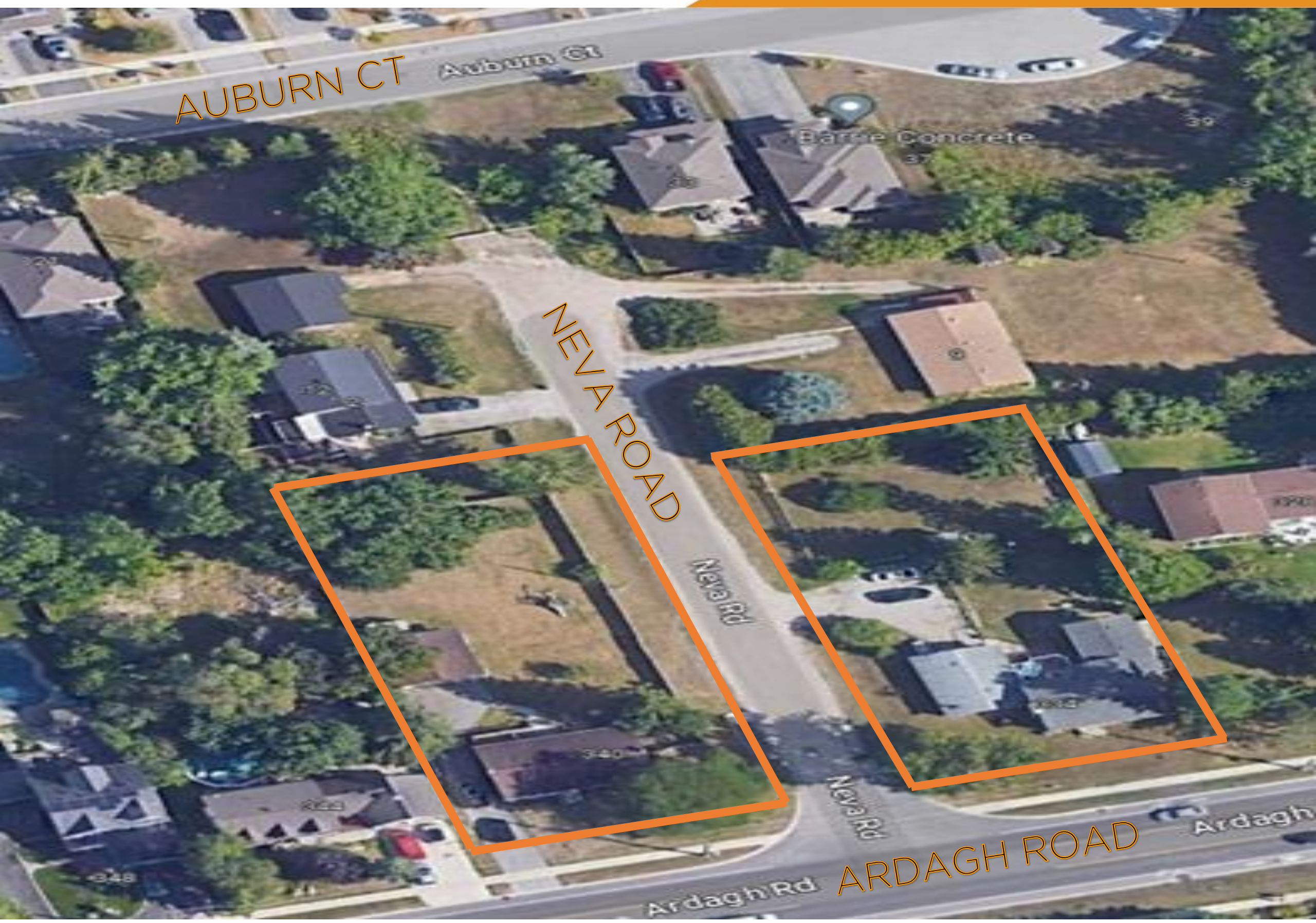


APLIN MARTIN

ENGINEERING ARCHITECTURE PLANNING SURVEYING

KING RICH HOMES GROUP.

334 & 340 Ardagh Rd, Barrie, On

Functional Servicing & Stormwater Management Report

354 DAVIS ROAD, SUITE 403, OAKVILLE, ON L6J 2X2
| WWW.APLINMARTIN.COM | (416) 644-1900

Project No: 22-7049

November 12, 2024

Aplin & Martin Consultants Ltd.

Quality Information

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Title: Project Engineer

Revision History

Revision	Date	Details	Name	Title
1	9-June-23	OPA, ZBA, SPA	Chesley Blahut	Project Manager
2	12-Nov-24	2nd Submission	Chesley Blahut	Engineering Lead

Distribution List

# Hard Copies	PDF Submission	Company/Association
1	1	King Rich Homes Group.

Statement of Limitations

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1.0 INTRODUCTION

Aplin Martin has been retained by King Rich Homes Group. to prepare a Functional Servicing and Stormwater Management Report (FSRSWM) in support of two 6-unit townhouse blocks and two 4-unit townhouse blocks, totaling 20 units. Each unit will have primary access off Neva Road. This FSRSWM has been prepared to assess and identify the servicing and Stormwater Management (SWM) requirements for this development in accordance with City of Barrie standards, as well as the standards set forth by the Ministry of Environment, Conservation and Parks (MECP).

1.1. Site Description

This proposed development is in Barrie, Ontario. The subject site currently consists of an existing 2 residential dwellings and a detached garage. The subject lands are surrounded by existing residential homes to the north, east and west and Ardagh Road to the south.

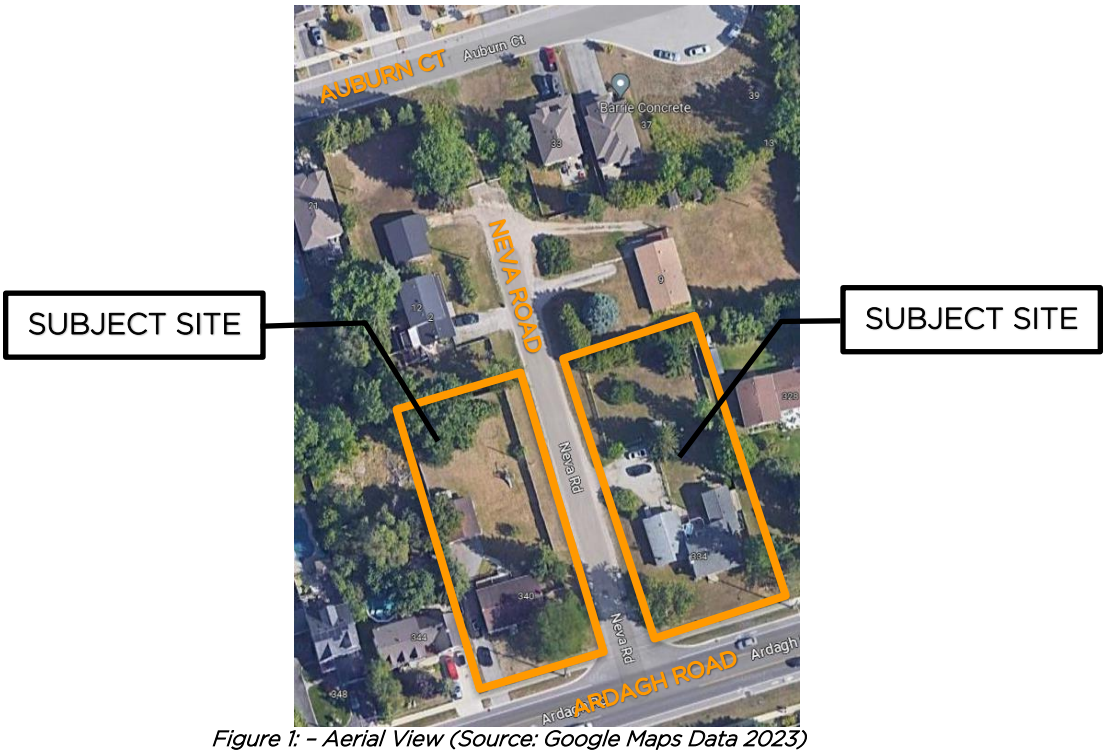


Figure 1: – Aerial View (Source: Google Maps Data 2023)

1.2. Proposed Development

The proposed development consists of two 6-unit townhouse blocks and two 4-unit townhouse blocks, totaling 20 units. Each unit will have one driveway primary access off Neva Road.

2.0 SANITARY SERVICING

2.1. Existing Sanitary Servicing

There is an existing 250mm sanitary sewer North of the site on Neva Road, which will drain to the north. The sanitary service for the existing dwellings will be abandoned during construction.

Table 1 summarizes the characteristics and results for the existing site:

Residential Dwelling Units	2
Equivalent Population (persons/unit)	3.1
Residential Population	6
Average Residential Flow (L/person/day)	225
Peak Residential Flow (L/s)	0.07
Infiltration (L/s)	0.10
Design Flow (L/s)	0.10

Table 1: Existing Sanitary Flow Calculations

2.2. Proposed Sanitary Servicing

The proposed redeveloped site will consist of two 6-unit townhouse blocks and two 4-unit townhouse blocks, totaling 20 units.

To calculate the proposed population, increase for the site, the following City standards for population densities and flow rates were used:

Residential

- 2.34 persons/unit for townhouse units
- Flow rate of 225 L/person/day for proposed

The infiltration factor for the City is 0.1 L/s per hectare.

Table 2 summarizes the characteristics and results for the site:

Townhouse Residential Units	20
Equivalent Population (persons/unit)	2.3
Residential Population	47
Average Residential Flow (L/person/day)	225
Peak Residential Flow (L/s)	0.55
Infiltration (L/s)	0.10
Design Flow (L/s)	0.65

Table 2: Proposed Sanitary Flow Calculations

Therefore, the proposed Peak Design Flow = 0.65 L/s.

The proposed development is to be serviced with a 200 mm diameter polyvinyl chloride (PVC) sanitary sewer sloped at 2.00%, which will extend from the existing 250 mm diameter sanitary sewer North of Neva Road. Individual sanitary service connection will be provided from the new sewer to service each dwelling.

3.0 DOMESTIC AND FIREFIGHTING WATER SUPPLY

3.1. Existing Water Supply

There are 2 municipal watermains that border the site, a 300 mm diameter watermain within Ardagh Road and a 150 mm diameter watermain within north of Neva Road. The watermain service connection for the existing dwellings are to be decommissioned and abandoned.

3.2. Proposed Water Supply

A 150 mm diameter water main is proposed extended from Neva Road and looped to Ardagh Road. Individual water service connection will be provided from the new main to service each dwelling and will be metered internally.

There is 1 existing fire hydrant located at the north-east side of Ardagh Road and Neva Road. A proposed fire hydrant is located on the west side of Neva Road, just north of the subject site to satisfy the maximum permitted hydrant spacing as per the City of Barrie's Water Transmission and Distribution Design Standard.

3.3. Design Considerations

The pressures and volumes must be sufficient for peak hour conditions and under fire conditions as established by the MECP Design Guidelines for Drinking Water Systems (2008). The minimal residual pressure under fire and non-fire conditions are 140 kPa (or 20 psi) and 275 kPa (or 40 psi), respectively.

The peak water demand of the site was calculated using the design population of the proposed development.

a)	Average Day Demand	- using 225 L/cap/day	0.07 L/s
b)	Maximum Day Demand	- 4.9 x daily residential demand	0.99 L/s
c)	Peak Hour Demand	- 7.4 x daily residential demand	0.66 L/s
d)	Fire Flow for Residential Space as per the Fire Underwriter's Survey 1999 Manual		116.00 L/s

Refer to Appendix C for the complete water demand calculations.

A Fire Hydrant Flow Test was conducted by Hydrant Testing Ontario on June 19, 2023. Refer to *Table 3* below for a summary of the results.

No. Ports Open	USGPM	Residual Pressure (PSI)
1	951	76
2	875	74
Theoretical Flow @ 20 PSI	5286	

Table 3: Fire Hydrant Flow Test Results

As the maximum theoretical flow provided (5286 USGPM or 333 L/s) @ 20 PSI is lower than the peak water demand, the existing municipal infrastructure will support the proposed development. Refer to Appendix C for the complete fire hydrant flow test results.

4.0 STORMWATER MANAGEMENT

4.1. Design Criteria

Stormwater Management for the proposed development is designed in accordance with the City of Barrie Design Criteria and Wet Weather Flow Management Guidelines. The following is a summary of the Stormwater Management criteria applicable to this project:

- Quantity Control – As per the City's requirements, the site must control the post-to-pre quantity control rate calculated using a maximum pre-development runoff coefficient of 0.50.
- Quality Control– The site shall treat stormwater runoff to enhanced level protection achieving 80% Total Suspended Solids (TSS) removal.
- Water Balance – The Site is located within the Nottawasaga Valley S.P.A. (Source Protection Area). The Site is found in an area identified as a Quantity Wellhead Protection Area WHPA-Q1 and WHPA-Q2 (low stress). The Site is located in a Groundwater Quality Vulnerable Area.

- Erosion Control – As outlined by the City for small developments, additional erosion control is not required given that the minimum 5 mm retention is achieved through the proposed water balance objectives.

4.2. Quantity Control

4.2.1. Existing Conditions

Under existing conditions, all site runoff (from area A1 Pre, A2 Pre and A3 Pre) is conveyed uncontrolled through Neva Road ditch system to Auburn Court. Roof runoff is released through rainwater leaders at each corner of the existing buildings. Ultimately these flows are joined within Auburn Court and conveyed west in an existing municipal detention facility. Refer to pre-development drainage area plan Fig-01 in Appendix D and a copy of the overall drainage area plan in Appendix D.

As noted above, City of Barrie design criteria requires that post-development site runoff be controlled to pre-development runoff rates calculated using a maximum runoff coefficient of 0.4. Refer to *Table 4* below for a summary of the target release rate established for this development using the City's IDF parameters.

Area ID	Area (ha)	Runoff Coefficient	2-Year Intensity (mm/hour)	2-Year Release Rate (L/s)	5-Year Intensity (mm/hour)	5-Year Release Rate (L/s)	100-Year Intensity (mm/hour)	100-Year Release Rate (L/s)
A1 + A2 + A3	0.43	0.4	83.1	39.2	109.1	51.5	180.4	85.2

Table 4: Target Release Rate Summary

4.2.2. Proposed Conditions

Proposed conditions maintain the existing drainage pattern by conveying the site flows to Neva Road, ultimately out letting to Auburn Court.

The proposed conditions consist of three catchment areas - A1 Post is controlled drainage from townhouse blocks 1 and 2 and conveyed overland via sheet flow and through rear yard catch basins to proposed storm sewer within Neva Road. A2 Post controls drainage from townhouse blocks 3 and 4 and conveyed overland via sheet flow and through rear yard catch basins to proposed storm sewer within Neva Road. A3 Post is the right-of-way runoff from Neva Road, which is captured within 2 catch basins at the northern development limit and released to the Neva Road storm sewer. Once in the Neva Road storm sewer, the runoff ultimately drains north to Auburn Court. Refer to post-development drainage area plan Fig-02 in Appendix D.

Quantity control measures are required to achieve the outlined target release rates. These measures include:

- 43.3 m^3 of storage provided by an 865 mm x 1345 mm elliptical storm pipe within the right of way
- A 180 mm diameter orifice tube downstream of manhole D1

Modified Rational Method (MRM) calculations were performed using the City of Barrie's IDF parameters to quantify the required storage for the proposed development. The proposed total site release rate for the 2-year through 100-year storm events does not exceed the established pre-development target release rate. See *Table* 5 below for a summary of the proposed SWM strategy.

Storm Frequency (years)	Area (m^2)	Coefficient	Storage Required (m^3)	Head on Orifice (m)	Total Release Rate (L/s)	Target Release Rate (L/s)
100	0.025	0.63	42.3	1.37	83.0	85.0

Table 5: Post-Development Discharge Summary

As indicated above, the proposed SWM design does not exceed the site runoff target release rate. This objective is achieved by restricting controlled flows with a 180 mm diameter orifice tube and by providing 43.3 m^3 of underground pipe storage.

4.3. Water Quality

As stated above, the water quality objective for the site is to achieve a minimum of 80% TSS removal. The site was previously considered as part of the design for Phase 1 of the Meadows Bear Creek subdivision. As part of such design, the subject lands were considered in the Enhanced Protection Level 1 quality calculation. All storm water runoff of the subdivision will be routed through a sediment forebay and wet pond facility. See Appendix D for an excerpt of the final Stormwater Management Report and accompanying calculations.

4.4. Water Balance

The subject site is located within the Middle Nottawasaga River Reach Subwatershed of the Nottawasaga Valley Watershed under the jurisdiction of NVCA, but not in a NVCA regulated area.

The Site is in The City of Barrie, Wellhead Protection Areas for Quantity (WHPA-Q1 and Q2) with low stress. Due to the groundwater control for the proposed development, groundwater withdrawal will occur at the Site. In addition, due to the site development, the site features will change including increased impervious surface area and decreased pervious area, which results in decrease in infiltration. The site is an area where changes in groundwater depletion and recharge rates could potentially affect the quantity of groundwater available for use. Because of this designation, the proposed development is required to maintain pre-development infiltration volumes on an annual basis.

The Site is located in a WHPA-D area, which indicates a municipal well which is sensitive to contamination, and which are arranged according to either a set distance or delineated based on the time of-travel (up to 25 years) that it would take for water entering the ground to enter the well. The Site is found in a WHPA-D area, which indicates that water and any pollution that may be present can reach the well within 25 years. The site has a WHPA-D score of 2. The site is within a highly vulnerable aquifer (score of 6). The area lies within a chloride contaminant issue contributing area.

Based on the water balance findings for 334 Ardagh Road by Sirati & Partners Consultants LTD, an infiltration deficit will be anticipated in an amount of 208 m3 /year (334 Ardagh) and 184 m3 /year (340 Ardagh) due to the development of the Site. On the other hand, a total amount of 632 m3 /year of roof water is anticipated to be available from the roofs of the buildings, which is sufficient to compensate for the infiltration deficit caused due to the proposed development. Refer to the full report by Sirati & Partners Consultants LTD dated November 8, 2024, for detailed calculations of the above results.

An analysis was completed and concluded that the site experiences an infiltration deficit of 392 m^3/year. This can be offset by infiltrating 3.6mm across the site in post-development conditions, which results in an infiltration volume of 11.0 m^3. To compensate for the deficit, an alternate groundwater recharge methodology shall be adopted. It should be noted that City is restricting use of LID methodology for deficit compensation due to VOC impacted groundwater, it is recommended to compensate this deficit by utilizing rain barrels (32 barrels of 0.35m^3 each

totaling 11.2 m^3 capacity) capturing the roof runoff and reusing for local irrigation of grassed swales and vegetation. See Appendix D for detailed water balance calculations.

4.5. Erosion and Sediment Control During Construction

Sediment control measures will be installed for all phases and activities during construction to reduce the volume sediment-laden runoff and minimize damage to the natural downstream system. The following Erosion and Sediment Control measures will be implemented:

- Contain sediment on-site by using cut-off swales, silt fences and sediment traps on existing and proposed catch basins.
- Provide a gravel mud mat at the entrance of the site.
- Conduct regular inspections of erosion and sediment control measures to ensure they are functioning as per design.

Once all phases of construction have been completed, removal of the erosion and sediment control measures can take place. Refer to Appendix E for the Erosion and Sediment Control Plan Drawing C03.

4.6. Proposed Storm Discharge Location

The proposed storm sewer system has been designed to convey the minor system (5-year) stormwater flows from the subject site and future external flows from the north of Auburn Court storm sewers. As demonstrated, the proposed storm sewers will not adversely impact the downstream network. The major flows (100-year) are proposed to be detained using an oversized storm sewer within the Neva Road ROW. A storm sewer design sheet has been provided in Appendix D for the portion of the storm sewer proposed on Neva Road.

Controlled site runoff from the subject residential development will ultimately discharge through a proposed 300 mm diameter storm service connection to the existing 300 mm diameter storm sewer located on Auburn Court This existing storm sewer conveys flows to the west before connecting to the existing 375 mm and 525mm diameter storm sewer flowing west on Wright Drive.

Storm sewers and appurtenances have been designed in accordance with the City of Barrie design criteria. Thus, the stormwater discharge from the Site will meet the storm sewer limits (Section 4, and Schedule A, Table 2) at the property line as outlined in the *Sewer Use By-law 2021-002*. Refer to Appendix E for the proposed storm servicing design shown on the Site Servicing Plan Drawing C02.

4.7 Groundwater Discharge

4.7.1 Short-term Dewatering (Construction)

A Hydrogeological Assessment was prepared for the subject site was prepared by Sirati & Partners Consultants LTD dated October 30, 2024, to identify the subsurface conditions of the subject site as well as the temporary and permanent dewatering requirements.

Based on the available information, the above assumptions and measurements, groundwater dewatering was not anticipated for excavation and construction of the foundations and/or underground basements for 334 Ardagh Road. See Appendix D for full Hydrogeological Assessment.

The design and installation of a construction dewatering system is the responsibility of the construction contractor. Appropriate measures should be taken during construction to deal with surface water and groundwater infiltration into excavation to enable construction. Around the perimeter of the excavation, an inceptor perimeter trench should be constructed to prevent surface water ingress entering the excavation areas.

4.8 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 6* below.

SWM Measure	Value Required / Provided
Quantity - Allowable / Actual Release Rate (Pre-development flow to post-development flow)	83.0 / 85.0 L/s
Storage – Pipe storage and orifice tube	42.3 / 43.3 m^3
Water Quality – Enhanced Protection Level 1 quality	Enhanced Protection Level 1 quality provided by downstream existing pond

Table 6: SWM Summary

5.0 CONCLUSIONS AND RECOMMENDATIONS

Based on our analysis of the proposed development and supporting documentation, the following conclusions and recommendations are made:

- Proposed townhouse blocks to connect to the proposed 200mm sanitary sewer within Neva Road, which connects to the existing 250mm capped connection at Auburn Court.
- Proposed townhouse blocks to connect to the proposed 150mm watermain within Neva Road, which connects to the existing 150mm capped watermain at Auburn Court and to the existing 300mm watermain within Ardagh Road.
- As per the City's requirements, the site must control the post-to-pre quantity control rate calculated using a maximum pre-development runoff coefficient of 0.50.
- Enhanced level protection achieving 80% Total Suspended Solids (TSS) removal is provided by downstream existing pond.
- The Site is located within the Nottawasaga Valley S.P.A. (Source Protection Area). The Site is found in an area identified as a Quantity Wellhead Protection Area WHPA-Q1 and WHPA-Q2 (low stress). The Site is located in a Groundwater Quality Vulnerable Area. Water balance will be provided by irrigation of roof drainage directed through rain barrels.

APPENDIX A

SUPPORTING DOCUMENTATION

SURVEYOR'S REAL PROPERTY REPORT–PART 1

PLAN OF SURVEY OF PART OF LOTS 5 & 6 REGISTERED PLAN 1192 CITY OF BARRIE COUNTY OF SIMCOE

SCALE 1:200

0 5 10 20 Metres

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PEARSON & PEARSON SURVEYING LTD. 2022

Ontario Land Surveyors

Metric

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

Part 2

DESCRIPTION OF LAND: PART OF LOTS 5 AND 6, REGISTERED PLAN 1192, CITY OF BARRIE, COUNTY OF SIMCOE.

REGISTERED EASEMENTS AND/OR RIGHTS OF WAY:

1. No.334 ARDAGH ROAD (PIN 58763–1025) – NO REGISTERED EASEMENTS OR RIGHTS OF WAY ON TITLE.
2. No.340 ARDAGH ROAD (PIN 58763–1016) – NO REGISTERED EASEMENTS OR RIGHTS OF WAY ON TITLE.

BOUNDARY FEATURES: NOTE ALL FENCES, DRIVEWAYS, HEDGES, SHEDS, GARAGE AND UTILITY POLES ARE SHOWN IN RELATION TO THE BOUNDARY.

COMPLIANCE WITH MUNICIPAL ZONING BY–LAWS: THIS PLAN DOES NOT CERTIFY ZONING COMPLIANCE OR IDENTIFY WHAT ZONING RESTRICTIONS ARE INVOLVED.

THIS REPORT WAS PREPARED FOR EUGENE STURINO AND THE UNDERSIGNED ACCEPTS AND NO RESPONSIBILITY FOR ITS USE BY OTHER PARTIES.

ADDITIONAL REMARKS: NOTE THE POSITION OF BOARD FENCE ON LOT 6 PROJECTS OVER THE WEST PROPERTY LIMIT.

Legend

■	DENOTES	SURVEY MONUMENT FOUND
□	DENOTES	SURVEY MONUMENT SET
SIB	DENOTES	STANDARD IRON BAR
IB	DENOTES	IRON BAR
OU	DENOTES	ORIGIN UNKNOWN
S	DENOTES	SET
M	DENOTES	MEASURED
WIT	DENOTES	WITNESS
N/S/E/W	DENOTES	NORTH/SOUTH/EAST/WEST
P	DENOTES	PLAN 51R–29800
P1	DENOTES	SURVEYOR'S REAL PROPERTY REPORT BY RUDY MAK SURVEYING LTD., O.L.S., DATED SEPTEMBER 21, 2000
P2	DENOTES	REGISTERED PLAN 51M–867
D	DENOTES	INSTRUMENT No.RO895296(PIN 58763–0301)
738	DENOTES	R.C. KIRKPATRICK, O.L.S.
974	DENOTES	T.C. SEAWRIGHT, O.L.S.
1546	DENOTES	RUDY MAK SURVEYING LTD., O.L.S.
ST	DENOTES	TIES TO STONE
FDN	DENOTES	TIES TO CONCRETE FOUNDATION
WD	DENOTES	TIES TO WOOD
BF	DENOTES	BOARD FENCE
CLF	DENOTES	CHAIN LINK FENCE
RF	DENOTES	RAIL FENCE
SRW	DENOTES	STONE RETAINING WALL
WRW	DENOTES	WOOD RETAINING WALL
BC	DENOTES	BOTTOM OF CURB ELEVATION
OHW	DENOTES	OVERHEAD WIRES
UP	DENOTES	UTILITY POLE
CB	DENOTES	CATCHBASIN
MH	DENOTES	MANHOLE
WV	DENOTES	WATER VALVE
FH	DENOTES	FIRE HYDRANT
Ø	DENOTES	DIAMETER (ROUND)
DS	DENOTES	DOOR SILL ELEVATION
	DENOTES	DECIDUOUS TREE WITH TRUNK DIAMETER
	DENOTES	CONIFEROUS TREE WITH TRUNK DIAMETER

REGISTERED PLAN 51M–867

LOT 127 | LOT 128

NEVA ROAD

BLOCK 175
PIN 58763 – 1681

LIMIT BETWEEN REGISTERED PLANS 1192 AND 51M–867

REGISTERED PLAN 1192

LOT 64 | LOT 65 | LOT 66 | LOT 67

REGISTERED PLAN 51M–646

BLOCK 210 (5.00m WIDENING)

PART 2, PLAN 51R – 41773

PART 3, PLAN 51R – 29800 | PART 1, PLAN 51R – 29800 | PART 2, PLAN 51R – 29800 | PART 4, PLAN 51R – 29800

PART 15, PLAN 51R – 29800
PIN 58763 – 1026

PART 16, PLAN 51R – 29800
PIN 58763 – 1017
WIDENED BY BY–LAW No.2000–240
INSTRUMENT No.LT457363

PART 17, PLAN 51R – 29800
PIN 58763 – 1017
WIDENED BY BY–LAW No.2000–240
INSTRUMENT No.LT457363

PART 18, PLAN 51R – 29800
PIN 58763 – 1024
WIDENED BY BY–LAW No.2000–299
INSTRUMENT No.LT466213

PART 19, PLAN 51R – 29800
PIN 58763 – 1020

PART 20, PLAN 51R – 29800

PART 23, PLAN 51R–29800
PIN 58763 – 1017
WIDENED BY BY–LAW No.2000–240
INSTRUMENT No.LT457363

PART 24, PLAN 51R – 29800
PIN 58763 – 1024
WIDENED BY BY–LAW No.2000–299
INSTRUMENT No.LT466213

PIN 58763 – 0336

PART OF LOT 3 CONCESSION 14
PIN 58763 – 0301

PART OF LOT 3 CONCESSION 14
PIN 58763 – 0302

LOT 4 | LOT 5 PIN 58763 – 1016 | LOT 6 PIN 58763 – 1025 | LOT 7 PIN 58763 – 1021

PIN 58763 – 1677

No. 344
1–1/2 Storey Frame Dwelling
DS=248.58
(Ties to Frame)

No. 340
1 Storey Brick Dwelling
DS=248.47
(Ties to Brick)

No. 334
1 Storey Frame & Stone Dwelling
DS=249.09
(Ties to Frame)

No. 328
1–1/2 Storey Frame & Stone Dwelling
DS=247.30

Vinyl Shed (Ties to Vinyl)

Brick & Wood Garage (Ties to Brick)

Wood Shed | Canopy

Wood Deck | Hot Tub | Steps | Concrete Porch | Covered Concrete Porch | Interlock | Gravel Area | Asphalt Area | Planter | SRW | Hedge | Driveway | Gravel | Concrete | Sidewalk | Curb Cut | Concrete Curb | Mail Box On Concrete | Metal Culvert 0.30Ø | Approximate Centreline of Ditch± | Top of Slope | Edge of Pavement | Approximate Centreline of Pavement

Bell Box | Gate | Shrub | Metal Pipe | Site Benchmark Top of Manhole Elevation=247.67m

IB(1546) | IB(738) | SIB(1546) | SIB(738) | CB | MH | FH | WV | UP | GW

N73°11'20"E(P1)
N73°09'50"E(M)

N16°49'15"W(M)
N16°48'20"W(P1&M)
N16°50'10"W(P1&M)
N16°49'05"W(M)
N16°48'30"W(P1)

N28°09'30"E(P1&M)
N61°50'30"W(P1&M)

(REFERENCE BEARING) N73°09'45"E

ARDAGH ROAD (BY BY–LAW No.2483)
PIN 58763 – 0002
(ORIGINAL ROAD ALLOWANCE BETWEEN CONCESSIONS 13 & 14)

SOUTHEAST CORNER OF LOT 5 REGISTERED PLAN 1192

SOUTHWEST CORNER OF LOT 6 REGISTERED PLAN 1192

Bearing Note

BEARINGS ARE UTM GRID AND THE NORTHERLY LIMIT OF ARDAGH ROAD AS WIDENED SHOWN ON PLAN 51R–29800 AS HAVING A BEARING OF N73°09'45"E.

Benchmark

ELEVATIONS ARE GEODETIC AND ARE REFERRED TO A CITY OF TORONTO BENCHMARK.
Station# : 03120080013 ELEVATION = 284.792m(DATUM: CGVD28: 78)

Note

TREE CALIPERS ARE NOT TO ARBORIST STANDARDS AND FOR ARBORIST CALIPER REFER TO ARBORIST REPORT.

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 THE 7TH DAY OF JULY, 2022.

July 07, 2022
Date

Jason Chun–Ho Mo
Ontario Land Surveyor

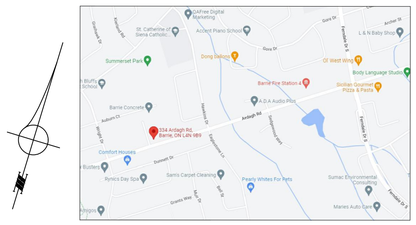
ASSOCIATION OF ONTARIO LAND SURVEYORS
PLAN SUBMISSION FORM
2192682

THIS PLAN IS NOT VALID UNLESS IT IS AN EMBOSSED ORIGINAL COPY ISSUED BY THE SURVEYOR. In accordance with Regulation 1026, Section 29(3).

10211 KEELE STREET, UNIT #16, MAPLE ONTARIO, L6A 4R7
O. : (289) 553–5453
E. : michelepearson@pearsonandpearson.ca
PEARSON PEARSON SURVEYING LTD.

DRAWING : 2485–ArdaghRoad334&340–SRPR.DWG | PROJECT : 2485
CALC. BY DL | DRAWN BY JC/JM | CHECKED BY MP/JM

	LOT STATISTICS:		Block 1 Individual Lots							
Landscape:	LOT AREA m2	Hard surface m2	Soft Landscp m2	Total Landscp %	Amenity Area m2	Lot Frontage	LOT AREA m2	BLDG AREA m2	TOTAL %	NOTES:
UNIT 1	200.46	23.37	105.57	0.53	88.06	8.75	200.46	71.16	0.35	1. Hard surface includes walkways & driveway area
UNIT 2	134.06	19.71	44.06	0.33	39.36	5.5	134.06	70.23	0.52	2. Soft landscape = grassed areas
UNIT 3	134.07	19.73	44.06	0.33	39.35	5.5	134.07	70.23	0.52	3. Amenity area includes rear/side yard and decks
UNIT 4	134.09	19.78	44.06	0.33	39.34	5.5	134.09	70.23	0.52	where applicable.
UNIT 5	134.1	19.74	44.06	0.33	39.33	5.5	134.1	70.23	0.52	
UNIT 6	164.71	19.78	74.6	0.45	64.98	6.75	164.71	70.23	0.43	4. BLDG AREA: Includes porches
	LOT STATISTICS:		Block 2 Individual Lots							
Landscape:	LOT AREA m2	Hard surface m2	Soft Landscp m2	Total Landscp %	Amenity Area m2	Lot Frontage	LOT AREA m2	BLDG AREA m2	TOTAL %	NOTES:
UNIT 7	164.73	19.79	74.59	0.45	64.97	6.75	164.73	70.23	0.43	1. Hard surface includes driveways and walkways
UNIT 8	134.14	19.79	44.07	0.33	39.3	5.5	134.14	70.23	0.52	2. Soft landscape = grassed areas
UNIT 9	134.15	19.81	44.07	0.33	39.3	5.5	134.15	70.23	0.52	3. Amenity area includes rear yard and decks
UNIT 10	164.77	19.83	74.61	0.45	64.93	6.75	164.77	70.23	0.43	where applicable.
										4. BLDG AREA: Includes porches
	LOT STATISTICS:		Block 3 Individual Lots							
Landscape:	LOT AREA m2	Hard surface m2	Soft Landscp m2	Total Landscp %	Amenity Area m2	Lot Frontage	LOT AREA m2	BLDG AREA m2	TOTAL %	NOTES:
UNIT 11	164.7	19.73	74.64	0.45	65.1	6.75	164.7	70.23	0.43	1. Hard surface includes driveways and walkways
UNTI 12	134.1	19.77	44.1	0.33	39.41	5.5	134.1	70.23	0.52	2. Soft landscape = grassed areas
UNIT 13	134.09	19.72	44.09	0.33	39.4	5.5	134.09	70.23	0.52	3. Amenity area includes rear yard and decks
UNIT 14	164.67	19.73	74.6	0.45	65.06	6.75	164.67	70.23	0.43	where applicable.
										4. BLDG AREA: Includes porches
	LOT STATISTICS:		Block 4 Individual Lots							
Landscape:	LOT AREA m2	Hard surface m2	Soft Landscp m2	Total Landscp %	Amenity Area m2	Lot Frontage	LOT AREA m2	BLDG AREA m2	TOTAL %	NOTES:
UNIT 15	164.66	19.72	74.61	0.45	65.06	6.75	164.66	70.23	0.43	1. Hard surface includes walkways & driveway area
UNIT 16	134.07	19.76	44.08	0.33	39.38	5.5	134.07	70.23	0.52	2. Soft landscape = grassed areas
UNIT 17	134.06	19.73	44.07	0.33	39.37	5.5	134.06	70.23	0.52	3. Amenity area includes rear/side yard and decks
UNIT 18	134.06	19.72	44.06	0.33	39.36	5.5	134.06	70.23	0.52	where applicable.
UNIT 19	134.05	19.73	44.05	0.33	39.35	5.5	134.05	70.23	0.52	
UNIT 20	200.64	24.47	105.56	0.53	88.01	8.74	200.64	71.16	0.35	4. BLDG AREA: Includes porches



KEYMAP:

Legend

■	DENOTES	SURVEY MONUMENT FOUND
□	DENOTES	SURVEY MONUMENT SET
SIB	DENOTES	STANDARD IRON BAR
IB	DENOTES	IRON BAR
OU	DENOTES	ORIGIN UNKNOWN
S	DENOTES	SET
M	DENOTES	MEASURED
WIT	DENOTES	WITNESS
N/S/E/W	DENOTES	NORTH/SOUTH/EAST/WEST
P	DENOTES	PLAN 51R–29800
P1	DENOTES	SURVEYOR'S REAL PROPERTY REPORT BY RUDY MAK SURVEYING LTD., O.L.S., DATED SEPTEMBER 21, 2000
P2	DENOTES	REGISTERED PLAN 51M–867
D	DENOTES	INSTRUMENT No.RO895296(PIN 58763–0301)
738	DENOTES	R.C. KIRKPATRICK, O.L.S.
974	DENOTES	T.C. SEAWRIGHT, O.L.S.
1546	DENOTES	RUDY MAK SURVEYING LTD., O.L.S.
ST	DENOTES	TIES TO STONE
FDN	DENOTES	TIES TO CONCRETE FOUNDATION
WD	DENOTES	TIES TO WOOD
BF	DENOTES	BOARD FENCE
CLF	DENOTES	CHAIN LINK FENCE
RF	DENOTES	RAIL FENCE
SRW	DENOTES	STONE RETAINING WALL
WRW	DENOTES	WOOD RETAINING WALL
BC	DENOTES	BOTTOM OF CURB ELEVATION
OHW	DENOTES	OVERHEAD WIRES
UP	DENOTES	UTILITY POLE
CB	DENOTES	CATCHBASIN
MH	DENOTES	MANHOLE
WV	DENOTES	WATER VALVE
FH	DENOTES	FIRE HYDRANT
Ø	DENOTES	DIAMETER (ROUND)
DS	DENOTES	DOOR SILL ELEVATION
	DENOTES	DECIDUOUS TREE WITH TRUNK DIAMETER
	DENOTES	CONIFEROUS TREE WITH TRUNK DIAMETER
RWL	DENOTES	RWL DOWNSPOUT DISCHARGE

SURVEYOR'S REAL PROPERTY REPORT–PART 1

PLAN OF SURVEY OF PART OF LOTS 5 & 6 REGISTERED PLAN 1192 CITY OF BARRIE COUNTY OF SIMCOE

SCALE 1:200

0 5 10 20 Metres

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Ontario Land Surveyors

Metric

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

Part 2

DESCRIPTION OF LAND: PART OF LOTS 5 AND 6, REGISTERED PLAN 1192, CITY OF BARRIE, COUNTY OF SIMCOE.

REGISTERED EASEMENTS AND/OR RIGHTS OF WAY:

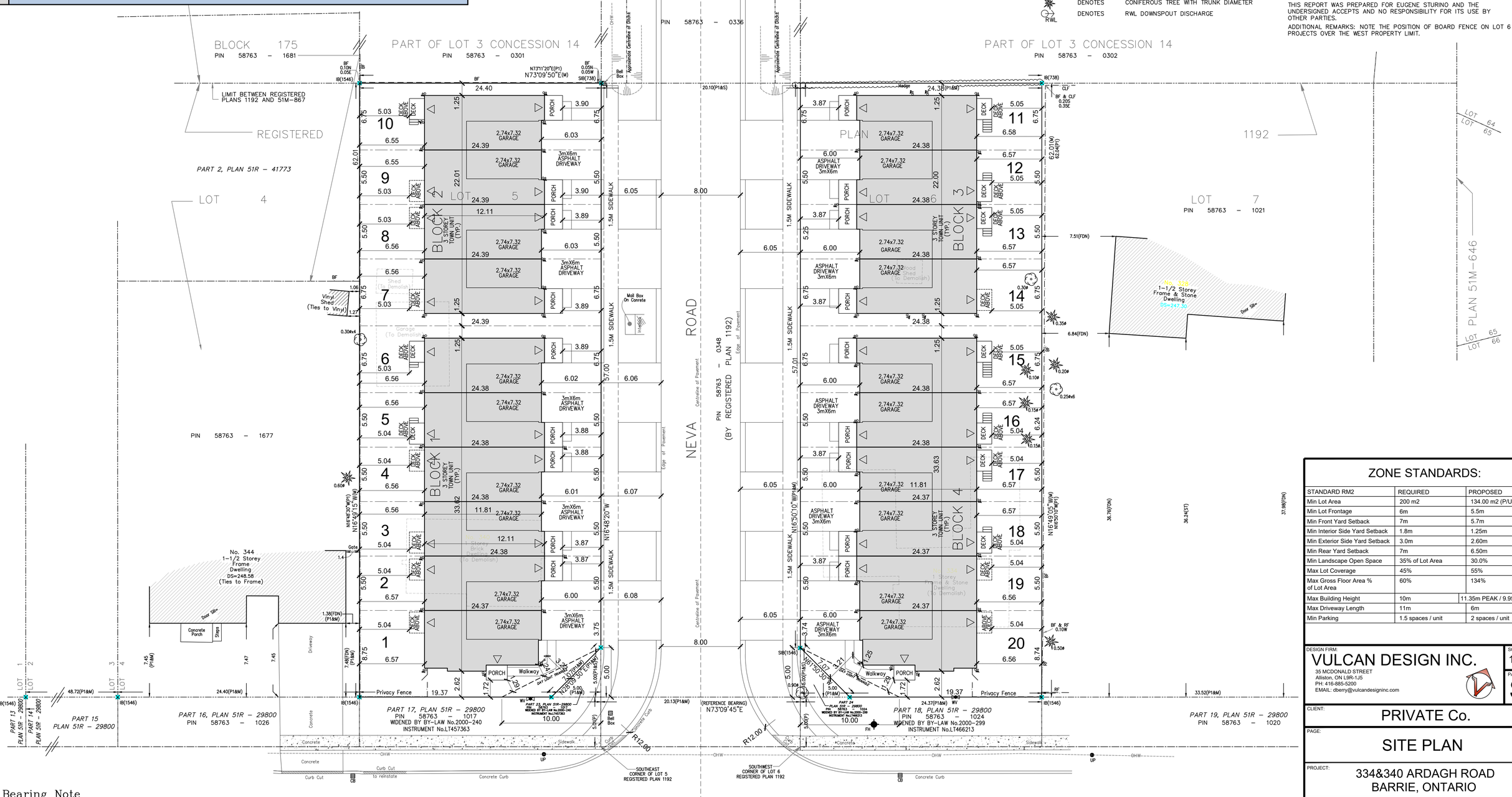
1. No.334 ARDAGH ROAD (PIN 58763–1025) – NO REGISTERED EASEMENTS OR RIGHTS OF WAY ON TITLE.
2. No.340 ARDAGH ROAD (PIN 58763–1016) – NO REGISTERED EASEMENTS OR RIGHTS OF WAY ON TITLE.

BOUNDARY FEATURES: NOTE ALL FENCES, DRIVEWAYS, HEDGES, SHEDS, GARAGE AND UTILITY POLES ARE SHOWN IN RELATION TO THE BOUNDARY.

COMPLIANCE WITH MUNICIPAL ZONING BY–LAWS: THIS PLAN DOES NOT CERTIFY ZONING COMPLIANCE OR IDENTIFY WHAT ZONING RESTRICTIONS ARE INVOLVED.

THIS REPORT WAS PREPARED FOR EUGENE STURINO AND THE UNDERSIGNED ACCEPTS AND NO RESPONSIBILITY FOR ITS USE BY OTHER PARTIES.

ADDITIONAL REMARKS: NOTE THE POSITION OF BOARD FENCE ON LOT 6 PROJECTS OVER THE WEST PROPERTY LIMIT.



Bearing Note

BEARINGS ARE UTM GRID AND THE NORTHERLY LIMIT OF ARDAGH ROAD AS WIDENED SHOWN ON PLAN 51R–29800 AS HAVING A BEARING OF N73°09'45"E.

Benchmark

ELEVATIONS ARE GEODETIC AND ARE REFERRED TO A CITY OF TORONTO BENCHMARK.
Station# : 03120080013 ELEVATION = 284.792m(DATUM: CGVD28: 78)

Note

TREE CALIPERS ARE NOT TO ARBORIST STANDARDS AND FOR ARBORIST CALIPER REFER TO ARBORIST REPORT.

ZONE STANDARDS:

STANDARD RM2	REQUIRED	PROPOSED
Min Lot Area	200 m2	134.00 m2 (P/UNIT)
Min Lot Frontage	6m	5.5m
Min Front Yard Setback	7m	5.7m
Min Interior Side Yard Setback	1.8m	1.25m
Min Exterior Side Yard Setback	3.0m	2.60m
Min Rear Yard Setback	7m	6.50m
Min Landscape Open Space	35% of Lot Area	30.0%
Max Lot Coverage	45%	55%
Max Gross Floor Area % of Lot Area	60%	134%
Max Building Height	10m	11.35m PEAK / 9.95m MID-PT.
Max Driveway Length	11m	6m
Min Parking	1.5 spaces / unit	2 spaces / unit

DESIGN FIRM:
VULCAN DESIGN INC.
35 MCDONALD STREET
Alliston, ON L9R-1J5
PH: 416-885-5200
EMAIL: dberry@vulcandesigninc.com

SCALE: 1:125

PAGE: S1

CLIENT: PRIVATE Co.

PAGE: SITE PLAN

PROJECT: 334&340 ARDAGH ROAD BARRIE, ONTARIO

NO.	REVISION:	DATE:	DWN.	CHK.
1.	ISSUED FOR REVIEW	SEP 29/22	DCB	DCB
2.	ISSUED FOR REVIEW	NOV 11/29	DCB	

DESIGNER BCIN DECLARATION

I DANIEL BERRY DECLARE THAT I HAVE REVIEWED & TAKE DESIGN RESPONDSIBILITY FOR THE DESIGN WORK UNDER DIVISION C, PART 3 SECTION 3.2 OF THE ONTARIO BUILDING CODE. I AM QUALIFIED AND THE FIRM IS REGISTERED IN THE APPROPRIATE CATEGORIES.
FIRM BCIN: 36501
DESIGNER BCIN: 21107

SIGNATURE:_____ DATE: NOV 30/23

Legend

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IB	DENOTES	IRON BAR
OU	DENOTES	ORIGIN UNKNOWN
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RWL	DENOTES	RWL DOWNSPOUT DISCHARGE

SURVEYOR'S REAL PROPERTY REPORT-PART 1

PLAN OF SURVEY OF PART OF LOTS 5 & 6 REGISTERED PLAN 1192 CITY OF BARRIE COUNTY OF SIMCOE

SCALE 1:200

0 5 10 20 Metres

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PEARSON & PEARSON SURVEYING LTD. 2022

Ontario Land Surveyors

Metric

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

Part 2

DESCRIPTION OF LAND: PART OF LOTS 5 AND 6, REGISTERED PLAN 1192, CITY OF BARRIE, COUNTY OF SIMCOE.

REGISTERED EASEMENTS AND/OR RIGHTS OF WAY:

1. No.334 ARDAGH ROAD (PIN 58763-1025) - NO REGISTERED EASEMENTS OR RIGHTS OF WAY ON TITLE.
2. No.340 ARDAGH ROAD (PIN 58763-1016) - NO REGISTERED EASEMENTS OR RIGHTS OF WAY ON TITLE.

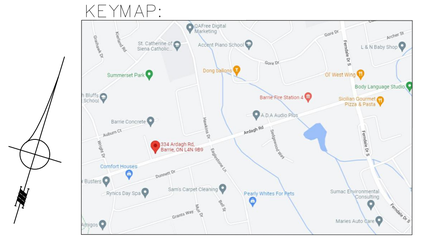
BOUNDARY FEATURES: NOTE ALL FENCES, DRIVEWAYS, HEDGES, SHEDS, GARAGE AND UTILITY POLES ARE SHOWN IN RELATION TO THE BOUNDARY.

COMPLIANCE WITH MUNICIPAL ZONING BY-LAWS: THIS PLAN DOES NOT CERTIFY ZONING COMPLIANCE OR IDENTIFY WHAT ZONING RESTRICTIONS ARE INVOLVED.

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ADDITIONAL REMARKS: NOTE THE POSITION OF BOARD FENCE ON LOT 6 PROJECTS OVER THE WEST PROPERTY LIMIT.

KEYMAP:



FIREBREAK REQUIREMENTS:

DENOTES - FIREBREAK LOTS

DENOTES - 1ST STAGE CONSTRUCTION BLOCKS

FIREBREAK PROCEDURES

WHERE BUILDING LOTS ARE LESS THAN 11 METERS (36 FEET) IN WIDTH AT ANY POINT, THE CITY MAY REQUIRE TWO (2) CONSECUTIVE LOTS OR BLOCKS OR COMBINATION THEREOF TO BE DESIGNATED AS FIRE BREAK LOTS SO AS NOT TO EXCEED 6 DWELLINGS IN A ROW WITHOUT THE OCCURRENCE OF A FIREBREAK.

FIREBREAK SHALL BE PROVIDED IMMEDIATELY ADJACENT TO EACH END OF A TOWNHOUSE BLOCK.

PARTIAL BUILDING PERMIT (FOUNDATION ONLY) MAY BE ISSUED FOR FIREBREAK LOTS. NOTWITHSTANDING THAT A BUILDING PERMIT MAY HAVE BEEN ISSUED FOR LOTS DESIGNATED AS FIREBREAK LOTS, NO CONSTRUCTION ABOVE THE LEVEL OF THE TOP OF THE FIRST FLOOR ASSEMBLY SHALL PROCEED UNTIL A FULL BUILDING PERMIT HAS BEEN ISSUED.

A FIREBREAK LOT SHALL BE MAINTAINED FREE OF ALL CONSTRUCTION MATERIAL, EQUIPMENT, AND DEBRIS.

NOTWITHSTANDING ANY OTHER PROVISION IN THIS BULLETIN, THE CITY'S CHIEF BUILDING OFFICIAL AND/OR THE FIRE CHIEF MAY ESTABLISH REQUIREMENTS AND/OR A FIREBREAK PLAN TO SUIT THE SITE AND/OR BUILDING(S).

RELEASE OF FIREBREAK LOTS/ ISSUANCE OF FULL BUILDING PERMIT

TOWNHOUSE BLOCKS ABUTTING FIREBREAK LOTS SHALL HAVE EXTERIOR CLADDING, ROOFING, FASCIA, SOFFITS, AND WINDOWS COMPLETED AND INSPECTED ON ALL SIDES OF THE TWO (2) UNITS CLOSEST TO THE FIREBREAK LOT PRIOR TO THE RELEASE OF THE FIREBREAK LOT(S).

THE OWNER MUST RECEIVE RELEASE OF THE FIREBREAK LOT PRIOR TO ISSUANCE OF A FULL BUILDING PERMIT FOR CONSTRUCTION ON A PREVIOUSLY DESIGNATED FIREBREAK LOT.

A BUILDING INSPECTOR WILL DETERMINE WHEN THE FULL BUILDING PERMIT CAN BE RELEASED FOR THE FIREBREAK LOT(S). ONCE THE ADJACENT BUILDINGS COMPLY WITH REQUIREMENT, THE OWNER MUST SUBMIT AN INSPECTION REQUEST AND AN INSPECTION IS REQUIRED TO VERIFY COMPLIANCE.

WHERE CONSTRUCTION OF A BUILDING OR STRUCTURE PROCEEDS ON ANY LOT IN CONTRAVENTION OF THE FIRE BREAK REQUIREMENTS, THE CITY MAY TAKE ANY ACTION NECESSARY TO ENFORCE THIS AGREEMENT AND MAY USE THE DEPOSITS PROVIDED BY THE OWNER FOR THE PURPOSES OF ASSOCIATED ADMINISTRATIVE AND LEGAL COST RECOVERY.

Bearing Note

BEARINGS ARE UTM GRID AND THE NORTHERLY LIMIT OF ARDAGH ROAD AS WIDENED SHOWN ON PLAN 51R-29800 AS HAVING A BEARING OF N73°09'45"E.

Benchmark

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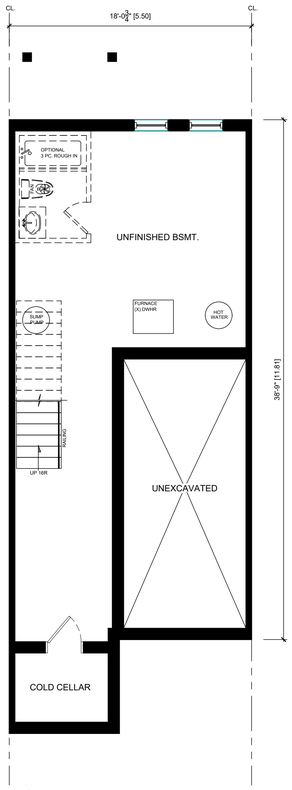
Note

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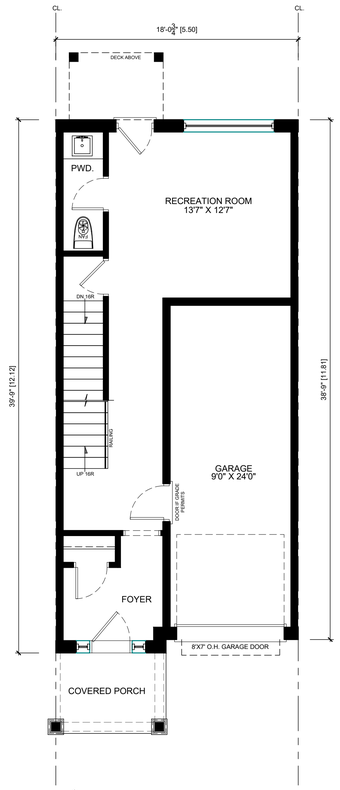
DESIGN FIRM:	SCALE: 1:125
VULCAN DESIGN INC.	PAGE: FB
35 MCDONALD STREET Alliston, ON L9R-1J5 PH: 416-885-5200 EMAIL: dberry@vulcandesigninc.com	
CLIENT:	PRIVATE Co.
PAGE:	FIREBREAK LOTS PLAN
PROJECT:	334&340 ARDAGH ROAD BARRIE, ONTARIO

NO.:	REVISION:	DATE:	DWN.	CHK.
1.	ISSUED FOR REVIEW	NOV 30/23	DCB	DCB

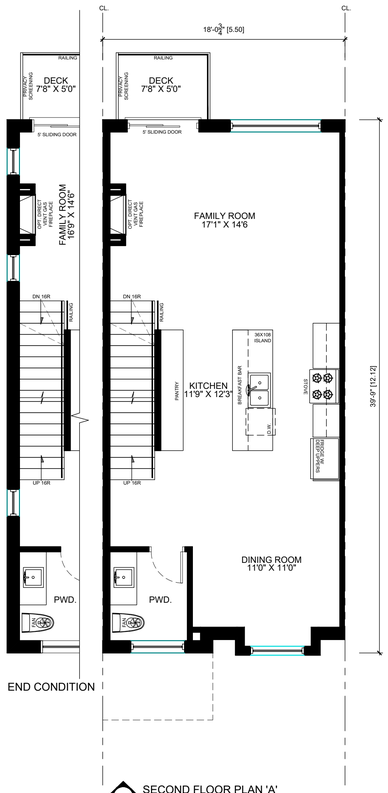
*CONSTRUCTION NOTES ARE THE PROPERTY OF VULCAN DESIGN INC. AND MAY NOT BE DUPLICATED OR COPIED WITH OUT THE WRITTEN CONSENT OF VULCAN DESIGN INC.
*ANY SUBSTITUTE MATERIALS TO NOTES STATED SHALL CONFORM TO O.B.C. REGULATIONS AND MANUFACTURES SPECIFICATIONS SHALL BE SUPPLIED BY BUILDER
**ONLY HEX NOTES IDENTIFIED ON PLANS / ELEVATIONS SHALL APPLY
*NOTES / CONSTRUCTION TO CONFORM TO 2012 ONTARIO BUILDING CODE



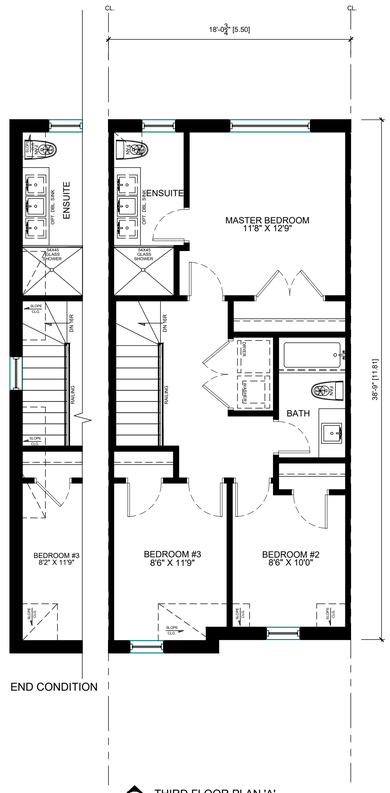
BASEMENT FLOOR PLAN 'A'
SCALE: AS NOTED ON PAGE
MODEL #1 BLOCK 1 & 3



GROUND FLOOR PLAN 'A'
SCALE: AS NOTED ON PAGE
MODEL #1 BLOCK 1 & 3



SECOND FLOOR PLAN 'A'
SCALE: AS NOTED ON PAGE
MODEL #1 BLOCK 1 & 3



THIRD FLOOR PLAN 'A'
SCALE: AS NOTED ON PAGE
MODEL #1 BLOCK 1 & 3

AREA CALCULATIONS				
GROUND	sf	470	m2	43.663
SECOND	sf	715	m2	66.424
THIRD	sf	708	m2	65.773
- O.T.B.	sf	0	m2	0.000
TOTAL	sf	1893	m2	175.860
FIN. BASEMENT	sf	0	m2	0.000
TOTAL	sf	1893	m2	175.860
COVERAGE CALCULATIONS				
GROUND	sf	470	m2	43.663
GARAGE	sf	237	m2	22.017
FRONT PORCH	sf	49	m2	4.552
REAR PORCH	sf	0	m2	0.000
CON. W/O PORCH	sf	707	m2	65.680
CON. W/ PORCH	sf	756	m2	70.232

VULCAN DESIGN INC.
Professional Service, Exceptional Value

35 MCDONALD STREET
ALLISTON, ON L9R 1J5
PH: 416-885-5200

EMAIL: dberry@vulcandesigninc.com
CONTACT PERSON: DANIEL BERRY

BCIN DECLARATION:

I DANIEL BERRY DECLARE THAT I HAVE REVIEWED & TAKE DESIGN RESPONSIBILITY FOR THE DESIGN WORK UNDER DIVISION C, PART 3 SECTION 3.2 OF THE ONTARIO BUILDING CODE. I AM QUALIFIED AND THE FIRM IS REGISTERED IN THE APPROPRIATE CATEGORIES.

