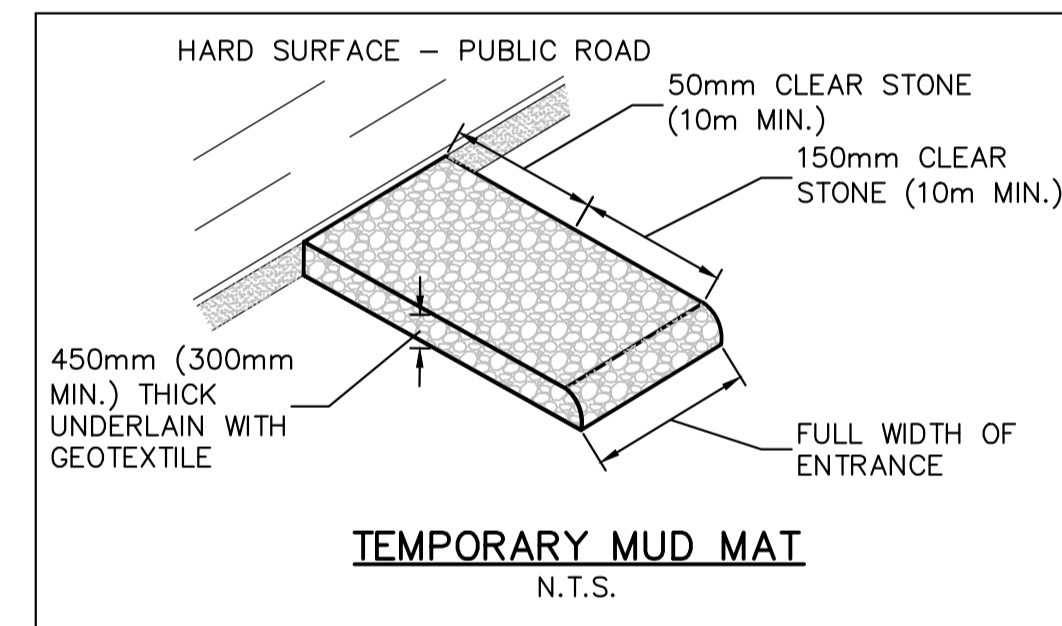
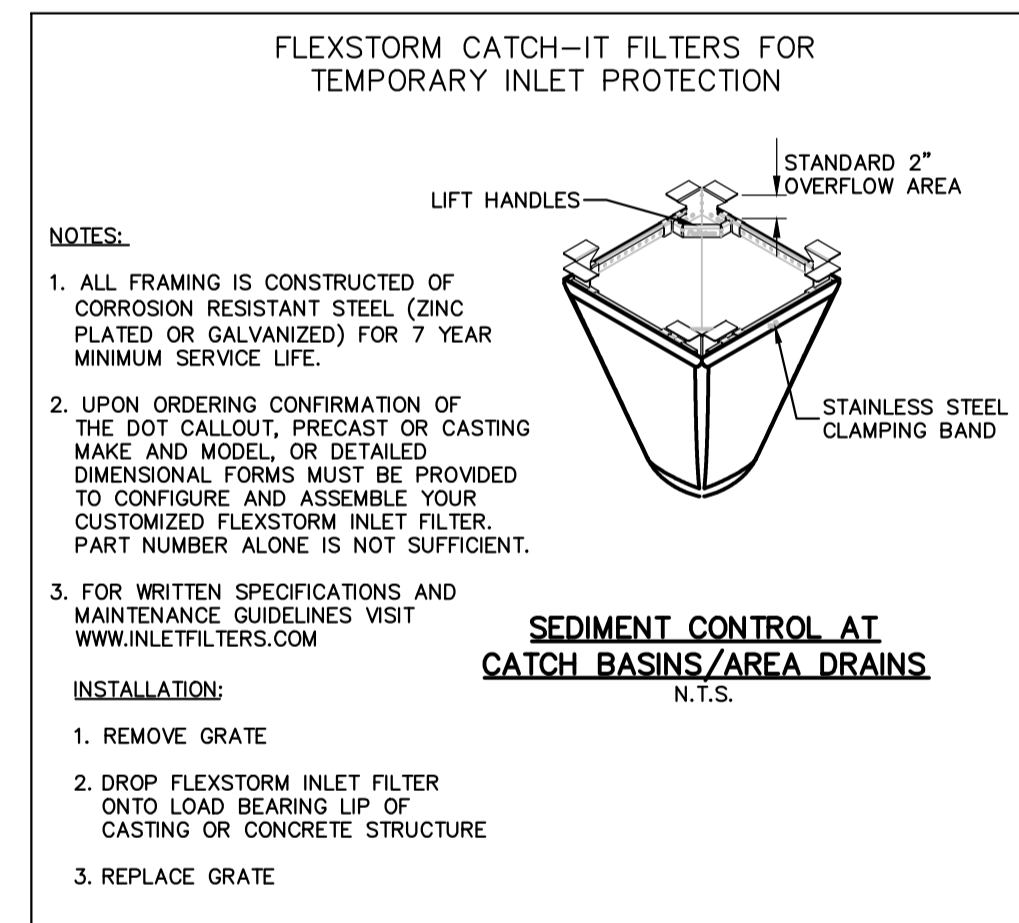
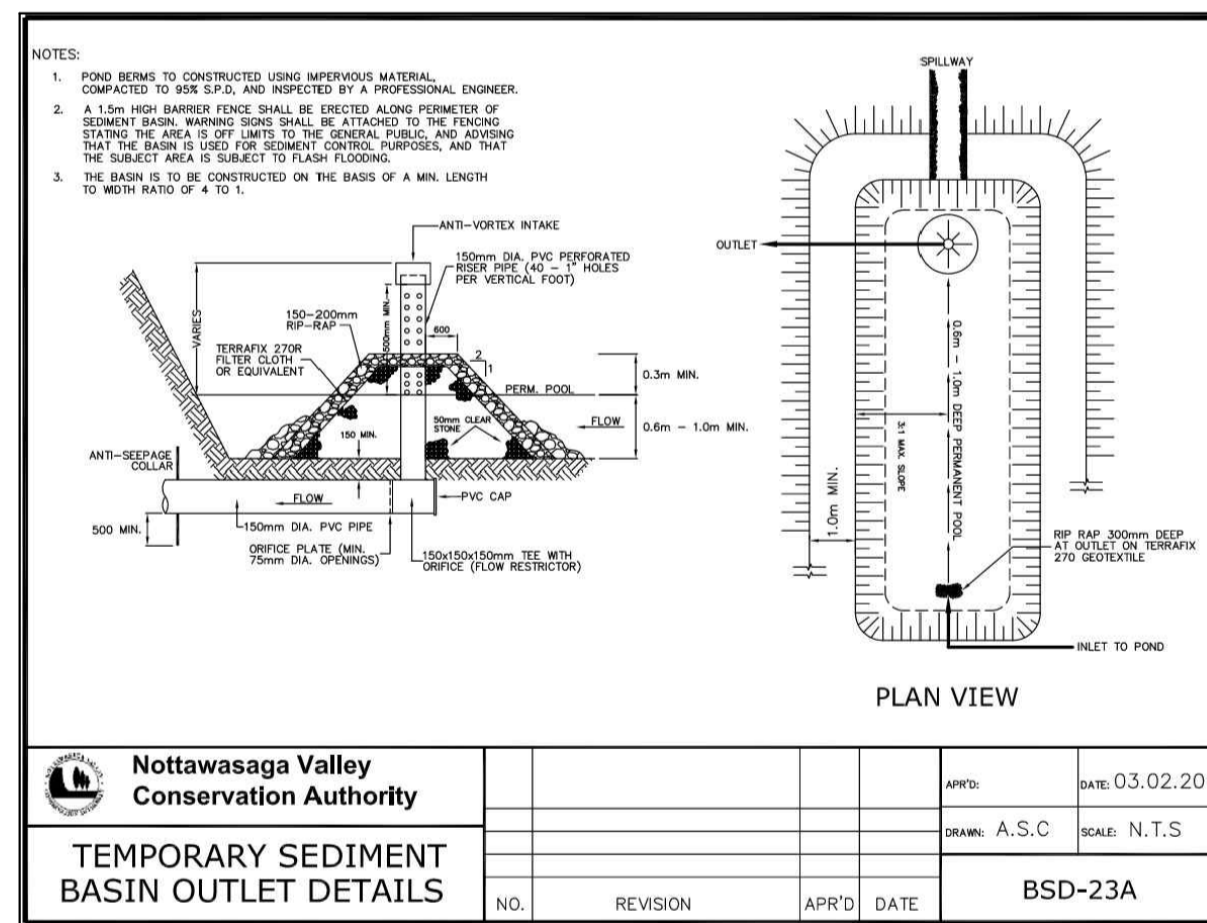
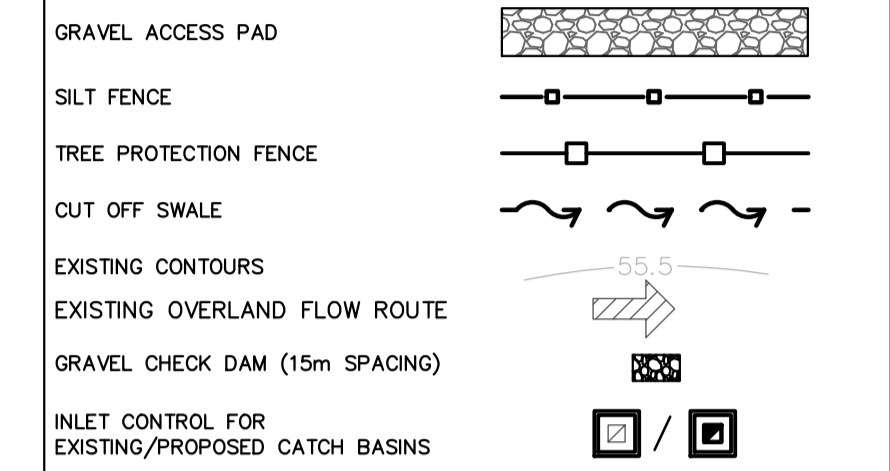