FIRM BCIN: 36501

DESIGNER BCIN: 21107

SIGNATURE:_____ DATE: _____

LEGEND / LINTELS:

LINTELS:

WOOD

W1	2/2"X8"
W2	2/2"X10"
W3	2/2"X12"
W4	3/2"X8"
W5	3/2"X10"
W6	3/2"X12"

LVL (2.0E)

2-LVL 7	2- 1 3/4" X 7-1/4"
3-LVL 7	3- 1 3/4" X 7-1/4"
2-LVL 9	2- 1 3/4" X 9-1/2"
3-LVL 9	3- 1 3/4" X 9-1/2"
2-LVL 11	2- 1 3/4" X 11-7/8"
3-LVL 11	3- 1 3/4" X 11-7/8"
2-LVL 14	2- 1 3/4" X 14"
3-LVL 14	3- 1 3/4" X 14"

U.N.O. FASTEN MULTIPLE PLY LVL'S (2) ROWS @ 12" O.C. 3 $\frac{1}{2}$" (16d) NAILS OR SDW SCREWS

STEEL LINTELS

S1	<4'-0" L3-1/2" X 3-1/2" - 1/4"
S2	< 6'-0" L4" X 3-1/2" X 1/4"
S3	< 8'-0" L5" X 3-1/2" X 5/16"
S4	< 10'-0" L6" X 3-1/2" X 5/16"

-BEAR LINTELS MIN. 6" EACH END
-LINTELS SHALL BE PRIMED TO "CISICPMA 2-3"
-ORIENT ANGLES LONG LEG VERT.
-MAX. 1" BRICK OVERHANG
-WEEP HOLES @ 56" O.C. MAX

ABBREVIATIONS:

DJ	DOUBLE JOIST
TJ	TRIPLE JOIST
GT	GIRDER TRUSS
'DO'	DO OVER
RJ	ROOF JOISTS
STL.	STEEL
SB.	SOLID BEARING (SEE 'FRAMING REQ.'S')
PL.	POINT LOAD
(FL.)	FLUSH
(DR.)	DROPPED
FG.	FIXED GLASS
FDTN.	FOUNDATION
BG.	BLACK GLASS
JT	JACK TRUSS
U/S	UNDERSIDE
T/O	TOP OF
FG.	FIXED GLASS
CLG.	CEILING
BBFM	BEAM BY FLOOR MANUFACTURE

SOLID BEARING (SAME WIDTH AS SUPPORTED MEMBER)
CONCENTRATED POINT LOAD
FIRE PLACE VENT
DRYER VENT
STOVE VENT
CELLAR VENT
SMOKE ALARM
CARBON MONOXIDE DETECTOR
HOSE BIB
WATERPROOF ELECTRICAL OUTLET
HOOD/CELLAR VENT
DRYER VENT

GAS LINE
CABLE LINE
PHONE JACK
CEILING EXHAUST FAN
PULL CHAIN CLG. LIGHT
CEILING LIGHT
3 WAY SWITCH
LIGHT SWITCH
120 VOLT RECEPTACLE
ELECTRIC RECEPTACLE (42" OFF FINISH FLOOR)
FLOOR DRAIN

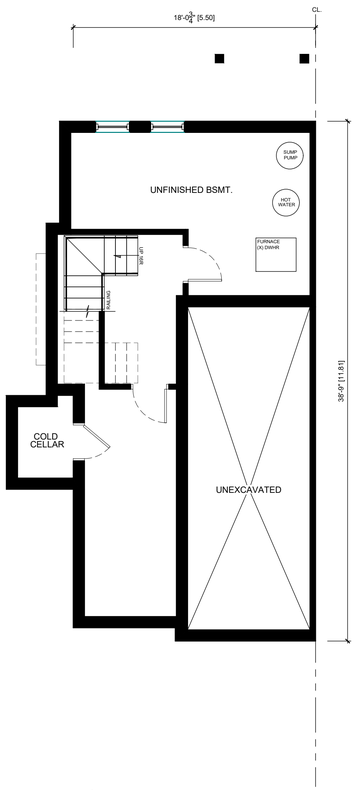
NO.	REVISION :	DATE:	DWN.	CHK
1	Issued for review	MAY04/23	dcb	dcb
2	Issued for review	NOV30/23	dcb	

PROJECT: V22-0677
334&340 ARDAGH ROAD
BARRIE, ON

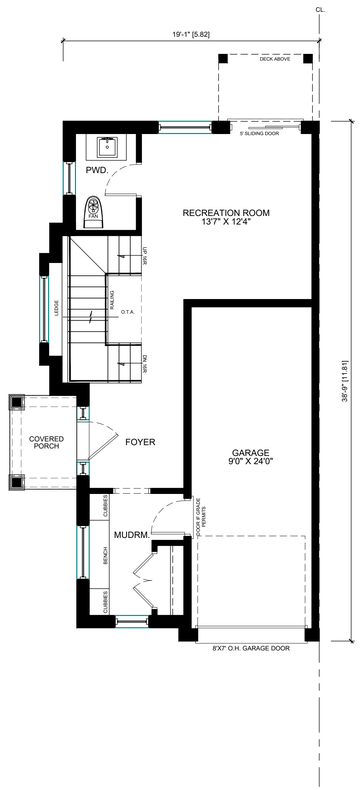
PG. CONTENT: FLOOR PLANS
SCALE: 3/16" = 1'-0"
PAGE: A1

Preliminary
(Not for Construction)

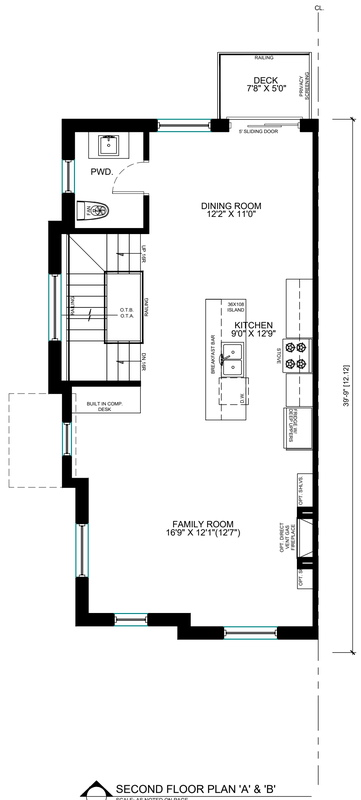
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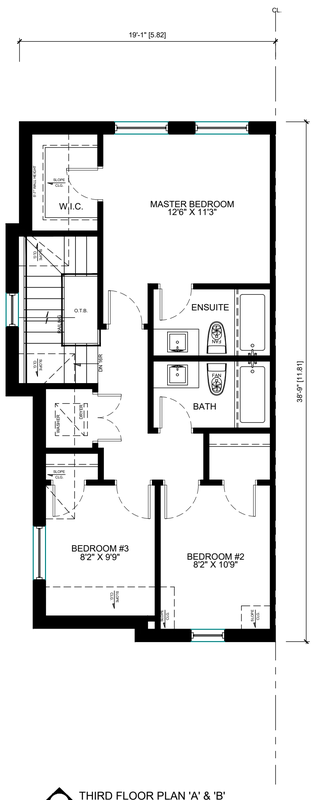
BASEMENT FLOOR PLAN 'A' & 'B'
SCALE: AS NOTED ON PAGE
MODEL #3 BLOCK 1 & 4



GROUND FLOOR PLAN 'A' & 'B'
SCALE: AS NOTED ON PAGE
MODEL #3 BLOCK 1 & 4



SECOND FLOOR PLAN 'A' & 'B'
SCALE: AS NOTED ON PAGE
MODEL #3 BLOCK 1 & 4



THIRD FLOOR PLAN 'A' & 'B'
SCALE: AS NOTED ON PAGE
MODEL #3 BLOCK 1 & 4

AREA CALCULATIONS				
GROUND	sf	493	m2	45.800
SECOND	sf	732	m2	68.003
THIRD	sf	726	m2	67.445
- O.T.B.	sf	25	m2	2.323
TOTAL	sf	1926	m2	178.925
FIN. BASEMENT	sf	0	m2	0.000
TOTAL	sf	1926	m2	178.925
COVERAGE CALCULATIONS				
GROUND	sf	493	m2	45.800
GARAGE	sf	238	m2	22.110
FRONT PORCH	sf	35	m2	3.252
REAR PORCH	sf	0	m2	0.000
CON. W/O PORCH	sf	731	m2	67.910
CON. W/ PORCH	sf	766	m2	71.161

VULCAN DESIGN INC.
Professional Service, Exceptional Value

35 MCDONALD STREET
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PH: 416-885-5200

EMAIL: dberry@vulcandesigninc.com
CONTACT PERSON: DANIEL BERRY

BCIN DECLARATION:

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FIRM BCIN: 36501

DESIGNER BCIN: 21107

SIGNATURE:_____ DATE: _____

LEGEND / LINTELS:

LINTELS:

WOOD

W1	2/2"X8"
W2	2/2"X10"
W3	2/2"X12"
W4	3/2"X8"
W5	3/2"X10"
W6	3/2"X12"

LVL (2.0E)

2-LVL 7	2- 1 3/4" X 7-1/4"
3-LVL 7	3- 1 3/4" X 7-1/4"
2-LVL 9	2- 1 3/4" X 9-1/2"
3-LVL 9	3- 1 3/4" X 9-1/2"
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3-LVL 11	3- 1 3/4" X 11-7/8"
2-LVL 14	2- 1 3/4" X 14"
3-LVL 14	3- 1 3/4" X 14"

U.N.O. FASTEN MULTIPLE PLY LVL'S (2) ROWS @ 12" O.C. 3 1/4" (16d) NAILS OR SDW SCREWS

STEEL LINTELS

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S3	< 8'-0" L5" X 3-1/2" X 5/16"
S4	< 10'-0" L6" X 3-1/2" X 5/16"

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-LINTELS SHALL BE PRIMED TO "CISC/CPMA 2-3"
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-MAX. 1" BRICK OVERHANG
-WEEP HOLES @ 56" O.C. MAX

ABBREVIATIONS:

DJ	DOUBLE JOIST
TJ	TRIPLE JOIST
GT	GIRDER TRUSS
'DO'	DO OVER
RJ	ROOF JOISTS
STL.	STEEL
SB.	SOLID BEARING (SEE 'FRAMING REQ.'S')
PL.	POINT LOAD
(FL.)	FLUSH
(DR.)	DROPPED
FG.	FIXED GLASS
FDTN.	FOUNDATION
BG.	BLACK GLASS
JT	JACK TRUSS
U/S	UNDERSIDE
T/O	TOP OF
FG.	FIXED GLASS
CLG.	CEILING
BBFM	BEAM BY FLOOR MANUFACTURE

SB SOLID BEARING (SAME WIDTH AS SUPPORTED MEMBER)
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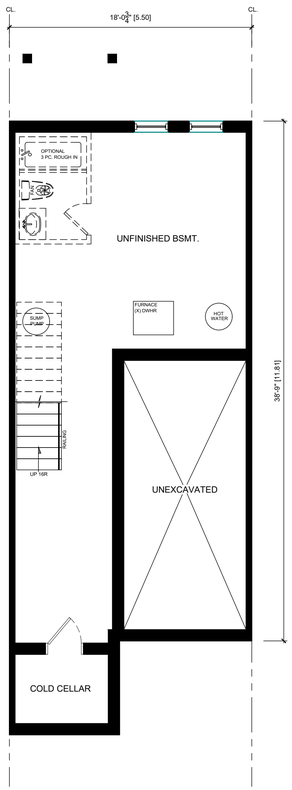
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PROJECT: V22-0677
334&340 ARDAGH ROAD
BARRIE, ON

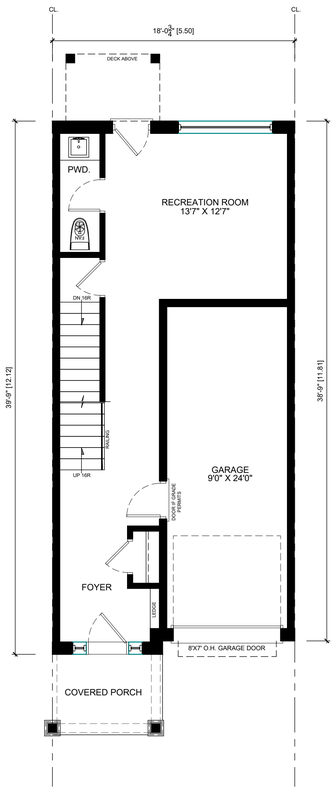
PG. CONTENT: FLOOR PLANS
SCALE: 3/16" = 1'-0"
PAGE: A2

Preliminary
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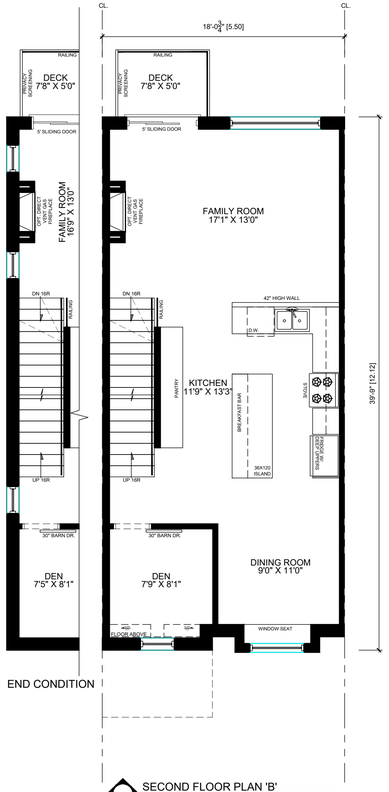
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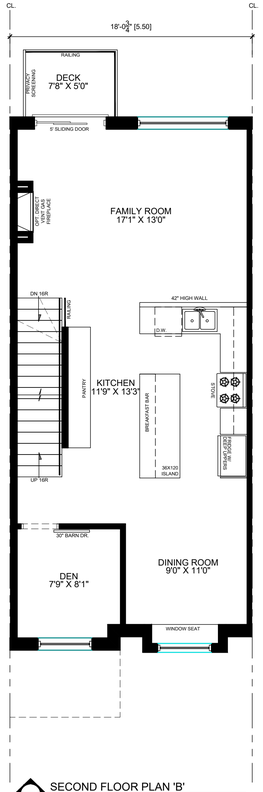
BASEMENT FLOOR PLAN 'B'
SCALE: AS NOTED ON PAGE
MODEL #2 BLOCK 2 & 4



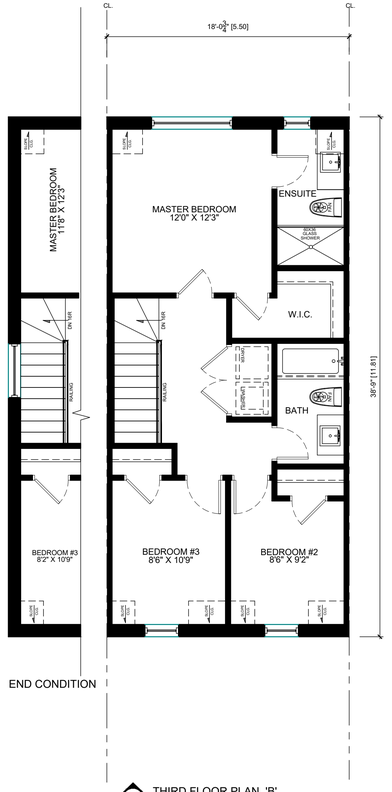
GROUND FLOOR PLAN 'B'
SCALE: AS NOTED ON PAGE
MODEL #2 BLOCK 2 & 4



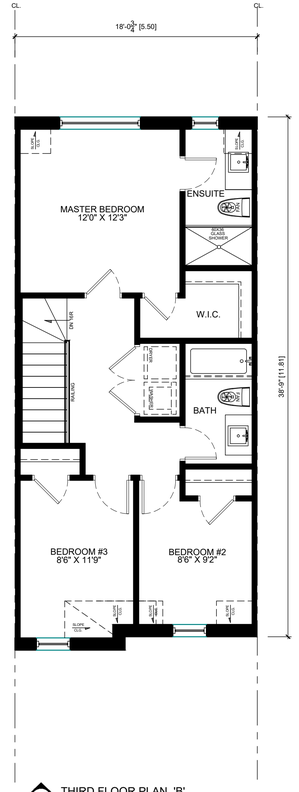
SECOND FLOOR PLAN 'B'
SCALE: AS NOTED ON PAGE
MODEL #2 BLOCK 2 & 4



SECOND FLOOR PLAN 'B'
SCALE: AS NOTED ON PAGE
MODEL #2A BLOCK 2 & 4



THIRD FLOOR PLAN 'B'
SCALE: AS NOTED ON PAGE
MODEL #2 BLOCK 2 & 4



THIRD FLOOR PLAN 'B'
SCALE: AS NOTED ON PAGE
MODEL #2A BLOCK 2 & 4

MODEL #2

AREA CALCULATIONS				
GROUND	sf	470	m2	43.663
SECOND	sf	715	m2	66.424
THIRD	sf	699	m2	64.937
- 0.7.8.	sf	0	m2	0.000
TOTAL	sf	1884	m2	175.024
FIN. BASEMENT	sf	0	m2	0.000
TOTAL	sf	1884	m2	175.024
COVERAGE CALCULATIONS				
GROUND	sf	470	m2	43.663
GARAGE	sf	237	m2	22.017
FRONT PORCH	sf	49	m2	4.552
REAR PORCH	sf	0	m2	0.000
CON. W/O PORCH	sf	707	m2	65.680
CON. W/ PORCH	sf	756	m2	70.232

MODEL #2A

AREA CALCULATIONS				
GROUND	sf	470	m2	43.663
SECOND	sf	715	m2	66.424
THIRD	sf	708	m2	65.773
- 0.7.8.	sf	0	m2	0.000
TOTAL	sf	1893	m2	175.860
FIN. BASEMENT	sf	0	m2	0.000
TOTAL	sf	1893	m2	175.860
COVERAGE CALCULATIONS				
GROUND	sf	470	m2	43.663
GARAGE	sf	237	m2	22.017
FRONT PORCH	sf	49	m2	4.552
REAR PORCH	sf	0	m2	0.000
CON. W/O PORCH	sf	707	m2	65.680
CON. W/ PORCH	sf	756	m2	70.232

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LVL (2.0E)

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42" ELECTRIC RECEPTACLE (42" OFF FINISH FLOOR)
FD FLOOR DRAIN
FLOOR DRAIN BELOW

NO.	REVISION :	DATE:	DWN	CHK
1	Issued for review	NOV14/22	dcb	dcb
2	Issued for review	NOV30/23	dcb	

PROJECT: V22-0677
334&340 ARDAGH ROAD
BARRIE, ON

PG. CONTENT: FLOOR PLANS
SCALE: 3/16" = 1'-0"
PAGE: A3

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BLOCK 1 TOWNHOUSE

PROPOSED EAST ELEVATION
SCALE: AS NOTED ON PAGE
MODEL #1



BLOCK 1 TOWNHOUSE

PROPOSED WEST ELEVATION
SCALE: AS NOTED ON PAGE
MODEL #1

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PROJECT: V22-0677
334&340 ARDAGH ROAD
BARRIE, ON

PG. CONTENT: ELEVATIONS
SCALE: 3/16" = 1'-0"
PAGE: A4

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BLOCK 1 TOWNHOUSE
PROPOSED SOUTH ELEVATION
SCALE: AS NOTED ON PAGE
MODEL #1 ELEVATION 'A'



BLOCK 1 TOWNHOUSE
PROPOSED NORTH ELEVATION
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MODEL #1

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334&340 ARDAGH ROAD
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PG. CONTENT: ELEVATIONS
SCALE: 3/16" = 1'-0"
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BLOCK 2 TOWNHOUSE

PROPOSED EAST ELEVATION 'B'
SCALE: AS NOTED ON PAGE
MODEL #2



BLOCK 2 TOWNHOUSE

PROPOSED WEST ELEVATION 'B'
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ALLISTON, ON L9R 1J5
PH: 416-885-5200

EMAIL: dberry@vulcandesigninc.com
CONTACT PERSON: DANIEL BERRY

BCIN DECLARATION:

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FIRM BCIN: 36501

DESIGNER BCIN: 21107

SIGNATURE:_____ DATE: _____

LEGEND / LINTELS:

LINTELS:

WOOD

W1	2/2"X8"
W2	2/2"X10"
W3	2/2"X12"
W4	3/2"X8"
W5	3/2"X10"
W6	3/2"X12"

LVL (2.0E)

2-LVL 7	2- 1 3/4" X 7-1/4"
3-LVL 7	3- 1 3/4" X 7-1/4"
2-LVL 9	2- 1 3/4" X 9-1/2"
3-LVL 9	3- 1 3/4" X 9-1/2"
2-LVL 11	2- 1 3/4" X 11-7/8"
3-LVL 11	3- 1 3/4" X 11-7/8"
2-LVL 14	2- 1 3/4" X 14"
3-LVL 14	3- 1 3/4" X 14"

U.N.O. FASTEN MULTIPLE PLY LVL'S (2) ROWS @ 12" O.C. 3 1/4" (16d) NAILS OR SDW SCREWS

STEEL LINTELS

S1	<4'-0" L3-1/2" X 3-1/2" - 1/4"
S2	< 6'-0" L4" X 3-1/2" X 1/4"
S3	< 8'-0" L5" X 3-1/2" X 5/16"
S4	< 10'-0" L6" X 3-1/2" X 5/16"

-BEAR LINTELS MIN. 6" EACH END
-LINTELS SHALL BE PRIMED TO "CISC/CPMA 2-3"
-ORIENT ANGLES LONG LEG VERT.
-MAX. 1" BRICK OVERHANG
-WEEP HOLES @ 56" O.C. MAX

ABBREVIATIONS:

DJ	DOUBLE JOIST
TJ	TRIPLE JOIST
GT	GIRDER TRUSS
'DO'	DO OVER
RJ	ROOF JOISTS
STL.	STEEL
SB.	SOLID BEARING (SEE 'FRAMING REQ.'S')
PL.	POINT LOAD
(FL.)	FLUSH
(DR.)	DROPPED
FG.	FIXED GLASS
FDTN.	FOUNDATION
BG.	BLACK GLASS
JT	JACK TRUSS
U/S	UNDERSIDE
T/O	TOP OF
FG.	FIXED GLASS
CLG.	CEILING
BBFM	BEAM BY FLOOR MANUFACTURE

SB SOLID BEARING (SAME WIDTH AS SUPPORTED MEMBER)
PL CONCENTRATED POINT LOAD
FIRE PLACE VENT
DRYER VENT
STOVE VENT
CELLAR VENT
SMOKE ALARM
CARBON MONOXIDE DETECTOR
HOSE BIB
WP WATERPROOF ELECTRICAL OUTLET
HOOD/CELLAR VENT
DRYER VENT

GAS LINE
CABLE LINE
PHONE JACK
FAN CEILING EXHAUST FAN
P.C. PULL CHAIN CLG. LIGHT
CEILING LIGHT
3 WAY SWITCH
LIGHT SWITCH
120 VOLT RECEPTACLE
42" ELECTRIC RECEPTACLE (42" OFF FINISH FLOOR)
FD FLOOR DRAIN
RANGE HOOD EXHAUST

NO.	REVISION :	DATE:	DWN.	CHK.
1	Issued for review	MAY04/23	dcb	dcb
2	Issued for review	NOV30/23	dcb	

PROJECT: V22-0677
334&340 ARDAGH ROAD
BARRIE, ON

PG. CONTENT: ELEVATIONS
SCALE: 3/16" = 1'-0"
PAGE: A6

Preliminary
(Not for Construction)

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BLOCK 2 TOWNHOUSE

PROPOSED SOUTH ELEVATION 'B'
SCALE: AS NOTED ON PAGE
MODEL #2



BLOCK 2 TOWNHOUSE

PROPOSED NORTH ELEVATION 'B'
SCALE: AS NOTED ON PAGE
MODEL #2

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FIRE PLACE VENT
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LIGHT SWITCH
120 VOLT RECEPTACLE
ELECTRIC RECEPTACLE (42" OFF FINISH FLOOR)
FLOOR DRAIN

NO.	REVISION :	DATE:	DWN.	CHK.
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2	Issued for review	NOV30/23	dcb	

PROJECT: V22-0677
334&340 ARDAGH ROAD
BARRIE, ON

PG. CONTENT: ELEVATIONS
SCALE: 3/16" = 1'-0"
PAGE: A7

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BLOCK 3 TOWNHOUSE

PROPOSED WEST ELEVATION
SCALE: AS NOTED ON PAGE
MODEL #1



BLOCK 3 TOWNHOUSE

PROPOSED EAST ELEVATION
SCALE: AS NOTED ON PAGE
MODEL #1

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PROJECT: V22-0677
334&340 ARDAGH ROAD
BARRIE, ON

PG. CONTENT: ELEVATIONS
SCALE: 3/16" = 1'-0"
PAGE: A8

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BLOCK 3 TOWNHOUSE
PROPOSED NORTH ELEVATION
SCALE: AS NOTED ON PAGE
MODEL #1



BLOCK 3 TOWNHOUSE
PROPOSED SOUTH ELEVATION
SCALE: AS NOTED ON PAGE
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FD FLOOR DRAIN (SUBJECT TO PLUMBING REQUIREMENTS)

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PROJECT: V22-0677
334&340 ARDAGH ROAD
BARRIE, ON

PG. CONTENT: ELEVATIONS
SCALE: 3/16" = 1'-0"
PAGE: A9

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BLOCK 4 TOWNHOUSE

PROPOSED WEST ELEVATION 'B'
SCALE: AS NOTED ON PAGE
MODEL #2



BLOCK 4 TOWNHOUSE

PROPOSED EAST ELEVATION 'B'
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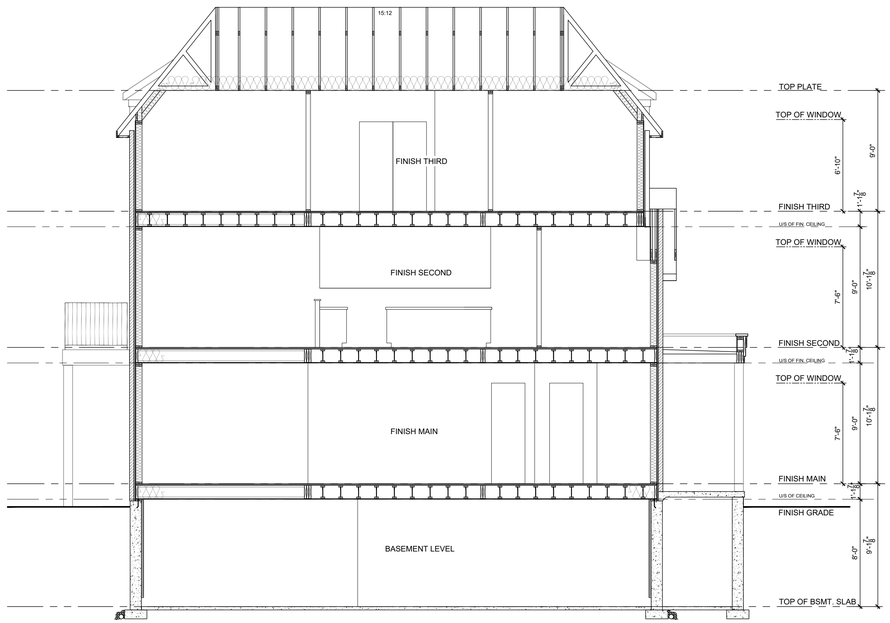
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PG. CONTENT: ELEVATIONS
SCALE: 3/16" = 1'-0"
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TYPICAL BUILDING SECTION
SCALE: AS NOTED ON PAGE



BLOCK 4 TOWNHOUSE
PROPOSED NORTH ELEVATION 'B'
SCALE: AS NOTED ON PAGE
MODEL #2



BLOCK 4 TOWNHOUSE
PROPOSED SOUTH ELEVATION
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-BEAR LINTELS MIN. 6" EACH END
-LINTELS SHALL BE PRIMED TO "CISC/CPMA 2-3"
-ORIENT ANGLES LONG LEG VERT.
-MAX. 1" BRICK OVERHANG
-WEEP HOLES @ 56" O.C. MAX

ABBREVIATIONS:

DJ	DOUBLE JOIST
TJ	TRIPLE JOIST
GT	GIRDER TRUSS
'DO'	DO OVER
RJ	ROOF JOISTS
STL.	STEEL
SB.	SOLID BEARING (SEE 'FRAMING REQ.'S')
PL.	POINT LOAD
(FL.)	FLUSH
(DR.)	DROPPED
FG.	FIXED GLASS
FDTN.	FOUNDATION
BG.	BLACK GLASS
JT	JACK TRUSS
U/S	UNDERSIDE
T/O	TOP OF
FG.	FIXED GLASS
CLG.	CEILING
BBFM	BEAM BY FLOOR MANUFACTURE

SB SOLID BEARING (SAME WIDTH AS SUPPORTED MEMBER)
PL CONCENTRATED POINT LOAD
FIRE PLACE VENT
DRYER VENT
STOVE VENT
CELLAR VENT
SA SMOKE ALARM
CMD CARBON MONOXIDE DETECTOR
HOSE BIB
WP WATERPROOF ELECTRICAL OUTLET
HOOD/CELLAR VENT
DRYER VENT

G GAS LINE
CABLE LINE
PHONE JACK
FAN CEILING EXHAUST FAN
P.C. PULL CHAIN CLG. LIGHT
CEILING LIGHT
3 3 WAY SWITCH
LIGHT SWITCH
120 VOLT RECEPTACLE
42" ELECTRIC RECEPTACLE (42" OFF FINISH FLOOR)
FD FLOOR DRAIN

NO.	REVISION :	DATE:	DWN.	CHK
1	Issued for review	MAY04/23	dcb	dcb
2	Issued for review	NOV30/23	dcb	

PROJECT: V22-0677
334&340 ARDAGH ROAD
BARRIE, ON

PG. CONTENT: ELEVATIONS
SCALE: 3/16" = 1'-0"
PAGE: A11

Preliminary
(Not for Construction)

APPENDIX B

SANITARY ANALYSIS

SANITARY SYSTEM DESIGN - CALCULATION SHEET

Municipal Proj # TBD

Project Title: Townhouse Development

Project Location: 340 &334 Ardagh Rd
Barrie, ON

Developer: King Rich Homes Group

AVERAGE DAILY FLOW

Residential=225 L/day/person

0.013 = MANNINGS "n"

0.10 = Inflow & Infiltration (L/s/ha)

Peaking Factor = Harmon Equation

Consultant: APLIN MARTIN

APLIN MARTIN
ENGINEERING ARCHITECTURE PLANNING SURVEYING

A&M Proj # 22-7049

Page: 1 of 1

Designed by: MY

Checked by: CAB

Date: Friday, June 23, 2023

Locations			Sub-Catchments								Flow Calculations					Pipe Parameters					Results			
Street	Manhole		Sub-Catchment No.	Area	Cum Area	Land Usage	Density	Pop Rate	Population	Cum. Pop	Usage Level	Avg Flow	Peaking Factor	Cum Peak Flow	Inflow & Infiltration	Design Flow	Sewer Design					Flow Ratio	Partial Velocity	Full Flow Velocity Check	Depth of Flow
	From	To		A (ha)	(ha)		(units)	(cap/unit) or (cap/ha)	(cap)	(cap)	L/cap/day	ADWF (L/s)	P_f	PDWF (L/s)	I&I (L/s)	Q (L/s)	S %	DIA mm	L m	V_{cap} m/s	Q_{cap} (L/s)	Q/Q_{cap} %	V_{act} (m/s)	$V_{act} \geq$ 0.60 (m/s)	d/D %
Neva Road	S1	S2	1	0.30	0.30	Residential	20	2.34	47	47	225	0.122	4.00	0.49	0.03	0.52	2.00	200	88	1.48	46.38	1%	0.49	OK	7%
Neva Road	S2	Ex Santiary MH	1	0.30	0.30	Residential	20	2.34	47	47	225	0.122	4.00	0.49	0.03	0.52	2.00	250	47	1.71	84.10	1%	0.47	OK	6%

APLIN MARTIN
ENGINEERING ARCHITECTURE PLANNING SURVEYING

EXISTING SANITARY FLOW - CALCULATION SHEET

AM Proj #	22-7049	A&M Proj #	22-7049
Project Title:	Residential Development	Page:	1 of 1
Project Location:	334 & 340 Ardagh Rd		
	Barrie, ON	Designed by:	MY
		Checked by:	CAB
		Date:	6/19/2023

Residential

Resident Units	2
Gross Drainage Area	0.30 ha
Population	6 people
Average Flow	0.02 L/s
Peaking Factor	4.49
Peak Residential Flow	0.07 L/s
Infiltration Flow	0.03 L/s
Total Design Flow	0.10 L/s

Average Residential = 225 L/person/day

Peaking Factor = Harmon Equation

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

P = Population in thosands

Population Density= 3.1 persons/unit (private housel

Infiltration= 0.1 L/sec/ha

EXISTING SANITARY FLOW - CALCULATION SHEET

AM Proj #	22-7049	A&M Proj #	22-7049
Project Title:	Residential Development	Page:	1 of 1
Project Location:	334 & 340 Ardagh Rd		
	Barrie, ON	Designed by:	MY
		Checked by:	CAB
		Date:	6/19/2023

Residential

Resident Units	2	
Gross Drainage Area	0.30	ha
Population	6	people
Average Flow	0.02	L/s
Peaking Factor	4.49	
Peak Residential Flow	0.07	L/s
Infiltration Flow	0.03	L/s
Total Design Flow	0.10	L/s

Average Residential = 225 L/person/day

Peaking Factor = Harmon Equation

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

P = Population in thosands

Population Density= 3.1 persons/unit (private households)

Infiltration= 0.1 L/sec/ha

PROPOSED SANITARY FLOW - CALCULATION SHEET

AM Proj #	22-7049	A&M Proj #	22-7049
Project Title:	Residential Development	Page:	1 of 1
Project Location:	334 & 340 Ardagh Rd		
	Barrie, ON	Designed by:	MY
		Checked by:	CAB
		Date:	May-08-23

Residential

Townhouse Units	20	
Gross Drainage Area	0.30	ha
Population	47	people
Average Flow	0.12	L/s
Peaking Factor	4.50	
Peak Residential Flow	0.55	L/s
Infiltration Flow	0.03	L/s
Total Design Flow	0.65	L/s

Average Residential = 225 L/person/day

Peaking Factor = Harmon Equation

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

P = Population in thosands

Population Density= 2.3 persons/unit (townhouse)

Infiltration= 0.1 L/sec/ha

APPENDIX C

WATER ANALYSIS

APLIN MARTIN
ENGINEERING ARCHITECTURE PLANNING SURVEYING

Project No.: 22-7049
Project Title: Residential Development
Project Location: 340 & 334 Ardagh Rd
Barrie, ON

Domestic Water Demand Calculation Sheet

Population Type	Avg. Consumption Rate	Unit
Residential	225	L/cap/day

Site Statistics			Population Density		
Land Use	Housing Type	Unit Count	Population Density	Population	Water Demand L/day
Residential	Townhouse	20	2.57	51	11565

Peaking Factors		
Land Use	Peak Hour	Maximum Day
Residential	7.4	4.9

Population Density		
3-Bad	2.6	persons/unit

Peak Flows - Residential				
	L/d	L/hr	L/min	L/s
Peak Hour	85581	3566	59.43	0.99
Maximum Day	56669	2361	39.35	0.66

Fire Flow Estimate

Date: 21-Jun-23
By: MY
Checked: CAB
A&M File No.: 22-7049

Residential Development
334 & 340 Ardagh Rd
Barrie, ON

Development Type: Townhouse Development

Fire Area Considered:

Type of Construction: Wood Frame C = 1.5

Area Calculation: Block 1 (6 Townhouses)

Ground Floor Area	263.8	
2nd Floor Area	400.00	
3rd Floor Area	396.40	
Total Floor Area (Block 1)	1060.20	m^2

Fire Flow From Formula (a): 220C(A^1/2) = 220 x 0.8 (1060.20 ^1/2) = 5731 L/min

Round off to the nearest 1,000 L/min = **6000** **L/min**

Occupancy: Residential

Add/Sub: -25.00 % -1500

Subtotal(b) 4500 L/min

Automatic Sprinklers: No

Subtract: 0 % x (b) = -

(throughout building)

Subtotal **4500** **L/min**

Exposures:

	Direction	Separation (Minimum)	Charge Limit (i.e. Charge not to Exceed)
Block 2	N	2.5	25
Block 4	E	31.5	5
Ex. Residential	W	7.9	20
Ardagh Road	S	42.5	5

	Applied Charge	
Add	25	%
Add	5	%
Add	20	%
Add	5	%
Total	55	%
Use	55	% x b = + 2475.00

Total 6975.00 L/min

Fire Flow Required **7000** **L/min**

Separation (m)			Charge	
0.0	to	3.0	25	%
3.1	to	10.0	20	%
10.1	to	20.0	15	%
20.1	to	30.0	10	%
30.1	to	45.0	5	%
45.1	and	Beyond	0	%

$$\frac{7000\ \text{L/min}}{60\ \text{s}} = 116.67\ \frac{\text{L}}{\text{s}}$$

Notes:
1. Fire flow calculation template is based on Fire Underwriter's Survey Calculations
2. Building information provided by Vulcan Design Inc.

Fire Flow Estimate

Date: 21-Jun-23
By: MY
Checked: CAB
A&M File No.: 22-7049

Residential Development
334 & 340 Ardagh Rd
Barrie, ON

Development Type: Townhouse Development

Fire Area Considered:

Type of Construction: Wood Frame C = 1.5

Area Calculation: Block 2 (4 Townhouses)

Ground Floor Area	174.8	
2nd Floor Area	265.60	
3rd Floor Area	263.20	
Total Floor Area (Block 2)	703.60	m^2

Fire Flow From Formula (a): 220C(A^1/2) = 220 x 0.8 (703.60 ^1/2) = 4668 L/min

Round off to the nearest 1,000 L/min = **5000** **L/min**

Occupancy: Residential

Add/Sub: -25.00 % -1250

Subtotal(b) 3750 L/min

Automatic Sprinklers: No

Subtract: 0 % x (b) = -

(throughout building)

Subtotal **3750** **L/min**

Exposures:

	Direction	Separation (Minimum)	Charge Limit (i.e. Charge not to Exceed)
Ex. Residential	N	17.0	15
Block 3	E	31.5	5
N/A	W		25
Block 1	S	2.5	25

	Applied Charge	
Add	15	%
Add	5	%
Add	25	%
Add	25	%
Total	70	%
Use	70	% x b = + 2625.00

Total 6375.00 L/min

Fire Flow Required **6000** **L/min**

Separation (m)			Charge	
0.0	to	3.0	25	%
3.1	to	10.0	20	%
10.1	to	20.0	15	%
20.1	to	30.0	10	%
30.1	to	45.0	5	%
45.1	and	Beyond	0	%

$$\frac{6000\ \text{L/min}}{60\ \text{s}} = 100.00\ \frac{\text{L}}{\text{s}}$$

Notes:
1. Fire flow calculation template is based on Fire Underwriter's Survey Calculations
2. Building information provided by Vulcan Design Inc.

Fire Flow Estimate

Date: 21-Jun-23
By: MY
Checked: CAB
A&M File No.: 22-7049

Residential Development
334 & 340 Ardagh Rd
Barrie, ON

Development Type: Townhouse Development

Fire Area Considered:

Type of Construction: Wood Frame C = 1.5

Area Calculation: Block 3 (4 Townhouses)

Ground Floor Area	174.8	
2nd Floor Area	265.60	
3rd Floor Area	263.20	
Total Floor Area (Block 3)	703.60	m^2

Fire Flow From Formula (a): 220C(A^1/2) = 220 x 0.8 (703.60 ^1/2) = 4668 L/min

Round off to the nearest 1,000 L/min = **5000** **L/min**

Occupancy: Residential

Add/Sub: -25.00 % -1250

Subtotal(b) 3750 L/min

Automatic Sprinklers: No

Subtract: 0 % x (b) = -

(throughout building)

Subtotal **3750** **L/min**

Exposures:

	Direction	Separation (Minimum)	Charge Limit (i.e. Charge not to Exceed)
Ex. Residential	N	7.4	20
Ex. Residential	E	13.7	15
Block 2	W	31.5	5
Block 4	S	2.5	25

	Applied Charge	
Add	20	%
Add	15	%
Add	5	%
Add	25	%
Total	65	%
Use	65	% x b = + 2437.50

Total 6187.50 L/min

Fire Flow Required **6000** **L/min**

Separation (m)			Charge	
0.0	to	3.0	25	%
3.1	to	10.0	20	%
10.1	to	20.0	15	%
20.1	to	30.0	10	%
30.1	to	45.0	5	%
45.1	and	Beyond	0	%

$$\frac{6000}{60}\ \frac{\text{L/min}}{\text{s}} = 100.00\ \frac{\text{L}}{\text{s}}$$

Notes:
1. Fire flow calculation template is based on Fire Underwriter's Survey Calculations
2. Building information provided by Vulcan Design Inc.

Fire Flow Estimate

Date: 21-Jun-23
By: MY
Checked: CAB
A&M File No.: 22-7049

Residential Development
334 & 340 Ardagh Rd
Barrie, ON

Development Type: Townhouse Development

Fire Area Considered:

Type of Construction: Wood Frame C = 1.5

Area Calculation: Block 4 (6 Townhouses)

Ground Floor Area	263.8	
2nd Floor Area	400.00	
3rd Floor Area	396.40	
Total Floor Area (Block 4)	1060.20	m^2

Fire Flow From Formula (a): 220C(A^1/2) = 220 x 0.8 (1060.20 ^1/2) = 5731 L/min

Round off to the nearest 1,000 L/min = **6000** **L/min**

Occupancy: Residential

Add/Sub: -25.00 % -1500

Subtotal(b) 4500 L/min

Automatic Sprinklers: No

Subtract: 0 % x (b) = -

(throughout building)

Subtotal **4500** **L/min**

Exposures:

	Direction	Separation (Minimum)	Charge Limit (i.e. Charge not to Exceed)
Block 3	N	2.5	25
Ex. Residential	E	13.7	15
Block 1	W	31.5	5
Ex. Residential	S	42.5	5

	Applied Charge	
Add	25	%
Add	15	%
Add	5	%
Add	5	%
Total	50	%
Use	50	% x b = + 2250.00

Total 6750.00 L/min

Fire Flow Required **7000** **L/min**

Separation (m)			Charge	
0.0	to	3.0	25	%
3.1	to	10.0	20	%
10.1	to	20.0	15	%
20.1	to	30.0	10	%
30.1	to	45.0	5	%
45.1	and	Beyond	0	%

$$\frac{7000\ \text{L/min}}{60} = 116.67\ \frac{\text{L}}{\text{s}}$$

Notes:
1. Fire flow calculation template is based on Fire Underwriter's Survey Calculations
2. Building information provided by Vulcan Design Inc.

Hydrant Testing Ontario
Tel: 289-354-1942
Info@HTOntario.ca

REPORT
N°. 2343R

June 30, 2023

To: Michelle Yip, EIT | Engineering Designer.
APLIN & MARTIN CONSULTANTS LTD. |
405-55 St. Clair Avenue West,
Toronto, ON, M4V 2Y7"

RE: Hydrant Flow Test - 334 & 340 Ardagh Rd, Barrie, ON

Please find the Report for the following works

Scope: Conducted Hydrant Flow Test as per NFPA291 / AWWA M17 recommendations and guidelines.

Hydrant Test Plan



HYDRANT FLOW TEST

Zone ID **BARRIE**

DATE: June 19, 2023 TIME: 11:15 AM

R -TEST HYDRANT ARDAGH ROAD HYDRANT No. 2492

HYDRANT MODEL: CENTURY COLOUR: YELLOW

STATIC PRESSURE psi (hr-20^0.54): **82** VARIANCE: 9.76%

Q - FLOW HYDRANT 340 ARDAGH ROAD HYDRANT No. 2493

HYDRANT MODEL: CENTURY COLOUR: YELLOW

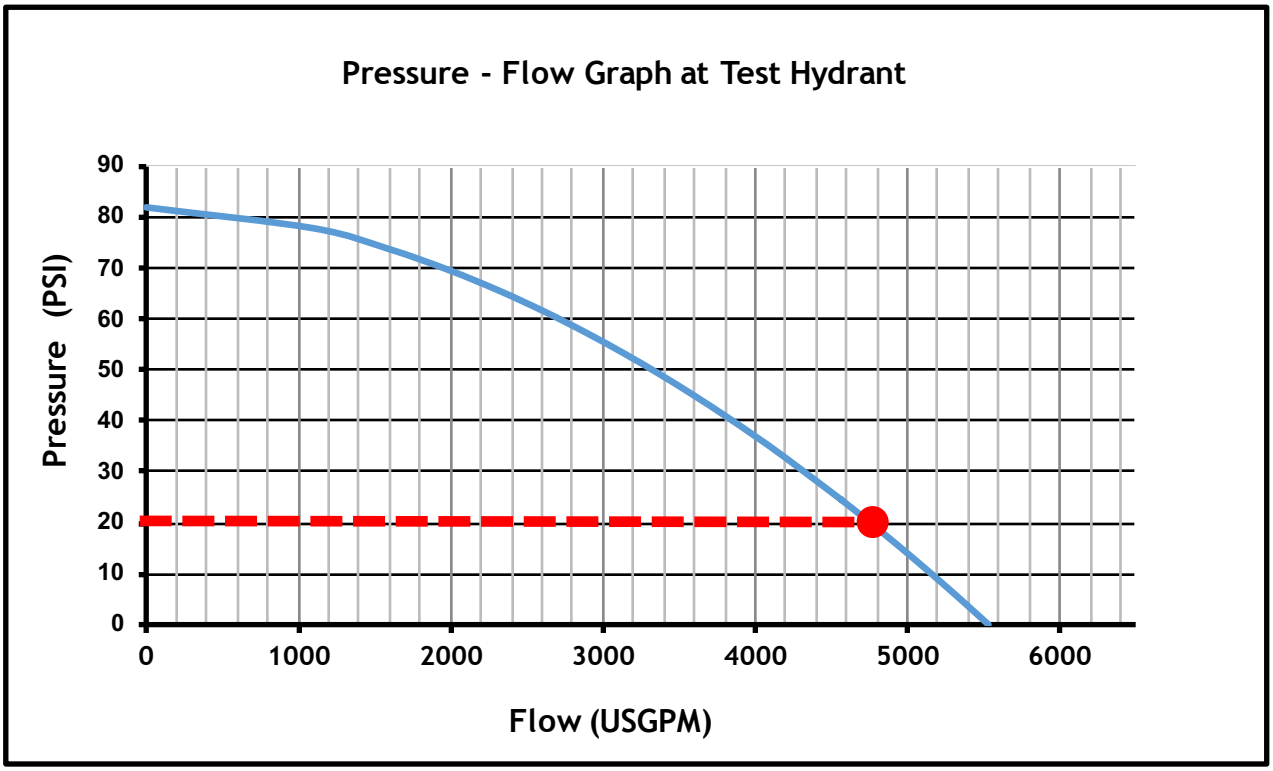
No. Outlets	Residual Pressure (hf-R^0.54)	Orofice Dia Dia. (in.) (d^2)	Coefficient 0.9	Nozzle PSI ($\sqrt{psi}$)	Q = Flow (USGPM) $Q=29.84\,(c)\,(d2)\,(\sqrt{psi})$
1	76	2.5		26	856
2	74	2.5		22	787
			Q_F = Total Flow (USGPM)		1575

Q_R = flow predicted @ 20 psi

$Q_R = Q_F * (H_r - 20^{\wedge 0.54}) / (H_f - R^{\wedge 0.54})$

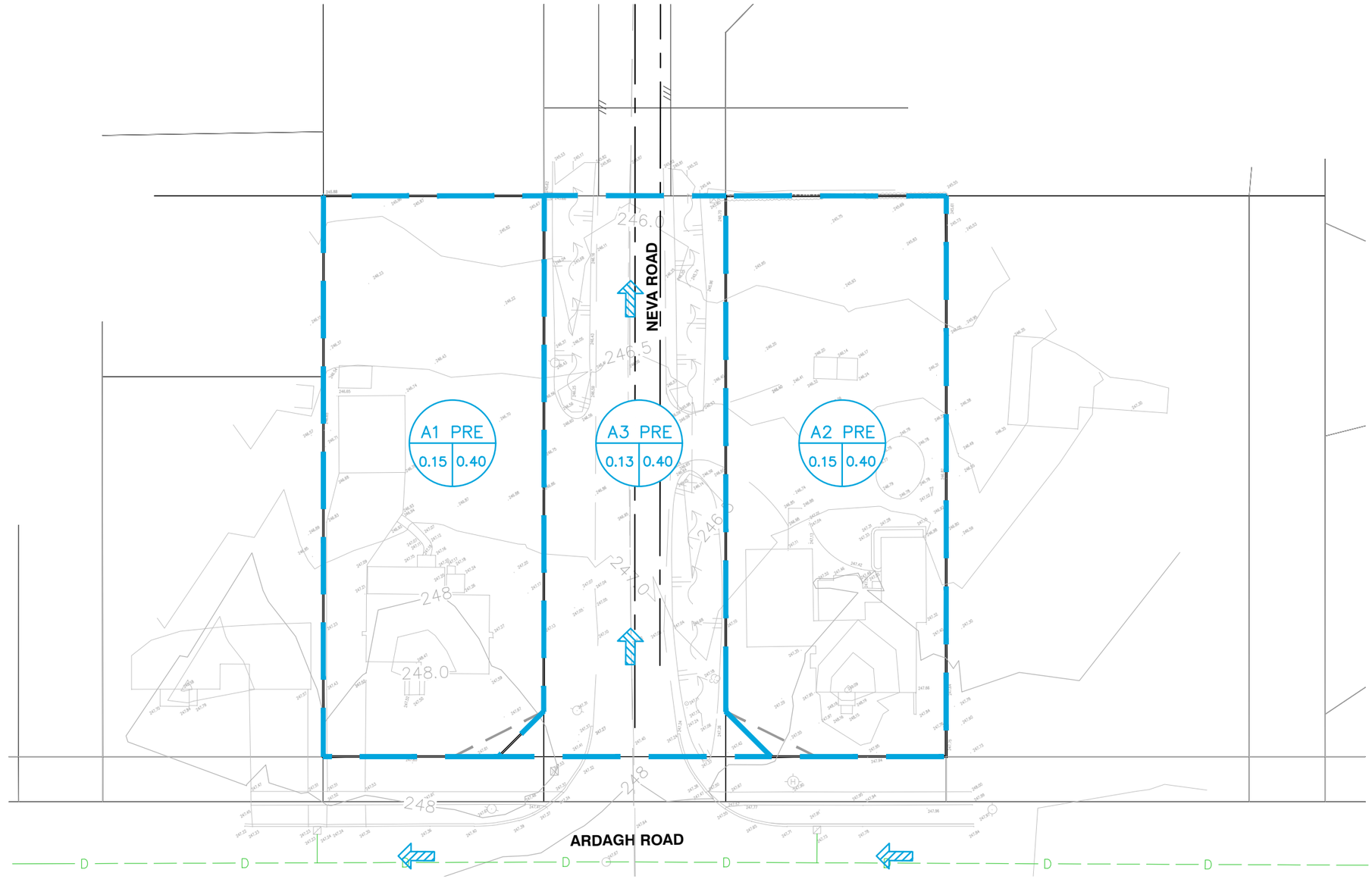
4758	
300	L/s

NFPA Rating: **CLASS AA - BLUE**



APPENDIX D

Stormwater Management Design



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:
KING RICH HOMES GROUP
4 DAIRY AVENUE
RICHMOND HILL, ON L4E 4X5

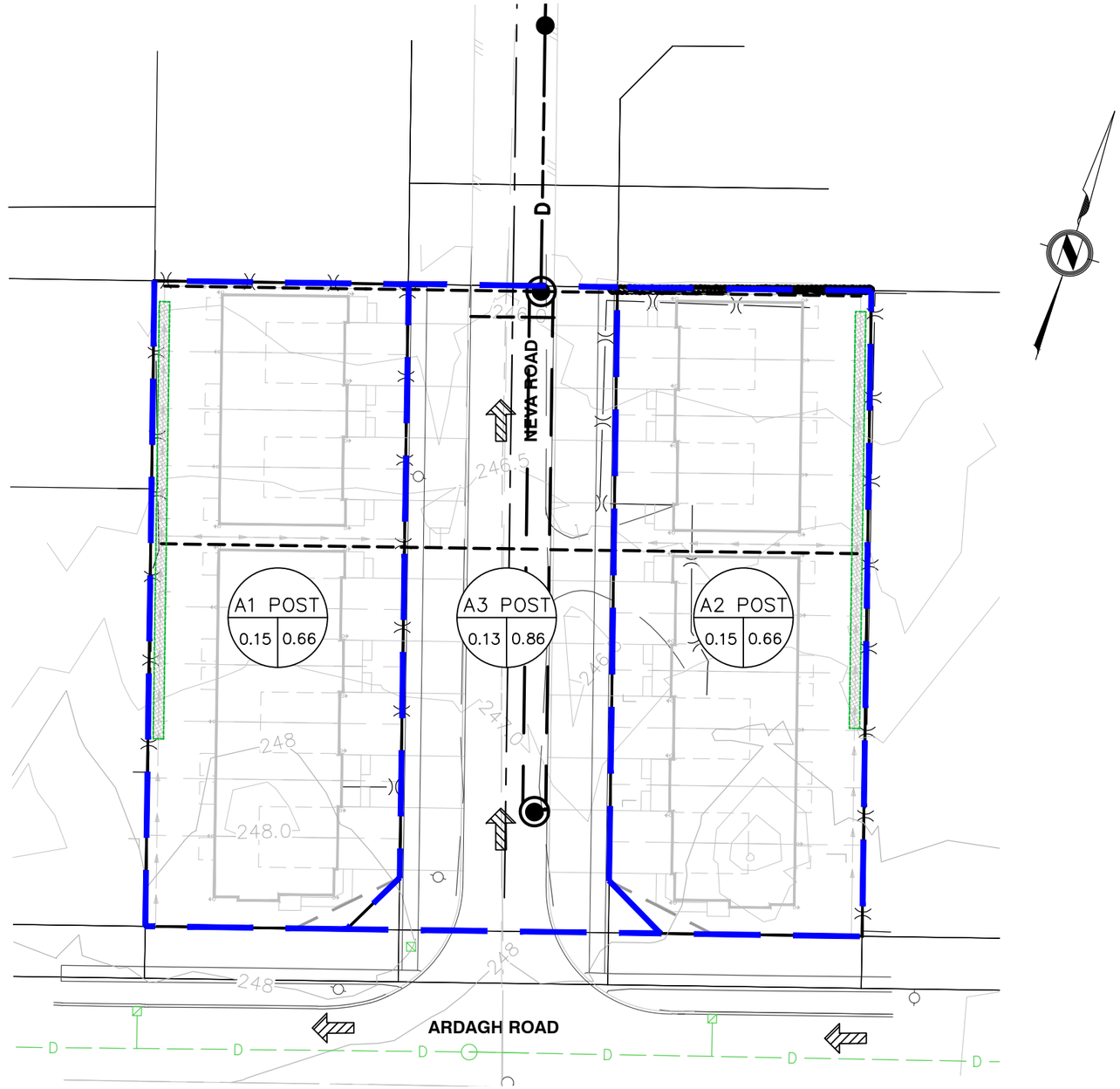
PROJECT:
RESIDENTIAL DEVELOPMENT
334 & 340 ARDAGH ROAD
BARRIE, ON L4N 9B9

LEGEND:
- EXISTING PROPERTY LINE
- PRE-DEVELOPMENT DRAINAGE AREA
- OVERLAND FLOW AAROW
- A1 PRE / 0.01 / 0.90 — DRAINAGE AREA ID; RUNOFF COEFFICIENT; DRAINAGE AREA (ha)

TITLE:
PRE-DEVELOPMENT DRAINAGE AREA PLAN

PROJECT NO.	DRAWING DATE:
22-7049	JUNE, 2023
FIGURE NO.	SCALE :
FIG-01	1:500

Jun 20 2023 - 3:38pm M:\YORK\2022\22-7049\DWG\ONSITE PRODUCTION\Figures\22-7049 - DAP.dwg/FIG-01 - DAP1 MYip



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:
KING RICH HOMES GROUP
4 DAIRY AVENUE
RICHMOND HILL, ON L4E 4X5

PROJECT:
RESIDENTIAL DEVELOPMENT
334 & 340 ARDAGH ROAD
BARRIE, ON L4N 9B9

LEGEND:
- POST-DEVELOPMENT DRAINAGE AREA
- OVERLAND FLOW ROUTE
- BUILDING OUTLINE
- PROPOSED PROPERTY LINE
- PROPOSED GREEN ROOF

A1 POST (0.06 | 0.84)
- DRAINAGE AREA ID
- RUNOFF COEFFICIENT
- DRAINAGE AREA (ha)

TITLE:
POST-DEVELOPMENT DRAINAGE AREA PLAN

PROJECT NO.	DRAWING DATE:
22-7049	JUNE, 2023
FIGURE NO.	SCALE :
FIG-02	1:500

Jun 20 2023 - 3:35pm M:\70\2022\22-7049\DWG\ONSITE PRODUCTION\Figures\22-7049 - DAP2.dwg/FIG-02 - DAP2 kYip

APLIN MARTIN
ENGINEERING ARCHITECTURE PLANNING SURVEYING

AM Proj #	22-7049
Project Title:	Residential Development
Project Location:	334 & 340 Ardagh Road, Barrie ON

Existing Runoff Coefficient

A1 Pre (340 Ardagh)	
Total Area (ha)	0.15
Landscaped Area	0.11
Impervious Area (ha)	0.04
Runoff Coefficient	0.41
*Max. Runoff Coefficient	0.40

A2 Pre (334 Ardagh)	
Total Area (ha)	0.15
Landscaped Area	0.12
Impervious Area (ha)	0.03
Runoff Coefficient	0.38
*Max. Runoff Coefficient	0.40

A3 Pre (Right of Way)	
Total Area (ha)	0.13
Landscaped Area	0.05
Impervious Area (ha)	0.08
Runoff Coefficient	0.64
*Max. Runoff Coefficient	0.40

Therefore, since the calculated runoff coefficient is greater than the Max. runoff coefficient allowed, 0.40 will be used as per Barrie Storm Drainage Area Plan.