EROSION & SEDIMENT CONTROL NOTES:

1. EROSION AND SEDIMENT CONTROL (ESC) MEASURES WILL BE IMPLEMENTED PRIOR TO, AND MAINTAINED DURING CONSTRUCTION PHASES, TO PREVENT ENTRY OF SEDIMENT INTO THE WATER. ALL DAMAGED EROSION AND SEDIMENT CONTROL MEASURES SHOULD BE REPAIRED OR REPLACED WITHIN 48 HOURS OF INSPECTION OR BOTH.
2. ALL DISTURBED AREAS WILL BE MINIMIZED TO THE EXTENT POSSIBLE, AND TEMPORARILY OR PERMANENTLY STABILIZED OR RESTORED AS THE WORK PROGRESSES.
3. SILT FENCE PER ATTACHED DETAIL TO BE INSTALLED AROUND PERIMETER OF PROPERTY OR AS DIRECTED BY SITE ENGINEER PRIOR TO COMMENCEMENT OF WORK.
4. TEMPORARY GRAVEL ACCESS PAD TO BE INSTALLED PRIOR TO COMMENCEMENT OF WORK.
5. CUTOFF SWALE AND SEDIMENT TRAP TO BE INSTALLED AS EARLY AS POSSIBLE.
6. INLET PROTECTION TO BE INSTALLED ON EXISTING CATCH BASINS AT THE START OF THE PROJECT AND PROPOSED CATCH BASINS AFTER INSTALLATION.
7. EROSION CONTROLS TO BE MAINTAINED AS DIRECTED BY THE ENGINEER DURING THE CONSTRUCTION PERIOD.
8. EROSION AND SEDIMENT CONTROL DEVICES MUST BE INSPECTED ON A REGULAR BASIS AND AFTER EVERY RAINFALL EVENT, AND MUST BE MAINTAINED AND REPAIRED IN A TIMELY MANNER TO PREVENT SEDIMENT FROM LEAVING THE SITE.



LEGEND



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1	04/13/2023	ISSUED FOR SITE PLAN APPLICATION	SB	CAB
REV	DATE	DESCRIPTION	BY	APP
		PART OF LOT 18 CONCESSION 4 GEOGRAPHIC TOWNSHIP OF VESPREA NOW IN THE CITY OF BARRIE COUNTY OF SIMCOE		
		LEGAL DESCRIPTION		
		ELEVATIONS SHOWN ON THIS PLAN ARE RELATED TO GEODETIC DATUM AND ARE DERIVED FROM BENCH MARK No 003120080033 HAVING A PUBLISHED ELEVATION OF 277.889 METRES.		
		BENCHMARK		

APLIN MARTIN
ENGINEERING ARCHITECTURE PLANNING SURVEYING

Aplin & Martin Consultants Ltd.
405 - 55 St. Clair Ave. West, O.N. Canada M4V 2Y7
Tel: (416) 644-1900, Fax: (416) 644-1889, Email: general@aplinmartin.com

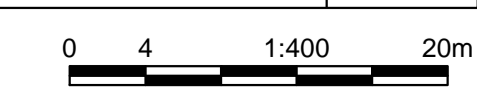
CLIENT

PETRO GOLD LTD.
261 ARNOLD AVE
VAUGHAN, ON L4J 1C3

PROJECT

MIXED-USE DEVELOPMENT
535 BAYFIELD STREET
BARRIE, ONTARIO

DRAWING TITLE		EROSION & SEDIMENT CONTROL PLAN	
DESIGN	DATE	SCALE	
CB	APRIL, 2023	1:400	
DRAWN	PROJECT NO.		
BL	21-7026		
CHECKED	DRAWING NO.		
CAB	C03		
APPROVED		REV.	
CAB		1	



- GRADE AND CROSSFALL ADJUSTMENT OF MAINTENANCE HOLE AND CATCHBASIN FRAMES WILL BE MADE USING PRODUCTS SPECIFICALLY MANUFACTURED FOR THAT PURPOSE.
- ADJUSTMENT UNITS MUST BE CERTIFIED TO MEET ALL PERTINENT OPS, CSA, ASTM AND MTO-DSM LISTS, OR OTHER INDUSTRY GUIDELINES FOR MATERIALS, PERFORMANCE AND USE AS APPLICABLE.
- ADJUSTMENT UNITS AND JOINTS WILL BE SEALED AND OR PARGED IN COMPLIANCE WITH MANUFACTURERS SPECIFICATIONS AND GUIDELINES
- MORTAR IS USED FOR LEVELING OF PRECAST UNITS ONLY. THE THICKNESS OF MORTAR WILL BE 10mm TO FILL ALL VOIDS CREATED BY IRREGULARITIES IN THE PRECAST UNITS TO ENSURE AN EVEN SURFACE ONLY.