APLIN MARTIN
ENGINEERING ARCHITECTURE PLANNING SURVEYING

AM Proj #	22-7049
Project Title:	Residential Development
Project Location:	334 & 340 Ardagh Road, Barrie ON

Composite Runoff Coefficient - Bathurst Street & Ardmore Road

A1 Post (340 Ardagh)	
Total Area (ha)	0.15
Landscaped Area	0.06
Impervious Area (ha)	0.09
Composite Runoff Coefficient	0.66

A2 Post (334 Ardagh)	
Total Area (ha)	0.15
Landscaped Area	0.05
Impervious Area (ha)	0.09
Composite Runoff Coefficient	0.66

A3 Post (Right of Way)	
Total Area (ha)	0.13
Landscaped Area	0.01
Impervious Area (ha)	0.12
Composite Runoff Coefficient	0.86

APLIN MARTIN
ENGINEERING ARCHITECTURE PLANNING SURVEYING

AM Proj # 22-7049
Project Title: Residential Development
Project Location: 334 & 340 Ardagh Road, Barrie ON

Existing Peak Flows

Area ID *	A (ha)	R.C.	Tc (min)
A1 Pre	0.15	0.40	10.00
A2 Pre	0.15	0.40	10.00
A3 Pre	0.13	0.40	10.00

IDF Data: City of Barrie			
Storm Frequency (yr)	a	b	c
2	675.586	4.681	0.780
5	843.019	4.582	0.763
10	976.898	4.745	0.760
25	1133.123	4.734	0.756
50	1251.473	4.847	0.753
100	1383.63	4.905	0.754

Allowable Release Rate for Ardagh Road Outlet (A1+A2+A3)

Event	A (ha)	R.C. **	I (mm/hr)	Q (m3/s)	Q (L/s)
2 Yr	0.43	0.40	83.1	0.0392	39.2
5 Yr	0.43	0.40	109.1	0.0515	51.5
10 Yr	0.43	0.40	126.4	0.0597	59.7
25 Yr	0.43	0.40	148.3	0.0700	70.0
50 Yr	0.43	0.40	164.1	0.0775	77.5
100 Yr	0.43	0.40	180.4	0.0852	85.2

Q= (A*R.C)*Intensity/360

APLIN MARTIN
ENGINEERING ARCHITECTURE PLANNING SURVEYING

AM Proj #	22-7049
Project Title:	Residential Development
Project Location:	334 & 340 Ardagh Road, Barrie ON

Post-Development Peak Flow Factors

Area ID	A (ha)	C	Tc (min)
A1 Post (340 Ardagh)	0.149	0.66	10.00
A2 Post (334 Ardagh)	0.149	0.66	10.00
A3 Post (Right of Way)	0.127	0.86	10.00
Total Area (ha)	**0.425**	**0.72**	**10.00**

IDF Data: City of Barrie			
Storm Frequency (yr)	a	b	c
2	675.586	4.681	0.780
5	843.019	4.582	0.763
10	976.898	4.745	0.760
25	1133.123	4.734	0.756
50	1251.473	4.847	0.753
100	1383.63	4.905	0.754

Actual Release Rates for Ardagh Road Outlet

Event	A (ha)	R.C. **	I (mm/hr)	Q (m3/s)	Q (L/s)
2 Yr	0.43	0.72	83.1	0.0707	70.7
5 Yr	0.43	0.72	109.1	0.0929	92.9
10 Yr	0.43	0.72	126.4	0.1076	107.6
25 Yr	0.43	0.72	148.3	0.1262	126.2
50 Yr	0.43	0.72	164.1	0.1397	139.7
100 Yr	0.43	0.72	180.4	0.1536	153.6

* Refer to FIG-02 for the post-development drainage area plan

100-Year Storage Volume Required (Modified Rational Method)

A1 Post + A2 Post + A3 Post		
Area	0.43	ha
Runoff Coefficient	0.72	
AC	0.306	
Max. Storage Required	42.3	m^3
Storage Provided	43.3	m^3
Orifice Invert	97.32	m
Max Head	1.37	m
Allowable Release Rate to Neva Road	0.085	m^3/s

Total Allowable Release Rate - Controlled and Uncontrolled: **0.085** m^3/s

Total Site Release Rate - Controlled and Uncontrolled: **0.083** m^3/s

City's IDF Data		Controlled - SWM Tank Storage			
Rainfall Duration Tr	Rainfall Intensity I	Storm Runoff	Runoff Volume	Release Volume	Storage Volume
min	mm/hour	cm/s	cm	cm	cm
10.00	180.4	0.154	92.16	49.87	**42.29**
15.00	145.1	0.123	111.15	74.80	**36.34**
20.00	122.5	0.104	125.16	99.74	**25.42**
25.00	106.7	0.091	136.29	124.67	**11.61**
30.00	95.0	0.081	145.55	149.61	**0.00**
35.00	85.9	0.073	153.50	174.54	**0.00**
40.00	78.6	0.067	160.49	199.48	**0.00**
45.00	72.5	0.062	166.74	224.41	**0.00**
50.00	67.5	0.057	172.40	249.35	**0.00**
55.00	63.2	0.054	177.58	274.28	**0.00**
60.00	59.5	0.051	182.36	299.22	**0.00**
65.00	56.3	0.048	186.80	324.15	**0.00**
70.00	53.4	0.045	190.96	349.09	**0.00**
75.00	50.9	0.043	194.87	374.02	**0.00**
80.00	48.6	0.041	198.56	398.96	**0.00**
85.00	46.5	0.040	202.07	423.89	**0.00**
90.00	44.7	0.038	205.40	448.83	**0.00**
95.00	43.0	0.037	208.58	473.76	**0.00**
100.00	41.4	0.035	211.62	498.70	**0.00**

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ENGINEERING ARCHITECTURE PLANNING SURVEYING

AM Proj # 22-7049
Project Title: Residential Development
Project Location: 334 & 340 Ardagh Road, Barrie ON

Orifice Calculations

Orifice Equation: $Q = C \times A \times \sqrt{2 \times g \times h}$

Storm Frequency	Coefficient	Post-Development Flowrate	Target Release Rate	Head	Required Diameter	Proposed Diameter	Area	Release Rate
Yr		m^3/s	m^3/s	m	mm	mm	m^2	m^3/s
100	0.63	0.085	0.085	1.37	182	180	0.025	0.083

APLIN MARTIN
ENGINEERING ARCHITECTURE PLANNING SURVEYING

AM #	22-7049
Project Title:	Residential Development
Project Location:	334 & 340 Ardagh Road, Barrie ON

Off-site Detention Storage

U/G Conduit	Pipe Size (Elliptical)	Equivalent Pipe Size	Area	Length	Volume
	(mm)	(mm)	(m^2)	(m)	(m^3)
D1-D2	865x1345	1050.00	0.87	50.00	43.3
				Sum	43.3

APLIN MARTIN
ENGINEERING ARCHITECTURE PLANNING SURVEYING

AM Proj #	22-7049
Project Title:	Residential Development
Project Location:	334 & 340 Ardagh Road, Barrie ON

Annual Hydrologic Budget

PRE-DEV			
Existing Landuse	Urban Lawns		
Hydrologic Soil Group (HSG)	B		
Infiltration Factor	0.7		
Topography	Rolling Land - 0.2		
Soils	Open Sandy Loam - 0.4		
Cover	Cultivated Land - 0.1		
	Pervious	Impervious	Total
Area (ha)	0.28	0.15	0.43
Precipitation (mm)	999	999	
ET (mm)	531	199.8	
Surplus (mm)	468	799.2	
Infiltration (mm)	327.6	0	
Runoff (mm)	140.4	799.2	
Volumes			
ET (m^3)	1484	291	1775
Infiltration (m^3)	916	0	916
Runoff(m^3)	392	1163	1555

POST-DEV			
Proposed Landuse	Urban Lawns		
Hydrologic Soil Group (HSG)	B		
Infiltration Factor	0.7		
Topography	Rolling Land - 0.2		
Soils	Open Sandy Loam - 0.4		
Cover	Cultivated Land - 0.1		
	Pervious	Impervious	Total
Area (ha)	0.12	0.31	0.43
Precipitation (mm)	999	999	
ET (mm)	531	199.8	
Surplus (mm)	468	799.2	
Infiltration (mm)	327.6	0	
Runoff (mm)	140.4	799.2	
Volumes			
ET (m^3)	621	615	1237
Infiltration (m^3)	383	0	383
Runoff(m^3)	164	2462	2626

POST-DEV WITH MITIGATION			
	Pervious	Impervious	Total
Area (ha)	0.12	0.31	0.43
Precipitation (mm)	999	999	
ET (mm)	531	199.8	
Surplus (mm)	468	799.2	
Infiltration (mm)	327.6	130	
Runoff (mm)	140.4	669.2	
Volumes			
ET (m^3)	621	615	1237
Infiltration (m^3)	383	400	784
Runoff(m^3)	164	2061	2225

SUMMARY			
Scenario	ET	Infiltration	Runoff
Pre-Development (1)	1775	916	1555
Post-Development (2)	1237	383	2626
Post-Development w Mitigation (3)	1237	784	2225
Percent Difference (1 and 3)	-30%	-14%	43%

* Sheet assumes 20% evapotranspiration on impervious surfaces

King Smoke Tree - Normal Data

Storm Depth (mm)	Number of Days						
	April	May	June	July	August	September	October
0.2	11.40	11.40	10.60	9.50	10.90	11.30	12.00
5	4.80	6.00	5.60	4.40	4.90	5.10	5.00
10	1.80	3.10	3.00	2.70	3.00	3.00	2.30
25	0.26	0.48	0.65	0.96	0.91	0.57	0.35

Storm Depth (mm)	Total # of days/year	Incremental Precipitation (mm/year)	Cumulative Precipitation (mm/year)
0.2	77.10	15.42	15.4
5	35.80	179.00	194.4
10	18.90	189.00	383.4
25	4.18	104.50	487.9

Target Infiltration	130	mm/year	# of Rain Barrels Required (0.35 cu.m)=	32
Contributing Area	0.95			
Runoff Coefficient			Vol. Provided=	11.2 cu.m
Design Precipitation	136.84	mm/year		
Retention Depth	3.56	mm		
Retention Volume	11.0	m^3		

DRAINAGE SYSTEM DESIGN - RATIONAL METHOD CALCULATION SHEET

Municipal Proj # N/A
Project Title: Townhouse Development
Project Location: 334 & 340 Ardagh Road
Barrie, Ontario
Developer: -

Storm Sewer Design Criteria
Design Return Period: 5 YEAR / 100 YEAR
MANNINGS "n" 0.013
Q5/100=RAIN N=0.00278

CITY OF BARRIE - RAINFALL INTENSITY

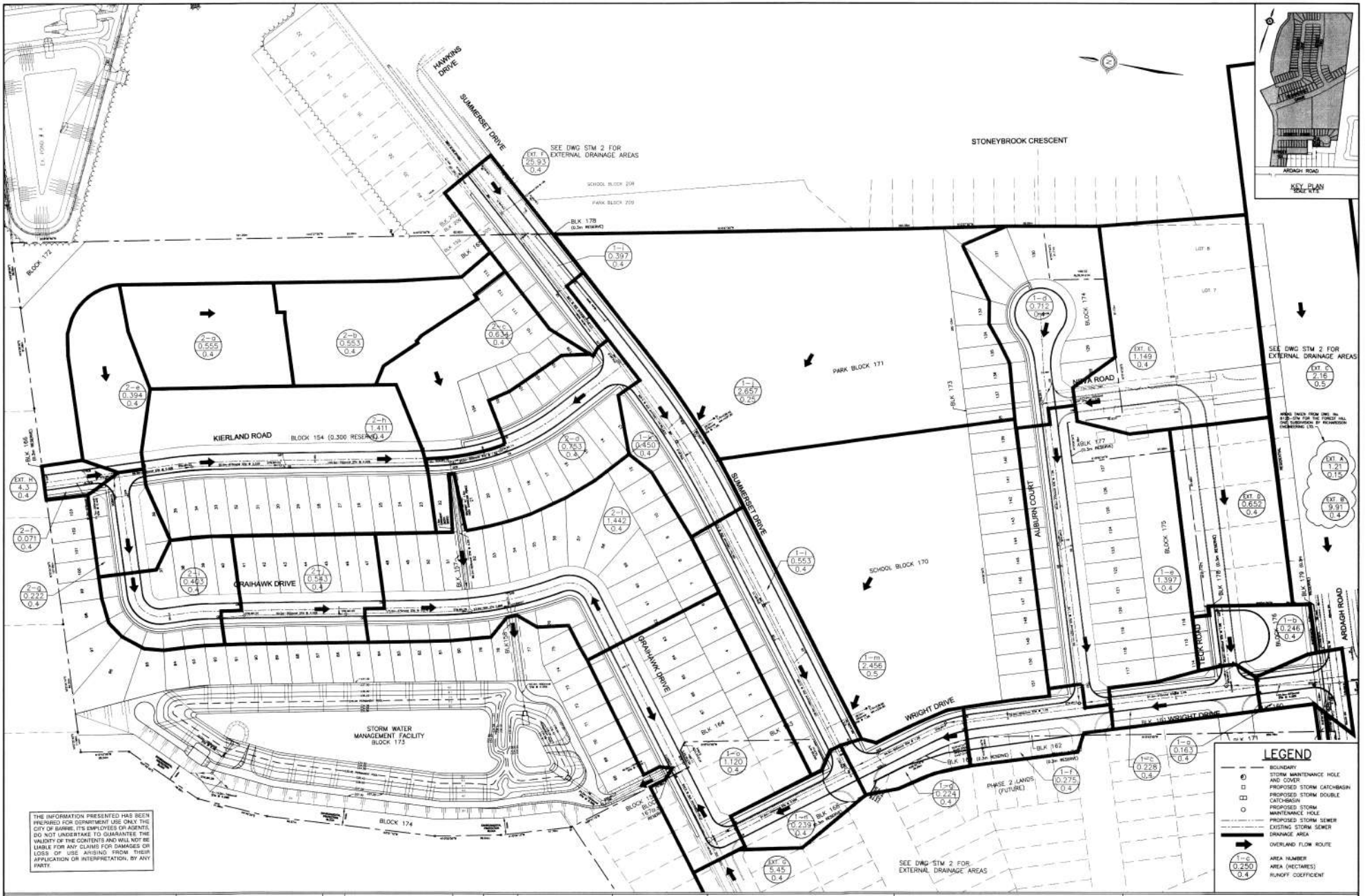
Consultant: APLIN MARTIN

APLIN MARTIN
ENGINEERING ARCHITECTURE PLANNING SURVEYING

A&M Proj # 22-7049
Page: 1 of 1
Designed by: JC
Checked by: CAB
Date: Jun-23

Locations			Sub-Catchments							Flow Calculations		Pipe Parameters									Comments
ID	Manhole		Sub-Catchment No.	Tributary Area			SUM AxR	Time of Concentration		Rain Fall Int. "I"	Q_5 Q_{100}	Sewer Design					Travel Time	Flow Ratios		Hydraulic Slope		Remarks
	From	To		A (ha)	R	AxR (ha)	(ha)	Inlet (min)	Total (min)	I (mm/hr)	(L/s)	S %	DIA mm	L m	V_{cap} m/s	Q_{cap} (L/s)	(min)	Q_5/Q_{cap} %	Q_{100}/Q_{cap} %	Q5 %	Q_{100} %	5 YEAR FLOW ROUTES
FULL SITE	MH D3	MH D2	A	0.43	0.72	0.31	0.31	10.0	10.0	104.9	51.5	2.00	1050	50.0	4.46	3861.8	0.2	1%	2%	0.00%	0.00%	IN PIPE
					0.72	0.31	0.31			174.1	83.1											
	MH D2	MH D1					0.31	10.0	10.2	104.9	51.5	2.50	300	25.6	2.16	152.9	0.2	34%	54%	0.28%	0.74%	IN PIPE
							0.31			174.1	83.1											
	MH D1	EX MH D1					0.31	10.2	10.4	103.9	51.5	1.53	300	55.5	1.69	119.6	0.5	43%	69%	0.28%	0.74%	IN PIPE
							0.31			172.5	83.1											

*First leg of sewer is 865x1345 elliptical shaped, which is a 1050 equivalent
*Flows of first leg restricted to maximum allowable of orifice for the proposed development



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GENERAL NOTES

REFER TO DETAIL SHEETS FOR GENERAL NOTES AND DETAILS.

BENCH MARKS

MONUMENT # 010880420 ELEV.=264.113m
LOWER NORTH SIDE OF ARDAGH ROAD, 260m EAST OF PATTERSON ROAD.

NO.	REVISIONS	DATE	APPROVED
3.	ISSUED FOR THIRD SUBMISSION	NOV10/04	
4.	PER NVCA COMMENTS	NOV23/04	
5.	PER CITY AND NVCA COMMENTS	DEC22/04	
6.	ISSUED FOR FOURTH SUBMISSION	APR20/05	
7.	ISSUED FOR MOE SUBMISSION	SEPT.8/05	
8.	ISSUED FOR CITY APPROVAL	OCT.12/05	
9.	ISSUED AS CONSTRUCTED	JUN.4/14	

CITY OF BARRIE
APPROVED
DATE.....
.....
DIRECTOR OF ENGINEERING

The Walter Fedy Partnership
ENGINEERS & PROJECT MANAGERS
... in the solutions business™

THE MEADOWS OF BEAR CREEK

STORM DRAINAGE AREA PLAN

CITY of BARRIE
ENGINEERING DEPARTMENT

SCALE HOR. 1:1000		DRAWING NO.	STM1
DESIGN J.S.G.	DRAWN L.B.R./J.S.G.	SHEET NO.	— —
REVIEWED S.R.K.	DATE MAY 12/04		

2006-104-010

GEOTECHNICAL INVESTIGATION
DRAFT REPORT
FOR PROPOSED DEVELOPMENT AT 340 AND 334 ARDAGH ROAD, BARRIE, ONTARIO

Prepared for:

Evans Planning

Prepared By:

SIRATI & PARTNERS CONSULTANTS LIMITED

SIRATI & PARTNERS
Geotechnical Hydrogeological & Environmental Solutions

Project: SP22-01117-00
April 5, 2023

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Ontario L3R 9T9
Tel: 905.940.1582
Fax: 905.940.2440

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APPENDIX B: LIMITATIONS OF REPORT

1. INTRODUCTION

Sirati & Partners Consultants Limited (SIRATI) was retained by Evans Planning (the "Client") to undertake a geotechnical investigation service to support the design for the proposed development at properties at 340 and 334 Ardagh Road, Barrie, Ontario (the "Site"). The properties are located on the West and East side of the Neva Road at Ardagh Road and Neva Road intersection.

The purpose of this geotechnical investigation was to determine the subsurface conditions at four (4) borehole locations and from the findings in the boreholes make engineering recommendations as following for design of the proposed development at 340 and 334 Ardagh Road, Barrie, Ontario.

1. Foundations
2. Floor slab and permanent drainage
3. Excavations and backfill
4. Earthquake considerations
5. Earth pressures
6. Temporary Shoring

A copy of the following was provided to SIRATI by the Client:

[**Ref.1**]: Site Plan, Drawing A-100, Prepared by Stamp and Hammer Architects, Dated July 2022.
[**Ref.2**]: Floor Plans, Drawing A-101, Prepared by Stamp and Hammer Architects, Dated July 2022.
[**Ref.3**]: Elevations, Drawing A-201, Prepared by Stamp and Hammer Architects, Dated July 2022.
[**Ref.4**]: Site Plan of Survey for the Survey conducted on July 7, 2022, prepared by Pearson + Pearson Surveying Ltd.

It should be noted, this report will only provide data and recommendations pertinent to the geotechnical aspect(s) of the project. The findings from the Hydrogeological Investigation, and the Environmental Site Assessment Phase II investigation will be provided under a separate cover.

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

The site investigation and recommendations follow generally accepted practice for geotechnical consultants in Ontario. The format and contents are guided by client specific needs and economics and do not conform to generalized standards for services. Laboratory testing for most part follows ASTM or CSA Standards or modifications of these standards that have become standard practice.

This report has been prepared for the Client and its designers. Third party use of this report without Sirati & Partners Consultants Limited (SIRATI) consent is prohibited. The limitation conditions presented in **Appendix B** form an integral part of the report and they must be considered in conjunction with this report.

2. THE SITE AND LOCAL GEOLOGY

According to the Paleozoic Geology of Southern Ontario (Ontario Geological Survey, 2007), the Site is underlain by the Middle Ordovician, Simcoe Group, Shadow Lake Formation and Lindsay Formation including limestone, dolostone, shale, arkose and sandstone.

The Site is covered by Glaciolacustrine coarse-grained sediment, consisting of silt and sand matrix (secondary soil materials of clay and silt). Based on Map P.3212 Bedrock Topography Barrie Area (OGS, 1993), the overburden thickness in the area of the Site is approximately 170 m.

3. FIELD AND LABORATORY WORK

Four (4) boreholes (BH/MW-01, BH/MW-02A to BH/MW-04, see Drawing 1A and 1B for location plan) were drilled at the subject properties to depths ranging between 6.7 m to 9.5 m below the existing grade. Boreholes were drilled with solid stem continuous flight auger equipment by a drilling sub-contractor under the direction and supervision of SIRATI personnel. Samples were retrieved at regular intervals with a 50 mm O.D. split-barrel sampler driven with a hammer weighing 624 N and dropping 760 mm in accordance with the Standard Penetration Test (SPT) method. The samples were logged in the field and returned to the SIRATI's laboratory for detailed examination by the project engineer and for laboratory testing.

It should be noted that an additional borehole (BH-02) was also bored using Hand-Auguring method for sample collection under the ESA Phase II portion of this project. As noted, the report for the ESA Phase II portion of the project will be provided under separate cover.

As well as visual examination in the laboratory, all the soil samples were tested for moisture content. Eight (8) selected soil samples were subjected to grain size analyses and hydrometer and two (2) soil samples were subjected to Atterberg Limits testing. The results of the laboratory tests are presented on the respective borehole log and Figures No. 7 to 10.

Water level observations were made during drilling and in the open boreholes upon completion of drilling. All four boreholes were equipped with monitoring wells upon completion of drilling for the monitoring of the long-term stabilized groundwater. The data and recommendations pertinent to groundwater that are provided in this report are geotechnical in nature. Information and recommendations pertinent to hydrogeological aspects of the project will be provided under separate cover.

According to [**Ref.4**] the existing site is relatively flat.

4. SITE AND SUBSURFACE CONDITIONS

The borehole locations are shown on Drawing 1A and 1B. Notes on sample descriptions and the general features of fill material and native soil are presented on Drawing 1A. Detailed subsurface conditions are presented on the Borehole Logs; Enclosures 2 to 5. The soil and groundwater conditions are summarized as follows.

4.1 Soil Conditions

Asphalt: A 40 mm thick surficial layer of asphalt was encountered in borehole BH/MW-03.

Granular fill: A 200 mm thick layer of granular fill material consisting of sand and gravel was observed directly below the surficial asphalt layer at borehole BH/MW-03.

Topsoil: A 230 mm to 305 mm thick surficial layer of topsoil was encountered at borehole BH/MW-01 and BH/MW-04.
It should be noted that the thickness of topsoil observed at the borehole locations may not be representative for the entire site and should not be relied on to calculate the amount of topsoil that need to be stripped from the site.

Clear Stone: A 50 mm thick surficial layer of clear stone was encountered at borehole location BH/MW-02A.

Fill Material: A layer of fill layer was observed underneath the surficial topsoil in boreholes BH/MW-01 and BH/MW-04 and extending to depths ranging from 1.8 m to 2.7 m below the existing ground surface, respectively. Fill material was encountered below the clear stone in BH/MW-02A and extending to 1.8 m below the existing ground surface. In BH/MW-03 fill material was encountered underlaying the granular fill and extending to 1.8 mbgs.

The fill material mainly consists of sand, trace to some silt, trace gravel, trace organics, trace rootlets. Fill material was generally moist and brown and dark brown in color.

The measured SPT ‘N’ values in the fill material ranged between 1 to 10 blows per 300 mm penetration, indicating a very loose to compacted state.

Cohesionless Soil Deposits: A layer of native cohesionless soil soils consist of sand/ poorly graded sand with gravel to silty sand/ silty sand with gravel, trace cobbles, and trace clay was encountered in all boreholes underlaying the fill material. Cohesionless soils was found underlaying the fill layer and extending to depths ranging between 6.1 m below the existing ground surface (in multiple boreholes) to the termination depth (6.7 m to 8.3 m) of the boreholes (in multiple boreholes). Native cohesionless soil deposits were generally brown in color and moist to wet.

The measured SPT 'N' values in the cohesionless soil materials ranged from 6 to over 50 blows per 300 mm penetration (increasing with depth), indicating a loose to very dense conditions.

Grain size and Hydrometer analysis of cohesionless soil samples (BH/MW-01/SS6, BH/MW-03/SS4, BH/MW-04/SS7, and BH/MW-04/ SS5) was conducted, and the result is presented on Figure 7 to 9, with the following fractions:

Clay: 1%
Silt: 6% to 38%
Sand: 57% to 68%
Gravel: 1% to 37%

Interbedded layers of Lean Clay and Silty Sand

Below the cohesionless soil deposits, native soil consisting of interbedded lean clay and silty sand with trace gravel, brown, and moist to wet was encountered at borehole BH/MW-02A, extending to the termination depth (9.5 m) of the borehole.

The measured SPT 'N' values in the interbedded lean clay material ranged from 18 to over 50 blows per 300 mm penetration, indicating a very stiff /compact to hard/ very dense consistency/conditions.

Two (2) grain size analysis of two (2) representative samples (BH/MW-02A/SS7, BH/MW-02A/SS9) were conducted, and the results are presented in Figure 7, with the following fractions:

Clay: 2% to 41%
Silt: 36% to 50%
Sand: 9% to 61%
Gravel: 0% to 1%

One representative sample (BH/MW-02A/SS7) was also subjected to Atterberg limits testing. The liquid limit was found to 37% and the plastic limit was found to 18%. The soil has a 19% plasticity index indicating an inorganic medium plastic clay (cohesive). The result is presented in Figure 10. The average soil moisture content of lean clay material at the borehole is at approximately 27% by weight and is below the liquid limit.

Lean Clay: Native cohesive soil comprising of lean clay with sand, and trace gravel was encountered in borehole BH/MW-04 underlaying the cohesionless soils and extending to the termination depth (8.2 m) of the borehole.

The measured SPT 'N' values in the cohesive strata ranged from 14 to 21 blows per 300 mm penetration, indicating stiff to very stiff consistency.

Grain size analysis of two (2) cohesive soil samples (BH/MW-04/ SS7, and BH/MW-04/ SS8) were conducted, and the results are presented in Figure 8, with the following fractions:

Clay: 14% and 30%
Silt: 44% and 57%
Sand: 25% and 29%
Gravel: 0% and 1%

One soil sample (BH/MW-04/ SS7) was also subjected to Atterberg limits testing. The liquid limit was found to be 25% and the plastic limit was measured at 15%. As such, the plasticity index of the tested soil is a 10% indicating an inorganic low plastic clay (cohesive). The result is presented in Figure 10. The average soil moisture content of the cohesive deposits at the borehole is at approximately 25% by weight and is equal to the liquid limit.

4.2 Groundwater Conditions

During drilling and upon completion of drilling, the short-term groundwater (unstabilized) in the boreholes (BH/MW-01, BH/MW-02A to BH/MW-04) was observed at depths ranging between 4.57 m (in multiple boreholes) to 5.79 m (BH/MW-04) below the existing ground surface. Boreholes were equipped with monitoring wells to determine the long-term (stabilized) groundwater level.

Long-term stabilized groundwater level was measured in the monitoring wells and the results are presented in Table 1.

It should be noted that the groundwater levels can vary and are subject to seasonal fluctuations in response to major weather events. For more discussion on groundwater conditions, please refer to the Hydrogeological report that will be presented under a different cover.

Table 1: Groundwater Levels Observed in Monitoring Wells

BH No.	Date of Drilling	Date of Observation	Depth of Groundwater below existing ground (m)
BH/MW– 01	January 20, 2023	February 27, 2023	4.91
BH/MW– 02A	January 20, 2023	February 27, 2023	5.72
BH/MW– 03	January 20, 2023	February 27, 2023	4.91
BH/MW– 04	January 20, 2023	February 27, 2023	5.04

5. SHALLOW FOUNDATION

It is understood that the purpose of this geotechnical investigation was to determine the subsurface conditions at four (4) borehole locations and from the findings in the boreholes make engineering recommendations for design of the proposed development at properties located at 340 and 334 Ardagh Road, Barrie, Ontario (the "Site").

At the time of preparing this report, the proposed design grades and foundations were not provided. The following engineering recommendations regarding the geotechnical design aspects of the proposed development at 334 Ardagh Road, Barrie, Ontario (the "Site") should be reviewed once the final design grades and foundations have been finalized.

Conventional Spread/Strip Footings:

Based on the borehole information, the proposed development can be supported by conventional spread and strip footings at or below the depths provided in Table 2. The foundations designed to the specified allowable bearing capacity at the serviceability limit states (SLS) are expected to settle less than 25 mm total and 19 mm differential.

It should be noted that the bearing capacities were provided based on the soil and groundwater condition at the borehole locations and as such, variability should be anticipated between the boreholes.

The geotechnical resistances provided in Table 2 are given for loads that will be applied perpendicular to the surface of the footings. Where the load is not applied perpendicular to the footing, inclination of the load should be taken into account in accordance with Section 6.7.2 of the CHBDC (2014).

Table 2: Bearing Values and Founding Levels of Spread Footings

BH No.	Material	Bearing Capacity at SLS (kPa)	Factored Geotechnical Resistance at ULS (kPa)	Minimum Depth Below Existing Ground (m)
BH/MW-01	Sand	120	180	2.1
BH/MW-02A	Sand	120	180	2.1
BH/MW-03	Sand	130	200	1.8
BH/MW-04	Sand	130	200	3.1

A Modulus of subgrade reaction 'K_s' of 5 MPa/m may be considered for the design of the foundation.

6. FLOOR SLAB AND PERMANENT DRAINAGE

The floor slab can be supported on grade provided any disturbed native soils are removed and the base thoroughly proof rolled. Any backfill required to raise the grade can consist of inorganic soil, placed in shallow lifts (less than 300 mm thick prior to compaction) and compacted to 98 percent of Standard Proctor Maximum Dry Density (SPMDD).

A moisture barrier consisting of at least 200 mm of 19 mm clear crushed stone should be installed under the floor slab.

A perimeter drainage system will be required around the exterior basement walls. The perimeter drainage for shoring systems is shown on Drawings 11 and 12, together with the underfloor drainage. Where the exposed subgrade consists of cohesionless soils below the groundwater table, all openings including the subgrade must be covered or wrapped with filter fabric, typically a Class II non-woven textile with a filtration opening size (F.O.S.) of 50 to 100 µm.

The 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 left exposed 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.

The floor slab should be structurally independent of any load bearing structural elements and should tolerate expected foundation settlements as indicated above.

7. FROST PROTECTION

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

There is no official rule governing the required founding depth for footings below unheated basement floors. Certainly, it will not be greater than the 1.2 m required in Southern Ontario for exterior footings.

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

8. EXCAVATIONS AND BACKFILL

The groundwater table observations (also summarized in Table 1) show that the groundwater level ranges between 4.91 mbgs (in BH/MW-01) to 5.70 mbgs (in BH/MW-02A). Furthermore, seasonal fluctuations in groundwater table should be also considered. Positive dewatering such as well points or educators will be required prior to any excavations in the cohesive soils below the groundwater table, otherwise, it will result in an unstable base and flowing sides. A contractor specializing in

dewatering should be retained to design the dewatering systems. The groundwater table must be lowered to at least 1m below the lowest excavation level, prior to bulk excavation.

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

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

The excavated soils are not considered to be free draining. Where free draining backfill is required, imported granular fill such as OPSS Granular B should be used.

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

9. EARTH PRESSURES

The lateral earth and water pressure acting at any depth on the basement walls can be calculated by the following formula:

In soils above the groundwater table ($z < d_w$):

$$p = K (\gamma z + q)$$

In soils below the groundwater table ($z \geq d_w$):

$$p = K \{\gamma d_w + \gamma_1 (z - d_w) + q\} + p_w$$

In which, $p_w = \gamma_w (z - d_w)$

where p = lateral earth and water pressure in kPa acting at a depth of z below ground surface

K = earth pressure coefficient K=0.50

γ = unit weight of soil above groundwater table, assuming $\gamma = 21.0$ kN/m^3

γ_1 = submerged unit weight of soil below groundwater table, assuming $\gamma_1 = 11.2$ kN/m^3

γ_w = unit weight of water, assuming $\gamma_w = 9.8$ kN/m^3

z	=	depth below ground surface to point of interest, in metres
d_w	=	depth of groundwater table below ground surface, in metres
q	=	value of surcharge in kPa
p_w	=	hydrostatic water pressure in kPa

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

10. EARTHQUAKE CONSIDERATIONS

Based on the borehole information and according to Table 4.1.8.4.A of OBC 2012, the subject site for the proposed building founded on competent native soils can be classified as “Class C”.

11. GENERAL COMMENTS ON REPORT

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

The comments given in this report are intended only for the guidance of design engineers. The number of boreholes required to determine the localized underground conditions between boreholes affecting construction costs, techniques, sequencing, equipment, scheduling, etc., would be much greater than has been carried out for design purposes. Contractors bidding on or undertaking the works should, in this light, decide on their own investigations, as well as their own interpretations of the factual borehole results, so that they may draw their own conclusions as to how the subsurface conditions may affect them.

The limitation conditions presented in Appendix B form an integral part of the report and they must be considered in conjunction with this report.

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

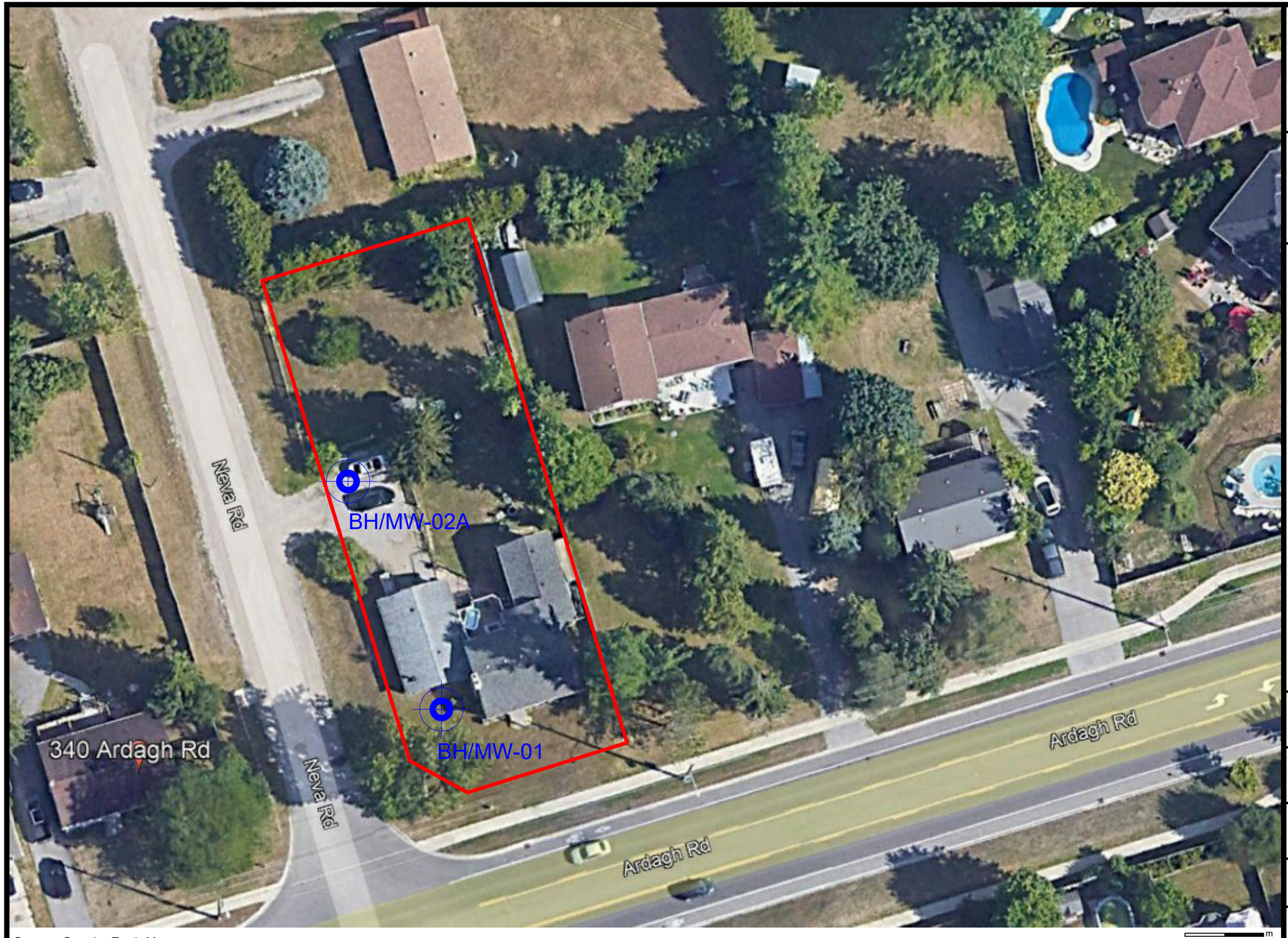
Yours truly,

SIRATI & PARTNERS CONSULTANTS LIMITED

Javad Sheikhtaheri, M.A.Sc., P.Eng.
Senior Geotechnical Engineer

Archie Sirati, Ph.D., P.Eng.
Principal Geotechnical Engineer

Drawings



Source: Google Earth Map

SIRATI & PARTNERS
160 Konrad Crescent
Markham, ON. L3R 9T9
Phone# 905 940 1582, Fax# 905 940 2440

North:

Legend:

Approximate Property Boundary

Borehole/Monitoring well

Project Title:

Geotechnical, Hydrogeological, ESA Phase II Services

Site Location:

334 Ardagh Road, Barrie, Ontario

Figure Title:

Borehole/Monitoring Well Location Plan

Scale:	Project Number:
As Shown	SP22-01117-0A
Date:	**Figure Number:**
March, 2023	1



Source: Google Earth Map

SIRATI & PARTNERS
160 Konrad Crescent
Markham, ON. L3R 9T9
Phone# 905 940 1582, Fax# 905 940 2440

North:

Legend:

Approximate Property Boundary

Borehole/Monitoring well

Project Title:

Geotechnical, Hydrogeological, ESA Phase II Services

Site Location:

340 Ardagh Road, Barrie, Ontario

Figure Title:

Borehole/Monitoring Well Location Plan

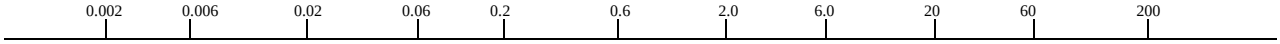
Scale:	Project Number:
As Shown	SP22-01117-0B
Date:	**Figure Number:**
March, 2023	1

Drawing 1A: Notes on Sample Descriptions

1. All sample descriptions included in this report follow the Canadian Foundations Engineering Manual soil classification system. This system follows the standard proposed by the International Society for Soil Mechanics and Foundation Engineering. Laboratory grain size analyses provided by Sirati & Partners Consultants Limited also follow the same system. Different classification systems may be used by others; one such system is the Unified Soil Classification. Please note that, with the exception of those samples where a grain size analysis has been made, all samples are classified visually. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.

ISSMFE SOIL CLASSIFICATION

CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE		



EQUIVALENT GRAIN DIAMETER IN MILLIMETRES

CLAY (PLASTIC) TO	FINE	MEDIUM	CRS.	FINE	COARSE
SILT (NONPLASTIC)	SAND			GRAVEL	

UNIFIED SOIL CLASSIFICATION

2. Fill: Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional geotechnical site investigation.

3. Till: The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (60 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.

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LOG OF BOREHOLE BH/MW-01

PROJECT: Geotechnical and Hydrogeologival Investigations
CLIENT: Evans Planning
PROJECT LOCATION: 334 Ardagh Road, Barrie, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4911860.692 E 601620.275

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150 mm
Date: Jan-20-2023

REF. NO.: SP22-01117-00 A
ENCL NO.: 2

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
247.2												
0.0 / 246.9	**TOPSOIL:** 305 mm		1	SS	4		247					
0.3	**FILL:** sand, trace to some silt, trace organics, trace rootlets, brown, moist, loose											
1	trace gravel, very loose		2	SS	2		246					
245.3			3	SS	15							
2 1.8	**SAND:** trace silt, trace gravel, brown, moist, compact		4	SS	20		245					
3	dense, trace cobbles		5	SS	43		244					
4 242.6							243					
4.6	**SILTY SAND WITH GRAVEL:** brown, wet, compact		6	SS	20	▽						23 38 38 1
5 6 241.1							W. L. 242.3 m Feb 27, 2023					
6.1 / 240.5	**SAND:** trace to some silt, trace gravel, brown, wet, very dense		7	SS	65		241					
6.7	**END OF BOREHOLE:**											

1. Borehole was open upon completion of drilling.
2. Groundwater level was encountered at 4.57 mbgs upon completion of drilling.
3. Monitoring well was installed in the borehole upon completion of drilling.
4. Groundwater level was measured at 4.9 mbgs on February 27, 2023.

DRAFT

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: + 3, × 3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

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LOG OF BOREHOLE BH/MW-02A

PROJECT: Geotechnical and Hydrogeologival Investigations
CLIENT: Evans Planning
PROJECT LOCATION: 334 Ardagh Road, Barrie, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4911889.336 E 601608.938

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150 mm
Date: Jan-20-2023

REF. NO.: SP22-01117-00 A
ENCL NO.: 3

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	ELEVATION
246.4					
246.4 / 0.1	**CLEAR STONE:** 50 mm				
	FILL: sand, some silt, trace gravel, dark brown, moist, loose	1	SS	5	246
1	trace silt, trace rootlets, very loose	2	SS	1	
244.6					245
2 1.8	**SAND:** trace silt, trace gravel, brown, moist, loose	3	SS	6	
		4	SS	21	244
3	trace cobbles, compact becoming poorly graded sand with gravel, trace cobbles, trace silt, dense	5	SS	35	243
4					
5	trace cobbles, wet	6	SS	30	242
6 240.3					241
6.1	**INTERBEDDED LAYERS OF LEAN CLAY AND SILTY SAND:** trace gravel, brown, moist to wet, compact/ very stiff	7	SS	18	240
7					239
8		8	SS	18	
9					238
236.9	trace cobbles, very dense/ hard	9	SS	50/ 76mm	237
9.5	**END OF BOREHOLE:**				

1. Borehole was open upon completion of drilling.
2. Water level was encountered at 4.72 mbgs upon completion of drilling.
3. Monitoring well installed at the BH/MW-02A .
4. Groundwater level was measured at 4.9 mbgs on February 27, 2023.

GROUND WATER CONDITIONS: W. L. 240.7 m, Feb 27, 2023

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)

SHEAR STRENGTH (kPa) (20 40 60 80 100)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%) (10 20 30)

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)

	GR	SA	SI	CL
240	0	9	50	41
237	1	61	36	2

DRAFT

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ε=3% Strain at Failure

SPCL SOIL LOG /DRAFT SP22-01117-00.GPJ SPCL.GDT 23-3-29

SIRATI & PARTNERS

LOG OF BOREHOLE BH-02

PROJECT: Geotechnical and Hydrogeologival Investigations

CLIENT: Evans Planning

PROJECT LOCATION: 334 Ardagh Road, Barrie, ON

DATUM: Geodetic

BH LOCATION: See Drawing 1

DRILLING DATA

Method: Solid Stem Auger

Diameter: 150 mm

Date: Jan-24-2023

REF. NO.: SP22-01117-00 A

ENCL NO.: 4

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT (w_P w w_L) WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"							GR SA SI CL
0.0	**TOPSOIL:** 200 mm		1	GRAB								
0.2	**FILL:** sand, trace gravel, trace silt, trace organics, brown, moist		2	GRAB								
0.6	**SAND:** some gravel, trace silt, brown, moist		3	GRAB								
1.1	**END OF BOREHOLE:** 1. Borehole was advanced by hand augering and was open and dry upon termination.											

DRAFT

SPCL SOIL LOG /DRAFT SP22-01117-00.GPJ SPCL.GDT 23-3-29

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES + 3, × 3: Numbers refer to Sensitivity ○ ε=3% Strain at Failure

SIRATI & PARTNERS

LOG OF BOREHOLE BH/MW-03

PROJECT: Geotechnical and Hydrogeological Investigations
CLIENT: Evans Planning
PROJECT LOCATION: 334 Ardagh Road, Barrie, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4911854.316 E 601572.832

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150 mm
Date: Jan-20-2023

REF. NO.: SP22-01117-00 A
ENCL NO.: 5

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS "N" / 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
247.2												
247.0 0.2	**ASPHALT:** 40 mm			AUGER			247					
246.8 0.4	**GRANULAR FILL:** sand and gravel, 200 mm		1	SS	27				○			
1	**FILL:** sand, trace to some silt, trace gravel, trace organics, brown, moist, loose		2	SS	4		246		○			
245.4			3	SS	41				○			
2 1.8	**SAND:** trace to some gravel, trace silt, brown, moist, dense, trace cobbles						245					
	becoming poorly graded sand with gravel, trace silt, very dense		4	SS	54				○			36 57 6 1
3	dense		5	SS	33		244		○			
4							243					
	wet		6	SS	47	▽			○			
5								W. L. 242.3 m Feb 27, 2023				
6 241.1												
6.1	**SILTY SAND:** trace gravel, trace clay, brown, very moist to wet, very dense		7	SS	74		241		○			1 68 30 1
7	grey											
							240					
8 238.9			8	SS	50/ 100mm		239		○			
8.3	**END OF BOREHOLE:**											
	1. Borehole was open upon completion of drilling. 2. Groundwater was encountered at 4.57 mbgs upon completion of drilling. 3. Monitoring well was installed in the borehole upon completion of drilling. 4. Groundwater level											

DRAFT

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ $^{\varepsilon}$=3% Strain at Failure

SIRATI & PARTNERS

LOG OF BOREHOLE BH/MW-04

PROJECT: Geotechnical and Hydrogeological Investigations
CLIENT: Evans Planning
PROJECT LOCATION: 334 Ardagh Road, Barrie, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4911881.359 E 601581.8

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150 mm
Date: Jan-20-2023

REF. NO.: SP22-01117-00 A
ENCL NO.: 6

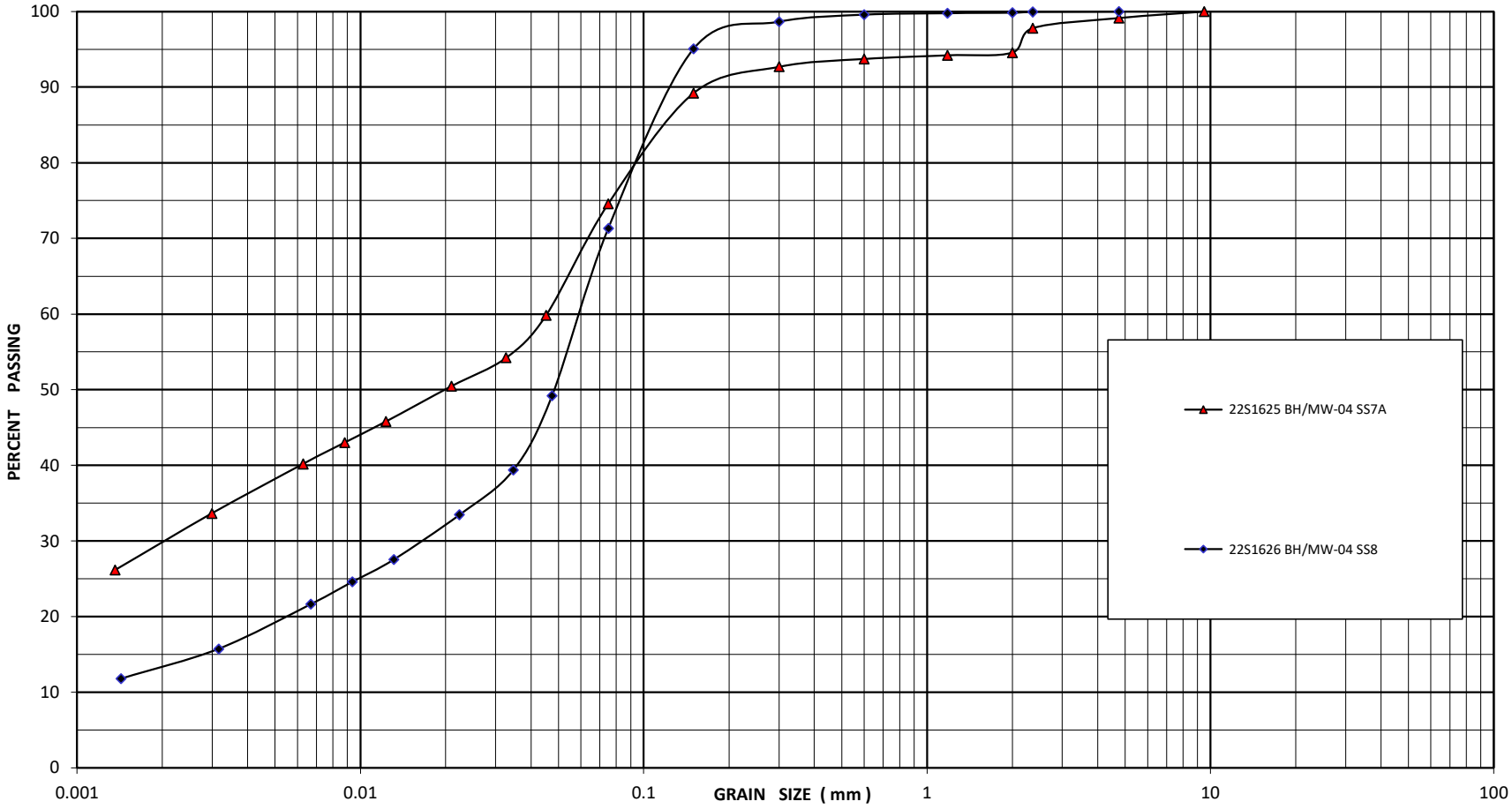
(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS "N" 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
246.6												
246.4 0.2	**TOPSOIL:** 230 mm		1	SS	1		246		○			
	FILL: sand, trace to some silt, trace gravel, trace organics, trace rootlets, brown, moist, loose		2	SS	1							
1							245					
	gravelly sand, trace silt		3	SS	3				○			
2 243.9			4	SS	10		244		○			
2.7	**POORLY GRADED SAND WITH GRAVEL:** trace cobbles, trace silt, brown, moist, dense trace cobbles		5	SS	37				○			37 57 (6)
4							243					
	very dense		6	SS	53		242		○			
5						W. L. 241.6 m Feb 27, 2023						
6 240.5	wet						241					
6.1	**LEAN CLAY WITH SAND:** trace gravel, grey, wet, very stiff		7	SS	21				⊖			1 25 44 30
7							240					
	stiff		8	SS	14		239		○			29 57 14
8 238.4												
8.2	**END OF BOREHOLE:**											
	1. Borehole was open upon completion of drilling. 2. Groundwater was encountered at 5.79 mbgs upon completion of drilling. 3. Monitoring well was installed in the borehole upon completion of drilling. 4. Groundwater level											

DRAFT

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

Graph


PERCENT PASSING
100
90
80
70
60
50
40
30
20
10
0
0.001
0.01
0.1
1
10
100
GRAIN SIZE (mm)
22S1625 BH/MW-04 SS7A
22S1626 BH/MW-04 SS8

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Geotechnical Hydrogeological & Environmental Solutions

Grain Size Analysis

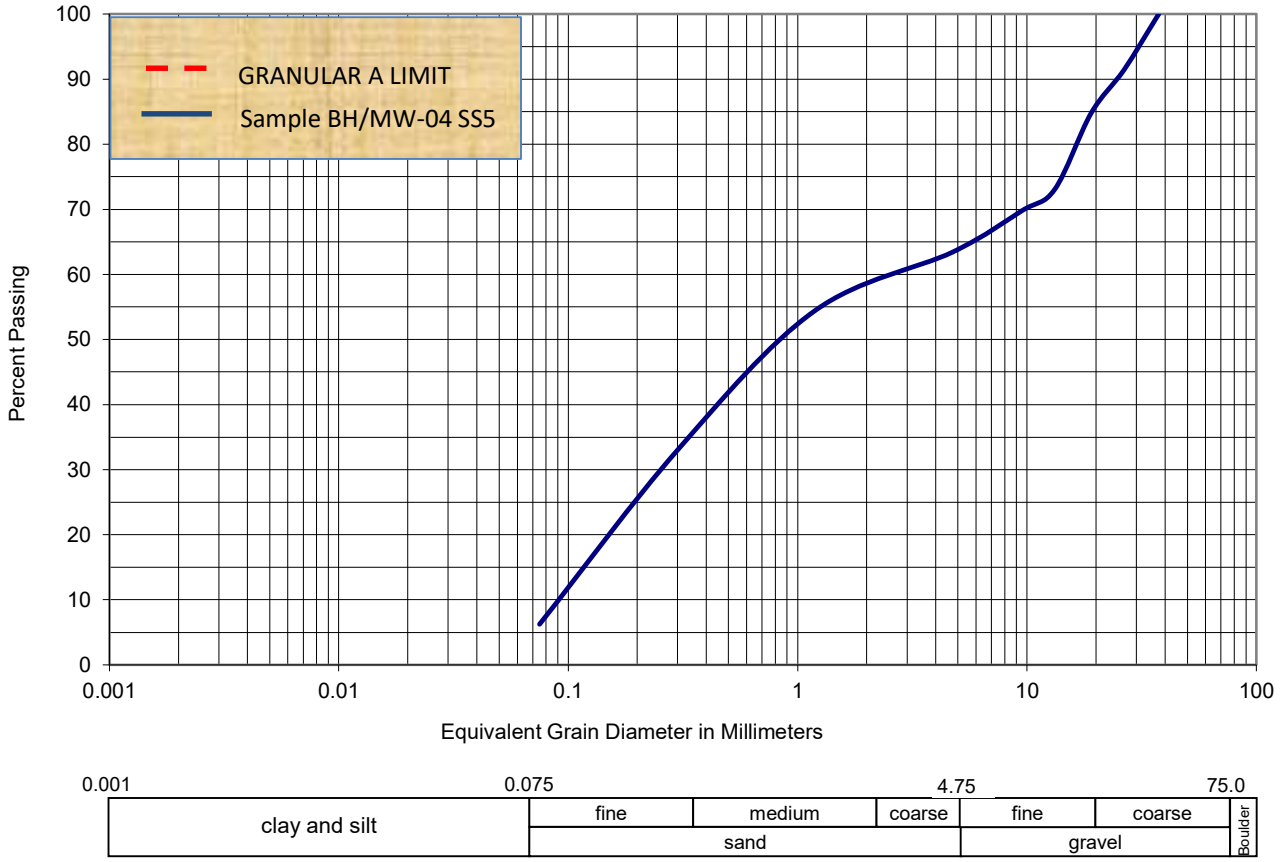
(Granular Material)

MTO LS-602

FIGURE NUMBER:
SAMPLE NUMBER: 22S1624 **Date Tested:** 3 Feb 2023
PROJECT NUMBER: SP22-1117-00
PROJECT NAME:
CLIENT: Evans Planning
PROJECT LOCATION: 334 – 340 Ardagh Road, Barrie, ON
SAMPLED BY: JS
DATE SAMPLED: 20-Jan-23
FIGURE NUMBER: 9
SAMPLE LOCATION: Sample BH/MW-04 SS5
DESCRIPTION: Sample BH/MW-04 SS5
SPECIFICATION: OPSS 1010 Granular A
COMMENTS:

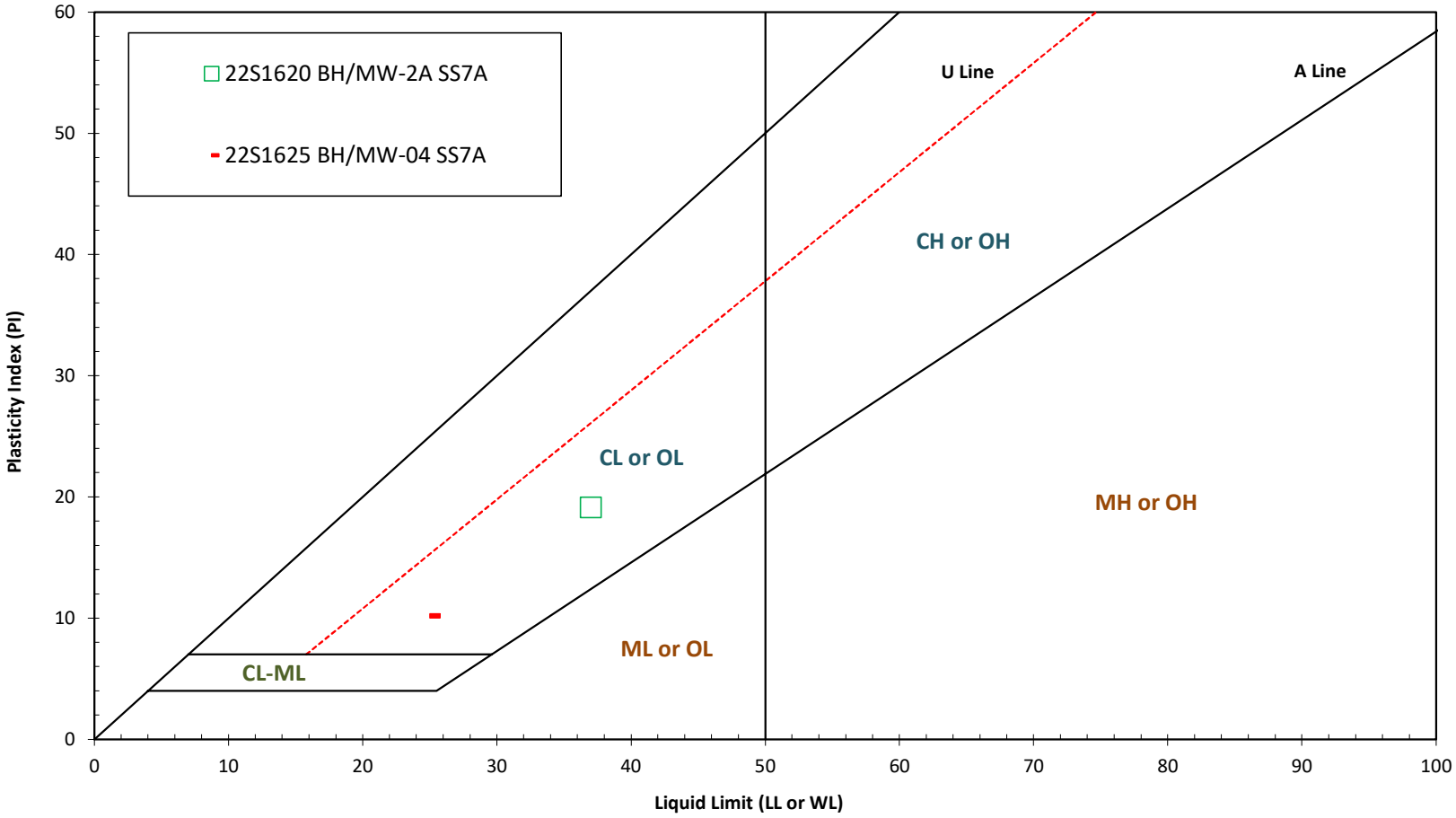
SIEVE SIZE	PERCENT PASSING	SPECIFICATIONS
37.5 mm	100.00	Upper limit
26.5 mm	91.44	100
19.0 mm	84.70	85-100
13.2 mm	73.06	65-90
9.5 mm	69.77	50-73
4.75 mm	63.45	35-55
1.18 mm	54.35	15-40
300 µm	32.98	5-22
75 µm	6.23	2-8

		Percentage of		
Sample No.	BH-SS	Gravel	Sand	Fines(Silt and Clay)
22S1624	BH/MW-04 SS5	37	57	6



Atterberg's Limits Test Report

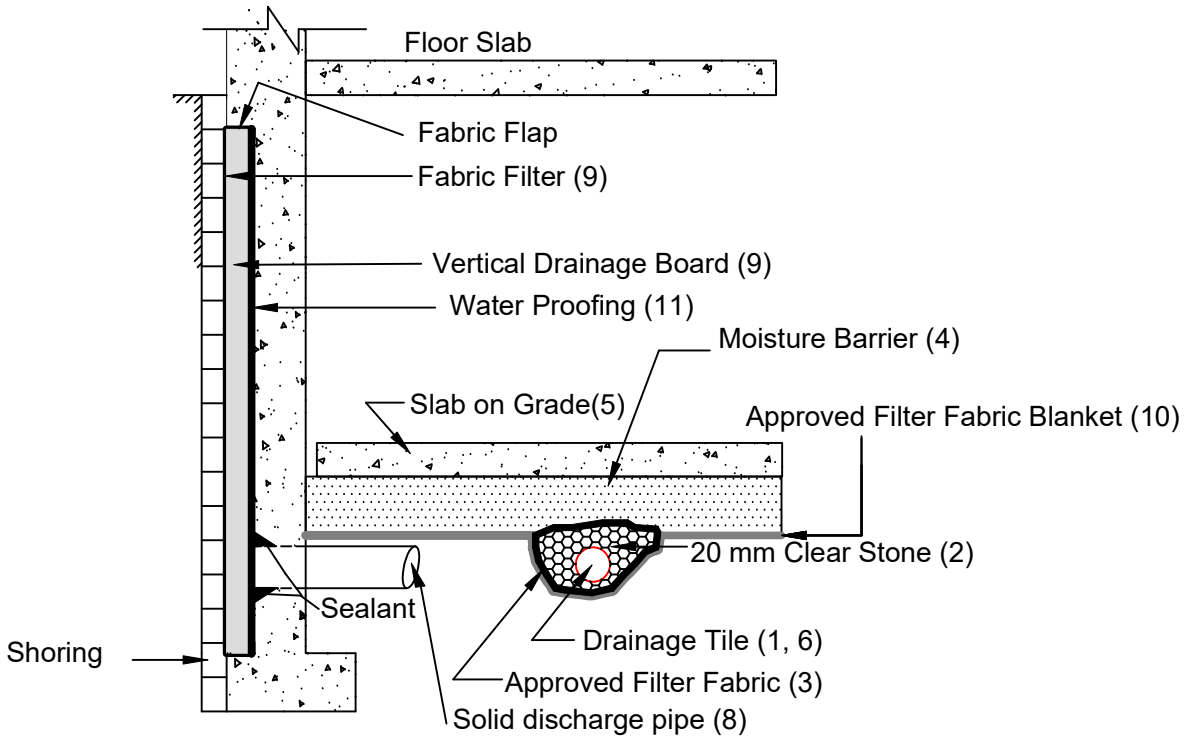
ASTM D4318-10



SIRATI & PARTNERS

Geotechnical Hydrogeological & Environmental Solutions

Date	:	08 February 2023
Project No.	:	SP22-01117-00
Figure No.	:	10

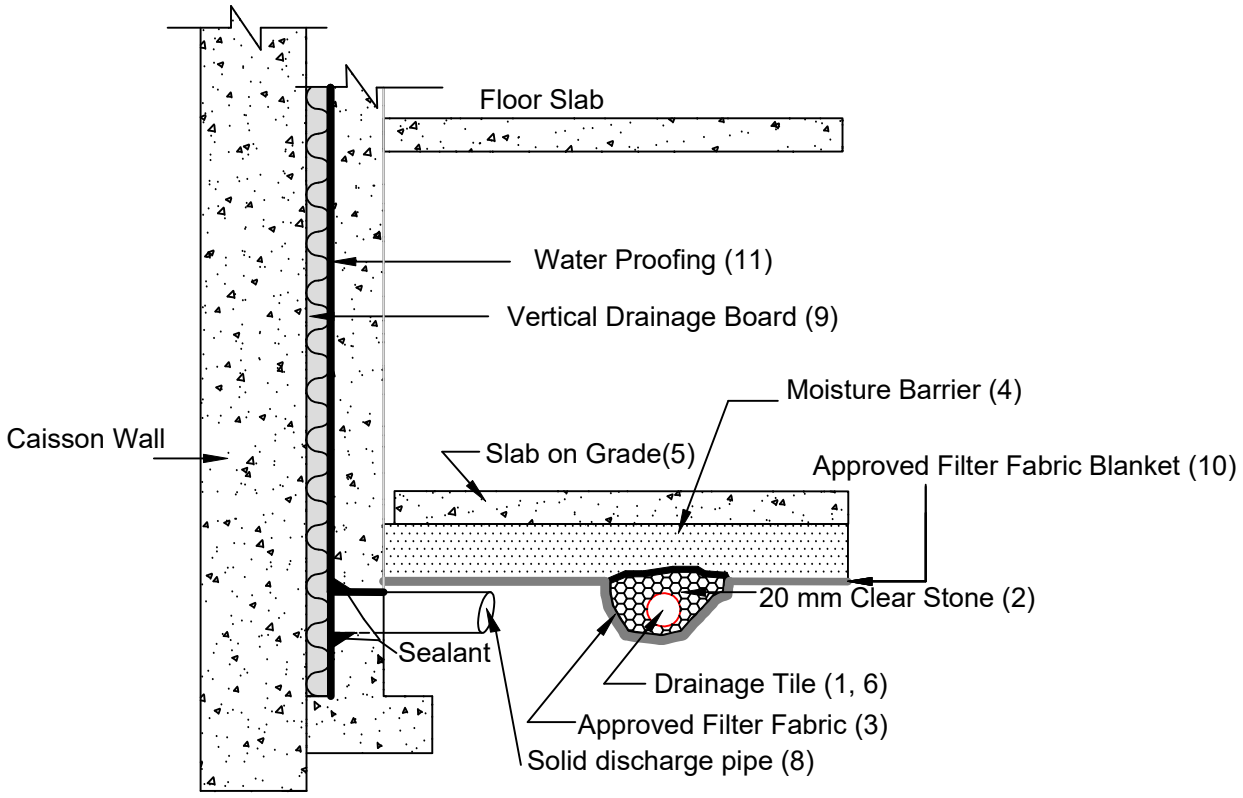


EXTERIOR FOOTING

Notes

1. Drainage tile to consist of 100 mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet, spaced between columns.
2. 20 mm (3/4") clear stone - 150 mm (6") top and side of drain. If drain is not on footing, place100 mm (4 inches) of stone below drain .
3. Wrap the clear stone with an approved filter membrane (Terrafix 270R or equivalent).
4. Moisture barrier to be at least 200 mm (8") of compacted clear 20 mm (3/4") stone or equivalent free draining material. A vapour barrier may be required for specialty floors.
5. Slab on grade should not be structurally connected to the wall or footing.
6. Underfloor drain invert to be at least 300 mm (12") below underside of floor slab. Drainage tile placed in parallel rows 6 to 8 m (20 to 25') centers one way. Place drain on 100 mm (4") clear stone with 150 mm (6") of clear stone on top and sides. Enclose stone with filter fabric as noted in (3).
7. Do not connect the underfloor drains to perimeter drains.
8. Solid discharge pipe located at the middle of each bay between the solider piles, approximate spacing 2.5 m, outletting into a solid pipe leading to a sump.
9. Vertical drainage board with filter cloth should be kept a minium of 1.2 m below exterior finished grade.
10. The entire subgrade to be sealed with approved filter fabric (Terrafix 270R or equivalent) if non-cohesive (sandy) soils below ground water table encountered.
11. The basement walls should be water proofed using bentonite or equivalent water-proofing system.
12. Review the geotechnical report for specific details. Final detail must be approved before system is considered acceptable.

DRAINAGE RECOMMENDATIONS
Shored Basement wall with Underfloor Drainage System
(not to scale)



EXTERIOR FOOTING

Notes

1. Drainage tile to consist of 100 mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet, spaced between columns.
2. 20 mm (3/4") clear stone - 150 mm (6") top and side of drain. If drain is not on footing, place100 mm (4 inches) of stone below drain .
3. Wrap the clear stone with an approved filter membrane (Terrafix 270R or equivalent).
4. Moisture barrier to be at least 200 mm (8") of compacted clear 20 mm (3/4") stone or equivalent free draining material. A vapour barrier may be required for specialty floors.
5. Slab on grade should not be structurally connected to the wall or footing.
6. Underfloor drain invert to be at least 300 mm (12") below underside of floor slab. Drainage tile placed in parallel rows 6 to 8 m (20 to 25') centers one way. Place drain on 100 mm (4") clear stone with 150 mm (6") of clear stone on top and sides. Enclose stone with filter fabric as noted in (3).
7. Do not connect the underfloor drains to perimeter drains.
8. Solid discharge pipe located at the middle of each bay between the solider piles, approximate spacing 2.5 m, outletting into a solid pipe leading to a sump.
9. Vertical drainage board mira-drain 6000 or eqivalent with filter cloth should be continous from bottom to 1.2 m below exterior finished grade.
10. The entire subgrade to be sealed with approved filter fabric (Terrafix 270R or equivalent) if non-cohesive (sandy) soils below ground water table encountered.
11. The basement walls must be water proofed using bentonite or equivalent water-proofing system.
12. Review the geotechnical report for specific details. Final detail must be approved before system is considered acceptable.

DRAINAGE RECOMMENDATIONS
Shored Basement wall with Underfloor Drainage System
(not to scale)

APPENDIX A

GUIDELINES FOR ENGINEERED FILL

GENERAL REQUIREMENTS FOR ENGINEERED FILL

Compacted imported soil that meets specific engineering requirements and is free of organics and debris and that has been continually monitored on a full-time basis by a qualified geotechnical representative is classified as engineered fill. Engineered fill that meets these requirements and is bearing on suitable native subsoil can be used for the support of foundations.

Imported soil used as engineered fill can be removed from other portions of a site or can be brought in from other sites. In general, most of Ontario soils are too wet to achieve the 100% Standard Proctor Maximum Dry Density (SPMDD) and will require drying and careful site management if they are to be considered for engineered fill. Imported non-cohesive granular soil is preferred for all engineered fill. For engineered fill, we recommend use of OPSS Granular 'B' sand and gravel fill material.

Adverse weather conditions such as rain make the placement of engineered fill to the required degree of density difficult or impossible; engineered fill cannot be placed during freezing conditions, i.e. normally not between December 15 and April 1 of each year.

The location of the foundations on the engineered fill pad is critical and certification by a qualified surveyor that the foundations are within the stipulated boundaries is mandatory. Since layout stakes are often damaged or removed during fill placement, offset stakes must be installed and maintained by the surveyors during the course of fill placement so that the contractor and engineering staff are continually aware of where the engineered fill limits lie. Excavations within the engineered fill pad must be backfilled with the same conditions and quality control as the original pad.

To perform satisfactorily, engineered fill requires the cooperation of the designers, engineers, contractors and all parties must be aware of the requirements. The minimum requirements are as follows; however, the geotechnical report must be reviewed for specific information and requirements.

1. Prior to site work involving engineered fill, a site meeting to discuss all aspects must be convened. The surveyor, contractor, design engineer and geotechnical engineer must attend the meeting. At this meeting, the limits of the engineered fill will be defined. The contractor must make known where all fill material will be obtained from and samples must be provided to the geotechnical engineer for review, and approval before filling begins.

2. Detailed drawings indicating the lower boundaries as well as the upper boundaries of the engineered fill must be available at the site meeting and be approved by the geotechnical engineer.

3. The building footprint and base of the pad, including basements, garages, etc. must be defined by offset stakes that remain in place until the footings and service connections are all constructed. Confirmation that the footings are within the pad, service lines are in place, and that the grade conforms to drawings, must be obtained by the owner in writing from the surveyor and Sirati & Partners Consultants Limited. Without this confirmation, no responsibility for the performance of the structure can be accepted by Sirati & Partners Consultants Limited (SIRATI). Survey drawing of the pre-and post-fill location and elevations will also be required.

4. The area must be stripped of all topsoil and fill materials. Subgrade must be proof-rolled. Soft spots must be dug out. The stripped native subgrade must be examined and approved by a SIRA -TI engineer prior to placement of fill.

5. The approved engineered fill material must be compacted to 100% Standard Proctor Maximum Dry Density throughout. Engineered fill should not be placed during the winter months. Engineered fill compacted to 100% SPMDD will settle under its own weight approximately 0.5% of the fill height and the structural engineer must be aware of this settlement. In addition to the settlement of the fill, additional settlement due to consolidation of the underlying soils from the structural and fill loads will occur and should be evaluated prior to placing the fill.

6. Full-time geotechnical inspection by SIRATI during placement of engineered fill is required. Workcannot commence or continue without the presence of the SIRATI representative.

7. The fill must be placed such that the specified geometry is achieved. Refer to the attached sketches for minimum requirements. Take careful note that the projection of the compacted pad beyond the footing at footing level is a minimum of 2 m. The base of the compacted pad extends 2 m plus the depth of excavation beyond the edge of the footing.

8. A bearing capacity of 150 kPa at SLS (225 kPa at ULS) can be used provided that all conditions outlined above are adhered to. A minimum footing width of 500 mm (20 inches) is suggested and footings must be provided with nominal steel reinforcement.

9. All excavations must be done in accordance with the Occupational Health and Safety Regulations of Ontario.

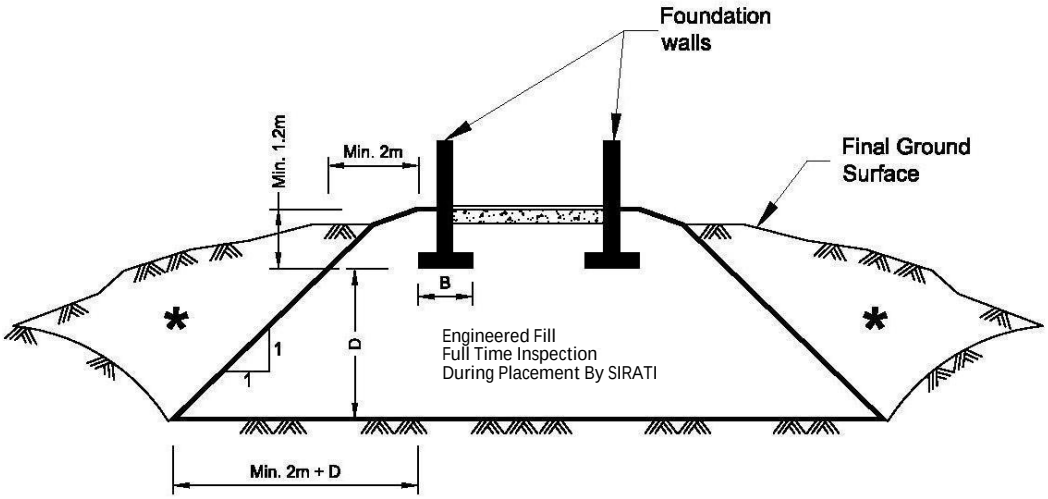
10. After completion of the engineered fill pad a second contractor may be selected to install footings. The prepared footing bases must be evaluated by engineering staff from SIRATI prior tofooting concrete placements. All excavations must be backfilled under full time supervision bySIRATI to the same degree as the engineered fill pad. Surface water cannot be allowed to pond inexcavations or to be trapped in clear stone backfill. Clear stone backfill can only be used with theapproval of SIRATI.

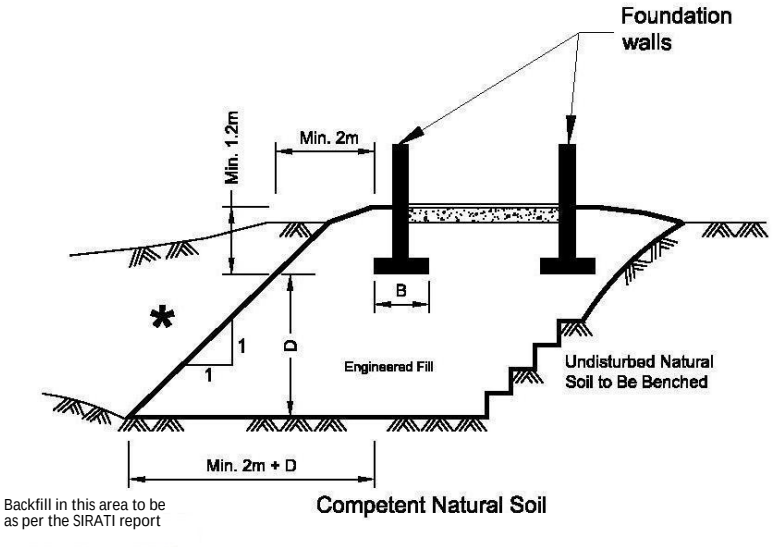
11. After completion of compaction, the surface of the engineered fill pad must be protected from disturbance from traffic, rain and frost. During the course of fill placement, the engineered fill must be smooth-graded, proof-rolled and sloped/crowned at the end of each day, prior to weekends and any stoppage in work in order to promote rapid runoff of rainwater and to avoid any ponding surface water. Any stockpiles of fill intended for use as engineered fill must also be smooth-bladed to promote runoff and/or protected from excessive moisture take up.

12. If there is a delay in construction, the engineered fill pad must be inspected and accepted by the geotechnical engineer. The location of the structure must be reconfirmed that it remains within the pad.

13. The geometry of the engineered fill as illustrated in these General Requirements is general in nature. Each project will have its own unique requirements. For example, if perimeter sidewalks are to be constructed around the building, then the projection of the engineered fill beyond the foundation wall may need to be greater.

14. These guidelines are to be read in conjunction with Sirati & Partners Consultants Limited (SIRA TI) report attached.


Foundation walls
Final Ground Surface
Min. 1.2m
Min. 2m
B
D
1
1
Engineered Fill
Full Time Inspection
During Placement By SIRATI
Min. 2m + D
Competent Natural Soil To Be Confirmed By SIRATI


Foundation walls
Min. 1.2m
Min. 2m
B
D
1
1
Engineered Fill
Undisturbed Natural Soil to Be Benched
Min. 2m + D
Backfill in this area to be as per the SIRATI report
Competent Natural Soil

Appendix B: Limitation and Use of the Report

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

The conclusions and recommendations given in this report are based on information determined at the borehole locations. The information contained herein in no way reflects on the environmental aspects of the project, unless otherwise stated. Subsurface and groundwater conditions between and beyond the boreholes may differ from those encountered at the borehole locations, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the site investigation. The benchmark and elevations used in this report are primarily to establish relative elevation differences between the borehole locations and should not be used for other purposes, such as grading, excavating, planning, development, etc. Professional judgement was exercised in gathering and analyzing data and formulation of recommendations using current industry guidelines and standards. Similar to all professional persons rendering advice, SIRATI cannot act as absolute insurer of the conclusion we have reached. No additional warranty or representation, expressed or implied, is included or intended in this report other than stated herein the report.

The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report.

The comments made in this report on potential construction problems and possible methods are intended only for the guidance of the designer. The number of boreholes may not be sufficient to determine all the factors that may affect construction methods and costs. For example, the thickness of surficial topsoil or fill layers may vary markedly and unpredictably. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the subsurface conditions may affect their work. This work has been undertaken in accordance with normally accepted geotechnical engineering practices.

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

We accept no responsibility for any decisions made or actions taken as a result of this report unless we are specifically advised of and participate in such action, in which case our responsibility will be as agreed to at that time. Any user of this report specifically denies any right to claims against the Consultant, Sub-Consultants, their officers, agents and employees in excess of the fee paid for professional services.

SIRATI engagement hereunder is subject to and condition upon, that SIRATI not being required by the Client, or any other third party to provide evidence or testimony in any legal proceedings pertaining to this finding of this report or providing litigations support services which may arise to be required in respect of the work produced herein by SIRATI. It is prohibited to publish, release or disclose to any third party the report produced by SIRATI pursuant to this engagement and such report is produced solely for the Client own internal purposes and which shall remain the confidential proprietary property of SIRATI for use by the Client, within the context of the work agreement. The Client will and does hereby remise and forever absolutely release SIRATI, its directors, officers, agents and shareholders of and from any and all claims, obligations, liabilities, expenses, costs, charges or other demands or requirements of any nature pertaining to the report produced by SIRATI hereunder. The Client will not commence any claims against any Person who may make a claim against SIRATI in respect of work produced under this engagement.

FINAL

HYDROGEOLOGICAL INVESTIGATION REPORT
PROPOSED DEVELOPMENT AT 334 & 340 ARDAGH ROAD,
CITY OF BARRIE, ONTARIO

Prepared for:

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SIRATI & PARTNERS CONSULTANTS LTD.

SIRATI & PARTNERS
Geotechnical Hydrogeological & Environmental Solutions

Project: SP22-01117-00

November 08, 2024

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Appendix A – Preliminary Design Plan Drawings

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Appendix H – Limitations and Use of The Report

1.0. INTRODUCTION AND BACKGROUND

Sirati & Partners Consultants Limited (SIRATI) was retained by Evans Planning (the Client) to conduct a Geotechnical Investigation, Phase One Environmental Site Assessment and Hydrogeological Services for a proposed residential development at 334 & 340 Ardagh Road in the City of Barrie, Ontario (the Site). See Figure 1 for the Site Location Plan drawing.

This report is consisting of findings from Hydrogeological Investigation performed for the Site. The work carried out for this Hydrogeological Investigation was completed in accordance with SIRATI's Proposal No. P22-09-108 (dated September 12, 2022) for the above noted scope of work. The findings of the Geotechnical Investigation and Phase One Environmental Site Assessment, completed concurrently with the Hydrogeological Investigation and prepared by SIRATI, are presented under separate cover. Pertinent information derived from these reports were used to complete the hydrogeological investigation.

1.1. Objective

The purpose of this hydrogeological investigation is to assess the existing subsurface hydrogeological conditions within the study area, using select borehole locations at the Site to make preliminary recommendations regarding hydrogeological aspects of the Site as they pertain to the development design. The hydrogeological investigation also provides an assessment of the potential dewatering and related permitting requirements for the proposed residential development, as well as the potential impacts to the surrounding environment due to proposed development and to provide recommendations on potential mitigation measures, where required.

This Hydrogeological Investigation is to perform based on the concept design plan and other work-related documents provided to SIRATI, in addition to applicable codes and standards. The recommendations provided in this report generally follow accepted practice for hydrogeological consultants in Ontario.

If there are any changes to the design features that are relevant to the analyses included in this report, SIRATI should be contacted to review the design and confirm whether the conclusions and recommendations contained within this report still apply. It may then be necessary to carry out additional field investigation and analysis before the recommendations made by SIRATI can be relied upon.

This report has been prepared for the use by the Client and its architects and designers for this Site. Third party use of this report without Sirati & Partners Consultants Limited consent is

prohibited. The limitation conditions presented in Section 15.0 and Appendix H form an integral part of the report and they must be considered in conjunction with this report.

1.2 Scope of Work

SIRATI is retained to perform Geotechnical Investigation, Phase One Environmental Site Assessment and Hydrogeological Investigation at the Site (reported under a separate cover). In conjunction with the Geotechnical Investigation and Phase One Environmental Site Assessment, this hydrogeological assessment is required to be carried out consisting of the following scope of work:

- **Review of available background information**: a review of available geological, environmental and hydrogeological information for the Site and surrounding areas and review of other investigation reports completed for the Site was conducted, if available. This is to provide background information to allow for characterization of regional and local geological and hydrogeological conditions.
- **Site inspection**: an inspection of the Property is to be conducted to review existing site conditions including identification of any hydrogeological features such as significant areas of potential groundwater recharge or areas of groundwater discharge.
- **Private well survey:** Review of a water well inventory survey conducted through the database maintained by the Ministry of Environment, Conservation and Parks (MECP) for the area within approximately 500 m radius of the Site. The well information was used in the assessment of potential impact on the water wells.
- **Completion of boreholes/monitoring wells:** Drill Boreholes and install monitoring wells at strategic locations within the Site to obtain the representative information of soil and groundwater at the Site.
- **Measurement of groundwater levels:** Perform well development and meassure groundwater levels in the monitoring wells at the Site. Interpret the monitoring data to analyse the groundwater flow regime.
- **In-situ hydraulic conductivity tests:** Perform in-situ hydraulic conductivity tests (rising head tests) in two (2) of the monitoring wells (BH/MW-02A and BH/MW-04) to estimate hydraulic conductivity of the underlying soils. The estimated hydraulic conductivity will be used for dewatering rate calculations.
- **Construction dewatering assessment:** Review the need for short-term construction dewatering and long-term drainage requirements, and the estimate the dewatering rates based on the

observed soil and groundwater conditions and the Preliminary design provided to SIRATI for the proposed construction.

- **PTTW and EASR:** Evaluate the need for permit-to-take-water (PTTW) or Environmental Activity and Sector Registry (EASR) registration , based on the short-term and long-term dewatering rates.
- **Water Balance (Preliminary):** estimation for a preliminary water balance for the proposed development in comparison to pre-development conditions using the Thornthwaite-Mather method based on the climate information obtained from the nearest Environment Canada weather station.
- **Assessment of potential impacts:** Assessment of potential impacts due to the proposed development and if required, identification of mitigation measures.
- **Reporting:** Prepare a hydrogeological investigation report summarising the findings and results obtained from the investigation and provide recommendations.

As mentioned, the hydrogeological investigation was carried out concurrently with the geotechnical investigation program. As such, the data obtained from the boreholes and monitoring wells are to be incorporated into this hydrogeological investigation report.

The hydrogeological study is to be carried out in accordance with all the following acts and regulations:

- Ontario Water Resources Act.
- Ontario Regulation 387/04 (Water Taking Regulation).
- Ontario Regulation 63/16 (Water Taking under the Environmental Protection Act).
- City of Barrie Sewer Use By-Law 2021-002.

2.0. LAND USE

Currently the Site (334 and 340 Ardagh Road) is used for residential purposes. The area surrounding the Site is currently utilized for residential purposes. The site features are shown on survey map included in Appendix A. See Figure 1 for the Site Location Plan drawing.

3.0. DEVELOPMENT PLAN

As presented in the Preliminary design drawings in Appendix A (Preliminary Drawing A1 334 & 340 Ardagh Road, Barrie Ontario, Vulcan Design Inc., Nov. 30/23), it is understood that the proposed

development will include a 20-unit Residential townhouse development that includes the Site properties, 334 and 340 Ardagh Road, Barrie, Ontario. These include 10 townhouse units at 334 Ardagh Road (Block 3 & Block 4) and 10 townhouse units at 340 Ardagh Road. (Block 1 & Block 2).

4.0. ENVIRONMENTAL FEATURES

To assess environmental features, the databases maintained by the Ministry of Natural Resources and Forestry (MNRF), the Ministry of Environment, Conservation and Parks (MECP) and the Nottawasaga Valley Conservation Authority (NVCA) were reviewed.

Based on the data reviewed, the Site is situated within the Middle Nottawasaga River Reach Sub-watershed of the Nottawasaga Valley Watershed under the jurisdiction of NVCA. The Bear Creek Central East Branch is located 345 m west of the Site and Henderson Creek is located 305 m east of the site. Figure 4 presents the location of the Site, Bear Creek Central East Branch and Henderson Creek.

Based on review of the MNRF database, the Site is not located in any area identified as an area of natural heritage & scientific interests (ANSI) or wetland, (Figure 4).

A regulated area represents the greatest physical extent of the combined hazards, plus a prescribed allowance as set out in the Conservation Authorities Act to protect and safeguard watershed health in terms of environmental areas such as wetlands, shorelines and watercourses. As such, a site located within a regulation area, development restrictions shall apply to the proposed development. The Site does not lie within a NVCA regulated area (as shown on Figure 5).

5.0. SOURCE WATER PROTECTION AREA

Based on review of the MECP's Source Protection Information Atlas, the Site is located within the Nottawasaga Valley S.P.A. (Source Protection Area). The Site is found in an area identified as a Quantity Wellhead Protection Area WHPA-Q1 and WHPA-Q2 (low stress). The Site is located in a Groundwater Quality Vulnerable Area (see Figure 6).

5.1. Quantity Wellhead Protection Area (WHPA-Q)

Based on review of the MECP's Source Protection Information Atlas, the Site is in The City of Barrie, Ontario, Wellhead Protection Areas for Quantity (WHPA-Q1 and Q2) with low stress. The Site is greater than 1 km southwest of the nearest municipal groundwater supply well head. It is not likely that temporary shallow construction dewatering at the Site will significantly impact the deeply seated municipal groundwater supply.

5.2. Wellhead Protection Area -D (WHPA-D)

Wellhead Protection Area (WHPA) is an area that is related to a wellhead, within which it is desirable to regulate or monitor drinking water threats. WHPAs are delineated for threats to quality and quantity.

Wellhead Protection Areas for Quality (WHPA-A, -B, -C, -D) are the areas near a municipal well which are sensitive to contamination, and which are arranged according to either a set distance or delineated based on the time of-travel (up to 25 years) that it would take for water entering the ground to reach the well. WHPAs are also delineated for municipal wells where nearby surface water flows can seep through soil and influence the well (WHPA-E). This situation is known as groundwater under the direct influence of surface water, or a GUDI well.

The Site is found in a WHPA-D area, which indicates that water and any pollution that may be present can reach the well within 25 years. The site has a WHPA-D score of 2. The site is within a highly vulnerable aquifer (score of 6). The area lies within a chloride contaminant issue contributing area.

6.0. PHYSICAL SETTING

6.1. Topography and Drainage

Using the interactive topographic map generator (https://atlas.gc.ca), the topography in the vicinity of the Site gently slopes from the south to the north. The area slopes from the Site (at elevation +/-247 mASL) northwards toward the low-lying wetland area of Bear Creek (400 m to the northwest at elevation +/-204 mASL). Drainage is anticipated to follow the local topography, towards the north/northwest to Bear Creek (as shown in Figure 4).

Based on the SIRATI geotechnical report, the Property is relatively flat with an elevation of 246.4 mASL to 247.2 mASL.

6.2. Physiography

According to Chapman and Putnam (1984), the Site is located within the Simcoe Lowlands, sand plain physiographic region (Nottawasaga Basin, bordering the Camp Borden Sand Plain). See Figure 7.

6.3. Overburden

According to the Surficial Geology of Southern Ontario (Ontario Geological Survey, 2003) the Site (as shown in Figure 8) is covered by Glaciolacustrine coarse-grained sediment, consisting of silt and sand matrix (secondary soil materials of clay and silt). Based on Map P.3212 Bedrock Topography Barrie Area (OGS, 1993), the overburden thickness around the Site is approximately 170 m.

6.4. Bedrock Geology

According to the Paleozoic Geology of Southern Ontario (Ontario Geological Survey, 2007), the Site (shown in Figure 9) is underlain by the Middle Ordovician, Simcoe Group, Shadow Lake Formation and Lindsay Formation including limestone, dolostone, shale, arkose and sandstone.

7.0. HYDROGEOLOGY

Water well records on file with the Ministry of the Environment, Conservation and Parks (MECP) serve as a database for this hydrogeological assessment. The well locations were provided from the MECP interactive water well record database. According to the well records, there appears to be no well record for the Site and 18 well records within a 500 m radius around the property. The locations of the recorded water wells are shown on Figure 10, see Appendix G for Well Record information.

The water well records include dug wells, domestic water wells, test holes, monitoring holes, observation holes and abandoned wells/test holes.

Based on the details in the well records, a thick layer of overburden materials is present in the study area. Bedrock was not encountered at the maximum water well depth of about 45.1 mbgs. The groundwater levels recorded in the water wells ranged from flowing conditions to 15.2 m below ground surface (eight domestic water well records were listed). Based on the details in the water well records, the overburden material noted consisted primarily of sand and sandy clayey gravelly till like deposits.

Note, one domestic type, metal cased potable type groundwater well was identified at the Site (at 340 Ardagh Road). No well tag was observed to be attached to the potable type of groundwater well and no MECP water well record was located for this well. This well is recommended to be decommissioned in accordance with O.Reg. 903 and local Municipal guidelines.

8.0. FIELD WORK METHODOLOGY

8.1. Borehole Drilling and Monitoring Well Installation

As part of the geotechnical investigation, two (2) boreholes equipped with monitoring wells (numbered as BH/MW-01 and BH/MW-02A) were drilled at 334 Ardagh Road and two (2) boreholes equipped with monitoring wells (numbered as BH/MW-03 and BH/MW-04) were drilled at 340 Ardagh Road on January 20, 2023. The approximate borehole and monitoring well locations are shown in Figure 2.

The boreholes were advanced to depths ranging from 6.7 mbgs to 9.5 mbgs, and monitoring wells were constructed using 2-inch diameter, 1.5 m or 3 m PVC screens at depths from 6.7 mbgs to 7.9 mbgs. The construction details for the monitoring wells are presented in the table below.

Table 8-1 Monitoring Well Construction Details

Monitoring Well	Ground Elevation (mAMSL)	Monitoring Well Depth (mbgs)	Screen Interval (mbgs)	Screened Soil
BH/MW-01	247.16	6.7	3.7 ~ 6.7	Sand to silty sand with gravel
BH/MW-02A	246.44	7.9	4.9 ~ 7.9	Sand to layers of clay and silt
BH/MW-03	247.21	7.6	4.6 ~ 7.6	Sand to silty sand
BH/MW-04	246.61	7.6	4.6 ~ 7.6	Sand with gravel to clay with sand

Notes: mAMSL – metres above mean sea level; mbgs – metres below ground surface

8.2. Groundwater Monitoring and Elevation Survey

After the well installation, groundwater levels were measured in the newly installed monitoring wells. In addition, location and elevation survey was conducted using a GPS unit for both the boreholes and the monitoring wells advanced at the Site.

8.3. Hydraulic Conductivity Test (Single Well Response Test/Slug Test)

In-situ hydraulic conductivity tests, also called single well response test or slug test, were conducted on two (2) monitoring wells, BH/MW-02A and BH/MW-04 on February 27, 2023. During the test, a datalogger was placed in the monitoring well after the initial water level was measured. Then, a certain amount of water was removed from the test well (for a rising head test) to create a water level drawdown in the well. The water level recovery was recorded by the datalogger, and the data was then used for estimating the hydraulic conductivity of the screened soil.

8.4. Groundwater Sampling and Chemical Testing

Groundwater samples were collected on May 07, 2024, from all monitoring wells BH/MW-01 BH/MW-02A, BH/MW-03, and BH/MW-04. Chemical testing was completed on the groundwater samples. Chemical testing was completed to assess the general water quality for the purpose of excess water disposal (potentially generated from the Site).

The groundwater samples were submitted to AGAT Laboratories for analysis as per City of Barrie Sewer Use By-Law 2021-002 Guidelines (a By-Law to prohibit, regulate and control discharges into bodies of waters within regional boundaries or into the regional sanitary sewers, storm sewers, sanitary sewage works and all tributary sewer systems).

9.0. SUMMARIZED SITE CONDITIONS

9.1. Soil Stratigraphy

The soil stratigraphy as recorded from the advanced boreholes completed by SIRATI, generally consisted of an upper layer of sandy fill material (1.8 m to a maximum depth of 2.7 m at BH/MW-04) over native soils. Native soils consisted of sand deposits with varied amounts of silt and varied amounts of gravel underlain by lean clay deposits interbedded with silt and sand. No bedrock was encountered at the maximum explored depth of 9.5 mbgs.

Following is the generalized stratigraphy encountered at 334 and 340 Ardagh Road (the Site), as depicted in the borehole logs.

334 ARDAGH ROAD:

Topsoil: A 305 mm thick surficial layer of topsoil was encountered at borehole BH/MW-01.

Clear Stone: A 50 mm thick surficial layer of clear stone was encountered at borehole location BH/MW-02A.

Fill Material: A layer of fill layer was observed underneath the surficial topsoil and clear stone in both boreholes and extending to 1.8 m below the existing ground surface. The fill material mainly consists of sand, trace to some silt, trace gravel, trace organics, trace rootlets. Fill material was generally moist and brown and dark brown in color.

The measured SPT 'N' values in the fill material ranged was 2 and 6 blows per 300 mm penetration, indicating a very loose to loose state.

Cohesionless Soil Deposits:

A layer of native cohesionless soils consist of silty sand with gravel to poorly graded sand with trace gravel, trace cobbles encountered at both borehole locations. Cohesionless soils was found underlaying the fill layer and extending to depths ranging between 6.1 m below the existing ground surface to the termination depth (6.7 m) of the borehole BH/MW-01. Native cohesionless soil deposits were generally brown in color and moist to wet.

The measured SPT 'N' values in the cohesionless soil materials ranged from 6 to 43 blows per 300 mm penetration (increasing with depth), indicating a loose to dense conditions.

Grain size analysis of cohesionless soil sample (BH/MW-01/SS6) was conducted, and the result is presented with the following fractions:

Clay: 1%
Silt: 38%

Sand: 38%
Gravel: 23%

Interbedded layers of Lean Clay and Silty Sand:

Below the cohesionless soil deposits, native soil consisting of interbedded lean clay and silty sand with trace gravel, brown, and moist to wet was encountered at borehole BH/MW-02A, extending to the termination depth (9.5 m) of the borehole.

The measured SPT 'N' values in the interbedded lean clay material ranged from 18 to over 50 blows per 300 mm penetration, indicating a very stiff /compact to hard/ very dense consistency/conditions.

Two (2) grain size analysis of two (2) representative samples (BH/MW-02A/SS7, BH/MW-02A/SS9) were conducted, and the results are presented with the following fractions:

Clay: 2% to 41%
Silt: 36% to 50%
Sand: 9% to 61%
Gravel: 0% to 1%

One representative sample (BH/MW-02A/SS7) was also subjected to Atterberg limits testing. The liquid limit was found to 37% and the plastic limit was found to 18%. The soil has a 19% plasticity index indicating an inorganic medium plastic clay (cohesive). The average soil moisture content of lean clay material at the borehole is at approximately 27% by weight and is below the liquid limit.

340 ARDAGH ROAD:

Asphalt: A 40 mm thick surficial layer of asphalt was encountered in borehole BH/MW-03.

Topsoil: A 230 mm thick surficial layer of topsoil was encountered at borehole BH/MW-04.

Granular fill: A 200 mm thick layer of granular fill material consisting of sand and gravel was observed directly below the surficial asphalt layer at borehole BH/MW-03.

Fill Material: A layer of fill material was observed underneath the granular fill layer in borehole BH/MW-03 and below the surficial topsoil layer in borehole BH/MW-04. The fill material mainly consists of sand to gravelly sand, trace to some silt, trace organics, and trace rootlets. Fill material was generally moist and brown and dark brown in color and extending to depths 1.8 m and 2.7 m below the existing grade.

The measured SPT 'N' values in the fill material ranged was 1 and 10 blows per 300 mm penetration, indicating very loose to loose compacted state.

Cohesionless Soil Deposits: A layer of native cohesionless soil soils consist of sand/ poorly graded sand with gravel to silty sand/ silty sand with gravel, trace cobbles, and trace clay was encountered in both boreholes underlaying the fill material. Native cohesionless deposits extend to depths ranging between 6.1 m below the existing grade (in BH/MW-04) and the termination depth (8.3 m) of the borehole (in BH/MW-03). Native cohesionless soil deposits were generally brown in color and moist to wet.

The measured SPT 'N' values in the cohesionless soil materials ranged from 10 to over 50 blows per 300 mm penetration, indicating compact to very dense material condition.

Grain size and Hydrometer analysis of cohesionless soil samples (BH/MW-03/SS4, BH/MW-04/SS7, and BH/MW-04/ SS5) was conducted, and the result is presented with the following fractions:

Clay: 1%
Silt: 6% to 30%
Sand: 57% to 68%
Gravel: 1% to 37%

Lean Clay: Native cohesive soil comprising of lean clay with sand, and trace gravel was encountered in borehole BH/MW-04 underlaying the cohesionless soils and extending to the termination depth (8.2 m) of the borehole.

The measured SPT 'N' values in the cohesive strata ranged from 14 to 21 blows per 300 mm penetration, indicating stiff to very stiff consistency.

Grain size analysis of two (2) cohesive soil samples (BH/MW-04/ SS7, and BH/MW-04/ SS8) were conducted, and the results are presented with the following fractions:

Clay: 14% and 30%
Silt: 44% and 57%
Sand: 25% and 29%
Gravel: 0% and 1%

One soil sample (BH/MW-04/ SS7) was also subjected to Atterberg limits testing. The liquid limit was found to be 25% and the plastic limit was measured at 15%. As such, the plasticity index of the tested soil is a 10% indicating an inorganic low plastic clay (cohesive). The average soil moisture content of the cohesive deposits at the borehole is at approximately 25% by weight and is equal to the liquid limit.

The details of the soil descriptions are presented in the Borehole Logs and gradation results in Appendix B. A geological cross-section profile is presented in Figure 12.

9.2. Groundwater Conditions

Groundwater conditions were observed during the borehole drilling. The boreholes were open upon completion. The boreholes encountered groundwater upon completion.

9.2.1 Groundwater Levels and Elevations

Groundwater levels were measured in all the newly installed monitoring wells on three (3) occasions, February 27, 2023, March 13, 2023, and May 07, 2024. The measured and recorded groundwater levels are presented in Table 9-1 below.

Table 9-1: Measured Groundwater Levels in 2023 – 334 & 340 Ardagh Rd., Barrie.

Monitoring Well	Ground Elevation (mAMSL)	Screen Depth (mbgs)	Date: 02/27/2023		Date: 03/13/2023	
			Depth to Groundwater (mbgs)	Groundwater Elevation (mAMSL)	Depth to Groundwater (mbgs)	Groundwater Elevation (mAMSL)
BH/MW-01	247.16	3.7 ~ 6.7	4.91	242.25	4.98	242.18
BH/MW-02A	246.44	4.9 ~ 7.9	5.70	240.74	5.40	241.04
BH/MW-03	247.21	4.6 ~ 7.6	4.91	242.30	4.91	242.30
BH/MW-04	246.61	4.6 ~ 7.6	5.04	241.57	5.04	241.57

Notes: mAMSL – metres above mean sea level; mbgs – metres below ground surface.

Table 9-1: Measured Groundwater Levels in 2024 – 334 & 340 Ardagh Rd., Barrie.

Monitoring Well	Ground Elevation (mAMSL)	Screen Depth (mbgs)	Date: 05/07/2024	
			Depth to Groundwater (mbgs)	Groundwater Elevation (mAMSL)
BH/MW-01	247.16	3.7 ~ 6.7	4.45	242.71
BH/MW-02A	246.44	4.9 ~ 7.9	4.57	241.87
BH/MW-03	247.21	4.6 ~ 7.6	4.46	242.75
BH/MW-04	246.61	4.6 ~ 7.6	4.49	242.12

Notes: mAMSL – metres above mean sea level; mbgs – metres below ground surface.

As presented above, the groundwater levels measured in the monitoring wells across the Site ranged from 4.45 mbgs at BH/MW-01 on May 07, 2024, to 5.70 mbgs at BH/MW-02A on February 27, 2023, while elevations ranged from 240.74 mAMSL at BH/MW-02A on February 27, 2023 to 242.75 mAMSL at BH/MW-03 on May 07, 2024.

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

9.2.2 Inferred Groundwater Flow Direction

Based on the water level elevations dated March 13, 2023, the groundwater elevation contours were established and are shown on Figure 11. The shallow unconfined aquifer groundwater flow direction was inferred to be northward.

9.3. Estimated Hydraulic Conductivity

The hydraulic conductivity (K-value) of the soils was estimated based on the results obtained from the single well response tests (slug tests).

Single well response tests or slug tests were conducted as part of this hydrogeological study in two (2) monitoring wells, BH/MW-02A and BH/MW-04 on February 27, 2023. Either a falling head test or a rising head test was performed on the wells. Based on the data obtained from the single well response test/slug test, the hydraulic conductivity for the screened soils was estimated utilizing the Aqtesolv pumping test software with the Hvorslev method. Records of the slug tests and the data processing are provided in Appendix C.

The results of the estimated hydraulic conductivity are summarized in Table 9-2 below.

Table 9-2: Results of Estimated Hydraulic Conductivity as per Slug Tests

Monitoring Well	Screen Depth (mbgs)	Tested Soil Type	Hydraulic Conductivity (m/s)
BH/MW-02A	4.9 ~ 7.9	Sand to layers of clay and silt	7.40×10^{-6}
BH/MW-04	4.6 ~ 7.6	Sand with gravel to clay with sand	2.58×10^{-5}
Average			1.66×10^{-5}

As presented above, the estimated hydraulic conductivity of BH/MW-02A was 7.40×10^{-6} m/s and 2.58×10^{-5} m/s at BH/MW-04, with an average of 1.66×10^{-5} m/s.

It is important to note that during the in-situ hydraulic conductivity test, the water level in both tests was below the top of screen.

9.4. Water Quality

Groundwater samples were collected from all monitoring wells (BH/MW-01, BH/MW-02A, BH/MW-03, and BH/MW-04) at 334 & 340 Ardagh Rd., Barrie, Ontario (The property), on May 07, 2024, from and were submitted to AGAT Laboratories for general chemistry compared to the City of Barrie Sewer Use By-Law Guidelines. It should be noted that AGAT Laboratories is accredited by the Canadian Association of Laboratory Accreditation (CALA).

The analyzed parameters for the groundwater included CBOD5, Organics, and Inorganics in Groundwater samples from the monitoring wells, BH/MW-01, BH/MW-02A, BH/MW-03, and BH/MW-04. A copy of the laboratory Certificate of Analysis is presented in Appendix D.

The analytical results were compared with the Limits for Town of Barrie Sewer Use By-law, and exceedances were found for several parameters. The details of the exceedances are presented in Table 9-3 below, Additionally, the analytical results for Trichloroethylene, derived from groundwater analysis and in accordance with O.Reg. 153/04, Table 2, are detailed in Table 9-4.

Table 9-3 - Exceedances of Barrie Sanitary & Storm Sewer Use By-Law Criteria (Inorganics)

SAMPLE ID	LOCATION	Guideline	PARAMETER	CRITERIA (mg/L)	RESULT (mg/L)
5846407	BH/MW-01	STORM	Total Chromium	0.08	**0.12**
			Total Copper	0.01	**0.12**
			Total Nicke	0.05	**0.12**
			Total Suspended Solids	15	**4030**
		SANITARY	Total Aluminum	50	**94.4**
			Total Iron	50	**112**
			Total Suspended Solids	350	**4030**
5846873	BH/MW-02A	STORM	Total Chromium	0.08	**0.14**
			Total Copper	0.01	**0.10**
			Total Nicke	0.05	**0.14**
			Total Suspended Solids	15	**10700**
			Total Zinc	0.04	**0.40**
		SANITARY	Total Aluminum	50	**98.8**
			Total Iron	50	**115**
			Total Suspended Solids	350	**10700**
5846874	BH/MW-03	STORM	Total Chromium	0.08	**0.13**
			Total Copper	0.01	**0.15**
			Total Nicke	0.05	**0.27**
			Total Suspended Solids	15	**9020**
		SANITARY	Total Aluminum	50	**83.0**
			Total Iron	50	**127**
			Total Suspended Solids	350	**9020**
5846875	BH/MW-04	STORM	Total Copper	0.01	**0.05**
			Total Nicke	0.05	**0.07**
			Total Suspended Solids	15	**4500**
		SANITARY	Total Iron	50	**56.5**
			Total Suspended Solids	350	**4500**

Table 9-4 - Trichloroethylene of Regulation 153/04, Table 2

LOCATION	CRITERIA (µg/L)	Date 27-Feb.-2023	Date 13-Mar.-2023 (µg/L)	Date 07-May-2024 (Organic) (µg/L)
BH/MW-01	1.6	**2.80**	-	**1.9**
BH/MW-02A	1.6	**1.78**	-	0.4
BH/MW-03	1.6	**2.46**	-	0.4
BH/MW-04	1.6	-	**2.18**	0.9

DISCUSSION

- As shown in the table 9-3, there are some exceedances in groundwater samples, therefore for discharge water during the construction treatment must done.
- For discharge water in sanitary, except the water resulting from BH/MW-01 which has exceedance for Total Aluminium the other water analysis shows only Total Iron and TSS has exceedance.
- According to the criteria in Regulation 153/04, Table 2, the recent groundwater analysis indicates that only the water sample from BH/MW-01 has an exceedance for Trichloroethylene.

10.0. CONSTRUCTION DEWATERING

Construction dewatering is intended to lower the groundwater levels in the excavation area in order to ensure a dry working condition.

The requirements for construction dewatering generally depend on the Site's soil and groundwater conditions including soil type, soil permeability or hydraulic conductivity, local groundwater levels, and the design of the proposed development such as the foundation and/or basement elevation, as well as the size of proposed structure, etc.

10.1. Proposed Development, Anticipated Excavation and Dewatering

The proposed development will consist of the construction of twenty (20) residential townhouse type structures. These include 10 townhouse units at 334 Ardagh Road. (Block 3 & Block 4) and 10 townhouse units at 340 Ardagh Road. (Block 1 & Block 2). Therefore, excavations will be expected for foundation and site services installation.

The geodetic elevations for the proposed finish grade were not specifically provided in the Preliminary drawings (Preliminary Drawing A4 334 & 340 Ardagh Road, Barrie Ontario, Vulcan Design Inc., November 30, 2023) as supplied by the Client, however, based on the Preliminary drawings, the top of U/S of footing is 4' MIN. (-1.22 m.) below the finish grade. According to the provided survey Drawing 2485-Ardagh Road 334 & 340 -SRPR.DWG (Pearson + Pearson Surveying Ltd., July 7, 2022), ground level at the site is currently at 245.8 mASL in the northern area of the Site to 248.0 mAMSL at the southeast area of the Site. It would be anticipated that excavations for foundations (including site services) may extend to the preliminary/estimated elevation of 243.78 mASL (Block 1), 245.38 mASL (Block 2), 245.18 mASL (Block 3) and 245.98 mAMSL (Block 4). Based on the groundwater table across the entire site, the highest water level is at 242.75 mASL in monitoring well BH/MW-03 on May 07, 2024. Assuming a 0.5 m dry condition below the underside of the footing, groundwater is not encountered, and dewatering will not be necessary.

Perimeter excavations to accommodate foundation construction are estimated to be approximately 1.0m wider for construction workability.

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

Please contact SIRATI for re-evaluation of the construction dewatering analyses once the preliminary design is finalized (final site grades, finalized foundation elevations, storm and septic sewer design).

10.2. Construction Dewatering Rate Estimation (Short-term)

As discussed, groundwater control in the form of construction dewatering would not be considered for the proposed foundation excavations and associated site services but for control rain fall during the construction it should be considered.

For rain fall dewatering rate assessment, the following measurements and assumptions based on available information would be made (See Appendix A for Preliminary Design Plan Drawings).

334 ARDAGH ROAD.;

- Excavation area: 336.0 m^2 + 490.0 m^2 = 826 m^2 (additional 1.0m per wall to accommodate workability)

340 ARDAGH ROAD.;

- Excavation area: 490.0 m^2 + 336.0 m^2 = 826 m^2 (additional 1.0m per wall to accommodate workability)

To account for the stormwater runoff on a rainy day during the construction at the Site, a 20 mm daily rainfall was considered for the purpose of dewatering design. The total runoff volume is given by the following formula:

Total Runoff Volume (V) per day = Excavation Area x Rainfall Intensity
= Area m^2 x 0.02 m/day
= m^3 /day or L/day.

Based on the above assumptions and measurements stormwater volume estimated to accumulate at 334 Ardagh Road would be approximately 16,520 L/day.

Based on the above assumptions and measurements stormwater volume estimated to accumulate at 340 Ardagh Road would be approximately 16,520 L/day.

To this end, appropriate measures should be taken during construction to deal with surface water into excavation to enable construction. Around the perimeter of the excavation, an inceptor perimeter trench should be constructed to prevent surface water ingress entering the excavation areas.

Please contact SIRATI for re-evaluation of the construction dewatering analyses once the preliminary design is finalized (final site grades, finalized U/S of Footing elevations, finalized foundation elevations, storm and septic sewer design).

The details of storm water runoff calculations are provided in Appendix E.

10.3. Sub-drain Dewatering (Long-term)

In general, a subdrainage system or weeping tile system is recommended to be constructed for the proposed building to avoid hydrostatic pressure from groundwater on the footing walls as well as to achieve a dry condition for the basement level.

Long term sub-drain dewatering may not be anticipated for 334 and 340 Ardagh Road, as per the design assumptions (available information) provided by the Client.

10.4. Regulatory Permits or Registration

Any construction dewatering or water taking in Ontario are governed by Ontario Regulation 387/04 – Water Taking and Transfer, an Ontario regulation made under the Ontario Water Resource Act (OWRA), and/or Ontario Regulation 63/16 – Registration under Part II.2 of the Act – Water Taking, made under Environmental Protection Act and/or Section 34 of the Ontario Water Resources Act (OWRA).

According to Section 34 of the OWRA, any water taking over 50,000 litres per day may not take place without a valid permit, which shall be applied and obtained in accordance with the MECP's permit-to-take-water (PTTW) Manual, dated April 2005.

According to O. Reg. 63/16, a PTTW will not be required for temporary construction dewatering (for six months or less) in an amount greater than 50,000 L/day but less than 400,000 L/day. However, a registration or posting shall be processed through Environmental Activity and Sector Registry (EASR).

Based on the available information, above assumptions and measurements, the temporary construction dewatering rate for 334 and 340 Ardagh Road will not be anticipated but the stormwater volume in the excavation area estimate would be approximately 16,520 L/day for each excavation area and for a total of 33,040 L/day. Therefore, no PTTW or EASR registration will be required either for the temporary construction dewatering or for the long-term drainage discharge for the proposed residential development.

10.5. Point of Discharge

For land developments in an urban area, the local sewer systems are usually used to receive the water generated from a development site. It is observed that catch basins and manholes are located along Ardagh Road, which can be considered as the water discharge points. However, if the local sewer system is selected, a permit or application to use the City of Barrie sewer system will be required.

11.0. WATER BALANCE

A preliminary water balance for the 334 Ardagh Road. Site and the 340 Ardagh Road. Site was completed. The water balance was calculated for both pre-development and post-development conditions to assess the change in overall rate of infiltration.