GENERAL NOTES
ROADWORKS

REV No.	DATE: OCT 2017
1	SCALE: N.T.S.
BSD-N2	

APPROVED
DATE: Oct 28/17
DIRECTOR OF ENGINEERING

GENERAL NOTES - WATERMAIN

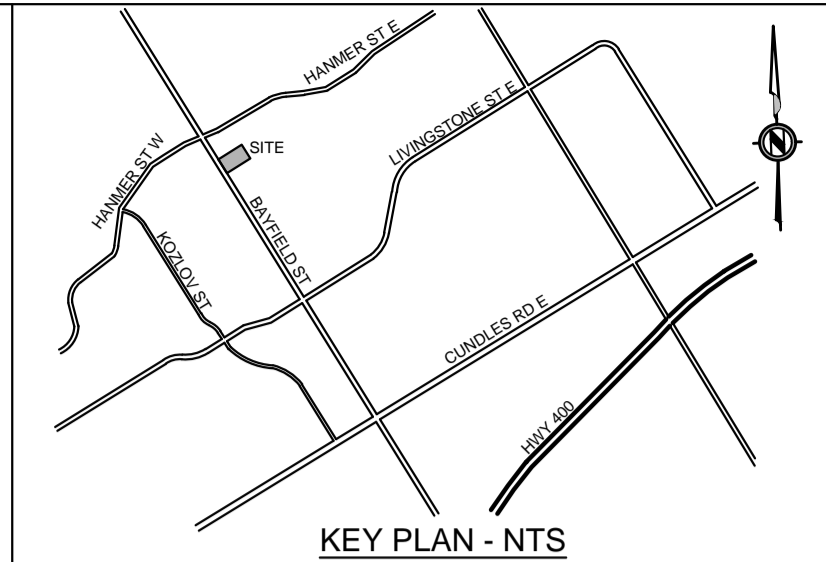
- CONTRACTORS SHALL INFORM THE CITY OF BARRIE WATER OPERATIONS DEPARTMENT A MINIMUM OF 48 HOURS IN ADVANCE OF THEIR INTENTIONS TO PERFORM WORK ON WATER INFRASTRUCTURE.
- OPERATION OF HYDRANTS AND VALVES ON THE POTABLE WATER SYSTEM BY OTHER THAN QUALIFIED WATER OPERATIONS STAFF IS PROHIBITED BY CURRENT BY-LAW. CITY SERVICE FEES ARE PER THE CURRENT FEES BY-LAW. THE CITY'S WATER OPERATIONS STAFF WILL SWAB, PRESSURE TEST, CHLORINATE AND FLUSH ALL NEW WATERMAINS.
- MINIMUM COVER OVER WATERMAIN SHALL BE 1.7m. THE MINIMUM HORIZONTAL SEPARATION BETWEEN WATERMAIN AND SEWERS SHALL BE 2.5m WHERE WATERMAIN CONFLICTS WITH SEWER PIPES, DEFLECT WATERMAIN HORIZONTALLY OR VERTICALLY WHILE PROVIDING A MINIMUM OF 0.5m CLEARANCE BETWEEN WATERMAIN AND SEWERS. MAINTAIN MINIMUM DEPTH OF COVER AT ALL TIMES.
- WATERMAIN SHALL BE INSTALLED IN BEDDING AS PER OPSD 802.010 (GRANULAR 'A' EMBEDMENT MATERIAL) FOR FLEXIBLE PIPES AND OPSD 802.030 OR 802.031 CLASS 'B' (GRANULAR 'X' BEDDING MATERIAL, GRANULAR 'K' OR SELECT NATIVE COVER MATERIAL) FOR RIGID PIPE UNLESS OTHERWISE APPROVED BY THE DIRECTOR OF WATER OPERATIONS. ALTERNATIVE EMBEDMENT MATERIAL - SAND MEETING GRADATION REQUIREMENTS OF OPSS MUNI 1004.05.07 COMPACTED TO 95% STANDARD PROCTOR MAXIMUM DRY DENSITY IS PERMISSIBLE WHERE NOTED IN STANDARD DETAILS. GEOTECHNICAL CERTIFICATION OF MATERIAL AND COMPACTION TESTING MUST BE PROVIDED EVERY 150 METRES. THE COMPACTION TESTING MUST INCLUDE THE ENTIRE EMBEDMENT ENVELOPE (HAUNCHES, BEDDING, TOP OF PIPE AND COVER).
- COPPER WATER MAINS AND SERVICES 25mm TO 50mm IN DIAMETER SHALL BE EMBEDDED IN SAND 100mm ABOVE AND BELOW TO CONFORM TO OPSS MUNI 1004.05.07.
- RESTRAINING WILL BE REQUIRED ON ALL HYDRANTS, THRUST BLOCKS, AS PER OPSD 1103.010 AND 1103.020. RESTRAINING DEVICES MAY BE REQUIRED IN ADDITION TO STANDARD CONCRETE THRUST BLOCKING WHERE SOIL CONDITIONS WARRANT AT THE CITY'S DISCRETION.
- NEW WATERMAINS TO BE PVC DR18 CL150 MINIMUM. DUCTILE IRON CL52 AS PER THE APPROVED MANUFACTURERS PRODUCTS FOR LINEAR WATER SYSTEMS LIST.
- TRACING WIRE SHALL BE #12 AWG HIGH STRENGTH COPPER CLAD (HS-CSS) AND SHALL BE INSTALLED ON THE TOTAL LENGTH OF ALL WATERMAIN AND BROUGHT UP AT EACH HYDRANT AND CONNECTED TO FLANGE BOLT. ALL SPLICES TO UTILIZE CONNECTORS AS PER THE APPROVED MANUFACTURERS PRODUCTS FOR LINEAR WATER SYSTEMS LIST.
- ALL WATER SERVICES SHALL BE MINIMUM 25mm TYPE 'K' COPPER OR 25mm CROSS-LINKED POLYETHYLENE UNLESS OTHERWISE APPROVED BY THE DIRECTOR OF WATER OPERATIONS. WATER SERVICE SADDLES SHALL BE USED WHEN TAPPING INTO PVC WATERMAIN.
- SERVICE TAPPINGS SHALL BE PLACED AT A MINIMUM SEPARATION OF 1.0m AND A MINIMUM OF 0.6m FROM JOINTS. (ENDS OF PIPE)
- RISER PIPES ARE TO BE INSTALLED AS PER BSD-510, AND REMOVED AS DIRECTED. SWABBING SCHEDULE TO BE SUPPLIED BY A WATER OPERATIONS FIELD REPRESENTATIVE. ALL RISERS ARE TO BE RESTRAINED OR THRUST BLOCKED.
- ALL NEW CURB STOPS AND BOXES TO BE LOCATED AT PROPERTY LINE AND OUT OF DRIVEWAYS AND SIDEWALKS.



GENERAL NOTES - WATERMAIN

REV No.	DATE: MAY 2015
2	SCALE: N.T.S.
BSD-500	

APPROVED
DATE: May 29/15
DIRECTOR OF ENGINEERING



LEGEND

GENERAL NOTES - SANITARY SEWER

SANITARY SEWERS

- SANITARY SEWER TO BE LOCATED AT THE CENTRELINE OF THE ROAD.
- SEWERS SHALL BE CONSTRUCTED WITH BEDDINGS AS PER OPSD-802.010, (GRAN. 'A' EMBEDMENT MATERIAL) FOR FLEXIBLE PIPES AND OPSD-802.030 OR 802.031 CLASS B (GRAN. 'A' BEDDING MATERIAL) FOR RIGID PIPE UNLESS OTHERWISE APPROVED BY THE DIRECTOR OF ENGINEERING.
- MAXIMUM DEFLECTION FROM COMBINED LIVE AND DEAD LOADING SHALL NOT EXCEED ANY C.S.A., O.P.S. OR MANUFACTURERS RECOMMENDED SPECIFICATIONS.
- PVC, CONCRETE AND PROFILE WALL PVC SEWERS SHALL HAVE RUBBER GASKET TYPE JOINTS AND SHALL BE CERTIFIED TO CONFORM TO ALL APPLICABLE CURRENT C.S.A. SPECIFICATIONS.
- CONCRETE SANITARY SEWERS SHALL HAVE A MINIMUM STRENGTH OF 50 N/m/mm CONFORMING TO CSA STANDARD A257.2-1982, CLASS 50-D (PREVIOUSLY C.S.A. STANDARD A257.2-1974, CLASS II).
- MAINTENANCE HOLE TOPS (FRAMES) ARE TO BE SET TO BASE COURSE ASPHALT GRADE AND THEN ADJUSTED TO FINAL GRADE WHEN THE TOP LIFT OF ASPHALT IS PLACED. ALL ADJUSTMENT WILL BE ACCORDANCE WITH BSD-N2.
- ALL CONNECTIONS TO NEW SANITARY MAINS SHALL BE PRE-MANUFACTURED, FABRICATED TEES. CONNECTIONS TO EXISTING SANITARY SEWER SHALL BE MADE WITH APPROVED FACTORY MADE TEES OR INSERTA-TEES IN STRICT ACCORDANCE TO MANUFACTURERS GUIDELINES.