11.1. Site Condition

The 334 Ardagh Road Site and the 340 Ardagh Road Site have previously been developed with residential dwellings, associated garages/sheds and paved areas. There are no open water bodies, creeks or wetlands located on the Site. The 334 Ardagh Road Site and the 340 Ardagh Road Site are proposed to be redeveloped with 20 residential townhouse units (10 townhouse units at 334 Ardagh Road and 10 townhouse units at 340 Ardagh Road).

For the purpose of water balance assessment, the development area can be categorized into three (3) types of areas: paved area, building/roof area and landscape/vegetated area, which are shown in Appendix A. A summary of the site area is listed in Table 11-1A (334 Ardagh Road) and Table 11-1B (340 Ardagh Road).

Table 11-1A: Pre-and Post-Development Site Conditions 334 Ardagh Road.

Type of Land Coverage	Pre-Development Area (m^2)	Post- Development Area (m^2)
Paved Area	28.75	201.97
Building/Roof Area	284.88	703.23
Landscape/Vegetated Area	1,185.4	593.83
Total (m^2)	1,499.03	1,499.03

Table 11-1B: Pre-and Post-Development Site Conditions 340 Ardagh Road.

Type of Land Coverage	Pre-Development Area (m^2)	Post- Development Area (m^2)
Paved Area	157	201.33
Building/Roof Area	223	593.76
Landscape/Vegetated Area	1118.32	703.23
Total (m^2)	1498.32	1,498.32

11.2. Site Level Water Balance

Based on the Thornthwaite and Mather methodology (1957), the water balance is an accounting of water in the hydrologic cycle. Precipitation (P) falls as rain and snow. It can run off towards lakes and streams (R), infiltrate to the groundwater table (I), or evaporate from ground or evapotranspiration by vegetation (ET). When long-term average values of P, R, I, and ET are used, there is minimal or no net change to groundwater storage (ΔS).

The annual water budget can be expressed as:

$$P = ET + R + I + \Delta S$$

Where:

P = Precipitation (mm/year)

ET = Evapotranspiration (mm/year)

R = Run-off (mm/year)

I = Infiltration (mm/year)

ΔS = Change in groundwater storage (taken as zero) (mm/year)

11.3. Climate Data

The climatic data including monthly average temperature and precipitation were obtained from Environment Canada, for Shanty Bay weather station (Climate Identifier: 6117684).

The data were available between the years 1973 to 2006 i.e. 33 years. Temporal variations of mean annual temperature and precipitation are shown in Figures 11-2 and 11-3.

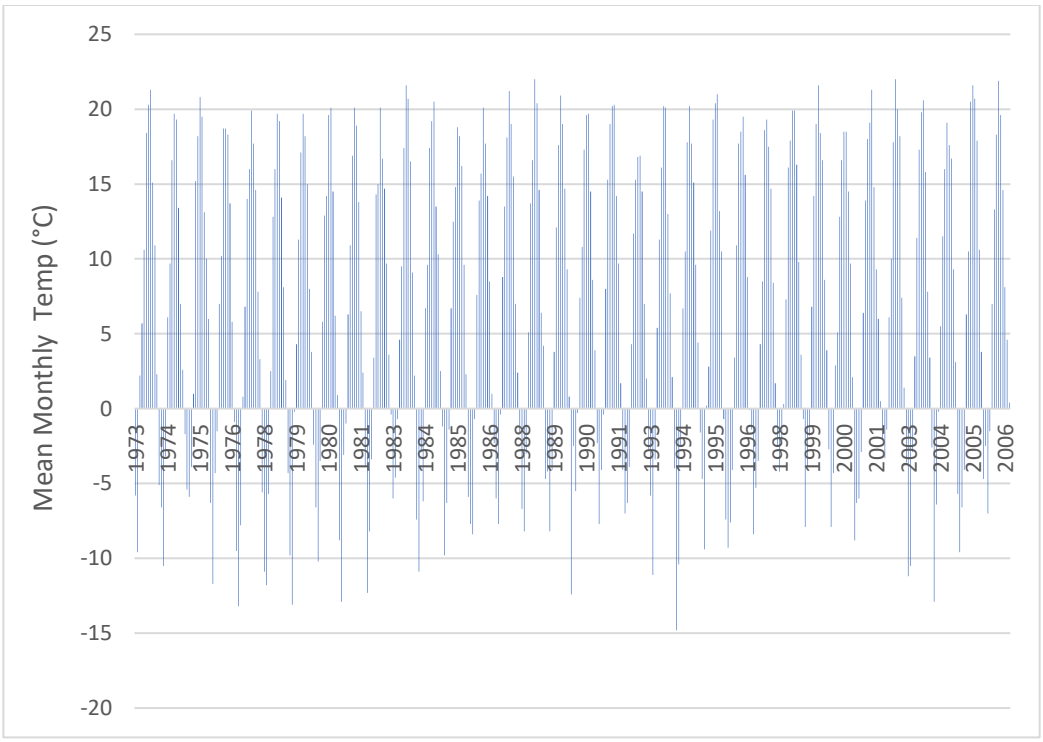


Figure 11.2: Mean Annual Temperature at the Site

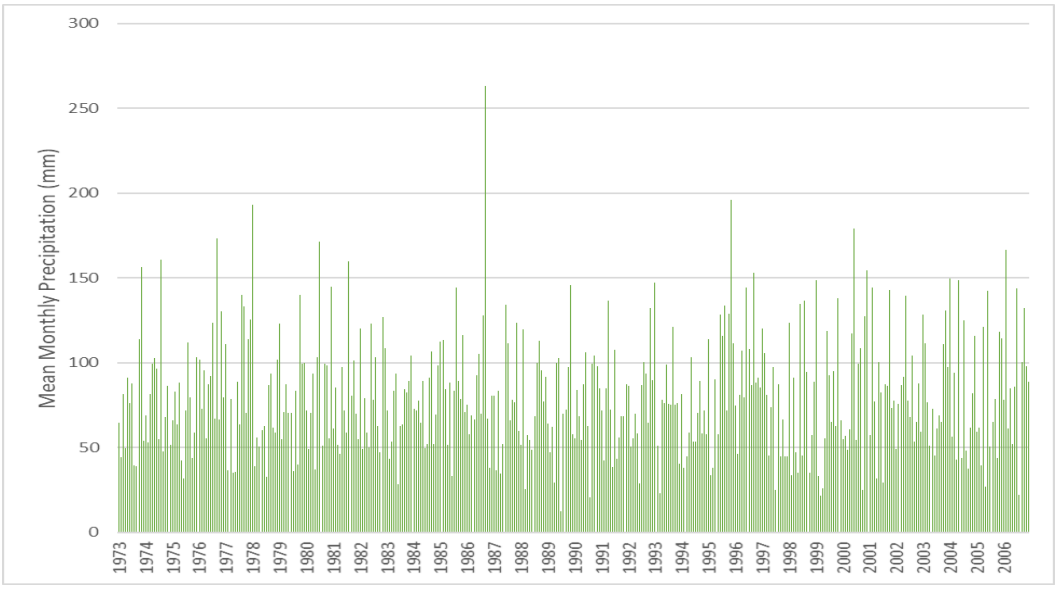


Figure 11.3: Mean Annual Precipitation at the Site

Average monthly variations of both temperature and precipitation were calculated for the period from 1973 to 2006 (33 years) and is presented below in Figure 11-3. The highest average temperature was recorded in the month of August, while the highest precipitation was in the month of November.

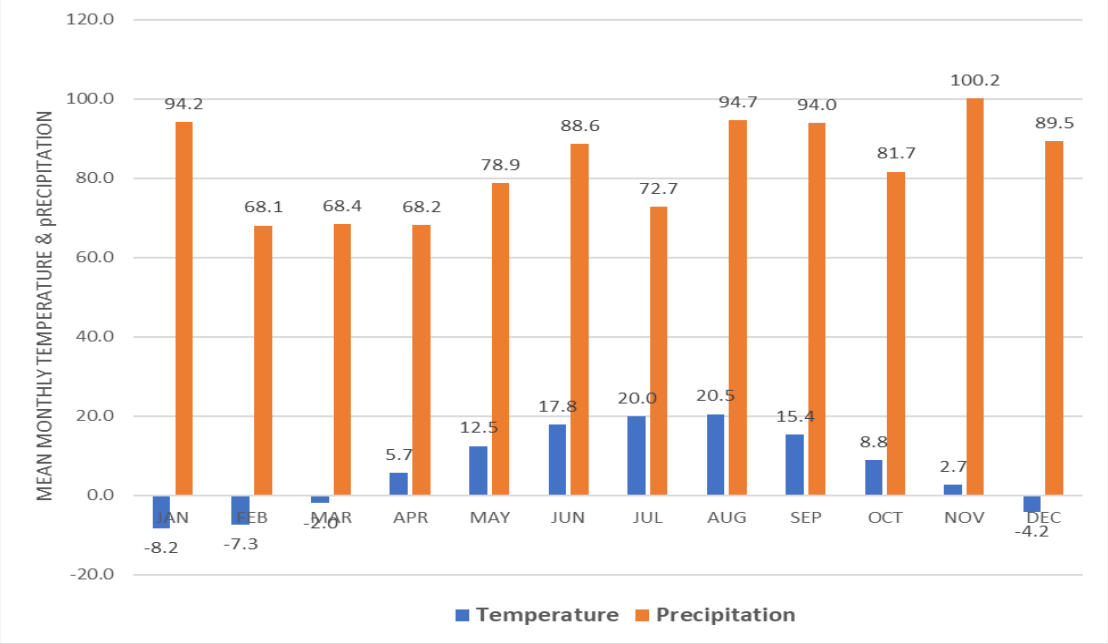


Figure 11.4: Mean Monthly Average Temperature and Precipitation at the Site

Based on the data for the precipitation and temperature, actual evapotranspiration was estimated to be about 531 mm/annum using the USGS Thornthwaite Monthly Water Balance software, and the average annual precipitation was recorded to be 999 mm/annum.

11.4. Infiltration and Run-off

As mentioned above, the actual evapotranspiration was estimated to be 531 mm/annum. Given the average annual precipitation of 999 mm/annum, there is a water surplus of 468 (=999-531) mm/annum occurring at the Site, which can either infiltrate into subsurface or go as run-off.

The rate of infiltration at a site is expected to vary, based on a number of factors to be considered in any infiltration model. To partition the available water surpluses into infiltration and surface run-off, the MECP infiltration factor was used. The MECP Storm Water Management Planning and Design Manual (2003) methodology for calculating total infiltration based on topography, soil type and land cover was used, and a corresponding run-off component was calculated for the soil moisture storage conditions.

11.5. Water Balance

The calculation of infiltration and runoff in the stages of pre-development and post-development is provided in Appendix F, and are presented in Tables 11-2A, 11-2B to 11-5A, 11-5B below. It should be noted that the statistical data used for the calculations was collected from drawing S1, November 30/23, prepared by Vulcan Design Inc.

Table 11-2A: Annual Pre-Development Water Balance 334 Ardagh Road

Land Use		Area (m^2)	Precipitation (m^3)	Evapotranspiration (m^3)	Infiltration (m^3)	Run-off (m^3)
Impervious Areas	Paved Area	29	29	3	0	26
	Building/ Roof Area	285	285	28	0	256
Pervious Areas	Landscape/ Vegetated Area	1185	1184	629	416	139
		1499	1498	661	416	421

Assuming no infiltration occurring in paved and roof areas, 10% of precipitation to be evaporated from paved and roof areas.

Table 11-3A: Annual Post-Development Water Balance 334 Ardagh Road.

Land Use		Area (m^2)	Precipitation (m^3)	Evapotranspiration (m^3)	Infiltration (m^3)	Run-off (m^3)
Impervious Areas	Paved Area	202	202	20	0	182
	Building/ Roof Area	703	703	70	0	632
Pervious Areas	Landscape/ Vegetated Area	594	593	315	208	69
		1,499	1,498	406	208	883

Assuming no infiltration occurring in paved and roof areas, 10% of precipitation to be evaporated from paved and roof areas.

Table 11-4A: Comparison of Pre- and Post Development Water Balance Components 334 Ardagh Road

	Precipitation (m^3)	Evapotranspiration (m^3)	Infiltration (m^3)	Run-off (m^3)
Pre-Development	1,498	661	416	421
Post-Development	1,498	406	208	883
Change in Volume		-255	-208	463
Change in %			-50	110

Table 11-5A: Requirement for Infiltration of Roof Run-off 334 Ardagh Road

Volume of Pre-Development Infiltration (m^3/annum)	416
Volume of Post-Development Infiltration (m^3/annum)	208
Deficit from Pre to Post Development Infiltration (m^3/annum)	208
Percentage of Roof Runoff required to match the pre-development infiltration (%)	33

Table 11-2B: Annual Pre-Development Water Balance 340 Ardagh Road

Land Use		Area (m^2)	Precipitation (m^3)	Evapotranspiration (m^3)	Infiltration (m^3)	Run-off (m^3)
Impervious Areas	Paved Area	157	157	16	0	141
	Building/ Roof Area	223	223	22	0	200
Pervious Areas	Landscape/ Vegetated Area	1,118	1,117	594	393	131
		1,498	1,497	632	393	473

Assuming no infiltration occurring in paved and roof areas, 10% of precipitation to be evaporated from paved and roof areas.

Table 11-3B: Annual Post-Development Water Balance 340 Ardagh Road

Land Use		Area (m^2)	Precipitation (m^3)	Evapotranspiration (m^3)	Infiltration (m^3)	Run-off (m^3)
Impervious Areas	Paved Area	201	201	20	0	181
	Building/ Roof Area	703	703	70	0	632
Pervious Areas	Landscape/ Vegetated Area	594	593	315	208	69
		1,498	1,497	406	208	883

Assuming no infiltration occurring in paved and roof areas, 10% of precipitation to be evaporated from paved and roof areas.

Table 11-4B: Comparison of Pre- and Post Development Water Balance Components 340 Ardagh Road

	Precipitation (m^3)	Evapotranspiration (m^3)	Infiltration (m^3)	Run-off (m^3)
Pre-Development	1,497	632	393	473
Post-Development	1,497	406	208	883
Change in Volume		-226	-184	410
Change in %			-47	87

Table 11-5B: Requirement for Infiltration of Roof Run-off 340 Ardagh Road

Volume of Pre-Development Infiltration (m^3/annum)	393
Volume of Post-Development Infiltration (m^3/annum)	208
Deficit from Pre to Post Development Infiltration (m^3/annum)	184
Percentage of Roof Runoff required to match the pre-development infiltration (%)	29

11.6. Water Deficit Compensation Methodology

Table 11-5A and 11-5B identifies the deficit of groundwater infiltration from Pre and Post development is estimated of 208m3/annum for 334 Ardagh Road and 184m3/annum for 340 Ardagh Road properties. To compensate potential deficit, an alternat groundwater recharge methodology shall be adopted. It should be noted that City is restricting use of LID methodology for deficit compensation due to VOC impacted groundwater, it is recommended to compensate this deficit by installing 400m3 capacity 'Stormwater Treatment Management Tank (STM Tank)' within the property boundary and utilize that water to infiltrate in the ground, using most suitable methodology for the site from below:

- If suitable, direct the roof water to rain barrels and use it for local irrigation;
- If suitable, direct the roof leaders to soakaway or infiltration pits, or to rain barrels;
- Irrigate grassed swales or vegetation from the STM tank or rain barrels; and
- Use of vegetated filter strips within the property;

11.7. Summary of Water Balance Calculation

Based on the above calculations, a water balance summary could be made as below for 334 Ardagh Road:

1) There is a net increase in run-off at the 334 Ardagh Rd. Site of about 463 m^3/annum (or

110% increase), from 421 m^3/annum to 883 m^3/annum. This increase is as a result of the development of the Site with more impervious areas such as roof and paved areas and reduction in pervious landscaped areas.

2) Without implementation of mitigation measures, there is a net deficit of about 208 m^3 /annum (50% decrease) in the post-development infiltration from 416 m^3 to 208 m^3 on a yearly basis.
3) There is a net volume of 632 m^3/annum potentially available to be collected from roof areas, which would be sufficient to fully compensate for the post-development infiltration deficit. A diversion of 33% of roof runoff will compensate the total infiltration deficit.
4) City is restricting use of LID methodology for deficit compensation due to VOC impacted groundwater,
5) It is recommended to design and install 'Stormwater Treatment Management Tank (STM Tank)' with a capacity to capture roof (rain) water only to compensate net deficit of 208m^3 and divert it to rain barrels or to soakaway or infiltration pits and use it for local irrigation.

Based on the above calculations, a water balance summary could be made as below for 340 Ardagh Rd.:

1) There is a net increase in run-off at the 340 Ardagh Road Site of about 410 m^3/annum (or 87% increase), from 473 m^3/annum to 883 m^3/annum. This increase is a result of the development of the Site with more impervious areas such as roof and paved areas and reduction in pervious landscaped areas.
2) Without implementation of mitigation measures, there is a net deficit of about 184 m^3 /annum (29% decrease) in the post-development infiltration from 393 m^3 to 208 m^3 on a yearly basis.
3) There is a net volume of 632 m^3/annum potentially available to be collected from roof areas, which would be sufficient to fully compensate for the post-development infiltration deficit. A diversion of 29% of roof runoff will compensate the total infiltration deficit.
4) City is restricting use of LID methodology for deficit compensation due to VOC impacted groundwater,
5) It is recommended to design and install 'Stormwater Treatment Management Tank (STM Tank)' with a capacity to capture roof (rain) water only to compensate net deficit of 184m3 and divert it to rain barrels or to soakaway or infiltration pits and use it for local irrigation.

11.8. Discussions on Enhance Water Balance Measures

Based on the above water balance calculations for 334 Ardagh Road, an infiltration deficit will be anticipated in an amount of 208 m^3/year due to the development of the Site. On the other hand, a total amount of 632 m^3/year of roof water is anticipated to be available from the roofs of the buildings, which is sufficient to compensate for the infiltration deficit caused due to the proposed development.

Based on the above water balance calculations for 340 Ardagh Road, an infiltration deficit will be anticipated in an amount of 184 m^3/year due to the development of the Site. It is our understanding that the City is restricting using LID infiltration methodology as the project site is located in an area where the groundwater is impacted with VOCs. As such, to compensates this deficit, it is our recommendation that the design engineer should use alternate recharging methodologies such as, permeable pavement in parking lots, walkways and roadways and/or create wetlands restoration/construction and improve soil permeability for the infiltration.

The soils identified at 334 and 340 Ardagh Road, were found to be mainly composed of sandy fill soils with varied amounts of silt to native sand soils, which generally have a fair to good infiltration capacity.

12.0. ASSESSMENT OF POTENTIAL IMPACTS

12.1. Natural Features

As discussed, no natural features such as creeks, open water body or wetlands are present on the Site. However, Bear Creek Central East Branch is located 345 m west of the Site and Henderson Creek is located 305 m east of the site. Given that short- and long-term dewatering are not required, no impacts are expected from the proposed development.

12.2. Private Water Wells on and near the Site

As discussed in Section 7, there are no MECP water wells recorded for water supply use at the Site. However, an existing water well was observed at 340 Ardagh Road. It is recommended the existing groundwater well be decommissioned in accordance with O.Reg. 903 and Municipal guidelines prior to construction activities at the Site. In addition, the Site and its vicinity are in an urban area in the City of Barrie, where the water supply is provided through the municipal water services. Therefore, no impact would be anticipated on the private water wells or water uses.

12.3. Quantity Wellhead Protection Area (WHPA-Q)

The Site is located in The City of Barrie, Wellhead Protection Areas for Quantity (WHPA-Q1 and Q2) with low stress. Given that short- and long-term dewatering are not required, no impacts are expected from the proposed development.

12.4. Wellhead Protection Area -D (WHPA-D)

The Site is located in a WHPA-D area, which indicates a municipal well which is sensitive to contamination, and which are arranged according to either a set distance or delineated based on the time of-travel (up to 25 years) that it would take for water entering the ground to enter the well. The Site is found in a WHPA-D area, which indicates that water and any pollution that may be present can reach the well within 25 years. The site has a WHPA-D score of 2. The site is within a highly vulnerable aquifer (score of 6). The area lies within a chloride contaminant issue contributing area.

It is known that no open water body or creek is located at the Site. Based on the water balance assessment, an infiltration deficit of about 208 m^3/year at 334 Ardagh Road and 184 m^3/year at 340 Ardagh Road would be estimated due to the proposed development. Therefore, the change in infiltration on Site would be an unfavorable factor that may influence a local municipal well. Significant impact to deeply seated municipal wells is not expected as diversion of roof runoff will compensate the total infiltration deficit, and any dewatering is anticipated to be within the upper aquifer only, and any municipal wells are located beyond 500 m from the Site.

12.5. Local Sewage Works

The storm water runoff generated during the construction may be discharged to the local sewer systems (storm and/or sanitary) on Ardagh Road. As discussed, the storm water runoff generated from the excavation area at the Site may be discharged to the local sewer systems after appropriate treatment. However, this may increase the load to the local sewer systems.

It should be noted that a permit or agreement to use the local sewer system shall be obtained from the City of Barrie prior to treated water discharge.

13.0. CONCLUSIONS AND RECOMMENDATIONS

This report was prepared by SIRATI in support of proposed residential development at 334 and 340 Ardagh Road, City of Barrie, Ontario (the Site). Based on the hydrogeological investigations conducted on the subject Property, the following conclusions are presented:

- The Site is situated within the Middle Nottawasaga River Reach Sub-watershed of the Nottawasaga Valley Watershed under the jurisdiction of Nottawasaga Valley Conservation Authority (NVCA). Bear Creek Central East Branch is located 345 m west of the Site and Henderson Creek is located 305 m east of the site.
- The Site is located within the Simcoe Lowlands, sand plain physiographic region. The Site is covered by Glaciolacustrine coarse-grained sediment, consisting of silt and sand matrix, the overburden thickness in the area of the Site is approximately 170 m. The Site is underlain by the Middle Ordovician, Simcoe Group, Shadow Lake Formation and Lindsay Formation including limestone, dolostone, shale, arkose and sandstone.
- The soils encountered in the boreholes at the Site generally consisted of an upper layer of sandy fill material (1.8 m to a maximum depth of 2.7 m at BH/MW-04) over native soils. Native soils consisted of sand deposits with varied amounts of silt and varied amounts of gravel underlain by lean clay deposits interbedded with silt and sand. No bedrock was encountered at the maximum explored depth of 9.5 mbgs.
- The groundwater levels measured in the monitoring wells across the Site ranged from 4.45 mbgs at BH/MW-01 to 5.70 mbgs at BH/MW-02A, while ground water elevations ranged from 240.74 mAMSL at BH/MW-02A to 242.75 mAMSL at BH/MW-03, with an inferred groundwater flow direction to the north.
- Based on the available information, the above assumptions and preliminary design, short-term dewatering may not be required for 334 and 340 Ardagh Road.
- The stormwater volume estimated to accumulate inside the excavation for 334 and 340 Ardagh Road would be approximately 16,520 L/day for each construction area and totally 33,040 L/day. EASR registration may not be required for construction dewatering.
- The average estimated hydraulic conductivity of the screened soils would be 1.66×10^{-5} m/s.
- Please contact SIRATI for re-evaluation of the construction dewatering analyses and long-term dewatering once the Preliminary design is Finalized (final site grades, finalized u/s of footing elevations, finalized foundation elevations, storm and septic sewer design).
- Based on the preliminary water balance assessment for 334 Ardagh Road, an infiltration deficit of about 208 m^3/year and a runoff increase of 463 m^3/year will be anticipated due to the proposed development.
- Based on the preliminary water balance assessment for 340 Ardagh Road, an infiltration deficit of about 184 m^3/year and a runoff increase of 410 m^3/year will be anticipated due to the proposed development.

- Given that the Site is located in WHPA-D and WHPA-Q1/Q2 areas, the dewatering activities and the infiltration deficit would be a threat to the groundwater recharge and influence the municipal wells. To mitigate the infiltration deficit, it is recommended that alternate recharge measures such as 'Permeable Pavement for parking lot, Walkways and roads to allow rainwater to seep through the recharge groundwater to compensate infiltration facilities measures would be incorporated into the design. It should be noted that selection and design of the recharge methods should be carried out by the project engineer. If required, SIRATI can conduct in-situ infiltration tests (Guelph Test) to assess the soil infiltration capacity.
- As the Site is located in WHPA-D and WHPA-Q1/Q2 area, a source protection plan may be prepared to address or discuss the activities occurring on the Site.
- One (1) domestic type, metal cased potable groundwater well was identified at the Site (at 340 Ardagh Road). No well tag was observed to be attached to the well and no MECP water well record was located for this well. This well is recommended to be decommissioned in accordance with O.Reg. 903 and local Municipal guidelines.
- Please contact SIRATI if you require a door-to-door well survey for the proposed development.

14.0. SELECTED BIBLIOGRAPHY

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Bedrock Geology; Ontario Ministry of Northern Development, Mines and Forestry; http://www.mndmf.gov.on.ca/mines/ogs_earth_e.asp; 2010

City of Barrie Sewer Use By-Law 2021-002

Topographic map generator (https://atlas.gc.ca)

MECP Source Protection Information Atlas (Web Mapping, https://www.gisapplication.Irc.gov.on.ca)

Nottawasaga Valley Conservation Authority (Web Mapping, https://www.nvca.on.ca)

Ministry of the Environment, Conservation and Parks (MECP), Map: Well Records – Ontario.ca (https://www.ontario.ca)

15.0. LIMITATIONS AND USE OF THE REPORT

This report was produced by SIRATI for the sole use of the Client for the Site and may not be relied upon by any other person or entity without the written authorization of SIRATI. The conclusions presented in this report are professional opinions based on the historical and current records search, visual observations and limited information provided by persons knowledgeable about past and current activities on this site. As such, SIRATI cannot be held responsible for environmental conditions at the Property that was not apparent from the available information. No investigation method can completely eliminate the possibility of obtaining partially imprecise or incomplete information; it can only reduce the possibility to an acceptable level.

Professional judgement was exercised in gathering and analyzing data and formulation of recommendations using current industry guidelines and standards. Similar to all professional persons rendering advice, SIRATI cannot act as absolute insurer of the conclusion we have reached. No additional warranty or representation, expressed or implied, is included or intended in this report other than stated herein the report.

The assessment should not be considered a comprehensive audit that eliminates all risks of encountering environmental problems. The information presented herein this report is primarily based on information collected during the hydrogeological study based on the condition of the Property at the time of site inspection/drilling followed by a review of historical data, as appended to this report.

In assessing the environmental setting of the Property, SIRATI has solely relied upon information supplied by others in good faith and has therefore assumed that the information supplied is factual and accurate. We accept no responsibility for any inaccurate information, misrepresentation or for any deficiency of the information supplied by any third party.

The scope of services performed in the execution of this investigation may not be appropriate to satisfy third parties. SIRATI accepts no responsibility for damages if any, suffered by any third party as a result of decisions made or action taken based on this report. Any use, copying or distribution of the report in whole or in part is not permitted without the express written permission of SIRATI and use of findings, conclusions and recommendations represented in this report, is at the sole risk of third parties.

In the event that during future work new information regarding the environmental condition of the Property is encountered, or in the event that the outstanding responses from the regulatory agencies indicate outstanding issues on file with respect to the Property, SIRATI should be notified in order that we may re-evaluate the findings of this assessment and provide amendments, as required.

16.0. SIGNATURES

Should you have any questions regarding the information presented or limitation set in this report, please do not hesitate to contact our office.

Yours truly,

Sirati and Partners Consultants Ltd.

Prepared by:	Reviewed by:	Approved by:
Hiva Elhami, M.Sc., G.I.T.	**Praharsh Dhyani, M. Sc., P. Geo**	**Archie Sirati, Ph.D., P.Eng**
Junior Hydrogeologist	Hydrogeology & Environmental Division Lead	Principal

FIGURES

SIRATI & PARTNERS

Geotechnical Hydrogeological & Environmental Solutions



Source: Google Earth Map

0 10 m

SIRATI & PARTNERS
160 Konrad Crescent
Markham, ON. L3R 9T9
Phone# 905 940 1582, Fax# 905 940 2440

North:

Legend:

Approximate Property Boundary

Project Title:
Hydrogeological Investigations

Site Location:
334-340 Ardagh Road,
Barrie, Ontario

Figure Title:
Site Location Plan

Scale:	Project Number:
As Shown	SP22-01117-00
Date:	**Figure Number:**
March, 2023	1



Source: Google Earth Map

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Markham, ON. L3R 9T9
Phone# 905 940 1582, Fax# 905 940 2440

North:

Legend:

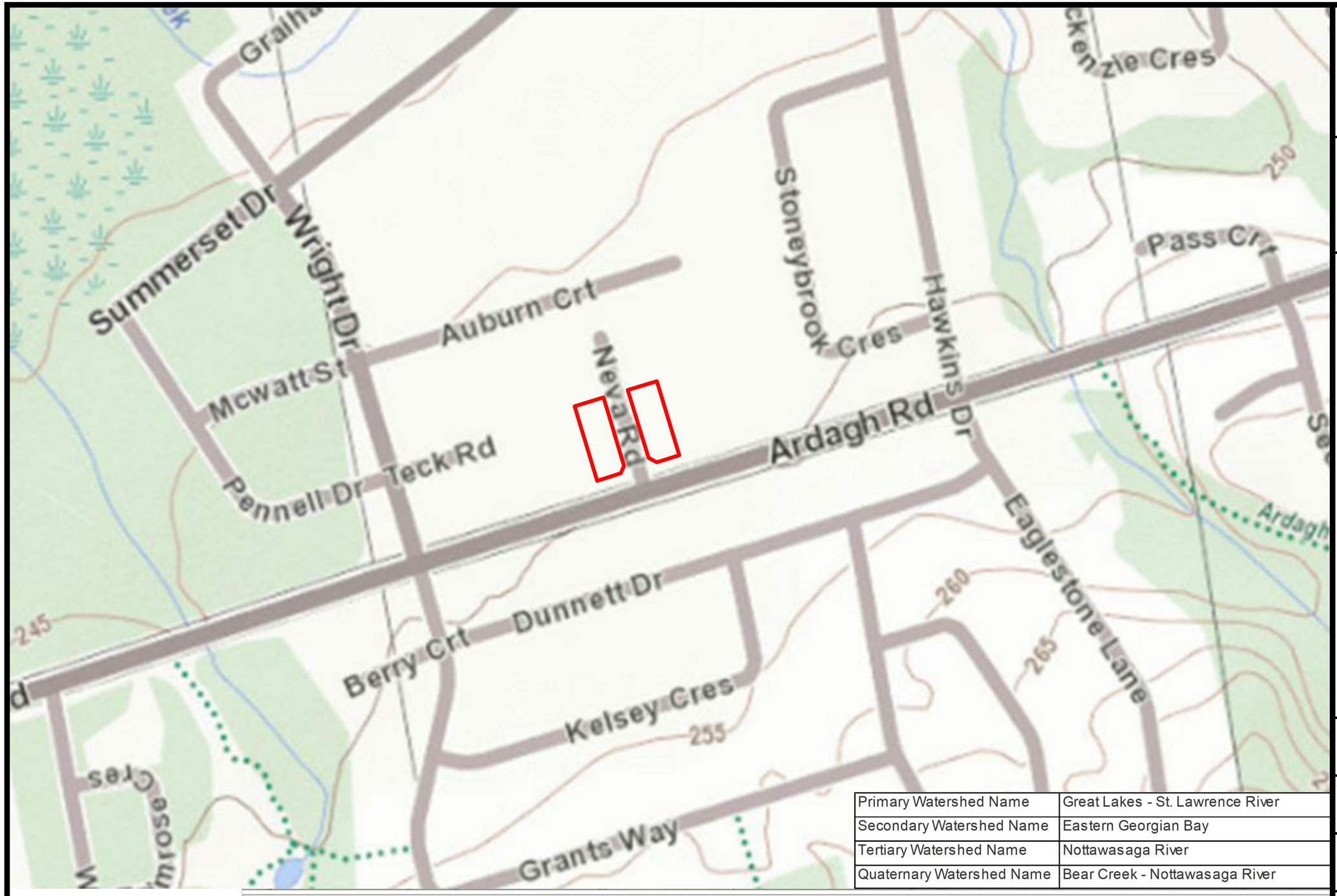
- Approximate Property Boundary
- Borehole/Monitoring well
- Borehole Location

Project Title:
Hydrogeological Investigations

Site Location:
334-340 Ardagh Road,
Barrie, Ontario

Figure Title:
Borehole/Monitoring Well and Cross Section Location Plan

Scale:	Project Number:
As Shown	SP22-01117-00
Date:	**Figure Number:**
March, 2023	2



Primary Watershed Name	Great Lakes - St. Lawrence River
Secondary Watershed Name	Eastern Georgian Bay
Tertiary Watershed Name	Nottawasaga River
Quaternary Watershed Name	Bear Creek - Nottawasaga River

0.4 0 km 0.18 0.4

Scale: 1 : 7,281

Projection: Web Mercator

Source: Ontario Watershed Boundaries(OWB)

The Ontario Ministry of Northern Development, Mines, Natural Resources and Forestry shall not be liable in any way for the use of, or reliance upon, this map or any information on this map. This map should not be used for: navigation, a plan of survey, routes, nor locations.

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North:

Legend:

Approximate Property Boundary

Assessment Parcel
Secondary Watershed
Tertiary Watershed
Quaternary Watershed
Great Lakes - St. Lawrence Basin
Hudson - James Bay Basin
Nelson River Basin
Diversions
Waterbody Outlet
Conservation Authority Dam
Provincial Dam
Federal Dam
OPG Dam
Other Dam
Virtual Flow Segment

Land Cover Compilation

Other
Cloud/Shadow
Clear Open Water
Turbid Water
Shoreline
Mudflats
Marsh
Swamp
Fen
Bog
Heath
Sparse Treed
Treed Upland
Deciduous Treed
Mixed Treed
Coniferous Treed
Plantations - Treed Cultivated
Hedge Rows
Disturbance
Open Cliff and Talus
Alvar
Sand Barren and Dune
Open Tallgrass Prairie
Tallgrass Savannah
Tallgrass Woodland
Sand/Gravel/Mine Tailings/Extraction
Bedrock
Community/Infrastructure
Agriculture and Undifferentiated Rural Land Use

Project Title:

Hydrogeological Investigations

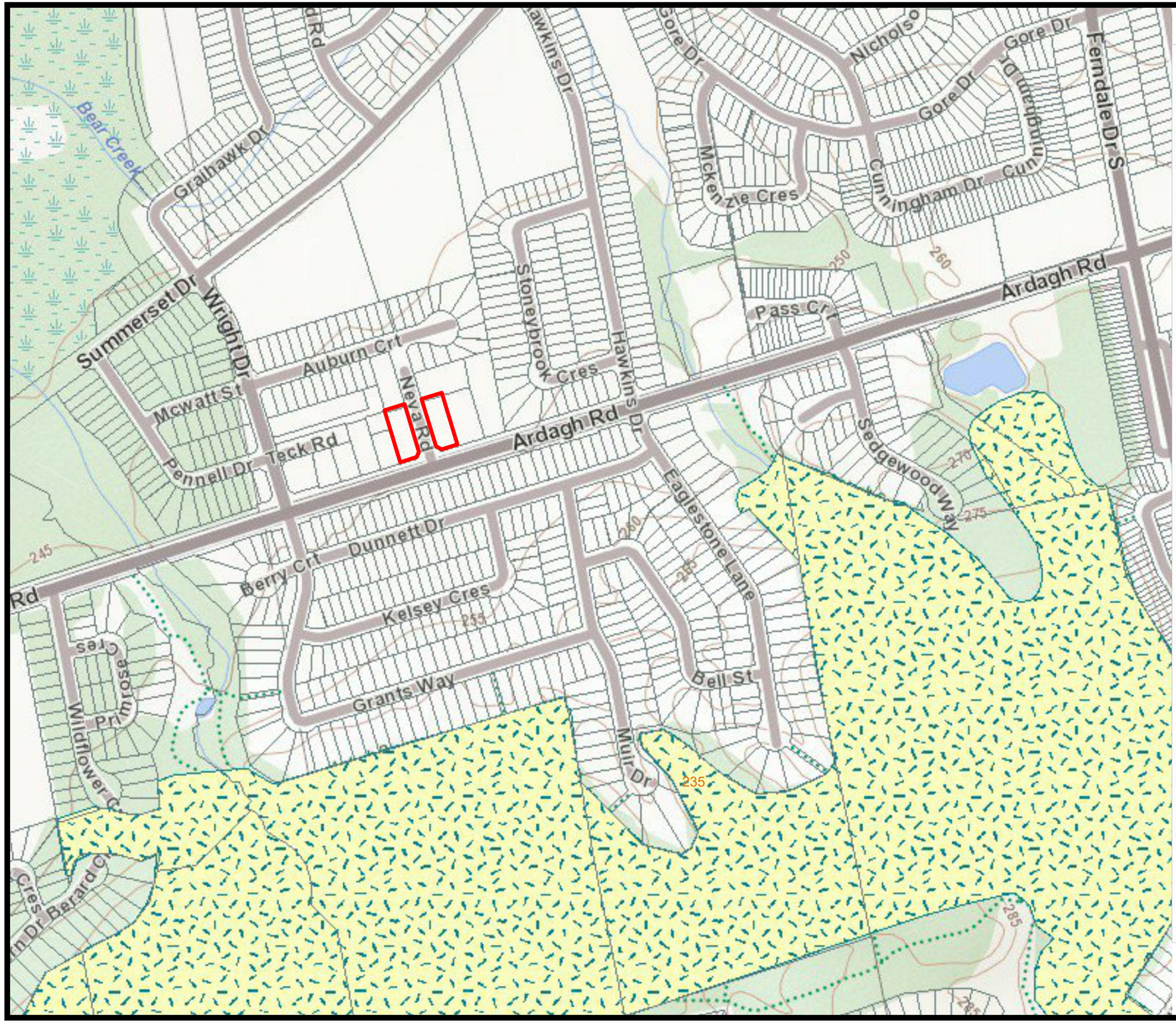
Site Location:

334-340 Ardagh Road,
Barrie, Ontario

Figure Title:

Watershed Map

Scale: As Shown	**Project Number:** SP22-01117-00
Date: March, 2023	**Figure Number:** 3



Topographic Legend

- Building as Symbol
- Building to Scale
- Airport
- Heliport \ Hospital Heliport
- Seaplane Base
- Ferry Route
- Trail Head \ Trail
- Railway \ Train Station
- Railway with Bridge
- Railway with Tunnel
- Road (Major → Minor)
- Winter Road
- Road with Bridge
- Road with Tunnel
- Primary, Kings or 400 Series Highway
- Secondary Highway
- Tertiary Highway
- District, County, Regional or Municipal Road
- Toll Highway
- One Way Road
- Road with Permanent Blocked Passage
- Road with Address Ranges
- Hydro Line, Communication Line or Unknown Transmission Line
- Natural Gas Pipeline, Water Pipeline or Unknown Pipeline
- Spot Height
- Index Contour
- Contour
- Wooded Area
- Wetland
- Waterbody
- Waterbody Elevation
- Watercourse
- Falls
- Rapids
- Rapids \ Falls
- Rapids
- Rocks
- Lock Gate
- Dam \ Hydro Wall
- Dam \ Hydro Wall
- Provincial \ State Boundary
- International Boundary
- Upper Tier \ District Municipal Boundary
- Lower Tier \ Single Tier Municipal Boundary
- Lot Line
- Indian Reserve
- Provincial Park
- National Park
- Conservation Reserve
- Military Lands

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North:

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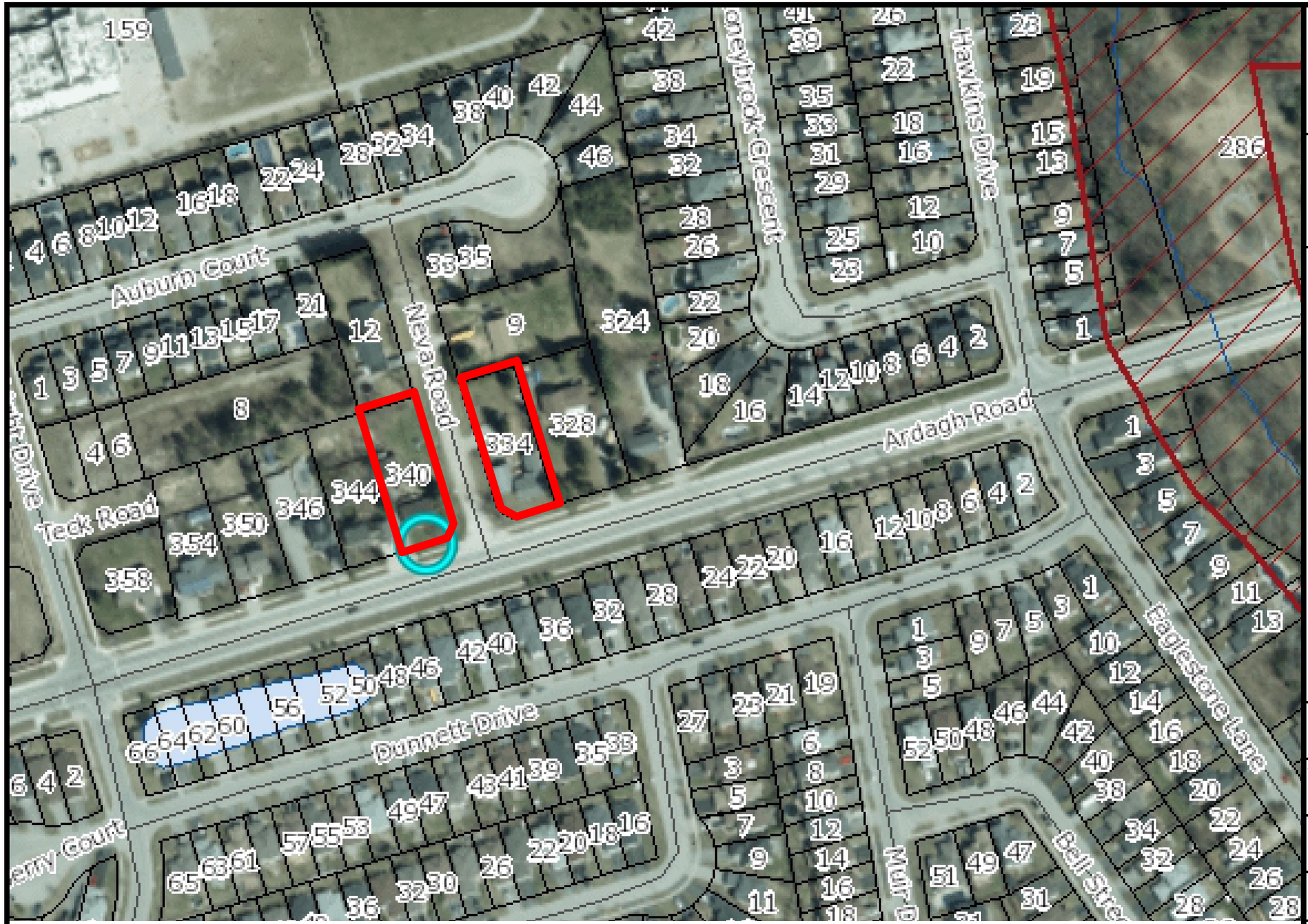
Approximate Property Boundary

Project Title:
Hydrogeological Investigations

Site Location:
334-340 Ardagh Road,
Barrie, Ontario

Figure Title:
Topography & Natural Heritage Map

Scale:	Project Number:
As Shown	SP22-01117-00
Date:	**Figure Number:**
March, 2023	4



Source: Nottawasaga Valley Conservation Authority

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North:

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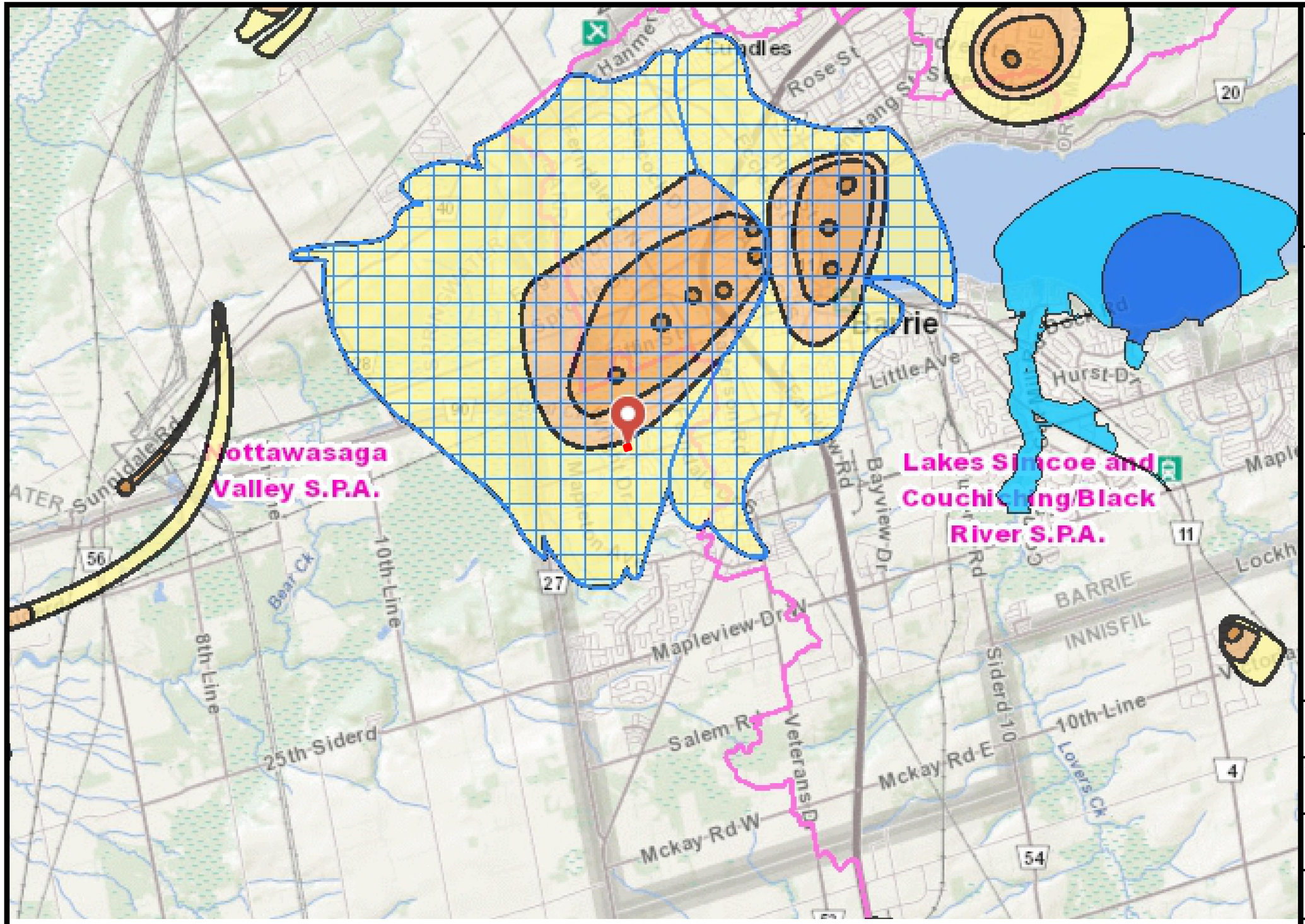
Approximate Property Boundary

Project Title:
Hydrogeological Investigation

Site Location:
334-340 Ardagh Road,
Barrie, Ontario

Figure Title:
NVCA Map

Scale:	Project Number:
As Shown	SP22-01117-00
Date:	**Figure Number:**
March, 2023	5



Source:

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North:

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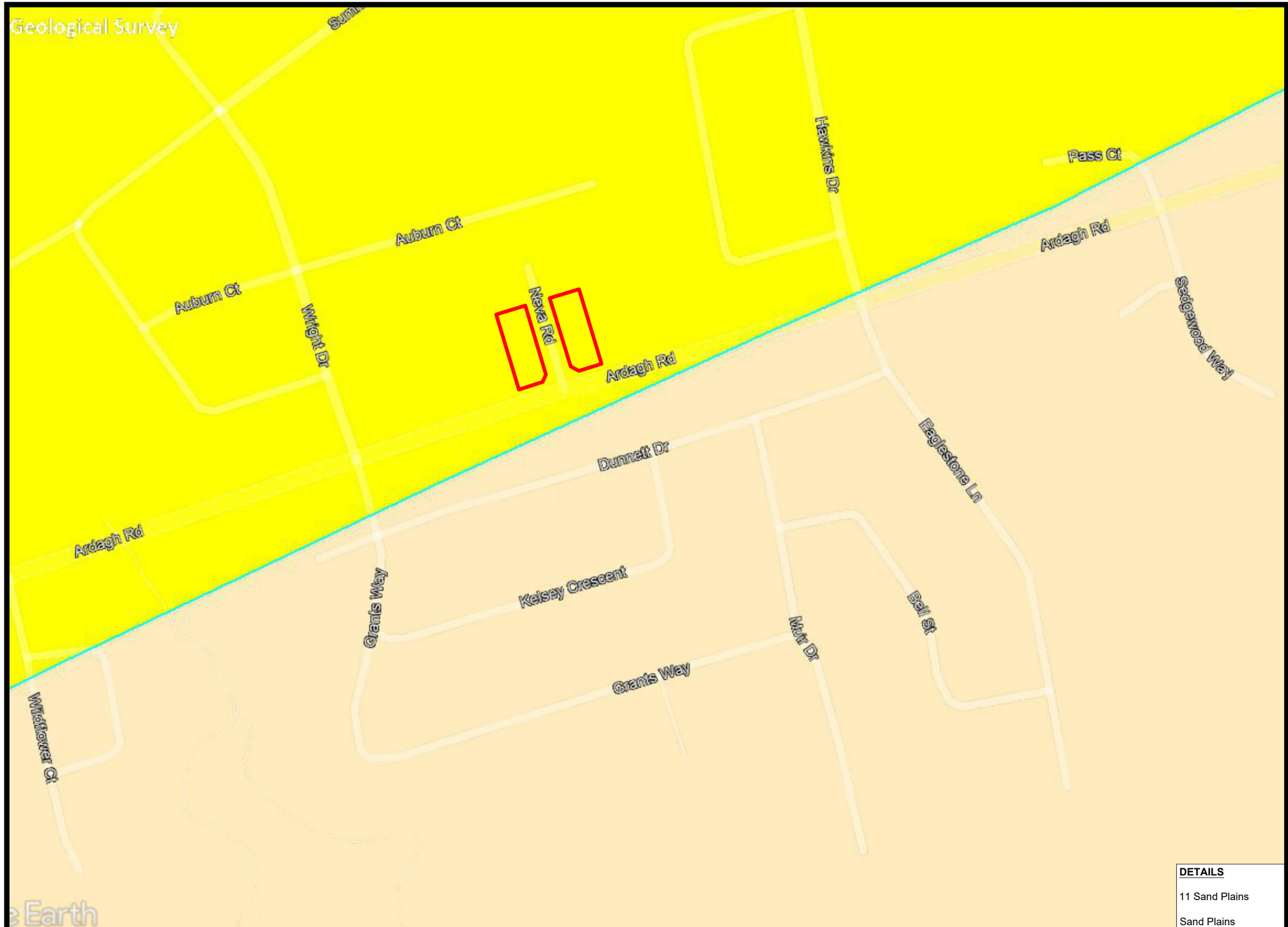
Approximate Property Boundary

Project Title:
Hydrogeological Investigation

Site Location:
334-340 Ardagh Road,
Barrie, Ontario

Figure Title:
MECP Source Protection Map

Scale:	Project Number:
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Date:	**Figure Number:**
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Markham, ON. L3R 9T9
Phone# 905 940 1582, Fax# 905 940 2440

North:

Legend:

Approximate Property Boundary

LEGEND
Physiographic Landforms

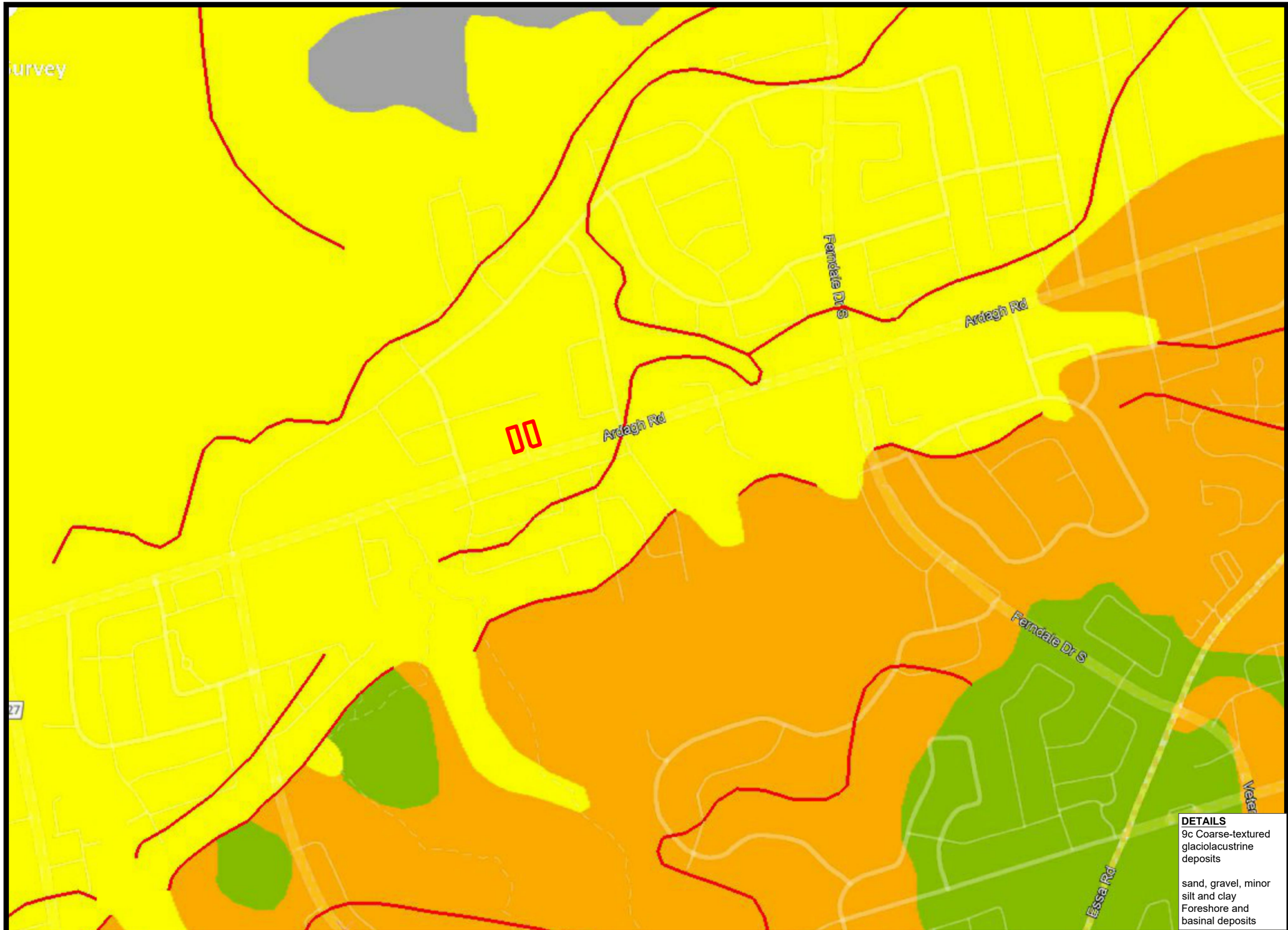
1	Escarpments
2	Till Moraines
3	Spillways
4	Kame Moraines
5	Till Plains (Undrumlinized)
6	Till Plains (Drumlinized)
7	Drumlins
8	Bevelled Till Plains
9	Limestone Plains
10	Shale Plains
11	Sand Plains
12	Clay Plains
13	Eskers
14	Beaches
15	Shallow Till And Rock Ridges
16	Bare Rock Ridges And Shallow Till
17	Peat And Muck

Project Title:
Hydrogeological Investigations

Site Location:
334-340 Ardagh Road,
Barrie, Ontario

Figure Title:
Physiography Map

Scale: As Shown	**Project Number:** SP22-01117-00
Date: March, 2023	**Figure Number:** 7



Source: Ontario Geological Survey (OGS) Google Earth

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160 Konrad Crescent
Markham, ON. L3R 9T9
Phone# 905 940 1582, Fax# 905 940 2440

North:

Legend:

Approximate Property Boundary

- Fill
- **Organic Deposits:** peat, muck and marl
- Silt
- Clay
- Sand
- Gravel
- Till (Diamicton)
- Sedimentary (Paleozoic) bedrock
- Precambrian bedrock
- 21 **Man-made deposits:** fill, sewage lagoon, landfill, urban development
- 20 **Organic Deposits:** peat, muck, marl
- 19 **Modern alluvial deposits:** clay, silt, sand, gravel, may contain organic remains
- 10 **Fine-textured glaciomarine deposits:** silt and clay, minor sand and gravel
  10a Massive to well laminated
  10b Interbedded silt and clay and gritty, pebbly flow till and rainout deposits
- 9 **Coarse-textured glaciolacustrine deposits:** sand, gravel, minor silt and clay
  9a Deltaic deposits
  9b Littoral deposits
  9c Foreshore and basinal deposits
- 8 **Fine-textured glaciolacustrine deposits:** silt and clay, minor sand and gravel
  8a Massive to well laminated
  8b Interbedded silt and clay and gritty, pebbly flow till and rainout deposits
- 7 **Glaciofluvial deposits:** river deposits and delta topset facies
  7a Sandy deposits
  7b Gravelly deposits
- 6 **Ice-contact stratified deposits:** sand and gravel, minor silt, clay and till
  6a In moraines, eskers, kames and crevasse fills
  6b In subaquatic fans

Project Title:

Hydrogeological Investigations

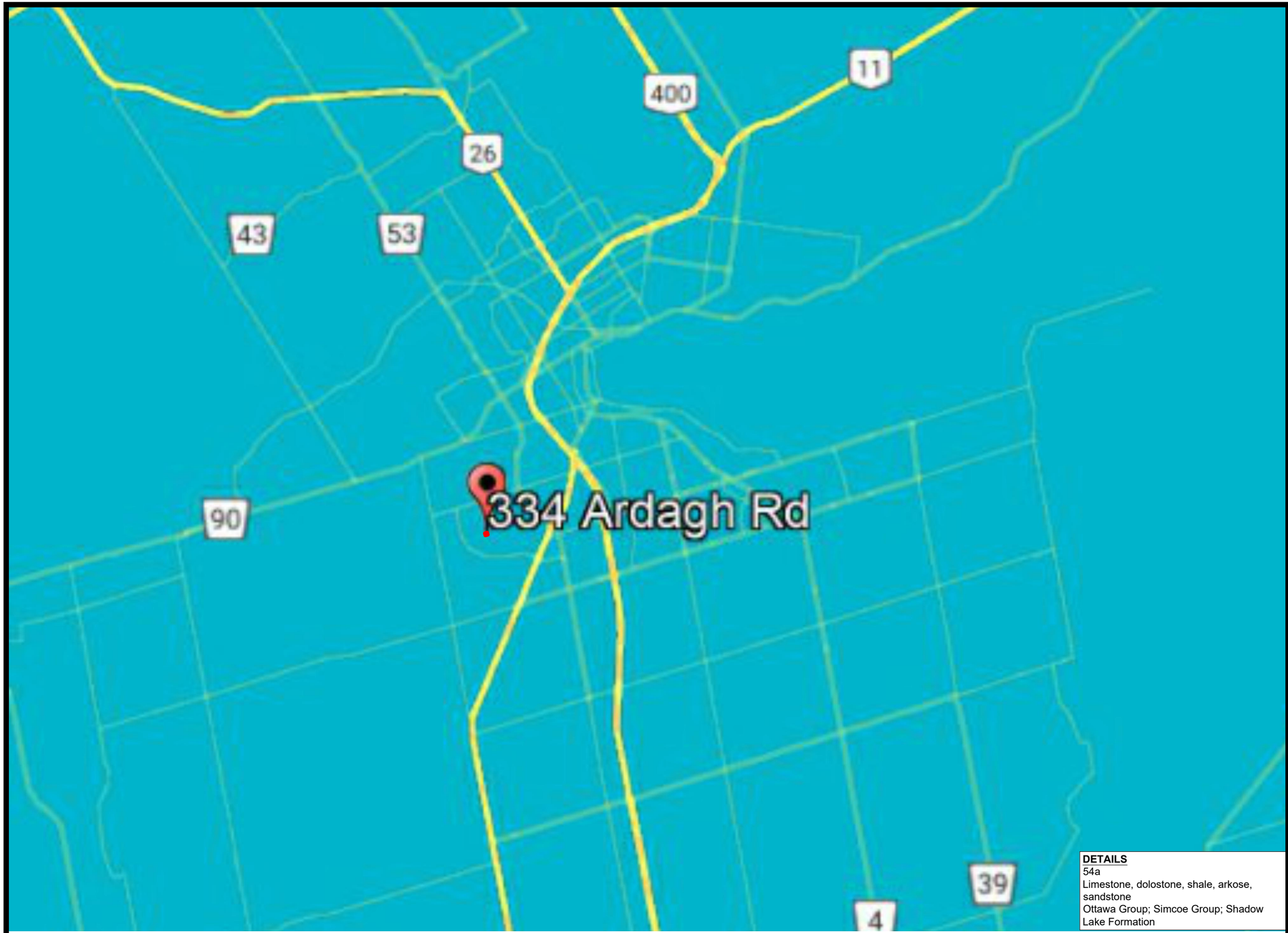
Site Location:

334-340 Ardagh Road,
Barrie, Ontario

Figure Title:

Surficial Geology Map

Scale:	Project Number:
As Shown	SP22-01117-00
Date:	**Figure Number:**
March, 2023	8



Source: Ontario Geological Survey (OGS) Google Earth

DETAILS
54a
Limestone, dolostone, shale, arkose, sandstone
Ottawa Group; Simcoe Group; Shadow Lake Formation

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Markham, ON. L3R 9T9
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North:

Legend:

Approximate Property Boundary

55 **Shale, limestone, dolostone, siltstone**
- 55a Queenston Fm.
- 55b Georgian Bay Fm.; Blue Mountain Fm.; Billings Fm.; Collingwood Mb.; Eastview Mb.
- 55c Linkend Gp.
- 55d Red Head Rapids Fm.
- 55e Churchill River Gp.
- 55f Bad Cache Rapids Gp.