GENERAL NOTES - STORM SEWER

STORM SEWER

- STORM SEWER TO BE PROVIDED ON ALL ROADS WITH CURB AND GUTTER.
- PLACE ALL CATCH BASIN LATERALS AT 2% GRADE UNLESS OTHERWISE NOTED. PIPE SIZE MINIMUM 250mm DIA. SINGLE, 300mm DIA. DOUBLE.
- STORM SEWERS SHALL BE CONSTRUCTED WITH BEDDING AS PER OPSD-802.010 (GRAN. 'A' EMBEDMENT MATERIAL) FOR FLEXIBLE PIPES AND OPSD-802.030 OR 802.031 CLASS B (GRAN. 'A' BEDDING MATERIAL) FOR RIGID PIPE UNLESS OTHERWISE APPROVED BY THE DIRECTOR OF ENGINEERING.
- MAINTENANCE HOLE TOPS (FRAMES) AND CATCH BASIN (FRAMES) ARE TO BE SET TO BASE COURSE ASPHALT GRADE AND THEN ADJUSTED TO FINAL GRADE WHEN THE TOP LIFT OF ASPHALT IS PLACED. ALL ADJUSTMENT WILL BE ACCORDANCE WITH BSD-N2.
- STORM SEWER TO BE LOCATED OFFSET 3.0m SOUTH OR EAST OF CENTRELINE UNLESS OTHERWISE SPECIFIED.
- ALL CONNECTIONS TO THE STORM MAIN SHALL BE MADE WITH A STORM MANHOLE OR APPROVED FACTORY TEE CONNECTION AS PER OPSD-708.01 OR 708.03.
- PIPE MATERIAL TO BE REINFORCED CONCRETE WITH A MINIMUM STRENGTH OF 50 N/m/mm CERTIFIED TO C.S.A. STANDARD A247.2-1982, CLASS 50-D (PREVIOUSLY C.S.A. STANDARD A257.2-1974, CLASS II) OR PVC CERTIFIED TO C.S.A. STANDARDS 182.2 AND 182.4.
- STORM SEWER TO BE MINIMUM 300mm DIAMETER WITH JOINTS CONFORMING TO C.S.A. STANDARD A257.3.
- ALL PIPE BEDDING MUST CONFORM TO OPSD, MAXIMUM COVER TABLE. NO FLEXIBLE PIPE SEWERS WILL BE INSTALLED WITH A DEPTH OF COVER GREATER THAN 6 METRES UNLESS SPECIFICALLY APPROVED BY THE DIRECTOR OF ENGINEERING.
- ALL PIPE HANDLING INSTALLATIONS MUST BE IN STRICT COMPLIANCE WITH MANUFACTURERS INSTALLATION GUIDES AND THE O.C.P.A. OR UNIBELL GUIDELINES.
- SUMP PUMP DISCHARGE PIPING IN BOULEVARD:
IN THE EVENT OF OVERACTIVE SUMP PUMP ACTIVITY, A 150mm DIAMETER PVC DR-28 SEWER MAY BE INSTALLED, WHEN SO DIRECTED BY THE DIRECTOR OF ENGINEERING, ALONG THE FRONTAGES OF DESIGNATED LOTS, WITH AN OFFSET OF 0.6m FROM BACK OF CURB. THIS SEWER IS TO BE CAPPED AT THE UPSTREAM END AND IS TO OUTLET INTO THE NEAREST CATCHBASIN DOWNSTREAM. DEPTH OF SEWER IS TO BE EQUAL TO SUBDRAIN DEPTH. NOT TO BE DIRECTLY CONNECTED TO FOUNDATION DRAINS.