MIDDLE ORDOVICIAN

54 **Limestone, dolostone, shale, arkose, sandstone**
- 54a Ottawa Gp.; Simcoe Gp.; Shadow Lake Fm. (now considered Upper Ordovician)
- 54b Chazy Gp.; Rockcliffe Fm.

LOWER ORDOVICIAN

53 **Dolostone, sandstone:** Beekmantown Gp.

CAMBRIAN (488.3 Ma to 542.0 Ma)

52 **Conglomerate, sandstone, shale, dolostone:** Potsdam Gp.; Nepean Fm.; Covey Hill Fm.

UNCONFORMITY

PRECAMBRIAN[4] (0.542 Ga to <3.85 Ga)

GRENVILLE PROVINCE[5]

PROTEROZOIC (0.542 Ga to 2.50 Ga)

NEO- TO MESOPROTEROZOIC (0.542 Ga to 1.6 Ga)

Tectonite unit: tectonites, straight gneisses, porphyroclastic gneisses, unsubdivided gneisses in major deformation z
protomylonites

CENTRAL METASEDIMENTARY BELT

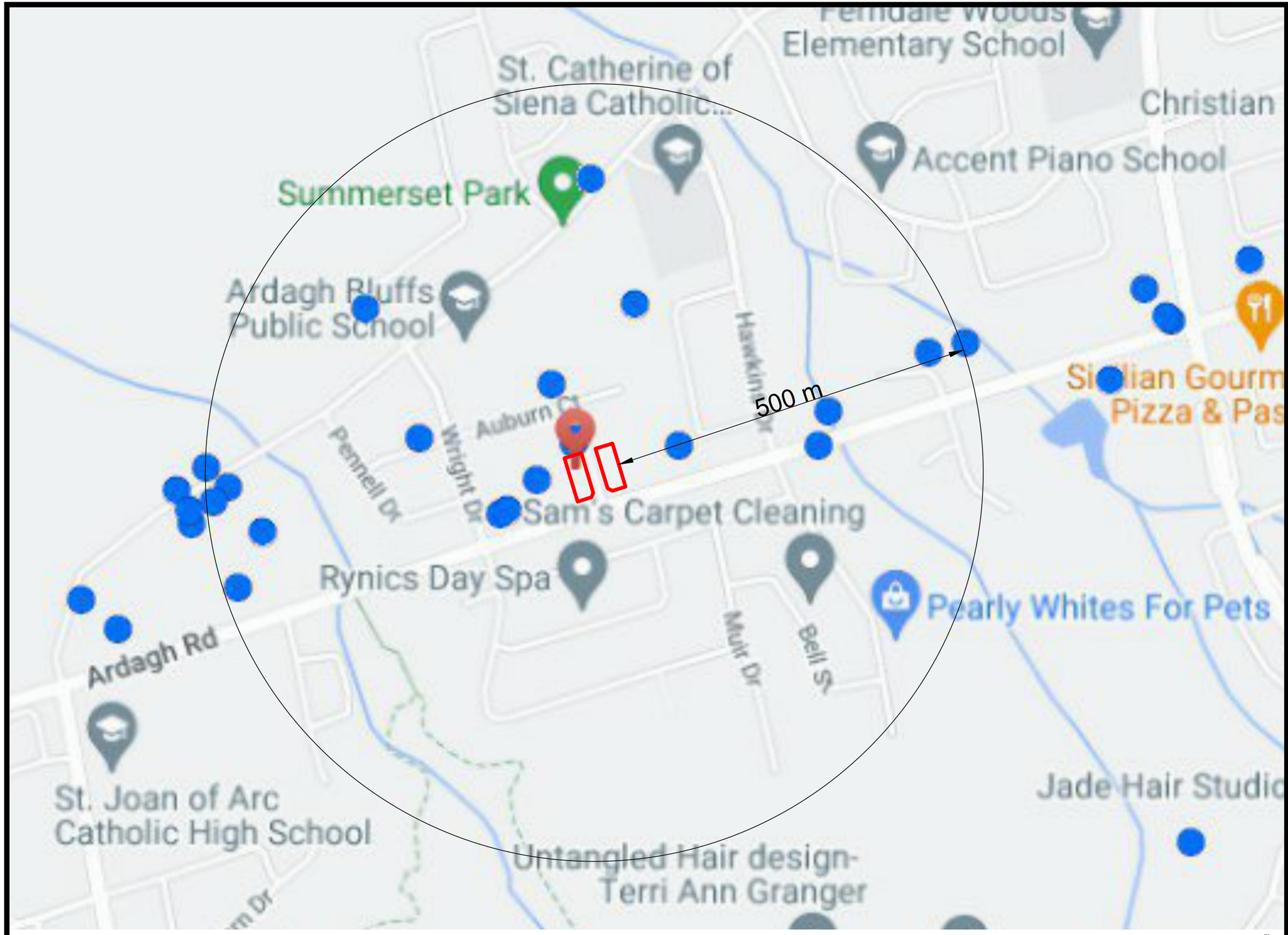
Late felsic plutonic rocks[1]: granodiorite, granite, syenite, pegmatite, alkalic granite, migmatitic gneisses
- 50a Granitic and syenitic gneisses
- 50b Granitic gneisses with metasedimentary xenoliths, migmatites, injection gneisses, pegmatites

Project Title:
Hydrogeological Investigations

Site Location:
334-340 Ardagh Road,
Barrie, Ontario

Figure Title:
Bedrock Geology Map

Scale:	Project Number:
As Shown	SP22-01117-00
Date:	**Figure Number:**
March, 2023	9



Source:https://maps.oakridgeswater.ca/Html5Viewer/index.html?viewer=ORMGPC&run=MECPWWISWells#

SIRATI & PARTNERS
160 Konrad Crescent
Markham, ON. L3R 9T9
Phone# 905 940 1582, Fax# 905 940 2440

North:

Legend:

- Approximate Property Boundary
- 500m Study Area
- MECP Well

Project Title:
Hydrogeological Investigations

Site Location:
334-340 Ardagh Road,
Barrie, Ontario

Figure Title:
MECP Water Well Records Map

Scale:	Project Number:
As Shown	SP22-01117-00
Date:	**Figure Number:**
March, 2023	10



SIRATI & PARTNERS

160 Konrad Crescent
Markham, ON. L3R 9T9
Phone# 905 940 1582, Fax# 905 940 2440

North:

Legend:

- Approximate Property Boundary
- Contour Line
- Inferred Shallow Groundwater Flow Direction
- Monitoring well

Note: Groundwater Elevation were obtained on March 13, 2023

Project Title:

Hydrogeological Investigations

Site Location:

334-340 Ardagh Road,
Barrie, Ontario

Figure Title:

Inferred Groundwater Flow Direction Map

Scale:	Project Number:
As Shown	SP22-01117-00
Date:	**Figure Number:**
March, 2023	11



Source: Google Earth Map

SIRATI & PARTNERS

160 Konrad Crescent
Markham, ON. L3R 9T9
Phone# 905 940 1582, Fax# 905 940 2440

North:

Legend:

- Property Boundary
- Paved Area
- Roof
- Landscape Area

Site Statistics for **334 Ardagh Rd.** :

Imprevious/Paved Area:	28.75	sq.m
Imprevious/Roof Area:	284.88	sq.m
Previous/Landscape Area:	1,185.4	sq.m
Total	1,499.03	sq.m

Site Statistics for **340 Ardagh Rd.**:

Imprevious/Paved Area:	157	sq.m
Imprevious/Roof Area:	223	sq.m
Previous/Landscape Area:	1118.32	sq.m
Total	1498.32	sq.m

Project Title:

Hydrogeological Investigations

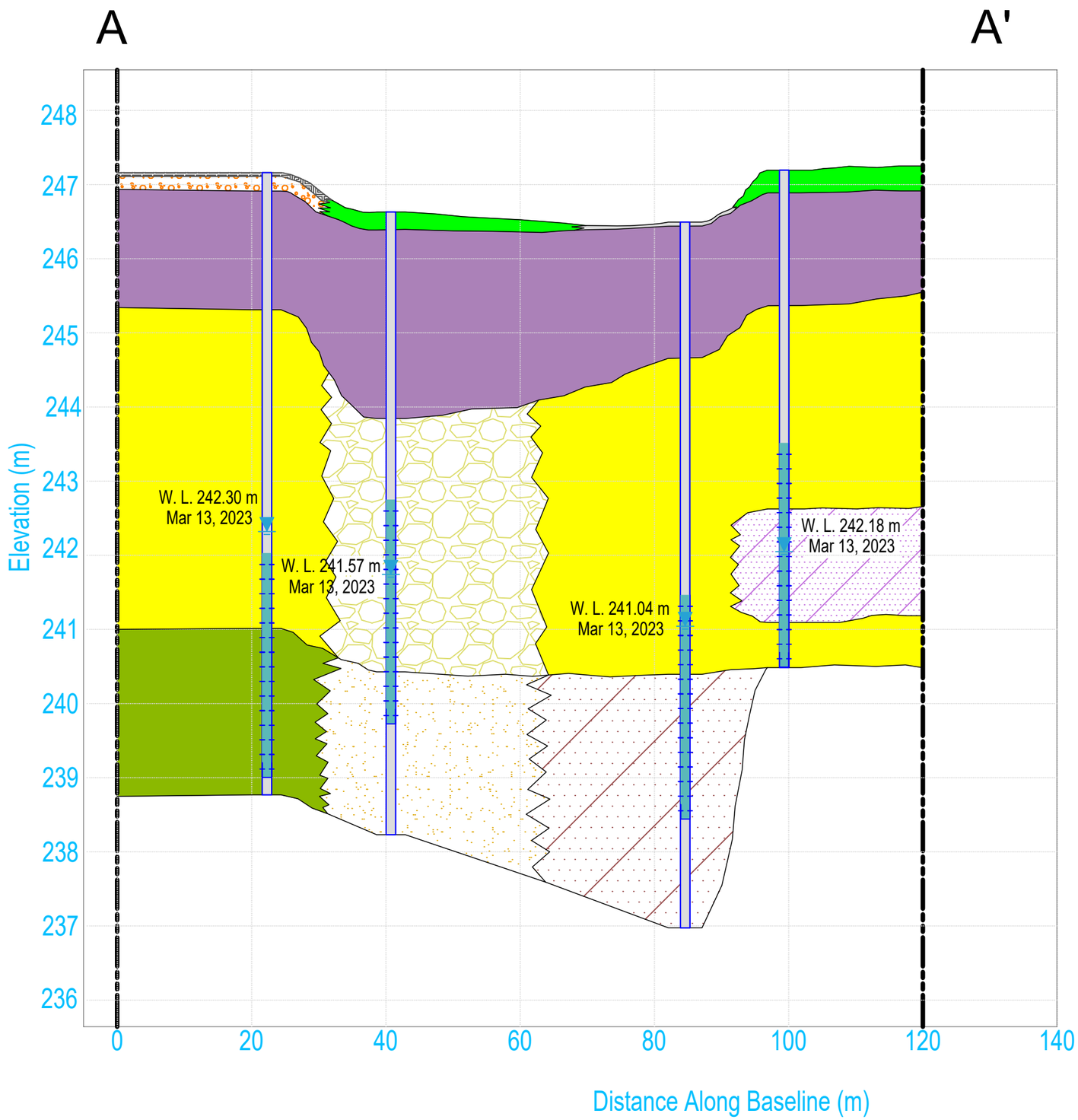
Site Location:

334-340 Ardagh Road,
Barrie, Ontario

Figure Title:

Pre-Development Statistical Plan

Scale: As Shown	**Project Number:** SP22-01117-00
Date: Sept., 2024	**Figure Number:** 11-1



SIRATI & PARTNERS
160 Konrad Crescent
Markham, ON. L3R 9T9
Phone# 905 940 1582, Fax# 905 940 2440

North:

Legend:

- Approximate Property Boundary
- Topsoil
- Asphalt
- Granular Fill
- Fill
- Sand
- Silty Sand
- CONCRETE
- Gravelly Sand
- Lean Clay with Sand
- Silty Sand with Gravel
- Clay and Silty Sand

BH/MW-XX
- Borehole / Well ID
- Water Level
- Well Screen

Note: Groundwater Elevation were obtained on March 13, 2023

Project Title:
Hydrogeological Investigations

Site Location:
334-340 Ardagh Road,
Barrie, Ontario

Figure Title:
Geologic Cross Section profile A-A'

Scale:	Project Number:
N.T.S	SP22-01117-00
Date:	**Figure Number:**
March, 2023	12

APPENDICES

SIRATI & PARTNERS

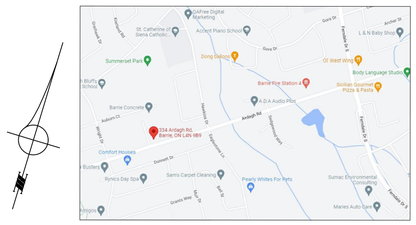
Geotechnical Hydrogeological & Environmental Solutions

APPENDIX A

SIRATI & PARTNERS

Geotechnical Hydrogeological & Environmental Solutions

	LOT STATISTICS:		Block 1 Individual Lots							
Landscape:	LOT AREA m2	Hard surface m2	Soft Landscp m2	Total Landscp %	Amenity Area m2	Lot Frontage	LOT AREA m2	BLDG AREA m2	TOTAL %	NOTES:
UNIT 1	200.46	23.37	105.57	0.53	88.06	8.75	200.46	71.16	0.35	1. Hard surface includes walkways & driveway area
UNIT 2	134.06	19.71	44.06	0.33	39.36	5.5	134.06	70.23	0.52	2. Soft landscape = grassed areas
UNIT 3	134.07	19.73	44.06	0.33	39.35	5.5	134.07	70.23	0.52	3. Amenity area includes rear/side yard and decks
UNIT 4	134.09	19.78	44.06	0.33	39.34	5.5	134.09	70.23	0.52	where applicable.
UNIT 5	134.1	19.74	44.06	0.33	39.33	5.5	134.1	70.23	0.52	
UNIT 6	164.71	19.78	74.6	0.45	64.98	6.75	164.71	70.23	0.43	4. BLDG AREA: Includes porches
	LOT STATISTICS:		Block 2 Individual Lots							
Landscape:	LOT AREA m2	Hard surface m2	Soft Landscp m2	Total Landscp %	Amenity Area m2	Lot Frontage	LOT AREA m2	BLDG AREA m2	TOTAL %	NOTES:
UNIT 7	164.73	19.79	74.59	0.45	64.97	6.75	164.73	70.23	0.43	1. Hard surface includes driveways and walkways
UNIT 8	134.14	19.79	44.07	0.33	39.3	5.5	134.14	70.23	0.52	2. Soft landscape = grassed areas
UNIT 9	134.15	19.81	44.07	0.33	39.3	5.5	134.15	70.23	0.52	3. Amenity area includes rear yard and decks
UNIT 10	164.77	19.83	74.61	0.45	64.93	6.75	164.77	70.23	0.43	where applicable.
										4. BLDG AREA: Includes porches
	LOT STATISTICS:		Block 3 Individual Lots							
Landscape:	LOT AREA m2	Hard surface m2	Soft Landscp m2	Total Landscp %	Amenity Area m2	Lot Frontage	LOT AREA m2	BLDG AREA m2	TOTAL %	NOTES:
UNIT 11	164.7	19.73	74.64	0.45	65.1	6.75	164.7	70.23	0.43	1. Hard surface includes driveways and walkways
UNTI 12	134.1	19.77	44.1	0.33	39.41	5.5	134.1	70.23	0.52	2. Soft landscape = grassed areas
UNIT 13	134.09	19.72	44.09	0.33	39.4	5.5	134.09	70.23	0.52	3. Amenity area includes rear yard and decks
UNIT 14	164.67	19.73	74.6	0.45	65.06	6.75	164.67	70.23	0.43	where applicable.
										4. BLDG AREA: Includes porches
	LOT STATISTICS:		Block 4 Individual Lots							
Landscape:	LOT AREA m2	Hard surface m2	Soft Landscp m2	Total Landscp %	Amenity Area m2	Lot Frontage	LOT AREA m2	BLDG AREA m2	TOTAL %	NOTES:
UNIT 15	164.66	19.72	74.61	0.45	65.06	6.75	164.66	70.23	0.43	1. Hard surface includes walkways & driveway area
UNIT 16	134.07	19.76	44.08	0.33	39.38	5.5	134.07	70.23	0.52	2. Soft landscape = grassed areas
UNIT 17	134.06	19.73	44.07	0.33	39.37	5.5	134.06	70.23	0.52	3. Amenity area includes rear/side yard and decks
UNIT 18	134.06	19.72	44.06	0.33	39.36	5.5	134.06	70.23	0.52	where applicable.
UNIT 19	134.05	19.73	44.05	0.33	39.35	5.5	134.05	70.23	0.52	
UNIT 20	200.64	24.47	105.56	0.53	88.01	8.74	200.64	71.16	0.35	4. BLDG AREA: Includes porches



KEYMAP:

Legend

■	DENOTES	SURVEY MONUMENT FOUND
□	DENOTES	SURVEY MONUMENT SET
SIB	DENOTES	STANDARD IRON BAR
IB	DENOTES	IRON BAR
OU	DENOTES	ORIGIN UNKNOWN
S	DENOTES	SET
M	DENOTES	MEASURED
WIT	DENOTES	WITNESS
N/S/E/W	DENOTES	NORTH/SOUTH/EAST/WEST
P	DENOTES	PLAN 51R–29800
P1	DENOTES	SURVEYOR'S REAL PROPERTY REPORT BY RUDY MAK SURVEYING LTD., O.L.S., DATED SEPTEMBER 21, 2000
P2	DENOTES	REGISTERED PLAN 51M–867
D	DENOTES	INSTRUMENT No.RO895296(PIN 58763–0301)
738	DENOTES	R.C. KIRKPATRICK, O.L.S.
974	DENOTES	T.C. SEAWRIGHT, O.L.S.
1546	DENOTES	RUDY MAK SURVEYING LTD., O.L.S.
ST	DENOTES	TIES TO STONE
FDN	DENOTES	TIES TO CONCRETE FOUNDATION
WD	DENOTES	TIES TO WOOD
BF	DENOTES	BOARD FENCE
CLF	DENOTES	CHAIN LINK FENCE
RF	DENOTES	RAIL FENCE
SRW	DENOTES	STONE RETAINING WALL
WRW	DENOTES	WOOD RETAINING WALL
BC	DENOTES	BOTTOM OF CURB ELEVATION
OHW	DENOTES	OVERHEAD WIRES
UP	DENOTES	UTILITY POLE
CB	DENOTES	CATCHBASIN
MH	DENOTES	MANHOLE
WV	DENOTES	WATER VALVE
FH	DENOTES	FIRE HYDRANT
Ø	DENOTES	DIAMETER (ROUND)
DS	DENOTES	DOOR SILL ELEVATION
	DENOTES	DECIDUOUS TREE WITH TRUNK DIAMETER
	DENOTES	CONIFEROUS TREE WITH TRUNK DIAMETER
RWL	DENOTES	RWL DOWNSPOUT DISCHARGE

SURVEYOR'S REAL PROPERTY REPORT–PART 1

PLAN OF SURVEY OF PART OF LOTS 5 & 6 REGISTERED PLAN 1192 CITY OF BARRIE COUNTY OF SIMCOE

SCALE 1:200

0 5 10 20 Metres

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PEARSON & PEARSON SURVEYING LTD. 2022

Ontario Land Surveyors

Metric

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

Part 2

DESCRIPTION OF LAND: PART OF LOTS 5 AND 6, REGISTERED PLAN 1192, CITY OF BARRIE, COUNTY OF SIMCOE.

REGISTERED EASEMENTS AND/OR RIGHTS OF WAY:

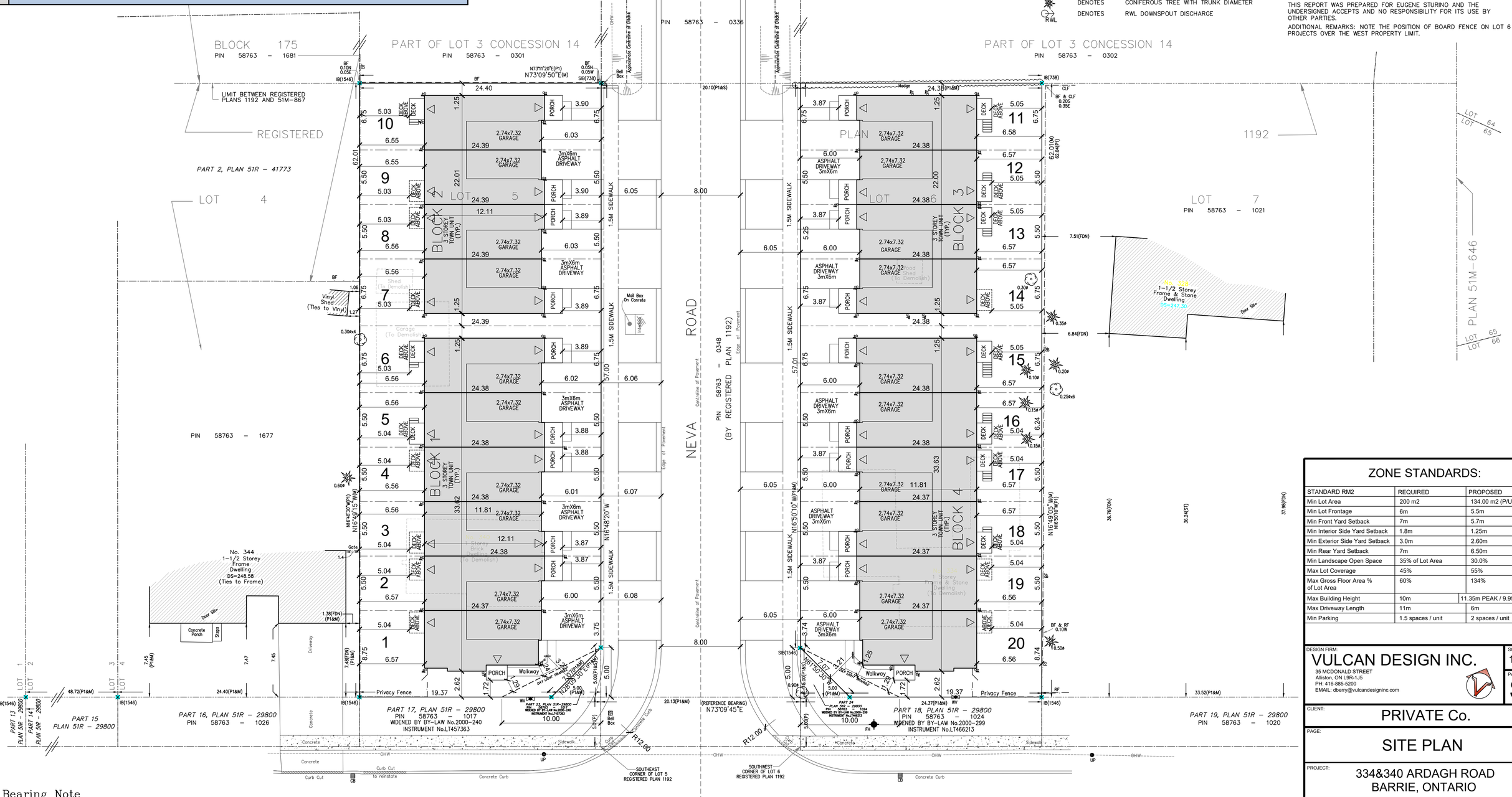
1. No.334 ARDAGH ROAD (PIN 58763–1025) – NO REGISTERED EASEMENTS OR RIGHTS OF WAY ON TITLE.
2. No.340 ARDAGH ROAD (PIN 58763–1016) – NO REGISTERED EASEMENTS OR RIGHTS OF WAY ON TITLE.

BOUNDARY FEATURES: NOTE ALL FENCES, DRIVEWAYS, HEDGES, SHEDS, GARAGE AND UTILITY POLES ARE SHOWN IN RELATION TO THE BOUNDARY.

COMPLIANCE WITH MUNICIPAL ZONING BY–LAWS: THIS PLAN DOES NOT CERTIFY ZONING COMPLIANCE OR IDENTIFY WHAT ZONING RESTRICTIONS ARE INVOLVED.

THIS REPORT WAS PREPARED FOR EUGENE STURINO AND THE UNDERSIGNED ACCEPTS AND NO RESPONSIBILITY FOR ITS USE BY OTHER PARTIES.

ADDITIONAL REMARKS: NOTE THE POSITION OF BOARD FENCE ON LOT 6 PROJECTS OVER THE WEST PROPERTY LIMIT.



Bearing Note

BEARINGS ARE UTM GRID AND THE NORTHERLY LIMIT OF ARDAGH ROAD AS WIDENED SHOWN ON PLAN 51R–29800 AS HAVING A BEARING OF N73°09'45"E.

Benchmark

ELEVATIONS ARE GEODETIC AND ARE REFERRED TO A CITY OF TORONTO BENCHMARK.
Station# : 03120080013 ELEVATION = 284.792m(DATUM: CGVD28: 78)

Note

TREE CALIPERS ARE NOT TO ARBORIST STANDARDS AND FOR ARBORIST CALIPER REFER TO ARBORIST REPORT.

ZONE STANDARDS:

STANDARD RM2	REQUIRED	PROPOSED
Min Lot Area	200 m2	134.00 m2 (P/UNIT)
Min Lot Frontage	6m	5.5m
Min Front Yard Setback	7m	5.7m
Min Interior Side Yard Setback	1.8m	1.25m
Min Exterior Side Yard Setback	3.0m	2.60m
Min Rear Yard Setback	7m	6.50m
Min Landscape Open Space	35% of Lot Area	30.0%
Max Lot Coverage	45%	55%
Max Gross Floor Area % of Lot Area	60%	134%
Max Building Height	10m	11.35m PEAK / 9.95m MID-PT.
Max Driveway Length	11m	6m
Min Parking	1.5 spaces / unit	2 spaces / unit

DESIGN FIRM:
VULCAN DESIGN INC.
35 MCDONALD STREET
Alliston, ON L9R-1J5
PH: 416-885-5200
EMAIL: dberry@vulcandesigninc.com

SCALE: 1:125

PAGE: S1

CLIENT: PRIVATE Co.

PAGE: SITE PLAN

PROJECT: 334&340 ARDAGH ROAD BARRIE, ONTARIO

NO.	REVISION:	DATE:	DWN.	CHK.
1.	ISSUED FOR REVIEW	SEP 29/22	DCB	DCB
2.	ISSUED FOR REVIEW	NOV 11/29	DCB	

DESIGNER BCIN DECLARATION

I DANIEL BERRY DECLARE THAT I HAVE REVIEWED & TAKE DESIGN RESPONDSIBILITY FOR THE DESIGN WORK UNDER DIVISION C, PART 3 SECTION 3.2 OF THE ONTARIO BUILDING CODE. I AM QUALIFIED AND THE FIRM IS REGISTERED IN THE APPROPRIATE CATEGORIES.
FIRM BCIN: 36501
DESIGNER BCIN: 21107

SIGNATURE:_____ DATE: NOV 30/23

Legend

■	DENOTES	SURVEY MONUMENT FOUND
□	DENOTES	SURVEY MONUMENT SET
SIB	DENOTES	STANDARD IRON BAR
IB	DENOTES	IRON BAR
OU	DENOTES	ORIGIN UNKNOWN
S	DENOTES	SET
M	DENOTES	MEASURED
WIT	DENOTES	WITNESS
N/S/E/W	DENOTES	NORTH/SOUTH/EAST/WEST
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	DENOTES	CONIFEROUS TREE WITH TRUNK DIAMETER
RWL	DENOTES	RWL DOWNSPOUT DISCHARGE

SURVEYOR'S REAL PROPERTY REPORT-PART 1

PLAN OF SURVEY OF PART OF LOTS 5 & 6 REGISTERED PLAN 1192 CITY OF BARRIE COUNTY OF SIMCOE

SCALE 1:200

0 5 10 20 Metres

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PEARSON & PEARSON SURVEYING LTD. 2022

Ontario Land Surveyors

Metric

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

Part 2

DESCRIPTION OF LAND: PART OF LOTS 5 AND 6, REGISTERED PLAN 1192, CITY OF BARRIE, COUNTY OF SIMCOE.

REGISTERED EASEMENTS AND/OR RIGHTS OF WAY:

1. No.334 ARDAGH ROAD (PIN 58763-1025) - NO REGISTERED EASEMENTS OR RIGHTS OF WAY ON TITLE.
2. No.340 ARDAGH ROAD (PIN 58763-1016) - NO REGISTERED EASEMENTS OR RIGHTS OF WAY ON TITLE.

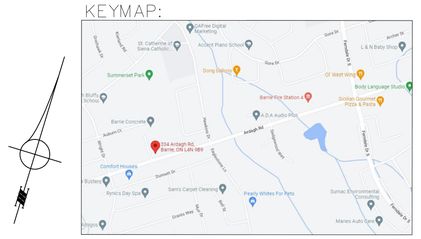
BOUNDARY FEATURES: NOTE ALL FENCES, DRIVEWAYS, HEDGES, SHEDS, GARAGE AND UTILITY POLES ARE SHOWN IN RELATION TO THE BOUNDARY.

COMPLIANCE WITH MUNICIPAL ZONING BY-LAWS: THIS PLAN DOES NOT CERTIFY ZONING COMPLIANCE OR IDENTIFY WHAT ZONING RESTRICTIONS ARE INVOLVED.

THIS REPORT WAS PREPARED FOR EUGENE STURINO AND THE UNDERSIGNED ACCEPTS AND NO RESPONSIBILITY FOR ITS USE BY OTHER PARTIES.

ADDITIONAL REMARKS: NOTE THE POSITION OF BOARD FENCE ON LOT 6 PROJECTS OVER THE WEST PROPERTY LIMIT.

KEYMAP:



FIREBREAK REQUIREMENTS:

DENOTES - FIREBREAK LOTS

DENOTES - 1ST STAGE CONSTRUCTION BLOCKS

FIREBREAK PROCEDURES

WHERE BUILDING LOTS ARE LESS THAN 11 METERS (36 FEET) IN WIDTH AT ANY POINT, THE CITY MAY REQUIRE TWO (2) CONSECUTIVE LOTS OR BLOCKS OR COMBINATION THEREOF TO BE DESIGNATED AS FIRE BREAK LOTS SO AS NOT TO EXCEED 6 DWELLINGS IN A ROW WITHOUT THE OCCURRENCE OF A FIREBREAK.

FIREBREAK SHALL BE PROVIDED IMMEDIATELY ADJACENT TO EACH END OF A TOWNHOUSE BLOCK.

PARTIAL BUILDING PERMIT (FOUNDATION ONLY) MAY BE ISSUED FOR FIREBREAK LOTS. NOTWITHSTANDING THAT A BUILDING PERMIT MAY HAVE BEEN ISSUED FOR LOTS DESIGNATED AS FIREBREAK LOTS, NO CONSTRUCTION ABOVE THE LEVEL OF THE TOP OF THE FIRST FLOOR ASSEMBLY SHALL PROCEED UNTIL A FULL BUILDING PERMIT HAS BEEN ISSUED.

A FIREBREAK LOT SHALL BE MAINTAINED FREE OF ALL CONSTRUCTION MATERIAL, EQUIPMENT, AND DEBRIS.

NOTWITHSTANDING ANY OTHER PROVISION IN THIS BULLETIN, THE CITY'S CHIEF BUILDING OFFICIAL AND/OR THE FIRE CHIEF MAY ESTABLISH REQUIREMENTS AND/OR A FIREBREAK PLAN TO SUIT THE SITE AND/OR BUILDING(S).

RELEASE OF FIREBREAK LOTS/ ISSUANCE OF FULL BUILDING PERMIT

TOWNHOUSE BLOCKS ABUTTING FIREBREAK LOTS SHALL HAVE EXTERIOR CLADDING, ROOFING, FASCIA, SOFFITS, AND WINDOWS COMPLETED AND INSPECTED ON ALL SIDES OF THE TWO (2) UNITS CLOSEST TO THE FIREBREAK LOT PRIOR TO THE RELEASE OF THE FIREBREAK LOT(S).

THE OWNER MUST RECEIVE RELEASE OF THE FIREBREAK LOT PRIOR TO ISSUANCE OF A FULL BUILDING PERMIT FOR CONSTRUCTION ON A PREVIOUSLY DESIGNATED FIREBREAK LOT.

A BUILDING INSPECTOR WILL DETERMINE WHEN THE FULL BUILDING PERMIT CAN BE RELEASED FOR THE FIREBREAK LOT(S). ONCE THE ADJACENT BUILDINGS COMPLY WITH REQUIREMENT, THE OWNER MUST SUBMIT AN INSPECTION REQUEST AND AN INSPECTION IS REQUIRED TO VERIFY COMPLIANCE.

WHERE CONSTRUCTION OF A BUILDING OR STRUCTURE PROCEEDS ON ANY LOT IN CONTRAVENTION OF THE FIRE BREAK REQUIREMENTS, THE CITY MAY TAKE ANY ACTION NECESSARY TO ENFORCE THIS AGREEMENT AND MAY USE THE DEPOSITS PROVIDED BY THE OWNER FOR THE PURPOSES OF ASSOCIATED ADMINISTRATIVE AND LEGAL COST RECOVERY.

Bearing Note

BEARINGS ARE UTM GRID AND THE NORTHERLY LIMIT OF ARDAGH ROAD AS WIDENED SHOWN ON PLAN 51R-29800 AS HAVING A BEARING OF N73°09'45"E.

Benchmark

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Station# : 03120080013 ELEVATION = 284.792m(DATUM: CGVD28: 78)

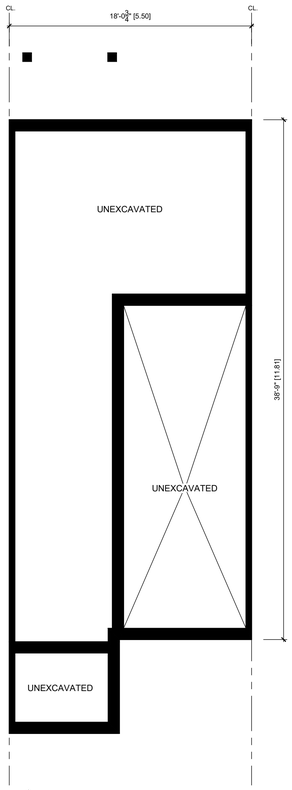
Note

TREE CALIPERS ARE NOT TO ARBORIST STANDARDS AND FOR ARBORIST CALIPER REFER TO ARBORIST REPORT.

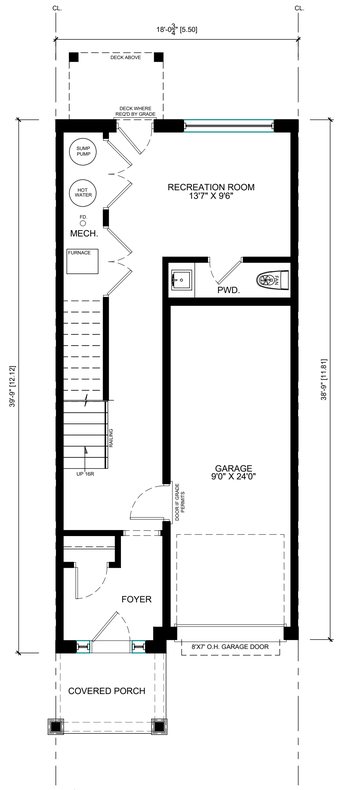
DESIGN FIRM:	SCALE: 1:125
VULCAN DESIGN INC.	PAGE: FB
35 MCDONALD STREET Alliston, ON L9R-1J5 PH: 416-885-5200 EMAIL: dberry@vulcandesigninc.com	
CLIENT:	PRIVATE Co.
PAGE:	FIREBREAK LOTS PLAN
PROJECT:	334&340 ARDAGH ROAD BARRIE, ONTARIO

NO.:	REVISION:	DATE:	DWN.	CHK.
1.	ISSUED FOR REVIEW	NOV 30/23	DCB	DCB

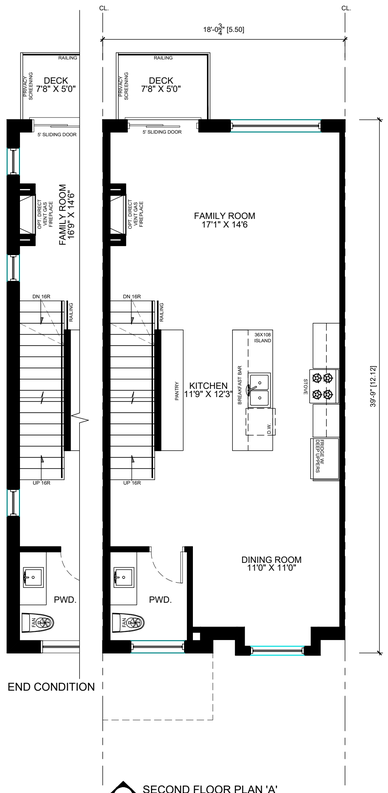
*CONSTRUCTION NOTES ARE THE PROPERTY OF VULCAN DESIGN INC. AND MAY NOT BE DUPLICATED OR COPIED WITH OUT THE WRITTEN CONSENT OF VULCAN DESIGN INC.
*ANY SUBSTITUTE MATERIALS TO NOTES STATED SHALL CONFORM TO O.B.C. REGULATIONS AND MANUFACTURES SPECIFICATIONS SHALL BE SUPPLIED BY BUILDER
**ONLY HEX NOTES IDENTIFIED ON PLANS / ELEVATIONS SHALL APPLY
*NOTES / CONSTRUCTION TO CONFORM TO 2012 ONTARIO BUILDING CODE



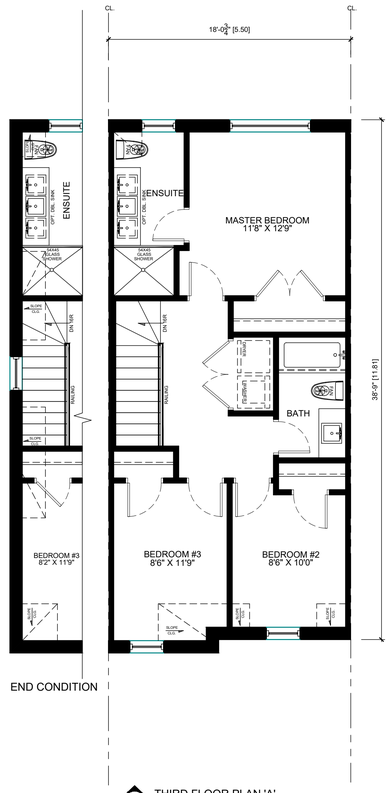
FOUNDATION PLAN 'A'
SCALE: AS NOTED ON PAGE
MODEL #1 BLOCK 1 & 3



GROUND FLOOR PLAN 'A'
SCALE: AS NOTED ON PAGE
MODEL #1 BLOCK 1 & 3



SECOND FLOOR PLAN 'A'
SCALE: AS NOTED ON PAGE
MODEL #1 BLOCK 1 & 3



THIRD FLOOR PLAN 'A'
SCALE: AS NOTED ON PAGE
MODEL #1 BLOCK 1 & 3

AREA CALCULATIONS				
GROUND sf	470	m2	43.663	
SECOND sf	715	m2	66.424	
THIRD sf	708	m2	65.773	
- O.T.B. sf	0	m2	0.000	
TOTAL sf	1893	m2	175.860	
FIN. BASEMENT sf	0	m2	0.000	
TOTAL sf	1893	m2	175.860	
COVERAGE CALCULATIONS				
GROUND sf	470	m2	43.663	
GARAGE sf	237	m2	22.017	
FRONT PORCH sf	49	m2	4.552	
REAR PORCH sf	0	m2	0.000	
CON. W/O PORCH sf	707	m2	65.680	
CON. W/ PORCH sf	756	m2	70.232	

VULCAN DESIGN INC.
Professional Service, Exceptional Value

35 MCDONALD STREET
ALLISTON, ON L9R 1J5
PH: 416-885-5200

EMAIL: dberry@vulcandesigninc.com
CONTACT PERSON: DANIEL BERRY

BCIN DECLARATION:

I DANIEL BERRY DECLARE THAT I HAVE REVIEWED & TAKE DESIGN RESPONSIBILITY FOR THE DESIGN WORK UNDER DIVISION C, PART 3 SECTION 3.2 OF THE ONTARIO BUILDING CODE. I AM QUALIFIED AND THE FIRM IS REGISTERED IN THE APPROPRIATE CATEGORIES.

FIRM BCIN: 36501

DESIGNER BCIN: 21107

SIGNATURE:_____ DATE: _____

LEGEND / LINTELS:

LINTELS:

WOOD

W1	2/2"X8"
W2	2/2"X10"
W3	2/2"X12"
W4	3/2"X8"
W5	3/2"X10"
W6	3/2"X12"

LVL (2.0E)

2-LVL 7	2- 1 3/4" X 7-1/4"
3-LVL 7	3- 1 3/4" X 7-1/4"
2-LVL 9	2- 1 3/4" X 9-1/2"
3-LVL 9	3- 1 3/4" X 9-1/2"
2-LVL 11	2- 1 3/4" X 11-7/8"
3-LVL 11	3- 1 3/4" X 11-7/8"
2-LVL 14	2- 1 3/4" X 14"
3-LVL 14	3- 1 3/4" X 14"

U.N.O. FASTEN MULTIPLE PLY LVL'S (2) ROWS @ 12" O.C. 3 1/" (16d) NAILS OR SDW SCREWS

STEEL LINTELS

S1	<4'-0" L3-1/2" X 3-1/2" - 1/4"
S2	< 6'-0" L4" X 3-1/2" X 1/4"
S3	< 8'-0" L5" X 3-1/2" X 5/16"
S4	< 10'-0" L6" X 3-1/2" X 5/16"

-BEAR LINTELS MIN. 6" EACH END
-LINTELS SHALL BE PRIMED TO *CISC/CPMA 2-3"
-ORIENT ANGLES LONG LEG VERT.
-MAX. 1" BRICK OVERHANG
-WEEP HOLES @ 56" O.C. MAX

ABBREVIATIONS:

DJ	DOUBLE JOIST
TJ	TRIPLE JOIST
GT	GIRDER TRUSS
'DO'	DO OVER
RJ	ROOF JOISTS
STL.	STEEL
SB.	SOLID BEARING (SEE 'FRAMING REQ.'S')
PL.	POINT LOAD
(FL.)	FLUSH
(DR.)	DROPPED
FG.	FIXED GLASS
FDTN.	FOUNDATION
BG.	BLACK GLASS
JT	JACK TRUSS
U/S	UNDERSIDE
T/O	TOP OF
FG.	FIXED GLASS
CLG.	CEILING
BBFM	BEAM BY FLOOR MANUFACTURE

SOLID BEARING (SAME WIDTH AS SUPPORTED MEMBER)
CONCENTRATED POINT LOAD
FIRE PLACE VENT
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CEILING EXHAUST FAN
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3 WAY SWITCH
LIGHT SWITCH
120 VOLT RECEPTACLE
ELECTRIC RECEPTACLE (42" OFF FINISH FLOOR)
FLOOR DRAIN

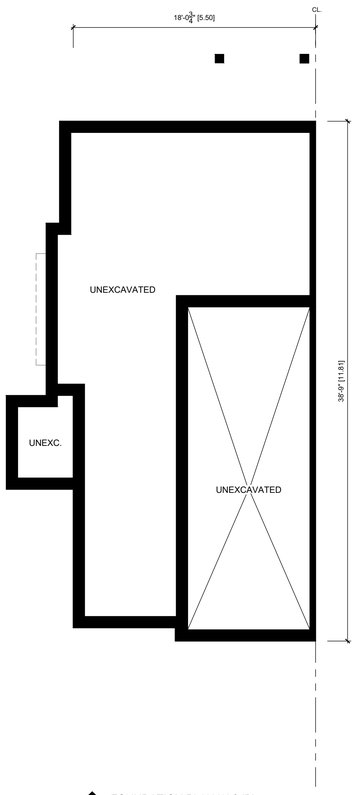
NO.	REVISION :	DATE:	DWN.	CHK
1	Issued for review	MAY04/23	dcb	dcb
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PROJECT: V22-0677
334&340 ARDAGH ROAD
BARRIE, ON

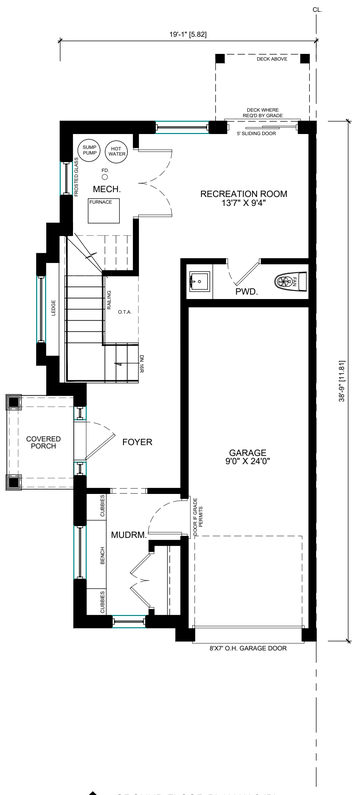
PG. CONTENT: FLOOR PLANS
SCALE: 3/16" = 1'-0"
PAGE: A1

Preliminary
(Not for Construction)

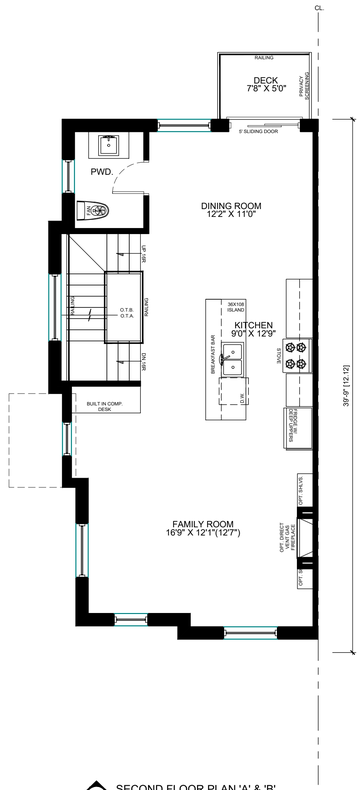
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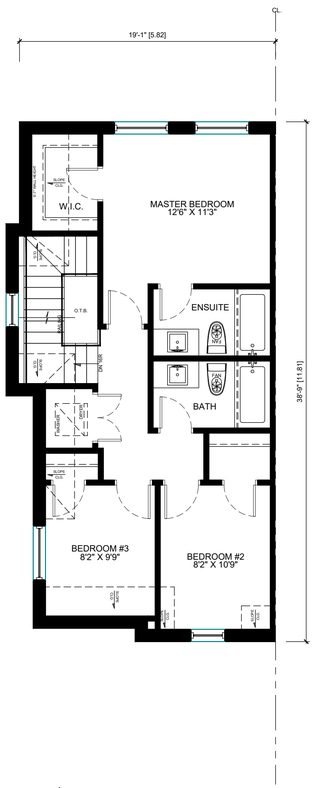
FOUNDATION PLAN 'A' & 'B'
SCALE: AS NOTED ON PAGE
MODEL #3 BLOCK 1 & 4



GROUND FLOOR PLAN 'A' & 'B'
SCALE: AS NOTED ON PAGE
MODEL #3 BLOCK 1 & 4



SECOND FLOOR PLAN 'A' & 'B'
SCALE: AS NOTED ON PAGE
MODEL #3 BLOCK 1 & 4



THIRD FLOOR PLAN 'A' & 'B'
SCALE: AS NOTED ON PAGE
MODEL #3 BLOCK 1 & 4

AREA CALCULATIONS				
GROUND	sf	493	m2	45.800
SECOND	sf	732	m2	68.003
THIRD	sf	726	m2	67.445
– O.T.B.	sf	25	m2	2.323
TOTAL	sf	1926	m2	178.925
FIN. BASEMENT	sf	0	m2	0.000
TOTAL	sf	1926	m2	178.925

COVERAGE CALCULATIONS				
GROUND	sf	493	m2	45.800
GARAGE	sf	238	m2	22.110
FRONT PORCH	sf	35	m2	3.252
REAR PORCH	sf	0	m2	0.000
CON. W/O PORCH	sf	731	m2	67.910
CON. W/ PORCH	sf	766	m2	71.161

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STEEL LINTELS

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S3	< 8'-0" L5" X 3-1/2" X 5/16"
S4	< 10'-0" L6" X 3-1/2" X 5/16"

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-WEEP HOLES @ 56" O.C. MAX

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TJ	TRIPLE JOIST
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'DO'	DO OVER
RJ	ROOF JOISTS
STL.	STEEL
SB.	SOLID BEARING (SEE 'FRAMING REQ.'S')
PL.	POINT LOAD
(FL.)	FLUSH
(DR.)	DROPPED
FG.	FIXED GLASS
FDTN.	FOUNDATION
BG.	BLACK GLASS
JT	JACK TRUSS
U/S	UNDERSIDE
T/O	TOP OF
FG.	FIXED GLASS
CLG.	CEILING
BBFM	BEAM BY FLOOR MANUFACTURE

SB SOLID BEARING (SAME WIDTH AS SUPPORTED MEMBER)
PL CONCENTRATED POINT LOAD
FIRE PLACE VENT
DRYER VENT
STOVE VENT
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SMOKE ALARM
CARBON MONOXIDE DETECTOR
HOSE BIB
WP WATERPROOF ELECTRICAL OUTLET
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42" FD ELECTRIC RECEPTACLE (42" OFF FINISH FLOOR)
FD FLOOR DRAIN

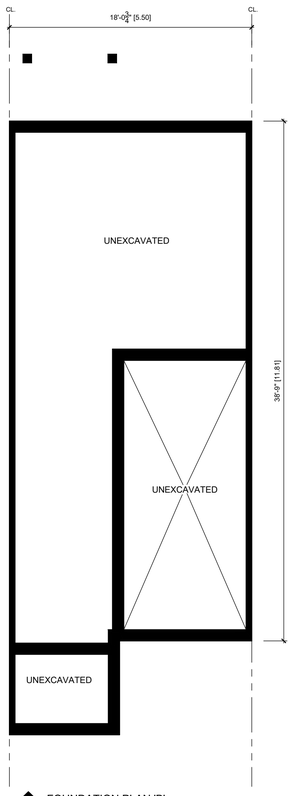
NO.	REVISION :	DATE:	DWN	CHK
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PROJECT: V22-0677
334&340 ARDAGH ROAD
BARRIE, ON

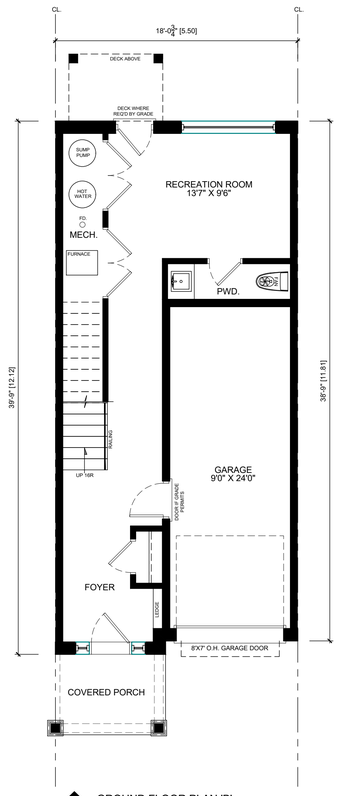
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SCALE: 3/16" = 1'-0"
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Preliminary
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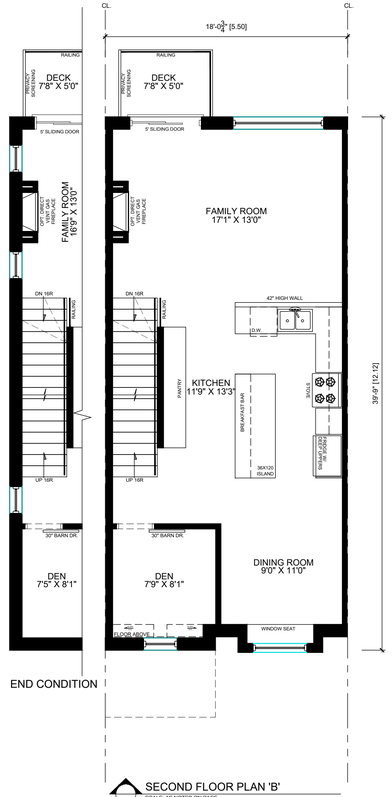
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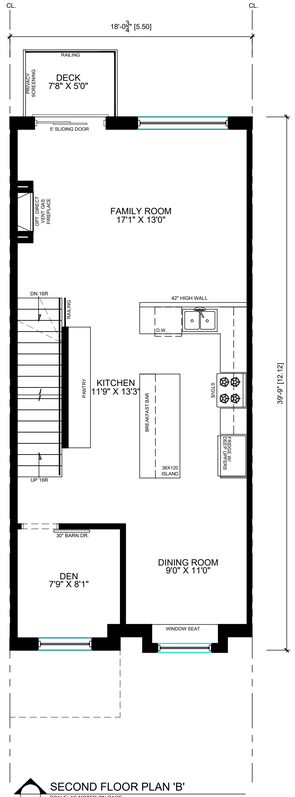
FOUNDATION PLAN 'B'
SCALE: AS NOTED ON PAGE
MODEL #2 BLOCK 2 & 4



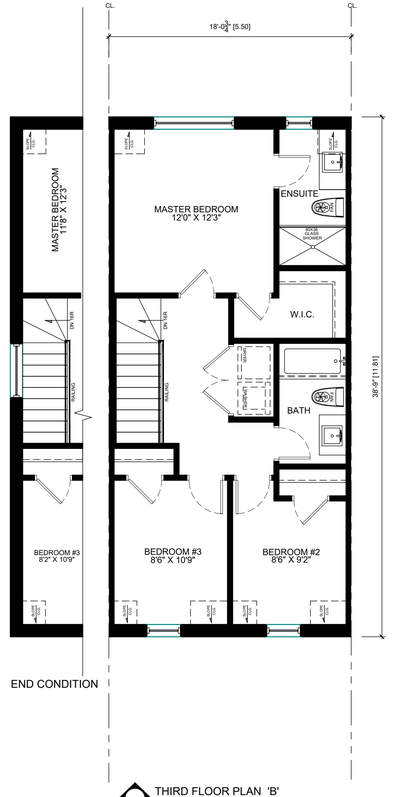
GROUND FLOOR PLAN 'B'
SCALE: AS NOTED ON PAGE
MODEL #2 BLOCK 2 & 4



SECOND FLOOR PLAN 'B'
SCALE: AS NOTED ON PAGE
MODEL #2 BLOCK 2 & 4

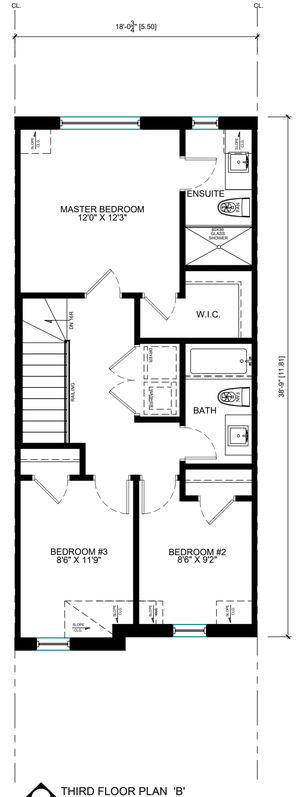


SECOND FLOOR PLAN 'B'
SCALE: AS NOTED ON PAGE
MODEL #2A BLOCK 2 & 4



END CONDITION

THIRD FLOOR PLAN 'B'
SCALE: AS NOTED ON PAGE
MODEL #2 BLOCK 2 & 4



THIRD FLOOR PLAN 'B'
SCALE: AS NOTED ON PAGE
MODEL #2A BLOCK 2 & 4

MODEL #2

AREA CALCULATIONS				
GROUND	sf	470	m2	43.663
SECOND	sf	715	m2	66.424
THIRD	sf	699	m2	64.937
- O.T.B.	sf	0	m2	0.000
TOTAL	sf	1884	m2	175.024
FIN BASEMENT	sf	0	m2	0.000
TOTAL	sf	1884	m2	175.024
COVERAGE CALCULATIONS				
GROUND	sf	470	m2	43.663
GARAGE	sf	237	m2	22.017
FRONT PORCH	sf	49	m2	4.552
REAR PORCH	sf	0	m2	0.000
COV. W/O PORCH	sf	707	m2	65.680
COV. W/ PORCH	sf	756	m2	70.232

MODEL #2A

AREA CALCULATIONS				
GROUND	sf	470	m2	43.663
SECOND	sf	715	m2	66.424
THIRD	sf	708	m2	65.773
- O.T.B.	sf	0	m2	0.000
TOTAL	sf	1893	m2	175.860
FIN BASEMENT	sf	0	m2	0.000
TOTAL	sf	1893	m2	175.860
COVERAGE CALCULATIONS				
GROUND	sf	470	m2	43.663
GARAGE	sf	237	m2	22.017
FRONT PORCH	sf	49	m2	4.552
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COV. W/O PORCH	sf	707	m2	65.680
COV. W/ PORCH	sf	756	m2	70.232

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SIGNATURE:_____ DATE: _____

LEGEND / LINTELS:

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W6	3/2"X12"

LVL (2.0E)

2-LVL 7	2- 1 3/4" X 7-1/4"
3-LVL 7	3- 1 3/4" X 7-1/4"
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STEEL LINTELS

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S2	< 6'-0" L4" X 3-1/2" X 1/4"
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-BEAR LINTELS MIN. 6" EACH END
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ABBREVIATIONS:

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42" ELECTRIC RECEPTACLE (42" OFF FINISH FLOOR)
FD. FLOOR DRAIN

NO.	REVISION :	DATE:	DWN	CHK
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PROJECT: V22-0677
334&340 ARDAGH ROAD
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PG. CONTENT: FLOOR PLANS
SCALE: 3/16" = 1'-0"
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BLOCK 1 TOWNHOUSE

PROPOSED EAST ELEVATION
SCALE: AS NOTED ON PAGE

MODEL #1



BLOCK 1 TOWNHOUSE

PROPOSED WEST ELEVATION
SCALE: AS NOTED ON PAGE

MODEL #1

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2-LVL 9	2- 1 3/4" X 9-1/2"
3-LVL 9	3- 1 3/4" X 9-1/2"
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3-LVL 11	3- 1 3/4" X 11-7/8"
2-LVL 14	2- 1 3/4" X 14"
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STEEL LINTELS

S1	<4'-0" L3-1/2" X 3-1/2" - 1/4"
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JT	JACK TRUSS
U/S	UNDERSIDE
T/O	TOP OF
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CLG.	CEILING
BBFM	BEAM BY FLOOR MANUFACTURE

SB	SOLID BEARING (SAME WIDTH AS SUPPORTED MEMBER)
PL	CONCENTRATED POINT LOAD
	FIRE PLACE VENT
	DRYER VENT
	STOVE VENT
	CELLAR VENT
SA	SMOKE ALARM
CO	CARBON MONOXIDE DETECTOR
	HOSE BIB
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PROJECT: V22-0677

334&340 ARDAGH ROAD
BARRIE, ON

PG. CONTENT: ELEVATIONS

SCALE: 3/16" = 1'-0"

PAGE: A4

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BLOCK 1 TOWNHOUSE
PROPOSED SOUTH ELEVATION
SCALE: AS NOTED ON PAGE
MODEL #1 ELEVATION 'A'



BLOCK 1 TOWNHOUSE
PROPOSED NORTH ELEVATION
SCALE: AS NOTED ON PAGE
MODEL #1

Preliminary
(Not for Construction)

VULCAN DESIGN INC.
Professional Service, Exceptional Value

35 MCDONALD STREET
ALLISTON, ON L9R 1J5
PH: 416-885-5200

EMAIL: dberry@vulcandesigninc.com
CONTACT PERSON: DANIEL BERRY

BCIN DECLARATION:

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FIRM BCIN: 36501

DESIGNER BCIN: 21107

SIGNATURE:_____ DATE: _____

LEGEND / LINTELS:

LINTELS:

WOOD

W1	2/2"X8"
W2	2/2"X10"
W3	2/2"X12"
W4	3/2"X8"
W5	3/2"X10"
W6	3/2"X12"

LVL (2.0E)

2-LVL 7	2- 1 3/4" X 7-1/4"
3-LVL 7	3- 1 3/4" X 7-1/4"
2-LVL 9	2- 1 3/4" X 9-1/2"
3-LVL 9	3- 1 3/4" X 9-1/2"
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3-LVL 11	3- 1 3/4" X 11-7/8"
2-LVL 14	2- 1 3/4" X 14"
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U.N.O. FASTEN MULTIPLE PLY LVL'S (2) ROWS @ 12" O.C. 3 1/4" (16d) NAILS OR SDW SCREWS

STEEL LINTELS

S1	<4'-0" L3-1/2" X 3-1/2" - 1/4"
S2	< 6'-0" L4" X 3-1/2" X 1/4"
S3	< 8'-0" L5" X 3-1/2" X 5/16"
S4	< 10'-0" L6" X 3-1/2" X 5/16"

-BEAR LINTELS MIN. 6" EACH END
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-MAX. 1" BRICK OVERHANG
-WEEP HOLES @ 56" O.C. MAX

ABBREVIATIONS:

DJ	DOUBLE JOIST
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GT	GIRDER TRUSS
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RJ	ROOF JOISTS
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SB.	SOLID BEARING (SEE 'FRAMING REQ.'S')
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FDTN.	FOUNDATION
BG.	BLACK GLASS
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BBFM	BEAM BY FLOOR MANUFACTURE

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DRYER VENT
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CELLAR VENT
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CARBON MONOXIDE DETECTOR
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WP. WATERPROOF ELECTRICAL OUTLET
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G GAS LINE
CABLE LINE
PHONE JACK
FAN CEILING EXHAUST FAN
P.C. PULL CHAIN CLG. LIGHT
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PROJECT: V22-0677
334&340 ARDAGH ROAD
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PG. CONTENT: ELEVATIONS
SCALE: 3/16" = 1'-0"
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BLOCK 2 TOWNHOUSE

PROPOSED EAST ELEVATION 'B'
SCALE: AS NOTED ON PAGE
MODEL #2



BLOCK 2 TOWNHOUSE

PROPOSED WEST ELEVATION 'B'
SCALE: AS NOTED ON PAGE
MODEL #2

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RANGE HOOD/FAN

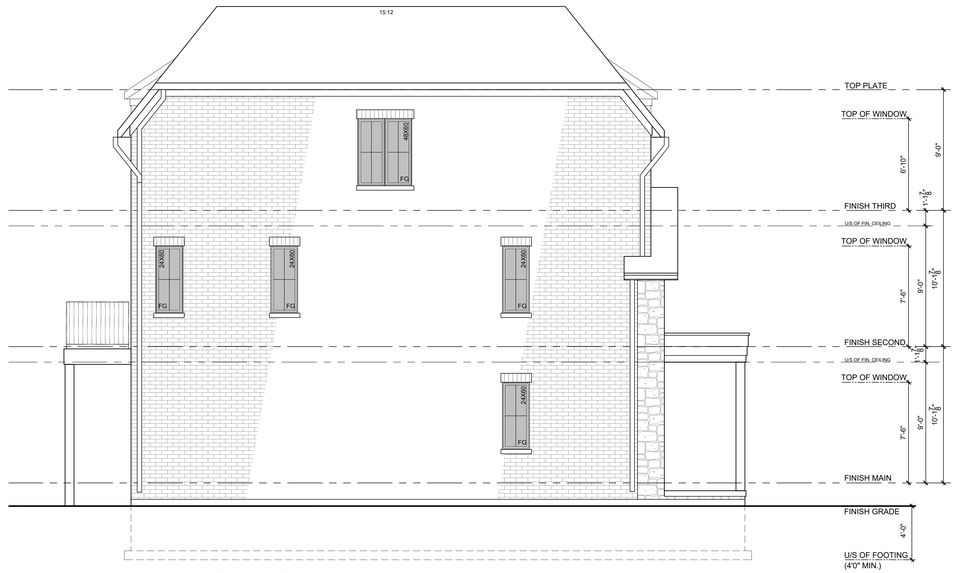
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PG. CONTENT: ELEVATIONS
SCALE: 3/16" = 1'-0"
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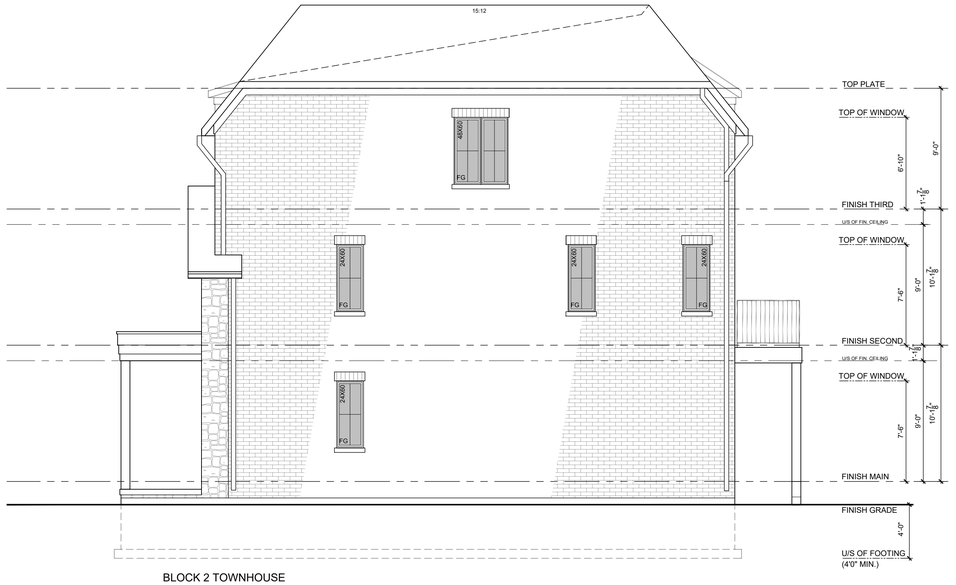
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SCALE: AS NOTED ON PAGE
MODEL #2



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334&340 ARDAGH ROAD
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PG. CONTENT: ELEVATIONS
SCALE: 3/16" = 1'-0"
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BLOCK 3 TOWNHOUSE

PROPOSED WEST ELEVATION
SCALE: AS NOTED ON PAGE
MODEL #1



BLOCK 3 TOWNHOUSE

PROPOSED EAST ELEVATION
SCALE: AS NOTED ON PAGE
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DESIGNER BCIN: 21107

SIGNATURE:_____ DATE: _____

LEGEND / LINTELS:

LINTELS:

WOOD

W1	2/2"X8"
W2	2/2"X10"
W3	2/2"X12"
W4	3/2"X8"
W5	3/2"X10"
W6	3/2"X12"

LVL (2.0E)

2-LVL 7	2- 1 3/4" X 7-1/4"
3-LVL 7	3- 1 3/4" X 7-1/4"
2-LVL 9	2- 1 3/4" X 9-1/2"
3-LVL 9	3- 1 3/4" X 9-1/2"
2-LVL 11	2- 1 3/4" X 11-7/8"
3-LVL 11	3- 1 3/4" X 11-7/8"
2-LVL 14	2- 1 3/4" X 14"
3-LVL 14	3- 1 3/4" X 14"

U.N.O. FASTEN MULTIPLE PLY LVL'S (2) ROWS @ 12" O.C. 3 1/4" (16d) NAILS OR SDW SCREWS

STEEL LINTELS

S1	<4'-0" L3-1/2" X 3-1/2" - 1/4"
S2	< 6'-0" L4" X 3-1/2" X 1/4"
S3	< 8'-0" L5" X 3-1/2" X 5/16"
S4	< 10'-0" L6" X 3-1/2" X 5/16"

-BEAR LINTELS MIN. 6" EACH END
-LINTELS SHALL BE PRIMED TO "CISC/CPMA 2-3"
-ORIENT ANGLES LONG LEG VERT.
-MAX. 1" BRICK OVERHANG
-WEEP HOLES @ 56" O.C. MAX

ABBREVIATIONS:

DJ	DOUBLE JOIST
TJ	TRIPLE JOIST
GT	GIRDER TRUSS
'DO'	DO OVER
RJ	ROOF JOISTS
STL.	STEEL
SB.	SOLID BEARING (SEE 'FRAMING REQ.'S')
PL.	POINT LOAD
(FL.)	FLUSH
(DR.)	DROPPED
FG.	FIXED GLASS
FDTN.	FOUNDATION
BG.	BLACK GLASS
JT	JACK TRUSS
U/S	UNDERSIDE
T/O	TOP OF
FG.	FIXED GLASS
CLG.	CEILING
BBFM	BEAM BY FLOOR MANUFACTURE

SB SOLID BEARING (SAME WIDTH AS SUPPORTED MEMBER)
CONCENTRATED POINT LOAD
FIRE PLACE VENT
DRYER VENT
STOVE VENT
CELLAR VENT
SMOKE ALARM
CARBON MONOXIDE DETECTOR
HOSE BIB
WP WATERPROOF ELECTRICAL OUTLET
HOOD/CELLAR VENT
DRYER VENT

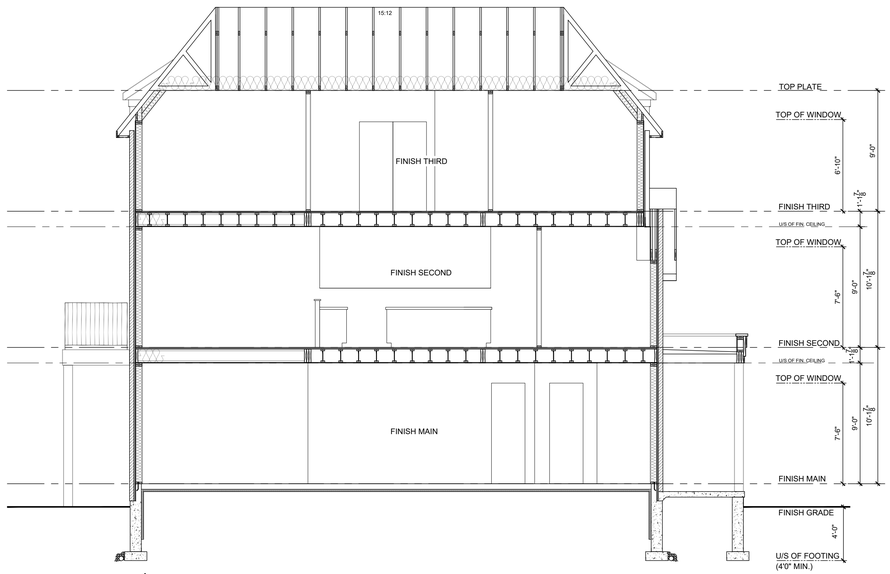
GAS LINE
CABLE LINE
PHONE JACK
FAN CEILING EXHAUST FAN
P.C. PULL CHAIN CLG. LIGHT
CEILING LIGHT
3 3 WAY SWITCH
LIGHT SWITCH
120 VOLT RECEPTACLE
42" ELECTRIC RECEPTACLE (42" OFF FINISH FLOOR)
FD FLOOR DRAIN

NO.:	REVISION :	DATE:	DWN.	CHK
1	Issued for review	MAY04/23	dcb	dcb
2	Issued for review	NOV30/23	dcb	

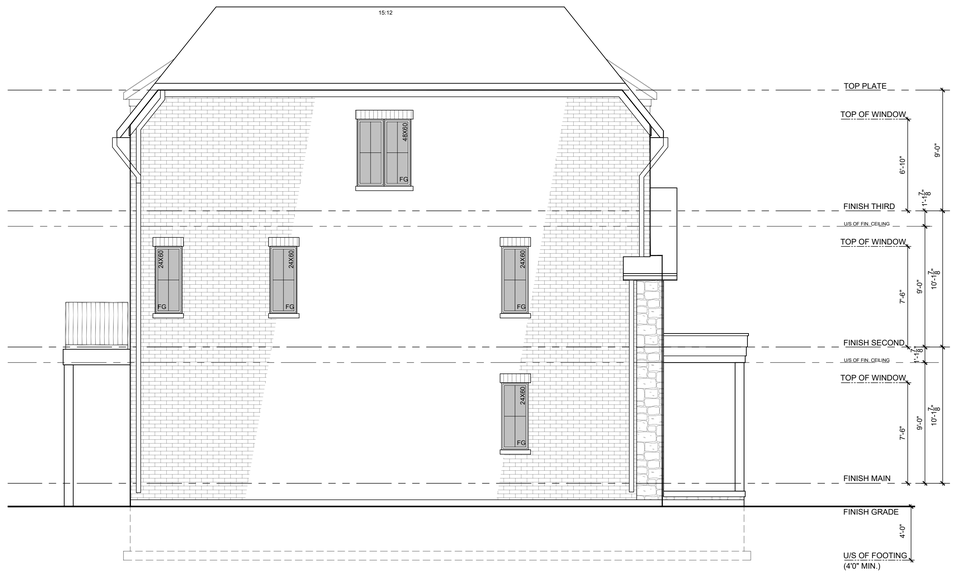
PROJECT: V22-0677
334&340 ARDAGH ROAD
BARRIE, ON

PG. CONTENT: ELEVATIONS
SCALE: 3/16" = 1'-0"
PAGE: A10

*CONSTRUCTION NOTES ARE THE PROPERTY OF VULCAN DESIGN INC. AND MAY NOT BE DUPLICATED OR COPIED WITH OUT THE WRITTEN CONSENT OF VULCAN DESIGN INC.
*ANY SUBSTITUTE MATERIALS TO NOTES STATED SHALL CONFORM TO O.B.C. REGULATIONS AND MANUFACTURES SPECIFICATIONS SHALL BE SUPPLIED BY BUILDER
**ONLY HEX NOTES IDENTIFIED ON PLANS / ELEVATIONS SHALL APPLY
*NOTES / CONSTRUCTION TO CONFORM TO 2012 ONTARIO BUILDING CODE



TYPICAL BUILDING SECTION
SCALE: AS NOTED ON PAGE



BLOCK 4 TOWNHOUSE

PROPOSED NORTH ELEVATION 'B'
SCALE: AS NOTED ON PAGE
MODEL #2



BLOCK 4 TOWNHOUSE
PROPOSED SOUTH ELEVATION
SCALE: AS NOTED ON PAGE
MODEL #1 ELEVATION 'B'

Preliminary
(Not for Construction)

VULCAN DESIGN INC.
Professional Service, Exceptional Value

35 MCDONALD STREET
ALLISTON, ON L9R 1J5
PH: 416-885-5200

EMAIL: dberry@vulcandesigninc.com
CONTACT PERSON: DANIEL BERRY

BCIN DECLARATION:

I DANIEL BERRY DECLARE THAT I HAVE REVIEWED & TAKE DESIGN RESPONSIBILITY FOR THE DESIGN WORK UNDER DIVISION C, PART 3 SECTION 3.2 OF THE ONTARIO BUILDING CODE. I AM QUALIFIED AND THE FIRM IS REGISTERED IN THE APPROPRIATE CATEGORIES.

FIRM BCIN: 36501

DESIGNER BCIN: 21107

SIGNATURE:_____ DATE: _____

LEGEND / LINTELS:

LINTELS:

WOOD

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(FL.)	FLUSH
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BG.	BLACK GLASS
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U/S	UNDERSIDE
T/O	TOP OF
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FIRE PLACE VENT
DRYER VENT
STOVE VENT
CELLAR VENT
SMOKE ALARM
CARBON MONOXIDE DETECTOR
HOSE BIB
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HOOD/CELLAR VENT
DRYER VENT
GAS LINE
CABLE LINE
PHONE JACK
FAN CEILING EXHAUST FAN
P.C. PULL CHAIN CLG. LIGHT
CEILING LIGHT
3 3 WAY SWITCH
LIGHT SWITCH
120 VOLT RECEPTACLE
42" ELECTRIC RECEPTACLE (42" OFF FINISH FLOOR)
FD FLOOR DRAIN

NO.	REVISION :	DATE:	DWN.	CHK
1	Issued for review	MAY04/23	dcb	dcb
2	Issued for review	NOV30/23	dcb	

PROJECT: V22-0677
334&340 ARDAGH ROAD
BARRIE, ON

PG. CONTENT: ELEVATIONS
SCALE: 3/16" = 1'-0"
PAGE: A11

SURVEYOR'S REAL PROPERTY REPORT–PART 1

PLAN OF SURVEY OF PART OF LOTS 5 & 6 REGISTERED PLAN 1192 CITY OF BARRIE COUNTY OF SIMCOE

SCALE 1:200

0 5 10 20 Metres

© COPYRIGHT
PEARSON & PEARSON SURVEYING LTD. 2022

Ontario Land Surveyors

Metric

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

Part 2

DESCRIPTION OF LAND: PART OF LOTS 5 AND 6, REGISTERED PLAN 1192, CITY OF BARRIE, COUNTY OF SIMCOE.

REGISTERED EASEMENTS AND/OR RIGHTS OF WAY:

1. No.334 ARDAGH ROAD (PIN 58763–1025) – NO REGISTERED EASEMENTS OR RIGHTS OF WAY ON TITLE.
2. No.340 ARDAGH ROAD (PIN 58763–1016) – NO REGISTERED EASEMENTS OR RIGHTS OF WAY ON TITLE.

BOUNDARY FEATURES: NOTE ALL FENCES, DRIVEWAYS, HEDGES, SHEDS, GARAGE AND UTILITY POLES ARE SHOWN IN RELATION TO THE BOUNDARY.

COMPLIANCE WITH MUNICIPAL ZONING BY–LAWS: THIS PLAN DOES NOT CERTIFY ZONING COMPLIANCE OR IDENTIFY WHAT ZONING RESTRICTIONS ARE INVOLVED.

THIS REPORT WAS PREPARED FOR EUGENE STURINO AND THE UNDERSIGNED ACCEPTS AND NO RESPONSIBILITY FOR ITS USE BY OTHER PARTIES.

ADDITIONAL REMARKS: NOTE THE POSITION OF BOARD FENCE ON LOT 6 PROJECTS OVER THE WEST PROPERTY LIMIT.

Legend

■	DENOTES	SURVEY MONUMENT FOUND
□	DENOTES	SURVEY MONUMENT SET
SIB	DENOTES	STANDARD IRON BAR
IB	DENOTES	IRON BAR
OU	DENOTES	ORIGIN UNKNOWN
S	DENOTES	SET
M	DENOTES	MEASURED
WIT	DENOTES	WITNESS
N/S/E/W	DENOTES	NORTH/SOUTH/EAST/WEST
P	DENOTES	PLAN 51R–29800
P1	DENOTES	SURVEYOR'S REAL PROPERTY REPORT BY RUDY MAK SURVEYING LTD., O.L.S., DATED SEPTEMBER 21, 2000
P2	DENOTES	REGISTERED PLAN 51M–867
D	DENOTES	INSTRUMENT No.RO895296(PIN 58763–0301)
738	DENOTES	R.C. KIRKPATRICK, O.L.S.
974	DENOTES	T.C. SEAWRIGHT, O.L.S.
1546	DENOTES	RUDY MAK SURVEYING LTD., O.L.S.
ST	DENOTES	TIES TO STONE
FDN	DENOTES	TIES TO CONCRETE FOUNDATION
WD	DENOTES	TIES TO WOOD
BF	DENOTES	BOARD FENCE
CLF	DENOTES	CHAIN LINK FENCE
RF	DENOTES	RAIL FENCE
SRW	DENOTES	STONE RETAINING WALL
WRW	DENOTES	WOOD RETAINING WALL
BC	DENOTES	BOTTOM OF CURB ELEVATION
OHW	DENOTES	OVERHEAD WIRES
UP	DENOTES	UTILITY POLE
CB	DENOTES	CATCHBASIN
MH	DENOTES	MANHOLE
WV	DENOTES	WATER VALVE
FH	DENOTES	FIRE HYDRANT
Ø	DENOTES	DIAMETER (ROUND)
DS	DENOTES	DOOR SILL ELEVATION
	DENOTES	DECIDUOUS TREE WITH TRUNK DIAMETER
	DENOTES	CONIFEROUS TREE WITH TRUNK DIAMETER

REGISTERED PLAN 51M–867

LOT 127 | LOT 128

NEVA ROAD

BLOCK 175
PIN 58763 – 1681

LIMIT BETWEEN REGISTERED PLANS 1192 AND 51M–867

REGISTERED PLAN 1192

LOT 64 | LOT 65 | LOT 66 | LOT 67

REGISTERED PLAN 51M–646

BLOCK 210 (5.00m WIDENING)

PART 2, PLAN 51R – 41773

PART 3, PLAN 51R – 29800 | PART 1, PLAN 51R – 29800 | PART 2, PLAN 51R – 29800 | PART 4, PLAN 51R – 29800

PART 15, PLAN 51R – 29800
PIN 58763 – 1026

PART 16, PLAN 51R – 29800
PIN 58763 – 1017
WIDENED BY BY–LAW No.2000–240
INSTRUMENT No.LT457363

PART 17, PLAN 51R – 29800
PIN 58763 – 1017
WIDENED BY BY–LAW No.2000–240
INSTRUMENT No.LT457363

PART 18, PLAN 51R – 29800
PIN 58763 – 1024
WIDENED BY BY–LAW No.2000–299
INSTRUMENT No.LT466213

PART 19, PLAN 51R – 29800
PIN 58763 – 1020

PART 20, PLAN 51R – 29800

PART 23, PLAN 51R–29800
PIN 58763 – 1017
WIDENED BY BY–LAW No.2000–240
INSTRUMENT No.LT457363

PART 24, PLAN 51R – 29800
PIN 58763 – 1024
WIDENED BY BY–LAW No.2000–299
INSTRUMENT No.LT466213

PIN 58763 – 0336

PART OF LOT 3 CONCESSION 14
PIN 58763 – 0301

PART OF LOT 3 CONCESSION 14
PIN 58763 – 0302

LOT 4 | LOT 5 PIN 58763 – 1016 | LOT 6 PIN 58763 – 1025 | LOT 7 PIN 58763 – 1021

PIN 58763 – 1677

No. 344
1–1/2 Storey Frame Dwelling
DS=248.58
(Ties to Frame)

No. 340
1 Storey Brick Dwelling
DS=248.47
(Ties to Brick)

No. 334
1 Storey Frame & Stone Dwelling
DS=249.09
(Ties to Frame)

No. 328
1–1/2 Storey Frame & Stone Dwelling
DS=247.30

Vinyl Shed (Ties to Vinyl)

Brick & Wood Garage (Ties to Brick)

Wood Shed | Canopy

Wood Deck | Hot Tub | Steps | Concrete Porch | Covered Concrete Porch | Interlock | Gravel Area | Asphalt Area | Planter | SRW | Hedge | Driveway | Gravel | Concrete | Sidewalk | Curb Cut | Concrete Curb | Mail Box On Concrete | Metal Culvert 0.30Ø | Approximate Centreline of Ditch± | Top of Slope | Edge of Pavement | Approximate Centreline of Pavement

Bell Box | Gate | Shrub | Metal Pipe | Site Benchmark Top of Manhole Elevation=247.67m

IB(1546) | IB(738) | SIB(1546) | SIB(738) | CB | MH | FH | WV | UP | GW

N73°11'20"E(P1)
N73°09'50"E(M)

N16°49'15"W(M)
N16°48'20"W(P1&M)
N16°50'10"W(P1&M)
N16°49'05"W(M)
N16°48'30"W(P1)

N28°09'30"E(P1&M)
N61°50'30"W(P1&M)

(REFERENCE BEARING) N73°09'45"E

ARDAGH ROAD (BY BY–LAW No.2483)
PIN 58763 – 0002
(ORIGINAL ROAD ALLOWANCE BETWEEN CONCESSIONS 13 & 14)

SOUTHEAST CORNER OF LOT 5 REGISTERED PLAN 1192

SOUTHWEST CORNER OF LOT 6 REGISTERED PLAN 1192

Bearing Note

BEARINGS ARE UTM GRID AND THE NORTHERLY LIMIT OF ARDAGH ROAD AS WIDENED SHOWN ON PLAN 51R–29800 AS HAVING A BEARING OF N73°09'45"E.

Benchmark

ELEVATIONS ARE GEODETIC AND ARE REFERRED TO A CITY OF TORONTO BENCHMARK.
Station# : 03120080013 ELEVATION = 284.792m(DATUM: CGVD28: 78)

Note

TREE CALIPERS ARE NOT TO ARBORIST STANDARDS AND FOR ARBORIST CALIPER REFER TO ARBORIST REPORT.

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 THE 7TH DAY OF JULY, 2022.

July 07, 2022
Date

Jason Chun–Ho Mo
Ontario Land Surveyor

ASSOCIATION OF ONTARIO LAND SURVEYORS
PLAN SUBMISSION FORM
2192682

THIS PLAN IS NOT VALID UNLESS IT IS AN EMBOSSED ORIGINAL COPY ISSUED BY THE SURVEYOR. In accordance with Regulation 1026, Section 29(3).

10211 KEELE STREET, UNIT #16, MAPLE ONTARIO, L6A 4R7
O. : (289) 553–5453
E. : michelepearson@pearsonandpearson.ca
PEARSON PEARSON SURVEYING LTD.

DRAWING : 2485–ArdaghRoad334&340–SRPR.DWG | PROJECT : 2485
CALC. BY DL | DRAWN BY JC/JM | CHECKED BY MP/JM

APPENDIX B

SIRATI & PARTNERS

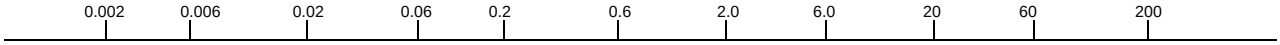
Geotechnical Hydrogeological & Environmental Solutions

Drawing Notes on Sample Descriptions

1. All sample descriptions included in this report follow the Canadian Foundations Engineering Manual soil classification system. This system follows the standard proposed by the International Society for Soil Mechanics and Foundation Engineering. Laboratory grain size analyses provided by Sirati & Partners Consultants Limited also follow the same system. Different classification systems may be used by others; one such system is the Unified Soil Classification. Please note that, with the exception of those samples where a grain size analysis has been made, all samples are classified visually. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.

ISSMFE SOIL CLASSIFICATION

CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE		



EQUIVALENT GRAIN DIAMETER IN MILLIMETRES

CLAY (PLASTIC) TO	FINE	MEDIUM	CRS.	FINE	COARSE
SILT (NONPLASTIC)	SAND			GRAVEL	

UNIFIED SOIL CLASSIFICATION

2. Fill: Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional geotechnical site investigation.

3. Till: The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (60 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.

SIRATI & PARTNERS

LOG OF BOREHOLE BH/MW-01

PROJECT: Geotechnical and Hydrogeologival Investigations
CLIENT: Evans Planning
PROJECT LOCATION: 334 Ardagh Road, Barrie, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4911860.692 E 601620.275

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150 mm
Date: Jan-20-2023

REF. NO.: SP22-01117-00 A
ENCL NO.: 2

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
247.2												
0.0 / 246.9	**TOPSOIL:** 305 mm		1	SS	4		247					
0.3	**FILL:** sand, trace to some silt, trace organics, trace rootlets, brown, moist, loose											
1	trace gravel, very loose		2	SS	2		246					
245.3			3	SS	15							
2 1.8	**SAND:** trace silt, trace gravel, brown, moist, compact		4	SS	20		245					
3	dense, trace cobbles		5	SS	43		244					
4 242.6							243					
4.6	**SILTY SAND WITH GRAVEL:** brown, wet, compact		6	SS	20	▽						23 38 38 1
5 6 241.1							W. L. 242.3 m Feb 27, 2023					
6.1 / 240.5	**SAND:** trace to some silt, trace gravel, brown, wet, very dense		7	SS	65		241					
6.7	**END OF BOREHOLE:**											

1. Borehole was open upon completion of drilling.
2. Groundwater level was encountered at 4.57 mbgs upon completion of drilling.
3. Monitoring well was installed in the borehole upon completion of drilling.
4. Groundwater level was measured at 4.9 mbgs on February 27, 2023.

DRAFT

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: + 3, × 3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

SIRATI & PARTNERS

LOG OF BOREHOLE BH/MW-02A

PROJECT: Geotechnical and Hydrogeologival Investigations
CLIENT: Evans Planning
PROJECT LOCATION: 334 Ardagh Road, Barrie, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4911889.336 E 601608.938

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150 mm
Date: Jan-20-2023

REF. NO.: SP22-01117-00 A
ENCL NO.: 3

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	ELEVATION
246.4					
246.4 / 0.1	**CLEAR STONE:** 50 mm				
	FILL: sand, some silt, trace gravel, dark brown, moist, loose	1	SS	5	246
1	trace silt, trace rootlets, very loose	2	SS	1	
244.6					245
2 1.8	**SAND:** trace silt, trace gravel, brown, moist, loose	3	SS	6	
		4	SS	21	244
3	trace cobbles, compact becoming poorly graded sand with gravel, trace cobbles, trace silt, dense	5	SS	35	243
4					
5	trace cobbles, wet	6	SS	30	242
6 240.3					241
6.1	**INTERBEDDED LAYERS OF LEAN CLAY AND SILTY SAND:** trace gravel, brown, moist to wet, compact/ very stiff	7	SS	18	240
7					239
8		8	SS	18	
9					238
236.9	trace cobbles, very dense/ hard	9	SS	50/ 76mm	237
9.5	**END OF BOREHOLE:**				

1. Borehole was open upon completion of drilling.
2. Water level was encountered at 4.72 mbgs upon completion of drilling.
3. Monitoring well installed at the BH/MW-02A .
4. Groundwater level was measured at 4.9 mbgs on February 27, 2023.

GROUND WATER CONDITIONS: W. L. 240.7 m, Feb 27, 2023

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)

SHEAR STRENGTH (kPa) (20 40 60 80 100)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%) (10 20 30)

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)

	GR	SA	SI	CL
240	0	9	50	41
237	1	61	36	2

DRAFT

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ε=3% Strain at Failure

SPCL SOIL LOG /DRAFT SP22-01117-00.GPJ SPCL.GDT 23-3-29

SIRATI & PARTNERS

LOG OF BOREHOLE BH-02

PROJECT: Geotechnical and Hydrogeologival Investigations

CLIENT: Evans Planning

PROJECT LOCATION: 334 Ardagh Road, Barrie, ON

DATUM: Geodetic

BH LOCATION: See Drawing 1

DRILLING DATA

Method: Solid Stem Auger

Diameter: 150 mm

Date: Jan-24-2023

REF. NO.: SP22-01117-00 A

ENCL NO.: 4

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT (w_P w w_L) WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"							GR SA SI CL
0.0	**TOPSOIL:** 200 mm		1	GRAB								
0.2	**FILL:** sand, trace gravel, trace silt, trace organics, brown, moist		2	GRAB								
0.6	**SAND:** some gravel, trace silt, brown, moist		3	GRAB								
1.1	**END OF BOREHOLE:** 1. Borehole was advanced by hand augering and was open and dry upon termination.											

DRAFT

SPCL SOIL LOG /DRAFT SP22-01117-00.GPJ SPCL.GDT 23-3-29

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES + 3, × 3: Numbers refer to Sensitivity ○ ε=3% Strain at Failure

SIRATI & PARTNERS

LOG OF BOREHOLE BH/MW-03

PROJECT: Geotechnical and Hydrogeological Investigations
CLIENT: Evans Planning
PROJECT LOCATION: 334 Ardagh Road, Barrie, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4911854.316 E 601572.832

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150 mm
Date: Jan-20-2023

REF. NO.: SP22-01117-00 A
ENCL NO.: 5

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS "N" / 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
247.2												
247.0 0.2	**ASPHALT:** 40 mm			AUGER			247					
246.8 0.4	**GRANULAR FILL:** sand and gravel, 200 mm		1	SS	27				○			
1	**FILL:** sand, trace to some silt, trace gravel, trace organics, brown, moist, loose		2	SS	4		246		○			
245.4			3	SS	41				○			
2 1.8	**SAND:** trace to some gravel, trace silt, brown, moist, dense, trace cobbles						245					
	becoming poorly graded sand with gravel, trace silt, very dense		4	SS	54				○			36 57 6 1
3	dense		5	SS	33		244		○			
4							243					
	wet		6	SS	47	▽			○			
5								W. L. 242.3 m Feb 27, 2023				
6 241.1												
6.1	**SILTY SAND:** trace gravel, trace clay, brown, very moist to wet, very dense		7	SS	74		241		○			1 68 30 1
7	grey											
							240					
8 238.9			8	SS	50/ 100mm		239		○			
8.3	**END OF BOREHOLE:**											
	1. Borehole was open upon completion of drilling. 2. Groundwater was encountered at 4.57 mbgs upon completion of drilling. 3. Monitoring well was installed in the borehole upon completion of drilling. 4. Groundwater level											

DRAFT

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ $^{\varepsilon}$=3% Strain at Failure

SIRATI & PARTNERS

LOG OF BOREHOLE BH/MW-04

PROJECT: Geotechnical and Hydrogeological Investigations
CLIENT: Evans Planning
PROJECT LOCATION: 334 Ardagh Road, Barrie, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4911881.359 E 601581.8

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150 mm
Date: Jan-20-2023

REF. NO.: SP22-01117-00 A
ENCL NO.: 6

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS "N" 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
246.6												
246.4 0.2	**TOPSOIL:** 230 mm											
	FILL: sand, trace to some silt, trace gravel, trace organics, trace rootlets, brown, moist, loose		1	SS	1		246		○			
1			2	SS	1							
	gravelly sand, trace silt		3	SS	3		245		○			
2 243.9			4	SS	10		244		○			
2.7	**POORLY GRADED SAND WITH GRAVEL:** trace cobbles, trace silt, brown, moist, dense trace cobbles		5	SS	37		243		○			37 57 (6)
4	very dense		6	SS	53		242		○			
5						W. L. 241.6 m Feb 27, 2023	241					
6 240.5	wet											
6.1	**LEAN CLAY WITH SAND:** trace gravel, grey, wet, very stiff		7	SS	21		240		⊖			1 25 44 30
7												
8 238.4	stiff		8	SS	14		239		○			29 57 14
8.2	**END OF BOREHOLE:**											

1. Borehole was open upon completion of drilling.
2. Groundwater was encountered at 5.79 mbgs upon completion of drilling.
3. Monitoring well was installed in the borehole upon completion of drilling.
4. Groundwater level

DRAFT

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

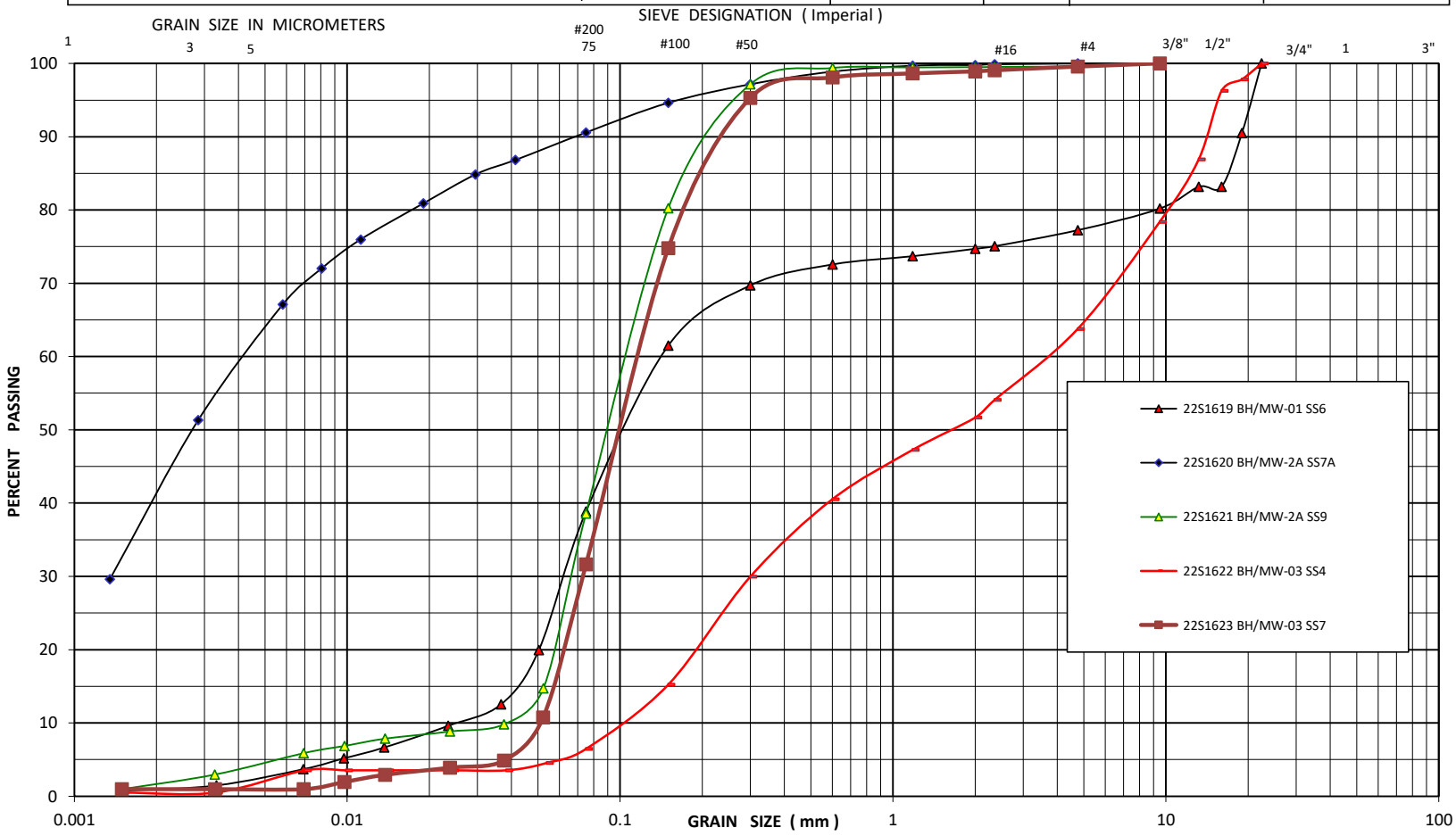
GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ⊖ ε_f=3% Strain at Failure

SIRATI & PARTNERS

GRAIN SIZE DISTRIBUTION

UNIFIED SOIL CLASSIFICATION SYSTEM

CLAY AND SILT	SAND			GRAVEL	
	Fine	Medium	Coarse	Fine	Coarse



Project No.	:	SP22-01117-00
Date	:	08 February 2023
Figure No.	:	7

SIRATI & PARTNERS
Geotechnical Hydrogeological & Environmental Solutions

Grain Size Analysis

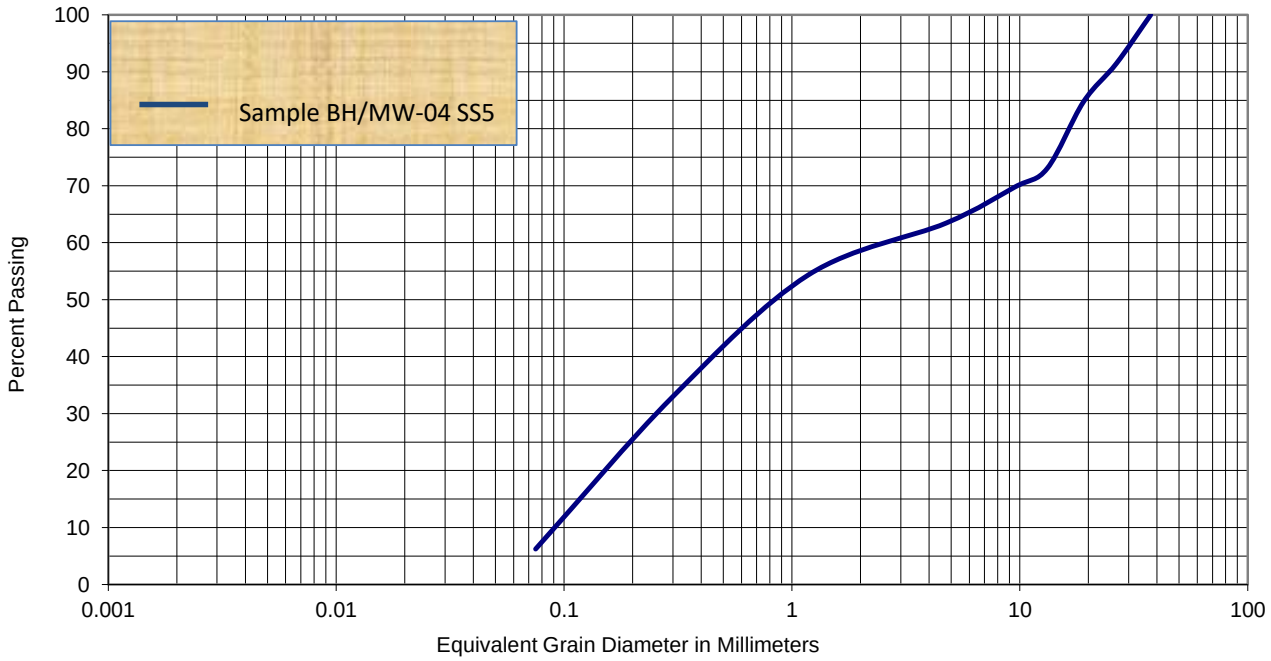
(Granular Material)

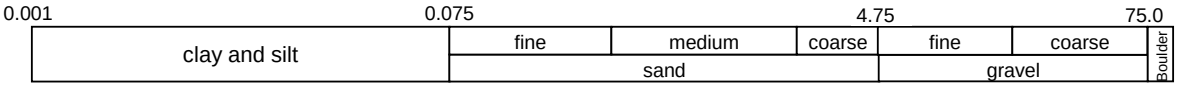
MTO LS-602

FIGURE NUMBER:
SAMPLE NUMBER: 22S1624 **Date Tested:** 3 Feb 2023
PROJECT NUMBER: SP22-1117-00
PROJECT NAME:
CLIENT: 334 – 340 Ardagh Road, Barrie, ON
PROJECT LOCATION:
SAMPLED BY:
DATE SAMPLED:
SUPPLIER:
SAMPLE LOCATION:
DESCRIPTION: Sample BH/MW-04 SS5
SPECIFICATION: OPSS 1010 Granular A
COMMENTS:

SIEVE SIZE	PERCENT PASSING	SPECIFICATIONS
37.5 mm	100.00	Upper limit
26.5 mm	91.44	100
19.0 mm	84.70	85-100
13.2 mm	73.06	65-90
9.5 mm	69.77	50-73
4.75 mm	63.45	35-55
1.18 mm	54.35	15-40
300 µm	32.98	5-22
75 µm	6.23	2-8

		Percentage of		
Sample No.	BH-SS	Gravel	Sand	Fines(Silt and Clay)
22S1624	BH/MW-04 SS5	37	57	6

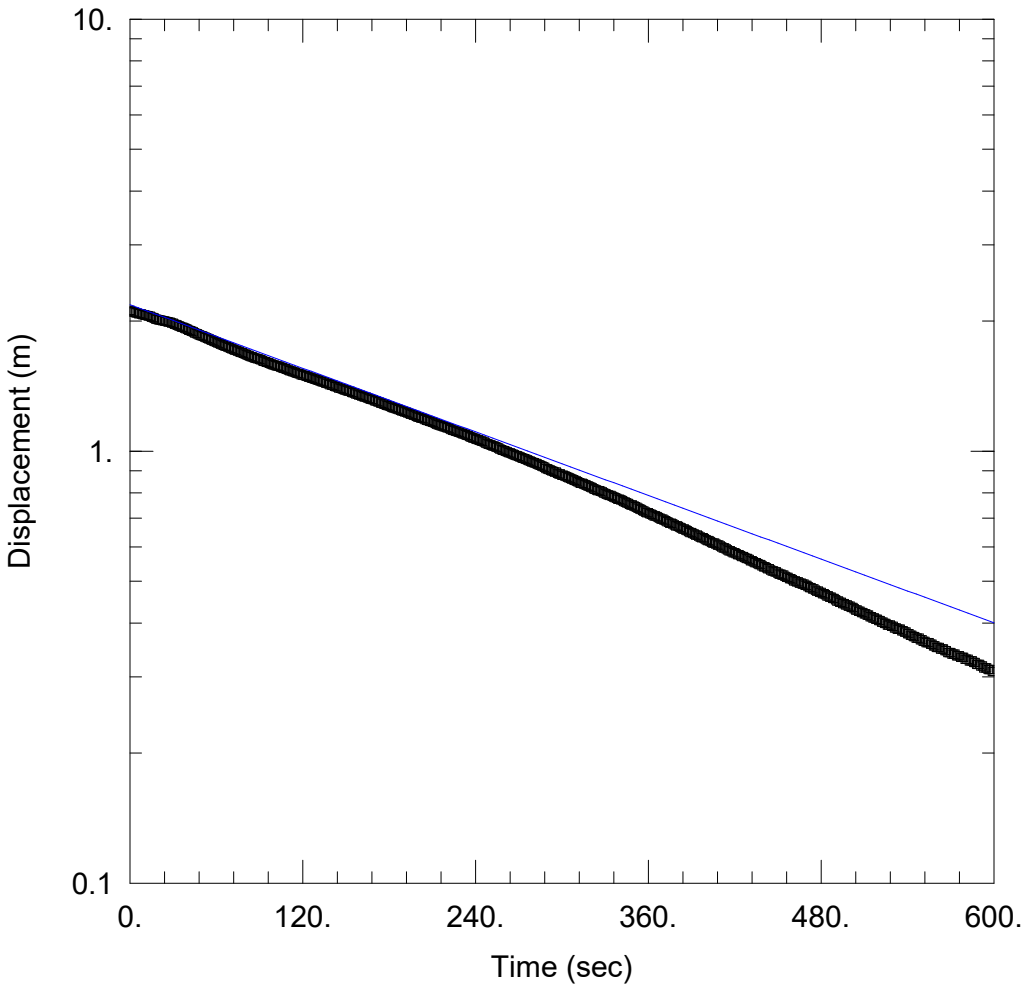




APPENDIX C

SIRATI & PARTNERS

Geotechnical Hydrogeological & Environmental Solutions



RISING HEAD

Data Set: Z:\...\BH MW-02A.aqt
Date: 03/02/23 Time: 10:11:28

PROJECT INFORMATION

Company: SIRATI & PARTNERS
Project: SP22-01117-00
Location: 334 Ardagh Rd., Barrie, ON
Test Well: BH/MW-02A
Test Date: 2023-February-27

AQUIFER DATA

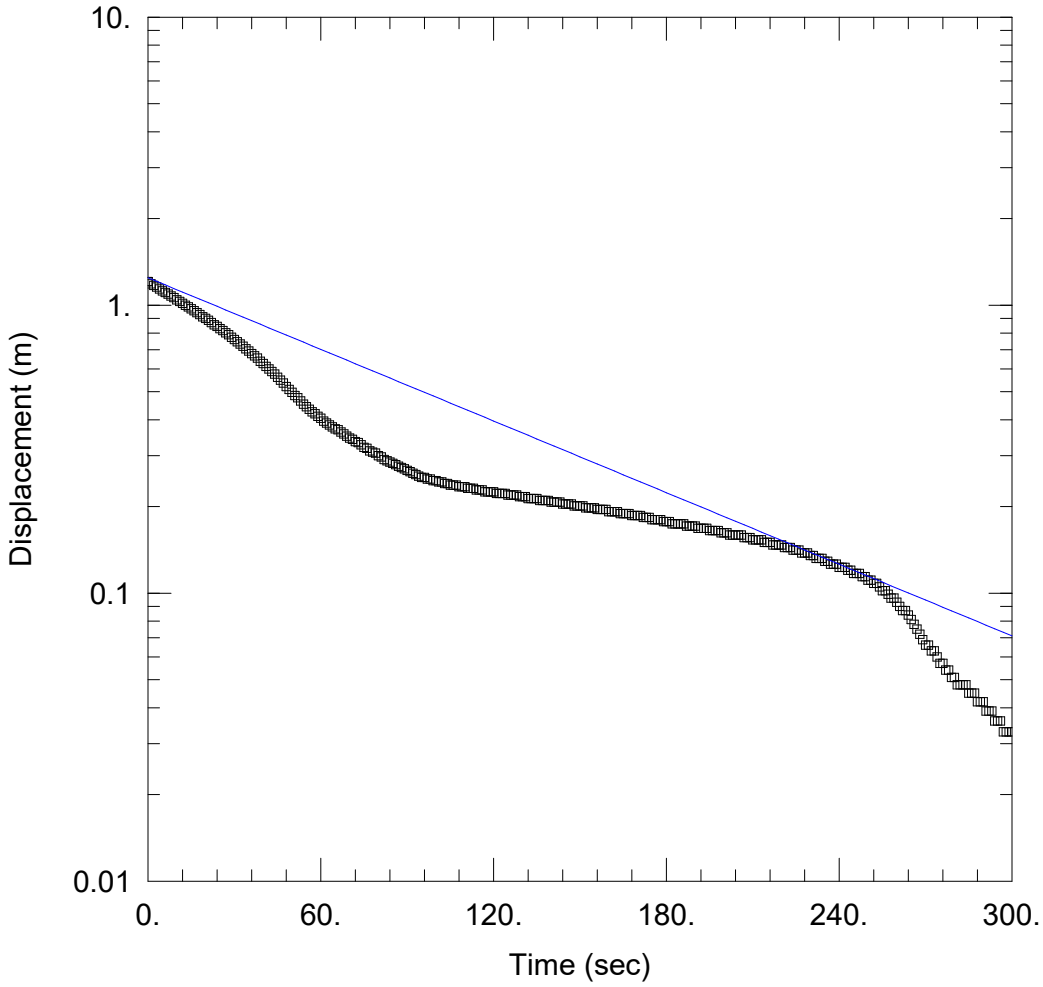
Saturated Thickness: 2.61 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH/MW-02A)

Initial Displacement: 2.115 m
Static Water Column Height: 2.61 m
Total Well Penetration Depth: 7.92 m
Screen Length: 3.04 m
Casing Radius: 0.0508 m
Well Radius: 0.0508 m
Water level below top of screen

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 7.404E-6 m/sec
y0 = 2.183 m



RISING HEAD

Data Set: Z:\...\BH MW-04.aqt
Date: 03/02/23 Time: 10:41:43

PROJECT INFORMATION

Company: SIRATI & PARTNERS
Project: SP22-01117-00
Location: 340 Ardagh Rd., Barrie, ON
Test Well: BH/MW-04
Test Date: 2023-February-27

AQUIFER DATA

Saturated Thickness: 2.53 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH/MW-04)

Initial Displacement: 1.206 m
Total Well Penetration Depth: 7.57 m
Casing Radius: 0.0508 m
Static Water Column Height: 2.53 m
Screen Length: 3. m
Well Radius: 0.0508 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 2.579E-5 m/sec
y0 = 1.245 m

APPENDIX D

SIRATI & PARTNERS

Geotechnical Hydrogeological & Environmental Solutions

AGAT Laboratories

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TEL (905)712-5100
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http://www.agatlabs.com

CLIENT NAME: SIRATI & PARTNERS CONSULTANTS LTD
160 KONRAD CRESCENT UNIT 4
MARKHAM, ON L3R 9T9
(905) 833-1582
ATTENTION TO: Hiva Elhami
PROJECT: SP22-01117-00
AGAT WORK ORDER: 24T148528
MISCELLANEOUS ANALYSIS REVIEWED BY: Amanjot Bhela, Lab Operation Manager
TRACE ORGANICS REVIEWED BY: Radhika Chakraberty, Trace Organics Lab Manager
WATER ANALYSIS REVIEWED BY: Yris Verastegui, Inorganic Team Lead
DATE REPORTED: May 21, 2024
PAGES (INCLUDING COVER): 15
VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

Notes

Disclaimer:

- *All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.*
- *All samples will be disposed of within 30 days after receipt unless a Long Term Storage Agreement is signed and returned. Some specialty analysis may be exempt, please contact your Client Project Manager for details.*
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- *The test results reported herewith relate only to the samples as received by the laboratory.*
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Certificate of Analysis

AGAT WORK ORDER: 24T148528

PROJECT: SP22-01117-00

CLIENT NAME: SIRATI & PARTNERS CONSULTANTS LTD

ATTENTION TO: Hiva Elhami

SAMPLING SITE:334 and 340 Ardagh Rd. Barrie

SAMPLED BY:Hiva

Barrie Sanitary - Organics

DATE RECEIVED: 2024-05-08

DATE REPORTED: 2024-05-21

		SAMPLE DESCRIPTION:		BH/MW-01	BH/MW-02A	BH/MW-03	BH/MW-04
		SAMPLE TYPE:		Water	Water	Water	Water
		DATE SAMPLED:		2024-05-07 11:40	2024-05-07 12:48	2024-05-07 13:50	2024-05-07 15:10
Parameter	Unit	G / S	RDL	5846407	5846873	5846874	5846875
Oil and Grease (animal/vegetable) in water	mg/L	150	0.5	0.77	0.63	0.63	0.50
Oil and Grease (mineral) in water	mg/L	15	0.5	<0.5	<0.5	<0.5	<0.5
Dichloromethane	mg/L	0.09	0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Benzene	mg/L	0.01	0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Trichloroethylene	mg/L	0.05	0.0002	0.0019	0.0004	0.0004	0.0009
Toluene	mg/L	0.02	0.0002	<0.0002	0.0004	0.0005	<0.0002
Tetrachloroethene	mg/L	0.06	0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Ethylbenzene	mg/L	0.06	0.0001	<0.0001	<0.0001	0.0002	<0.0001
1,1,2,2-Tetrachloroethane	mg/L	0.06	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
1,4-Dichlorobenzene	mg/L	0.08	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
1,2-Dichlorobenzene	mg/L	0.05	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Xylenes (Total)	mg/L	0.3	0.0002	<0.0002	0.0003	0.0004	<0.0002
Hexachlorobenzene	mg/L	0.0001	0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Naphthalene	mg/L		0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Acenaphthylene	mg/L		0.00011	<0.00011	<0.00011	<0.00011	<0.00011
Acenaphthene	mg/L		0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Fluorene	mg/L		0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Phenanthrene	mg/L		0.00011	<0.00011	<0.00011	<0.00011	<0.00011
Anthracene	mg/L		0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Fluoranthene	mg/L		0.00012	<0.00012	<0.00012	<0.00012	<0.00012
Pyrene	mg/L		0.00012	<0.00012	<0.00012	0.00042	<0.00012
Benzo(a)anthracene	mg/L		0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chrysene	mg/L		0.0001	<0.0001	<0.0001	0.0003	<0.0001
Benzo(b)fluoranthene	mg/L		0.0001	<0.0001	<0.0001	0.0003	<0.0001
Benzo(k)fluoranthene	mg/L		0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Benzo(a)pyrene	mg/L		0.001	<0.001	<0.001	<0.001	<0.001
Indeno(1,2,3-cd)pyrene	mg/L		0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Dibenzo(a,h)anthracene	mg/L		0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Benzo(ghi)perylene	mg/L		0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Certified By: R. Chakraberty

Results relate only to the items tested. Results apply to samples as received.