CITY OF BARRIE STANDARD

GENERAL NOTES
SANITARY SEWERS

4.	NOTE 'B' - "ENGINEERING"	B.R.	2002.10.28	APR'D:	R.G.N.	DATE:	92.05.15
3.	NOTE 'B' OPSD NUMBER REVISION	K.C.	2000.03.16				
2.	NOTE 'F' CHANGED	K.C.	98.03.30	DRAWN:	L.A.J.	SCALE:	N.T.S.
1.	CHANGES TO B. TO G.	K.C.	95.04.24				
NO.	REVISION	APR'D	DATE	BSD-N3			

CITY OF BARRIE STANDARD

GENERAL NOTES
STORM SEWERS

4.	NOTE 'K' - SUMP PUMP DISCHARGE PIPING	B.R.	2003.01.07	APR'D:	R.G.N.	DATE:	92.05.15
3.	NOTE 'Y' & 'C' - "DIRECTOR OF ENGINEERING"	B.R.	2002.10.28				
2.	NOTE 'C' OPSD NUMBER REVISION	K.C.	2000.03.16	DRAWN:	L.A.J.	SCALE:	N.T.S.
1.	NOTE 'D' CHANGED	K.C.	98.03.30				
NO.	REVISION	APR'D	DATE	BSD-N5			

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NOTICE TO CONTRACTOR
IT IS THE RESPONSIBILITY OF THE CONTRACTOR'S SURVEYOR TO VERIFY THAT ALL LEGAL SURVEY DIMENSIONS SHOWN ON THE ENGINEERS DRAWINGS AGREE WITH THOSE ON THE REGISTERED LEGAL SURVEY PLAN. SHOULD THERE BE ANY DISCREPANCIES, THEN IMMEDIATELY NOTIFY THE ENGINEER OF RECORD

THE LOCATION OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY & HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ITS REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.

1	04/13/2023	ISSUED FOR SITE PLAN APPLICATION	SB	CAB
REV	DATE	DESCRIPTION	BY	APP
		PART OF LOT 18 CONCESSION 4 GEOGRAPHIC TOWNSHIP OF VESPREA NOW IN THE CITY OF BARRIE COUNTY OF SIMCOE		
		LEGAL DESCRIPTION		
		ELEVATIONS SHOWN ON THIS PLAN ARE RELATED TO GEODETIC DATUM AND ARE DERIVED FROM BENCH MARK No 003120080033 HAVING A PUBLISHED ELEVATION OF 277.889 METRES.		
		BENCHMARK		



Aplin & Martin Consultants Ltd.
405 - 55 St. Clair Ave. West, O.N. Canada M4V 2Y7
Tel: (416) 644-1900, Fax: (416) 644-1889, Email: general@aplinmartin.com

CLIENT
PETRO GOLD LTD.
261 ARNOLD AVE
VAUGHAN, ON L4J 1C3

PROJECT
MIXED-USE DEVELOPMENT
535 BAYFIELD STREET
BARRIE, ONTARIO

DRAWING TITLE
STANDARD NOTES

DESIGN	DATE	SCALE
CB	APRIL, 2023	N.T.S.
DRAWN	PROJECT NO.	
BL	21-7026	
CHECKED	DRAWING NO.	REV.
CAB	C04	1
APPROVED		
CAB		