AGAT Laboratories

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MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
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FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 24T148528

PROJECT: SP22-01117-00

CLIENT NAME: SIRATI & PARTNERS CONSULTANTS LTD

ATTENTION TO: Hiva Elhami

SAMPLING SITE:334 and 340 Ardagh Rd. Barrie

SAMPLED BY:Hiva

Barrie Sanitary - Organics

DATE RECEIVED: 2024-05-08 **DATE REPORTED: 2024-05-21**

				SAMPLE DESCRIPTION:	BH/MW-01	BH/MW-02A	BH/MW-03	BH/MW-04
				SAMPLE TYPE:	Water	Water	Water	Water
				DATE SAMPLED:	2024-05-07 11:40	2024-05-07 12:48	2024-05-07 13:50	2024-05-07 15:10
Parameter	**Unit**	**G / S**	**RDL**		**5846407**	**5846873**	**5846874**	**5846875**
Total PAHs	mg/L	0.005	0.0003		<0.0003	<0.0003	0.0010	<0.0003
Surrogate	**Unit**	**Acceptable Limits**						
Toluene-d8	% Recovery	50-140			95	93	101	94
4-Bromofluorobenzene	% Recovery	50-140			100	96	103	98
TCMX	%	50-140			97	104	86	84
2-Fluorophenol	%	50-140			79	74	70	85
phenol-d6 surrogate	%	50-140			71	85	73	74
2,4,6-Tribromophenol	%	50-140			88	81	85	77
Chrysene-d12	%	50-140			89	88	99	88

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Limits for Sanitary Sewer Discharge - The City of Barrie - By-Law No. 2012-172
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

5846407-5846875 Oil and Grease animal/vegetable is a calculated parameter. The calculated value is the difference between Total O&G and Mineral O&G.
Xylenes total is a calculated parameter. The calculated value is the sum of m&p-Xylene and o-Xylene.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: R. Chakraberty

Results relate only to the items tested. Results apply to samples as received.

AGAT Laboratories

5835 COOPERS AVENUE
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TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 24T148528

PROJECT: SP22-01117-00

CLIENT NAME: SIRATI & PARTNERS CONSULTANTS LTD

ATTENTION TO: Hiva Elhami

SAMPLING SITE:334 and 340 Ardagh Rd. Barrie

SAMPLED BY:Hiva

BOD5

DATE RECEIVED: 2024-05-08

DATE REPORTED: 2024-05-21

					SAMPLE DESCRIPTION:	BH/MW-01	BH/MW-02A	BH/MW-03	BH/MW-04
					SAMPLE TYPE:	Water	Water	Water	Water
					DATE SAMPLED:	2024-05-07 11:40	2024-05-07 12:48	2024-05-07 13:50	2024-05-07 15:10
Parameter	Unit	G / S: A	G / S: B	RDL		5846407	5846873	5846874	5846875
Biochemical Oxygen Demand, Total	mg/L	300	15	2		<2[<B]	<2[<B]	<2[<B]	<2[<B]

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Limits for Sanitary Sewer Discharge - The City of Barrie - By-Law No. 2012-172, B Refers to Limits for Storm Sewer Discharge - The City of Barrie - By-Law No. 2012-172
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Analysis performed at AGAT Halifax (unless marked by *)

Certified By: Iris Verástegui

Results relate only to the items tested. Results apply to samples as received.

AGAT Laboratories

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FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 24T148528

PROJECT: SP22-01117-00

CLIENT NAME: SIRATI & PARTNERS CONSULTANTS LTD

ATTENTION TO: Hiva Elhami

SAMPLING SITE:334 and 340 Ardagh Rd. Barrie

SAMPLED BY:Hiva

Barrie Sanitary/Storm Sewer Use By-law - Inorganics

DATE RECEIVED: 2024-05-08

DATE REPORTED: 2024-05-21

					SAMPLE DESCRIPTION:		BH/MW-02A		BH/MW-03		BH/MW-04
					SAMPLE TYPE:		Water		Water		Water
					DATE SAMPLED:		2024-05-07 12:48		2024-05-07 13:50		2024-05-07 15:10
Parameter	Unit	G / S: A	G / S: B	RDL	5846407	RDL	5846873	RDL	5846874	RDL	5846875
pH	pH Units	6.0-9.5	6.0-9.5	NA	8.08	NA	7.83	NA	7.83	NA	7.99
Chemical Oxygen Demand	mg/L	600		5	14[<A]	5	6[<A]	5	12[<A]	5	10[<A]
Total Suspended Solids	mg/L	350	15	10	4030[>A]	10	10700[>A]	10	9020[>A]	10	4500[>A]
Total Phosphorus	mg/L	10		0.06	1.93[<A]	0.06	3.72[<A]	0.06	3.64[<A]	0.06	3.74[<A]
Total Kjeldahl Nitrogen	mg/L	100		0.10	<0.10[<A]	0.10	<0.10[<A]	0.10	<0.10[<A]	0.10	<0.10[<A]
Fluoride	mg/L	10		0.05	<0.05[<A]	0.05	<0.05[<A]	0.05	<0.05[<A]	0.05	<0.05[<A]
Chloride	mg/L	1500		0.10	90.0[<A]	0.49	513[<A]	0.24	436[<A]	0.12	237[<A]
Sulphate	mg/L	1500		0.10	11.1[<A]	0.38	27.1[<A]	0.19	29.8[<A]	0.10	20.3[<A]
Sulphide	mg/L	1.0		0.01	<0.01[<A]	0.01	<0.01[<A]	0.01	<0.01[<A]	0.01	<0.01[<A]
Phenols	mg/L	0.1		0.002	0.002[<A]	0.002	<0.002[<A]	0.002	<0.002[<A]	0.002	<0.002[<A]
Cyanide, SAD	mg/L	1.2		0.002	<0.002[<A]	0.002	0.004[<A]	0.002	0.002[<A]	0.002	<0.002[<A]
Total Aluminum	mg/L	50		0.20	94.4[>A]	0.20	98.8[>A]	0.20	83.0[>A]	0.20	42.8[<A]
Total Antimony	mg/L	5.0		0.003	<0.003[<A]	0.003	<0.003[<A]	0.003	<0.003[<A]	0.003	<0.003[<A]
Total Arsenic	mg/L	1.0		0.06	<0.06[<A]	0.06	<0.06[<A]	0.06	<0.06[<A]	0.06	<0.06[<A]
Total Barium	mg/L	5.0		0.04	0.96[<A]	0.04	1.22[<A]	0.04	1.06[<A]	0.04	0.57[<A]
Total Bismuth	mg/L	5.0		0.04	<0.04[<A]	0.04	<0.04[<A]	0.04	<0.04[<A]	0.04	<0.04[<A]
Total Cadmium	mg/L	0.7	0.001	0.002	<0.002[<A]	0.002	<0.002[<A]	0.002	<0.002[<A]	0.002	<0.002[<A]
Total Chromium	mg/L	2.0	0.08	0.06	0.12[B-A]	0.06	0.14[B-A]	0.06	0.13[B-A]	0.06	<0.06[<B]
Total Cobalt	mg/L	5.0		0.010	0.053[<A]	0.010	0.043[<A]	0.010	0.049[<A]	0.010	0.035[<A]
Total Copper	mg/L	2.0	0.01	0.04	0.12[B-A]	0.04	0.10[B-A]	0.04	0.15[B-A]	0.04	0.05[B-A]
Total Iron	mg/L	50		1.00	112[>A]	1.00	115[>A]	1.00	127[>A]	1.00	56.5[>A]
Total Lead	mg/L	0.7	0.05	0.010	0.038[<B]	0.010	0.040[<B]	0.010	0.046[<B]	0.010	0.020[<B]
Total Manganese	mg/L	5.0		0.04	3.37[<A]	0.04	3.59[<A]	0.04	3.58[<A]	0.04	2.19[<A]
Total Mercury	mg/L	0.01		0.0002	<0.0002[<A]	0.0002	<0.0002[<A]	0.0002	<0.0002[<A]	0.0002	<0.0002[<A]
Total Molybdenum	mg/L	5.0		0.04	<0.04[<A]	0.04	<0.04[<A]	0.04	<0.04[<A]	0.04	<0.04[<A]
Total Nickel	mg/L	2.0	0.05	0.06	0.12[B-A]	0.06	0.14[B-A]	0.06	0.27[B-A]	0.06	0.07[B-A]
Total Selenium	mg/L	1.0		0.04	<0.04[<A]	0.04	<0.04[<A]	0.04	<0.04[<A]	0.04	0.05[<A]
Total Silver	mg/L	0.4		0.002	<0.002[<A]	0.002	<0.002[<A]	0.002	<0.002[<A]	0.002	<0.002[<A]
Total Tin	mg/L	5.0		0.04	<0.04[<A]	0.04	<0.04[<A]	0.04	<0.04[<A]	0.04	<0.04[<A]

Certified By: Iris Verástegui

Results relate only to the items tested. Results apply to samples as received.

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Certificate of Analysis

AGAT WORK ORDER: 24T148528

PROJECT: SP22-01117-00

CLIENT NAME: SIRATI & PARTNERS CONSULTANTS LTD

ATTENTION TO: Hiva Elhami

SAMPLING SITE:334 and 340 Ardagh Rd. Barrie

SAMPLED BY:Hiva

Barrie Sanitary/Storm Sewer Use By-law - Inorganics

DATE RECEIVED: 2024-05-08

DATE REPORTED: 2024-05-21

				SAMPLE DESCRIPTION:	BH/MW-01		BH/MW-02A		BH/MW-03		BH/MW-04
				SAMPLE TYPE:	Water		Water		Water		Water
				DATE SAMPLED:	2024-05-07 11:40		2024-05-07 12:48		2024-05-07 13:50		2024-05-07 15:10
Parameter	Unit	G / S: A	G / S: B	RDL	5846407	RDL	5846873	RDL	5846874	RDL	5846875
Total Vanadium	mg/L	5.0		0.04	0.20[<A]	0.04	0.15[<A]	0.04	0.16[<A]	0.04	0.09[<A]
Total Zinc	mg/L	2.0	0.04	0.40	<0.40[<A]	0.40	0.40[B-A]	0.40	<0.40[<A]	0.40	<0.40[<A]

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Limits for Sanitary Sewer Discharge - The City of Barrie - By-Law No. 2012-172, B Refers to Limits for Storm Sewer Discharge - The City of Barrie - By-Law No. 2012-172
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

5846407-5846875 Dilution required, RDL has been increased accordingly.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: Iris Verástegui

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Exceedance Summary

AGAT WORK ORDER: 24T148528

PROJECT: SP22-01117-00

CLIENT NAME: SIRATI & PARTNERS CONSULTANTS LTD

ATTENTION TO: Hiva Elhami

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
5846407	BH/MW-01	ON Barrie SM	Barrie Sanitary/Storm Sewer Use By-law - Inorganics	Total Chromium	mg/L	0.08	0.12
5846407	BH/MW-01	ON Barrie SM	Barrie Sanitary/Storm Sewer Use By-law - Inorganics	Total Copper	mg/L	0.01	0.12
5846407	BH/MW-01	ON Barrie SM	Barrie Sanitary/Storm Sewer Use By-law - Inorganics	Total Nickel	mg/L	0.05	0.12
5846407	BH/MW-01	ON Barrie SM	Barrie Sanitary/Storm Sewer Use By-law - Inorganics	Total Suspended Solids	mg/L	15	4030
5846407	BH/MW-01	ON Barrie SN	Barrie Sanitary/Storm Sewer Use By-law - Inorganics	Total Aluminum	mg/L	50	94.4
5846407	BH/MW-01	ON Barrie SN	Barrie Sanitary/Storm Sewer Use By-law - Inorganics	Total Iron	mg/L	50	112
5846407	BH/MW-01	ON Barrie SN	Barrie Sanitary/Storm Sewer Use By-law - Inorganics	Total Suspended Solids	mg/L	350	4030
5846873	BH/MW-02A	ON Barrie SM	Barrie Sanitary/Storm Sewer Use By-law - Inorganics	Total Chromium	mg/L	0.08	0.14
5846873	BH/MW-02A	ON Barrie SM	Barrie Sanitary/Storm Sewer Use By-law - Inorganics	Total Copper	mg/L	0.01	0.10
5846873	BH/MW-02A	ON Barrie SM	Barrie Sanitary/Storm Sewer Use By-law - Inorganics	Total Nickel	mg/L	0.05	0.14
5846873	BH/MW-02A	ON Barrie SM	Barrie Sanitary/Storm Sewer Use By-law - Inorganics	Total Suspended Solids	mg/L	15	10700
5846873	BH/MW-02A	ON Barrie SM	Barrie Sanitary/Storm Sewer Use By-law - Inorganics	Total Zinc	mg/L	0.04	0.40
5846873	BH/MW-02A	ON Barrie SN	Barrie Sanitary/Storm Sewer Use By-law - Inorganics	Total Aluminum	mg/L	50	98.8
5846873	BH/MW-02A	ON Barrie SN	Barrie Sanitary/Storm Sewer Use By-law - Inorganics	Total Iron	mg/L	50	115
5846873	BH/MW-02A	ON Barrie SN	Barrie Sanitary/Storm Sewer Use By-law - Inorganics	Total Suspended Solids	mg/L	350	10700
5846874	BH/MW-03	ON Barrie SM	Barrie Sanitary/Storm Sewer Use By-law - Inorganics	Total Chromium	mg/L	0.08	0.13
5846874	BH/MW-03	ON Barrie SM	Barrie Sanitary/Storm Sewer Use By-law - Inorganics	Total Copper	mg/L	0.01	0.15
5846874	BH/MW-03	ON Barrie SM	Barrie Sanitary/Storm Sewer Use By-law - Inorganics	Total Nickel	mg/L	0.05	0.27
5846874	BH/MW-03	ON Barrie SM	Barrie Sanitary/Storm Sewer Use By-law - Inorganics	Total Suspended Solids	mg/L	15	9020
5846874	BH/MW-03	ON Barrie SN	Barrie Sanitary/Storm Sewer Use By-law - Inorganics	Total Aluminum	mg/L	50	83.0
5846874	BH/MW-03	ON Barrie SN	Barrie Sanitary/Storm Sewer Use By-law - Inorganics	Total Iron	mg/L	50	127
5846874	BH/MW-03	ON Barrie SN	Barrie Sanitary/Storm Sewer Use By-law - Inorganics	Total Suspended Solids	mg/L	350	9020
5846875	BH/MW-04	ON Barrie SM	Barrie Sanitary/Storm Sewer Use By-law - Inorganics	Total Copper	mg/L	0.01	0.05
5846875	BH/MW-04	ON Barrie SM	Barrie Sanitary/Storm Sewer Use By-law - Inorganics	Total Nickel	mg/L	0.05	0.07
5846875	BH/MW-04	ON Barrie SM	Barrie Sanitary/Storm Sewer Use By-law - Inorganics	Total Suspended Solids	mg/L	15	4500
5846875	BH/MW-04	ON Barrie SN	Barrie Sanitary/Storm Sewer Use By-law - Inorganics	Total Iron	mg/L	50	56.5
5846875	BH/MW-04	ON Barrie SN	Barrie Sanitary/Storm Sewer Use By-law - Inorganics	Total Suspended Solids	mg/L	350	4500

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Quality Assurance

CLIENT NAME: SIRATI & PARTNERS CONSULTANTS LTD

AGAT WORK ORDER: 24T148528

PROJECT: SP22-01117-00

ATTENTION TO: Hiva Elhami

SAMPLING SITE:334 and 340 Ardagh Rd. Barrie

SAMPLED BY:Hiva

Trace Organics Analysis

RPT Date: May 21, 2024			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Barrie Sanitary - Organics															
Oil and Grease (animal/vegetable) in water	5845047		< 0.5	< 0.5	NA	< 0.5	88%	70%	130%	103%	70%	130%	105%	70%	130%
Oil and Grease (mineral) in water	5845047		< 0.5	< 0.5	NA	< 0.5	96%	70%	130%	92%	70%	130%	93%	70%	130%
Dichloromethane	5847389		<0.0003	<0.0003	NA	< 0.0003	71%	50%	140%	102%	60%	130%	91%	50%	140%
Benzene	5847389		<0.0002	<0.0002	NA	< 0.0002	69%	50%	140%	76%	60%	130%	79%	50%	140%
Trichloroethylene	5847389		<0.0002	<0.0002	NA	< 0.0002	72%	50%	140%	85%	60%	130%	74%	50%	140%
Toluene	5847389		<0.0002	<0.0002	NA	< 0.0002	73%	50%	140%	79%	60%	130%	78%	50%	140%
Tetrachloroethene	5847389		0.0020	0.0018	10.0%	< 0.0002	65%	50%	140%	68%	60%	130%	76%	50%	140%
Ethylbenzene	5847389		<0.0001	<0.0001	NA	< 0.0001	71%	50%	140%	74%	60%	130%	74%	50%	140%
1,1,2,2-Tetrachloroethane	5847389		<0.0001	<0.0001	NA	< 0.0001	85%	50%	140%	74%	60%	130%	71%	50%	140%
1,4-Dichlorobenzene	5847389		<0.0001	<0.0001	NA	< 0.0001	78%	50%	140%	79%	60%	130%	83%	50%	140%
1,2-Dichlorobenzene	5847389		<0.0001	<0.0001	NA	< 0.0001	86%	50%	140%	81%	60%	130%	86%	50%	140%
Hexachlorobenzene	5841788		< 0.00001	< 0.00001	NA	< 0.00001	98%	50%	140%	99%	50%	140%	82%	50%	140%
Naphthalene	5848458		< 0.0003	< 0.0003	NA	< 0.0003	108%	50%	140%	73%	50%	140%	74%	50%	140%
Acenaphthylene	5848458		< 0.00011	< 0.00011	NA	< 0.00011	94%	50%	140%	82%	50%	140%	85%	50%	140%
Acenaphthene	5848458		< 0.00010	< 0.00010	NA	< 0.00010	95%	50%	140%	74%	50%	140%	99%	50%	140%
Fluorene	5848458		< 0.0002	< 0.0002	NA	< 0.0002	103%	50%	140%	77%	50%	140%	85%	50%	140%
Phenanthrene	5848458		< 0.00011	< 0.00011	NA	< 0.00011	103%	50%	140%	71%	50%	140%	89%	50%	140%
Anthracene	5848458		< 0.00007	< 0.00007	NA	< 0.00007	106%	50%	140%	73%	50%	140%	85%	50%	140%
Fluoranthene	5848458		< 0.00012	< 0.00012	NA	< 0.00012	113%	50%	140%	73%	50%	140%	96%	50%	140%
Pyrene	5848458		< 0.00012	< 0.00012	NA	< 0.00012	110%	50%	140%	71%	50%	140%	85%	50%	140%
Benzo(a)anthracene	5848458		< 0.00008	< 0.00008	NA	< 0.00008	83%	50%	140%	71%	50%	140%	85%	50%	140%
Chrysene	5848458		< 0.00005	< 0.00005	NA	< 0.00005	111%	50%	140%	100%	50%	140%	74%	50%	140%
Benzo(b)fluoranthene	5848458		< 0.00003	< 0.00003	NA	< 0.00003	101%	50%	140%	99%	50%	140%	81%	50%	140%
Benzo(k)fluoranthene	5848458		< 0.00006	< 0.00006	NA	< 0.00006	111%	50%	140%	100%	50%	140%	85%	50%	140%
Benzo(a)pyrene	5848458		< 0.001	< 0.001	NA	< 0.001	100%	50%	140%	69%	50%	140%	88%	50%	140%
Indeno(1,2,3-cd)pyrene	5848458		< 0.00003	< 0.00003	NA	< 0.00003	82%	50%	140%	93%	50%	140%	96%	50%	140%
Dibenzo(a,h)anthracene	5848458		< 0.00009	< 0.00009	NA	< 0.00009	96%	50%	140%	67%	50%	140%	85%	50%	140%
Benzo(ghi)perylene	5848458		< 0.00006	< 0.00006	NA	< 0.00006	98%	50%	140%	76%	50%	140%	74%	50%	140%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By: R. Chakraberty

AGAT Laboratories is accredited to ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA) and/or Standards Council of Canada (SCC) for specific tests listed on the scope of accreditation. AGAT Laboratories (Mississauga) is also accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) for specific drinking water tests. Accreditations are location and parameter specific. A complete listing of parameters for each location is available from www.cala.ca and/or www.scc.ca. The tests in this report may not necessarily be included in the scope of accreditation. RPDs calculated using raw data. The RPD may not be reflective of duplicate values shown, due to rounding of final results.

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Quality Assurance

CLIENT NAME: SIRATI & PARTNERS CONSULTANTS LTD

AGAT WORK ORDER: 24T148528

PROJECT: SP22-01117-00

ATTENTION TO: Hiva Elhami

SAMPLING SITE:334 and 340 Ardagh Rd. Barrie

SAMPLED BY:Hiva

Water Analysis

RPT Date: May 21, 2024			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Barrie Sanitary/Storm Sewer Use By-law - Inorganics															
pH	5845142		7.63	7.69	0.8%	NA	99%	90%	110%						
Chemical Oxygen Demand	5847984		49	48	2.1%	< 5	101%	90%	110%	100%	90%	110%	87%	70%	130%
Total Suspended Solids	5847931		<10	<10	NA	< 10	100%	80%	120%						
Total Phosphorus	5852462		0.13	0.13	0.0%	< 0.02	104%	70%	130%	102%	80%	120%	NA	70%	130%
Total Kjeldahl Nitrogen	5838267		0.13	0.14	NA	< 0.10	97%	70%	130%	101%	80%	120%	89%	70%	130%
Fluoride	5844099		<0.05	<0.05	NA	< 0.05	100%	70%	130%	101%	80%	120%	98%	70%	130%
Chloride	5844099		123	123	0.0%	< 0.10	94%	70%	130%	103%	80%	120%	103%	70%	130%
Sulphate	5844099		39.0	39.1	0.3%	< 0.10	97%	70%	130%	102%	80%	120%	98%	70%	130%
Sulphide	5860288		<0.01	<0.01	NA	< 0.01	102%	90%	110%	101%	90%	110%	101%	80%	120%
Phenols	5844490		<0.002	<0.002	NA	< 0.002	101%	90%	110%	98%	90%	110%	102%	80%	120%
Cyanide, SAD	5843428		0.009	0.008	NA	< 0.002	105%	70%	130%	91%	80%	120%	100%	70%	130%
Total Aluminum	5838284		0.153	0.145	5.4%	< 0.010	120%	70%	130%	108%	80%	120%	109%	70%	130%
Total Antimony	5838284		<0.003	<0.003	NA	< 0.003	100%	70%	130%	100%	80%	120%	100%	70%	130%
Total Arsenic	5838284		<0.003	<0.003	NA	< 0.003	98%	70%	130%	97%	80%	120%	101%	70%	130%
Total Barium	5838284		0.027	0.026	3.8%	< 0.002	100%	70%	130%	101%	80%	120%	99%	70%	130%
Total Bismuth	5838284		<0.002	<0.002	NA	< 0.002	95%	70%	130%	99%	80%	120%	94%	70%	130%
Total Cadmium	5838284		<0.0001	<0.0001	NA	< 0.0001	98%	70%	130%	102%	80%	120%	95%	70%	130%
Total Chromium	5838284		<0.003	<0.003	NA	< 0.003	98%	70%	130%	99%	80%	120%	103%	70%	130%
Total Cobalt	5838284		<0.0005	<0.0005	NA	< 0.0005	106%	70%	130%	101%	80%	120%	105%	70%	130%
Total Copper	5838284		<0.002	<0.002	NA	< 0.002	99%	70%	130%	99%	80%	120%	99%	70%	130%
Total Iron	5838284		0.186	0.196	NA	< 0.050	106%	70%	130%	102%	80%	120%	106%	70%	130%
Total Lead	5838284		<0.0005	<0.0005	NA	< 0.0005	93%	70%	130%	96%	80%	120%	93%	70%	130%
Total Manganese	5838284		0.094	0.111	16.6%	< 0.002	107%	70%	130%	94%	80%	120%	114%	70%	130%
Total Mercury	5846273		<0.0002	<0.0002	NA	< 0.0002	103%	70%	130%	104%	80%	120%	97%	70%	130%
Total Molybdenum	5838284		<0.002	0.003	NA	< 0.002	100%	70%	130%	106%	80%	120%	113%	70%	130%
Total Nickel	5838284		0.003	0.003	NA	< 0.003	105%	70%	130%	98%	80%	120%	102%	70%	130%
Total Selenium	5838284		<0.002	<0.002	NA	< 0.002	102%	70%	130%	97%	80%	120%	94%	70%	130%
Total Silver	5838284		<0.0001	<0.0001	NA	< 0.0001	104%	70%	130%	101%	80%	120%	107%	70%	130%
Total Tin	5838284		<0.002	<0.002	NA	< 0.002	100%	70%	130%	96%	80%	120%	98%	70%	130%
Total Vanadium	5838284		<0.002	<0.002	NA	< 0.002	110%	70%	130%	102%	80%	120%	103%	70%	130%
Total Zinc	5838284		<0.020	<0.020	NA	< 0.020	100%	70%	130%	100%	80%	120%	101%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate NA: results are under 5X the RDL and will not be calculated.
Matrix spike NA: Spike level < native concentration. Matrix spike acceptance limits do not apply and are not calculated.

BOD5

Biochemical Oxygen Demand, Total	5850501	6	6	NA	< 2	105%	70%	130%	

Comments: If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.

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AGAT Laboratories

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http://www.agatlabs.com

Quality Assurance

CLIENT NAME: SIRATI & PARTNERS CONSULTANTS LTD

AGAT WORK ORDER: 24T148528

PROJECT: SP22-01117-00

ATTENTION TO: Hiva Elhami

SAMPLING SITE:334 and 340 Ardagh Rd. Barrie

SAMPLED BY:Hiva

Water Analysis (Continued)

RPT Date: May 21, 2024			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

Certified By:

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Method Summary

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PROJECT: SP22-01117-00 | **ATTENTION TO: Hiva Elhami**

SAMPLING SITE:334 and 340 Ardagh Rd. Barrie | **SAMPLED BY:Hiva**

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Oil and Grease (animal/vegetable) in water	VOL-91-5011	EPA SW-846 3510C & SM 5520	BALANCE
Oil and Grease (mineral) in water	VOL-91-5011	EPA SW-846 3510C & SM 5520	BALANCE
Dichloromethane	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Benzene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Trichloroethylene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Toluene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Tetrachloroethene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Ethylbenzene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
1,1,2,2-Tetrachloroethane	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
1,4-Dichlorobenzene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
1,2-Dichlorobenzene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Xylenes (Total)	VOL-91-5001	modified from EPA 5030B & EPA 8260D	CALCULATION
Hexachlorobenzene	ORG-91-5112	EPA SW846 3510C & 8081B	GC/ECD
Toluene-d8	VOL-91- 5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
4-Bromofluorobenzene	VOL-91- 5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
TCMX	ORG-91-5112	modified from EPA SW-846 3510C & 8081B	GC/ECD
Naphthalene	ORG-91-5114	modified from EPA 3510C and EPA 8270E	GC/MS
Acenaphthylene	ORG-91-5114	modified from EPA 3510C and EPA 8270E	GC/MS
Acenaphthene	ORG-91-5114	modified from EPA 3510C and EPA 8270E	GC/MS
Fluorene	ORG-91-5114	modified from EPA 3510C and EPA 8270E	GC/MS
Phenanthrene	ORG-91-5114	modified from EPA 3510C and EPA 8270E	GC/MS
Anthracene	ORG-91-5114	modified from EPA 3510C and EPA 8270E	GC/MS
Fluoranthene	ORG-91-5114	modified from EPA 3510C and EPA 8270E	GC/MS
Pyrene	ORG-91-5114	modified from EPA 3510C and EPA 8270E	GC/MS
Benzo(a)anthracene	ORG-91-5114	modified from EPA 3510C and EPA 8270E	GC/MS
Chrysene	ORG-91-5114	modified from EPA 3510C and EPA 8270E	GC/MS
Benzo(b)fluoranthene	ORG-91-5114	modified from EPA 3510C and EPA 8270E	GC/MS
Benzo(k)fluoranthene	ORG-91-5114	modified from EPA 3510C and EPA 8270E	GC/MS
Benzo(a)pyrene	ORG-91-5114	modified from EPA 3510C and EPA 8270E	GC/MS

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SAMPLING SITE:334 and 340 Ardagh Rd. Barrie

SAMPLED BY:Hiva

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Indeno(1,2,3-cd)pyrene	ORG-91-5114	modified from EPA 3510C and EPA 8270E	GC/MS
Dibenzo(a,h)anthracene	ORG-91-5114	modified from EPA 3510C and EPA 8270E	GC/MS
Benzo(ghi)perylene	ORG-91-5114	modified from EPA 3510C and EPA 8270E	GC/MS
Total PAHs	ORG-91-5114	modified from EPA 3510C and EPA 8270E	CALCULATION
2-Fluorophenol	ORG-91-5114	modified from EPA 3510C, 8270E & ON MOECC E3265	GC/MS
phenol-d6 surrogate	ORG-91-5114	modified from EPA 3510C, 8270E & ON MOECC E3265	GC/MS
2,4,6-Tribromophenol	ORG-91-5114	modified from EPA 3510C, 8270E & ON MOECC E3265	GC/MS
Chrysene-d12	ORG-91-5114	modified from EPA 3510C and EPA 8270E	GC/MS

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PROJECT: SP22-01117-00 | **ATTENTION TO: Hiva Elhami**

SAMPLING SITE:334 and 340 Ardagh Rd. Barrie | **SAMPLED BY:Hiva**

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Biochemical Oxygen Demand, Total	INOR-121-6023	SM 5210 B	INCUBATOR
pH	INOR-93-6000	modified from SM 4500-H+ B	PC TITRATE
Chemical Oxygen Demand	INOR-93-6042	modified from SM 5220 A and SM 5220 D	SPECTROPHOTOMETER
Total Suspended Solids	INOR-93-6028	modified from EPA 1684,ON MOECC E3139,SM 2540C,D	BALANCE
Total Phosphorus	INOR-93-6022	modified from SM 4500-P B and SM 4500-P E	SPECTROPHOTOMETER
Total Kjeldahl Nitrogen	INOR-93-6048	modified from EPA 351.2 and SM 4500-NORG D	LACHAT FIA
Fluoride	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Chloride	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Sulphate	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Sulphide	INOR-93-6054	modified from SM 4500 S2- D	SPECTROPHOTOMETER
Phenols	INOR-93-6072	modified from SM 5530 D	LACHAT FIA
Cyanide, SAD	INOR-93-6051	modified from MOECC E3015; SM 4500-CN- A, B, & C	SEGMENTED FLOW ANALYSIS
Total Aluminum	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Antimony	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Arsenic	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Barium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Bismuth	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Cadmium	MET -93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Chromium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Cobalt	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Copper	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Iron	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Lead	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Manganese	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Mercury	MET-93-6100	modified from EPA 245.2 and SM 3112 B	CVAAS
Total Molybdenum	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Nickel	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Selenium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Silver	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Tin	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS

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ATTENTION TO: Hiva Elhami

SAMPLING SITE:334 and 340 Ardagh Rd. Barrie

SAMPLED BY:Hiva

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Total Vanadium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Zinc	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS

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AGAT Laboratories

Have feedback? Scan here for a quick survey!

5835 Coopers Avenue
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webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Laboratory Use Only

Work Order #: 24T148528

Cooler Quantity: 2 L

Arrival Temperatures: 3.9 | 4.7 | 4.9

~~Depot~~ Temperatures: 5.3 | 5.9 | 4.8

Custody Seal Intact: ☐ Yes ☐ No ☑ N/A

Notes: L / I

Report Information:

Company: Sirati and Partners
Contact: Hiva Elhami
Address: 160 Konrad Cres., Markham, ON L3R 9T9
Phone: 905 940 1582 Fax: 905 940 2440
Reports to be sent to:
1. Email: Nick@Sirati.ca
2. Email: Hiva@Sirati.ca

Regulatory Requirements:

(Please check all applicable boxes)

☐ Regulation 153/04
Table _____ *Indicate One*
☐ Ind/Com ☐ Res/Park ☐ Agriculture
Soil Texture *(Check One)* ☐ Coarse ☐ Fine

☐ Regulation 406
Table _____ *Indicate One*
☐ Ind/Com ☐ Res/Park ☐ Agriculture

☐ Regulation 558
☐ CCME

☑ Sewer Use ☑ Sanitary ☑ Storm
Town of Barrie *Region*
☐ Prov. Water Quality Objectives (PWQO)
☐ Other _____ *Indicate one*

Turnaround Time (TAT) Required:

Regular TAT ☐ 5 to 7 Business Days

Rush TAT *(Rush Surcharges Apply)*

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply): _____

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CSR

Project Information:

Project: SP22-01117-00
Site Location: 334 and 340 Ardagh Rd. Barrie
Sampled By: _____
AGAT Quote #: _____ PO: _____
Please note: If quotation number is not provided, client will be billed full price for analysis.

Is this submission for a Record of Site Condition (RSC)? ☐ Yes ☐ No

Report Guideline on Certificate of Analysis ☐ Yes ☐ No

Invoice Information:

Bill To Same: Yes ☑ No ☐

Company: _____
Contact: _____
Address: _____
Email: Hiva@Sirati.ca Nick@Sirati.ca Firuze@Sirati.ca

Legal Sample ☐

Sample Matrix Legend

GW	Ground Water	SD	Sediment
O	Oil	SW	Surface Water
P	Paint	R	Rock/Shale
S	Soil		

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI, DOC Y/N	O. Reg 153: Metals & Inorganics	Metals - ☐ CrVI, ☐ Hg, ☐ HWSB	BTEX, F1-F4 PHCs	VOC	PAHs	PCBs: Arochlors ☐	O. Reg 406: Regulation 406 Characterization Package pH, Metals, BTEX, F1-F4	EC, SAR	Regulation 406 SPLP Rainwater Leach mSPLP ☐ Metals ☐ VOCs ☐ SVOCs ☐ OC	O. Reg 558: Landfill Disposal Characterization TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs TCLP:	Corrosivity: ☐ Moisture ☐ Sulphide	Sewer by-Law	Potentially Hazardous or High Concentration (Y/N)
1. BH/MW_01	May 07,24	11:40 AM PM	21	GW		N												✓	
2. BH/MW_02A	"	12:48 AM PM	21	"		N												✓	
3. BH/MW_03	"	13:50 AM PM	21	"		N												✓	
4. BH/MW_04	"	15:10 AM PM	21	"		N												✓	
5.		AM PM																	
6.		AM PM																	
7.		AM PM																	
8.		AM PM																	
9.		AM PM																	
10.		AM PM																	
11.		AM PM																	

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Hiva Elhami	May 07, 2024	16:40	[signature]	May 8	3p
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

Page _____ of _____

N°: T-157132

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APPENDIX E

SIRATI & PARTNERS

Geotechnical Hydrogeological & Environmental Solutions

Short Term Dewatering Calculations for Block 1 - 340 Ardagh Rd.

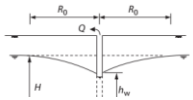
Groundwater Dewatering Calculation (Q1)

A- Initial Water Level Elevation (m)	B - Assumed Aquifer Bottom Elevation (m)	C - Target Water Level Elevation (m)	D - Assumed Bottom of Dewatering Well (m)
242.3		241.1	240.1

Partially Penetrating Well Method

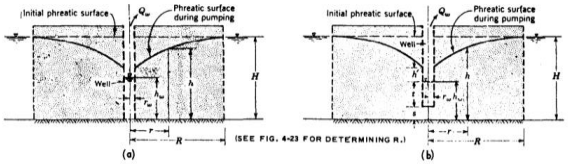
H-s = A-D (m)	t =C-D (m)	s=D-B (m)	k (m/s)	a (m)	b (m)	Eq. 7.1 re (m)	Eq. 7.2 re (m)	Average re (m)	Zone of Influence from Center of Excavation Ro (m)	Zone of Influence from Edge of Excavation R	No safety factor Q1 (L/day)	safety factor of 3.0 Q1 (L/day)
2.2	1		1.66E-05	35	14	6.3	12.5	9.4	24	15	**18,378**	**55,133**

Fully penetrating well, unconfined aquifer, circular source at distance R_0 (Dupuit–Forcheimer equation)



$$Q = \frac{\pi k\left(H^2 - h_w^2\right)}{\ln\left[R_0 / r_e\right]} \qquad (7.5)$$

k = soil permeability;
H = initial water table level in aquifer;
h_w = lowered water level in equivalent well;
r_e = equivalent radius of well;
R_0 = radius of influence.



FULLY PENETRATING WELL

FLOW, Q_w, OR DRAWDOWN, $H^2 - h^2$, NEGLECTING HEIGHT OF FREE DISCHARGE, h' (CONDITION (a)).

$$Q_w = \frac{\pi k (H^2 - h^2)}{\ln (R/r)} \qquad (1) \qquad \text{OR} \qquad Q_w = \frac{\pi k \left(H^2 - h_w^2\right)}{\ln (R/r_w)} \qquad (2)$$

FLOW, Q_w, TAKING h' INTO ACCOUNT (b) CAN BE ESTIMATED ACCURATELY FROM EQ 2 USING HEIGHT OF WATER, t + s (s = 0 FOR FULLY PENETRATING WELL), FOR THE TERM h_w.

FULLY OR PARTIALLY PENETRATING WELL

FLOW, Q_w, FOR ANY GRAVITY WELL WITH A CIRCULAR SOURCE

$$Q_w = \frac{\pi k[(H - s)^2 - t^2]}{\ln (R/r_w)} \left[1 + \left(0.30 + \frac{10 r_w}{H}\right) \sin \frac{1.8s}{H}\right] \qquad (3)$$

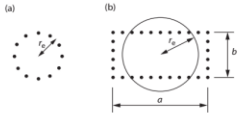


Figure 7.5 Equivalent radius of arrays of wells. (a) Circular system of radius r_e. (b) Rectangular system.

plan dimensions a by b, the equivalent radius can be estimated by assuming a well of equal perimeter

$$r_e = \frac{(a+b)}{\pi} \qquad (7.1)$$

or equal area

$$r_e = \sqrt{\frac{ab}{\pi}} \qquad (7.2)$$

RADIUS OF INFLUENCE, R, CAN BE ESTIMATED FOR BOTH ARTESIAN AND GRAVITY FLOWS BY

$$R = C (H - h_w) \sqrt{k} \qquad (1)$$

WHERE R, H, AND h_w ARE DEFINED PREVIOUSLY AND EXPRESSED IN FEET. COEFFICIENT OF PERMEABILITY, k, IS EXPRESSED IN 10^{-4} CM/SEC.

AND C = 3 FOR ARTESIAN AND GRAVITY FLOWS TO A WELL.

C = 1.5 TO 2.0 FOR A SINGLE LINE OF WELLPOINTS.

2) Stormwater runoff as per 20 mm per day

Precipitation	Site Area	Q2
m/day	m2	L/day
0.02	490	9800

Total Dewatering Volume Q = Q1 + Q2

Q= **64,933** L/day

Long Term Dewatering Calculations - for Block 1- 340 Ardagh Rd.

Scenario 1

Initial water level (mAMSL) =	242.3
Average sub-drainage level (mAMSL) =	242.2
Height of wall drain or drawdown (m)=	0.1
Underground level area (m2) =	490

$$Q' = \frac{K(h_0^2 - h_L^2)}{2L}$$

k	1.66E-05	m/s
R=3000*h*SQRT(K)	1.2	m
h0	1.1	m
hL	1	m
L = R/2	0.6	m
Q (Flux)	2.85E-06	m2/s
Equivalent Perimeter Length	88.5	m
Q (Subdrain)	**21,825**	**L/d**
Q (Sub Drain)	**0.3**	**L/s**
Saftey Factor	1.5	
Q (Subdrain)	**32,738**	**L/d**
Q (Sub Drain)	**0.4**	**L/s**

APPENDIX F

SIRATI & PARTNERS

Geotechnical Hydrogeological & Environmental Solutions

DETAILED WATER BALANCE CALCULATIONS

334 Ardagh Road, Barrie, ON

1 Climate Information

Precipitation	933	mm/a
Actual Evapotranspiration	556	mm/a
Water Surplus	377	mm/a

2 Infiltration Rates

Table 2 Approach - Infiltration factors

Topography: Rolling land	0.25
Soil Type: Glacial Till (Predominantly sand and gravel)	0.4
Cover: Cultivated Land	0.1
Total	**0.75**

Infiltration (0.75 x 377)	283	mm/a
Run-off (377-283)	94	mm/a

Table 3 Approach - Typical Recharge Rates

Coarse Sand and Gravel	>250	mm/a
Fine to medium sand	200-250	mm/a
Silty sand to sandy silt	150-200	mm/a
Silt	125-150	mm/a
Clayey Silt	100- 125	mm/a
Clay	<100	mm/a

Site development area is underlain predominantly by SILTY SAND to SANDY SILT soils

Based on the above, the recharge rate is typically 150-200 mm/a

3 Pre-Development Property Statistics	**ha**	**m2**
Paved Area	0.002875	28.75
Roof Area	0.028488	284.88
Landscape Area	0.118543	1,185
Total	**0.1499**	**1,499**

4 Post-Development Property Statistics	**ha**	**m2**
Paved Area	0.01925	193
Roof Area	0.070323	703
Gravel Bed	0.00282	28
Landscape Area	0.05751	575
Total Land Area	**0.149903**	**1,499**

5. Annual Pre-Development Water Balance

Land Use		Area (m^2)	Precipitation (m^3)	Evapotranspiration (m3)	Infiltration (m^3)	Run-off (m^3)
Impervious Areas	Paved Area	29	27	3	0	24
	Building/Roof Area	285	266	27	0	239
Pervious Areas	Landscape Area	1185	1106	659	335	112
		1499	**1399**	**688**	**335**	**375**

Assuming no infiltration occurring in paved and roof areas, and 10% of precipitation to be evaporated from paved and roof areas.

6. Annual Post-Development Water Balance

Land Use		Area (m^2)	Precipitation (m^3)	Evapotranspiration (m3)	Infiltration (m^3)	Run-off (m^3)
Impervious Areas	Paved Area	193	180	18	0	162
	Building/Roof Area	703	656	66	0	591
Pervious Areas	Landscape Area	575	402	320	62	21
	Gravel Bed	28	20	16	3	1
		1,499	**1,258**	**419**	**65**	**774**

Assuming no infiltration occurring in paved and roof areas, 10% of precipitation to be evaporated from paved and general roof areas.

7. Comparision of Pre- and Post -Development

	Precipitation (m^3)	Evapotranspiration (m3)	Infiltration (m^3)	Run-off (m^3)
Pre-Development	**1,399**	**688**	**335**	**375**
Post-Development	**1,399**	**419**	**65**	**774**
Change in Volume		**-269**	**-270**	**399**
Change in %			**-81**	**106**

8. Requirement for Infiltration of Roof Run-off

Volume of Pre-Development Infiltration	335
Volume of Post-Development Infiltration	65
Deficit from Pre to Post Development Infiltration	270
Percentage of Roof Runoff required to match the pre-development infiltration	46

DETAILED WATER BALANCE CALCULATIONS

340 Ardagh Road, Barrie, ON

1 Climate Information

Precipitation	933	mm/a
Actual Evapotranspiration	556	mm/a
Water Surplus	377	mm/a

2 Infiltration Rates

Table 2 Approach - Infiltration factors

Topography: Rolling land	0.25
Soil Type: Glacial Till (Predominantly sand and gravel)	0.4
Cover: Cultivated Land	0.1
Total	**0.75**

Infiltration (0.75 x 377)	283	mm/a
Run-off (377-283)	94	mm/a

Table 3 Approach - Typical Recharge Rates

Coarse Sand and Gravel	>250	mm/a
Fine to medium sand	200-250	mm/a
Silty sand to sandy silt	150-200	mm/a
Silt	125-150	mm/a
Clayey Silt	100- 125	mm/a
Clay	<100	mm/a
Site development area is underlain predominantly by SILTY SAND to SANDY SILT soils		
Based on the above, the recharge rate is typically	150-200	mm/a

3 Pre-Development Property Statistics	**ha**	**m2**
Paved Area	0.0157	157
Roof Area	0.0223	223
Landscape Area	0.111832	1,118
Total	**0.149832**	**1,498**

4 Post-Development Property Statistics	**ha**	**m2**
Paved Area	0.01918	192
Roof Area	0.070323	703
Grevel Bed	0.003264	33
Landscape Area	0.057066	571
Total Land Area	**0.149833**	**1,498**

5. Annual Pre-Development Water Balance

Land Use		Area (m^2)	Precipitation (m^3)	Evapotranspiration (m3)	Infiltration (m^3)	Run-off (m^3)
Impervious Areas	Paved Area	157	146	15	0	132
	Building/Roof Area	223	208	21	0	187
Pervious Areas	Landscape Area	1,118	1,043	622	316	105
		1,498	**1,398**	**657**	**316**	**424**

Assuming no infiltration occurring in paved and roof areas, and 10% of precipitation to be evaporated from paved and roof areas.

6. Annual Post-Development Water Balance

Land Use		Area (m^2)	Precipitation (m^3)	Evapotranspiration (m3)	Infiltration (m^3)	Run-off (m^3)
Impervious Areas	Paved Area	192	179	18	0	161
	Building/Roof Area	703	656	66	0	591
Pervious Areas	Landscape Area	571	399	317	62	21
	Gravel Bed	33	23	18	4	1
		1,498	**1,257**	**419**	**65**	**773**

Assuming no infiltration occurring in paved and roof areas, 10% of precipitation to be evaporated from paved and general roof areas.

7. Comparision of Pre- and Post -Development

	Precipitation (m^3)	Evapotranspiration (m3)	Infiltration (m^3)	Run-off (m^3)
Pre-Development	**1,398**	**657**	**316**	**424**
Post-Development	**1,398**	**419**	**65**	**773**
Change in Volume		**-238**	**-251**	**349**
Change in %			**-79**	**82**

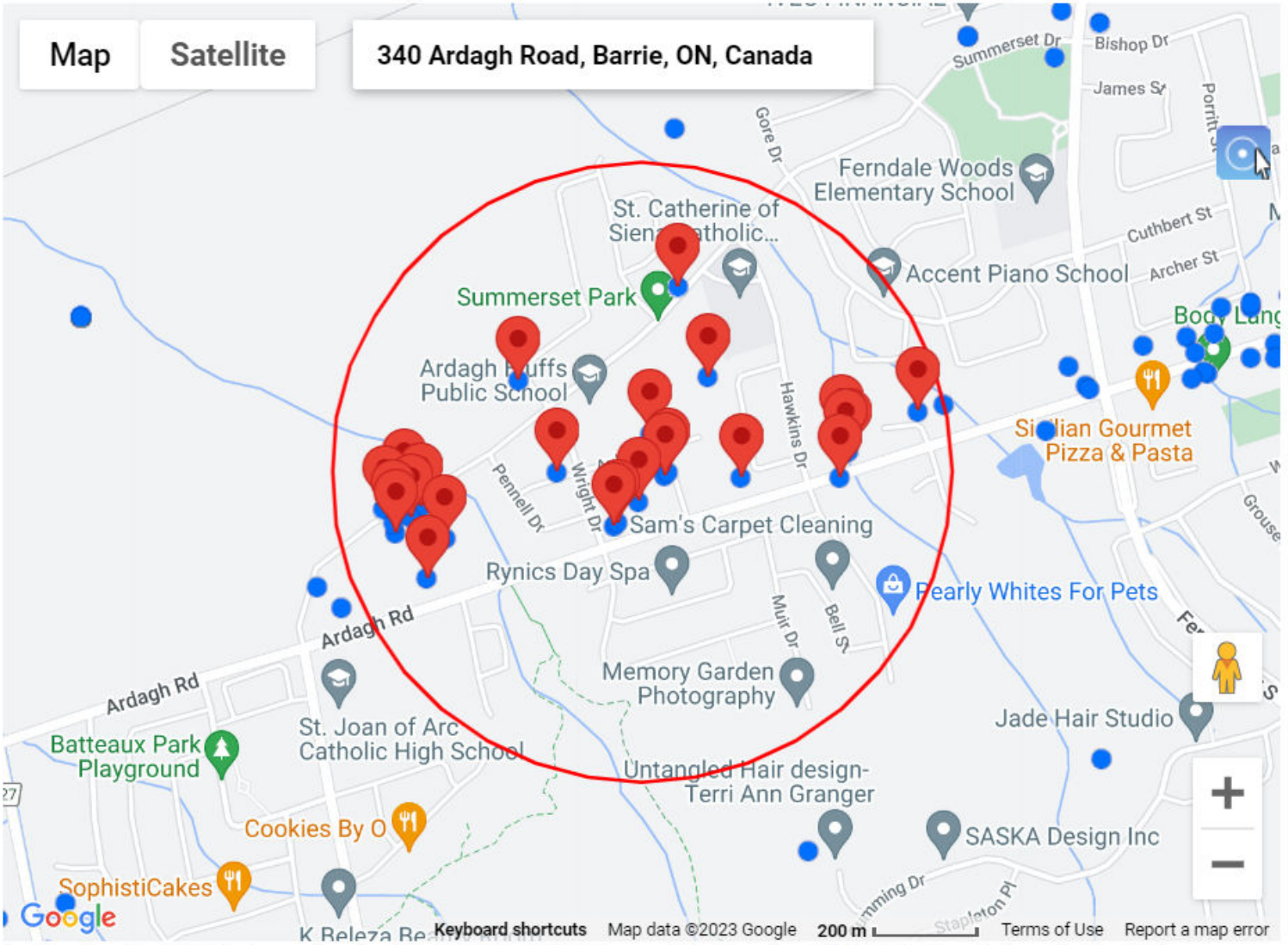
8. Requirement for Infiltration of Roof Run-off

Volume of Pre-Development Infiltration	316
Volume of Post-Development Infiltration	65
Deficit from Pre to Post Development Infiltration	251
Percentage of Roof Runoff required to match the pre-development infiltration	43

APPENDIX G

SIRATI & PARTNERS

Geotechnical Hydrogeological & Environmental Solutions



Latitude:44.35424, Longitude:-79.73016 (UTM Zone:17, Easting:601201, Northing:4912003)

Well ID	Well Record Information	Well Tag # (since 2003)	Audit #	Contractor Lic#	Well Depth (m)
5701514	PDF|HTML	N/A	N/A	4715	18.3
5701688	PDF|HTML	N/A	N/A	4753	9.1
5709611	PDF|HTML	N/A	N/A	4608	7.0
5710470	PDF|HTML	N/A	N/A	4608	7.6
5719410	PDF|HTML	N/A	N/A	1467	27.1
5719579	PDF|HTML	N/A	N/A	1467	26.8
5728987	PDF|HTML	N/A	111289	3602	25.9
5731300	PDF|HTML	N/A	148244	3602	21.9
5734834	PDF|HTML	N/A	156610	2801	94.5
5738948	PDF|HTML	A010794	Z11826	6607	3.0
7149889	PDF|HTML	A097054	Z111899	7219	N/A
7150340	PDF|HTML	N/A	Z103426	2513	N/A
7303756	PDF|HTML	A217625	Z274175	7241	4.9

7303756	PDF | HTML	A217625	Z274175	7241	4.9
7303914	PDF | HTML	A217647	Z274174	7241	4.6
7333788	HTML	A139489	Z265166	7314	2.3
7384091	PDF | HTML	A312273	Z354319	7744	N/A
7384093	PDF | HTML	A312275	Z354338	7744	N/A
7384094	PDF | HTML	A312272	Z354322	7744	N/A
7401741	PDF | HTML	A240942	EO8O5MTA	7732	N/A
7401767	PDF | HTML	_NO_TAG	X99N6RXV	7732	N/A
7401770	PDF | HTML	_NO_TAG	IESUHAK5	7732	N/A
7401773	PDF | HTML	_NO_TAG	ON9TI9CG	7732	N/A
7420205	PDF | HTML	A352844	IPBDBXI4	7360	7.6
7420206	PDF | HTML	A352846	OERUEGBN	7360	10.7

APPENDIX H

SIRATI & PARTNERS

Geotechnical Hydrogeological & Environmental Solutions

LIMITATION AND USE OF THE REPORT

This report was produced by SIRATI for the Client and may not be relied upon by any other person or entity without the written authorization of SIRATI. The conclusions presented in this report are professional opinions based on the historical and current records search, visual observations and limited information provided by persons knowledgeable about past and current activities on this site. As such, SIRATI cannot be held responsible for environmental conditions at the Property that was not apparent from the available information. No investigation method can completely eliminate the possibility of obtaining partially imprecise or incomplete information; it can only reduce the possibility to an acceptable level.

Professional judgement was exercised in gathering and analyzing data and formulation of recommendations using current industry guidelines and standards. Similar to all professional persons rendering advice, SIRATI cannot act as absolute insurer of the conclusion we have reached. No additional warranty or representation, expressed or implied, is included or intended in this report other than stated herein the report.

The assessment should not be considered a comprehensive audit that eliminates all risks of encountering environmental problems. The information presented herein this report is primarily based on information collected during the hydrogeological study based on the condition of the Property at the time of site inspection/drilling followed by a review of historical data, as appended to this report.

In assessing the environmental setting of the Property, SIRATI has solely relied upon information supplied by others in good faith and has therefore assumed that the information supplied is factual and accurate. We accept no responsibility for any inaccurate information, misrepresentation or for any deficiency of the information supplied by any third party.

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In the event that during future work new information regarding the environmental/hydrogeological condition of the Property is encountered, or in the event that the outstanding responses from the regulatory agencies indicate outstanding issues on file with respect to the Property, SIRATI should be notified in order that we may re-evaluate the findings of this assessment and provide amendments, as required.

APPENDIX E

Engineering Plans