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telephone (519) 823-4995 **fax** (519) 941-8120 **web** www.rjburnside.com

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Technical Memorandum

Date: May 15, 2023 **Project No.:** 300043141.0002

Project Name: 1004 Mapleview Drive - Site Plan Approval Hydrogeology Brief

Client Name: 970 Mapleview Construction Inc.

Submitted To: Sal Crimi - S.C. Land Management Inc.

Submitted By: Stephanie Charity, B.Sc., P.Geo.

Reviewed By: Dwight Smikle, M.Sc., P.Geo

1.0 Introduction

R.J. Burnside & Associates Limited (Burnside) has been requested to prepare the following hydrogeological brief to support submission of an application for Site Plan Approval at 1004 Mapleview Drive, Barrie Ontario (herein referred to as the subject lands). The legal address is Block 211 51M-1221-1004 Mapleview Drive, Town of Barrie, Ontario.

The subject lands are located within the 970 Mapleview Inc. lands that were previously studied by Burnside and for which a report entitled “Hydrogeological Study in Support of Draft Plan – 970 Mapleview Construction Inc. Barrie, Ontario” was completed in November 2019. The current hydrogeology brief draws from the work previously completed as the hydrogeological conditions are consistent with the previous work.

The subject lands are approximately 1.73 ha located on Mapleview Drive East in the southeast portion of the 970 Mapleview Inc. lands (Figure 1). The Site Plan (4 Architecture Inc.) includes townhomes with parking and amenity space (Appendix A).

2.0 Hydrogeological Setting

The local soils underlying the subject lands were investigated as a part of various studies that were previously completed, including the Burnside hydrogeological study and geotechnical studies completed by Golder. Details of local soils and soil stratigraphy are outlined in the Burnside 2019 report (see attached borehole location plan, Figure 2). Numerous boreholes were drilled as part of previous studies to determine the properties of the underlying soils. The locations of boreholes drilled in the area of the subject lands are shown on Figure 2 (attached).

Boreholes logs from boreholes in the vicinity of the subject lands are provided in Appendix B. The boreholes provide sufficient confirmation that the geology of the subject lands is consistent with that of the previous study.

The boreholes indicate that the local soils in the vicinity of the subject lands consist of sandy silt to silty sand in the shallow overburden. Geological cross-sections were produced as part of the Burnside study and indicated that the 970 Mapleview lands are underlain by a layer of sand and silt with a thickness of up to 13 m overlying silt clay till. Cross-section A-A', produced for the current study illustrates the interpreted hydrogeological setting beneath the subject lands (Figure 3) and confirms that the setting is consistent with the findings of the earlier Burnside report. Based on this interpretation the shallow overburden conditions are considered to be relatively consistent across space and data gathered for locations within the immediate vicinity of the subject lands are representative of conditions on the subject lands.

2.1 Seasonal Groundwater High

Groundwater monitoring was completed as part of previous studies at monitoring wells in the vicinity of the subject lands. Hydrographs from these studies are provided in Appendix C. The groundwater data are summarized below in Table 1 for wells located in the vicinity of the subject lands.

Table 1: Groundwater Levels

Well	Highest GW Level	Distance to Site
BH16-30	255.5 masl (7.33 mbgs)	100 m west
BH-A	255.17 masl (4.20 mbgs)	50 m east
BH-C	255.69 masl (4.85 mbgs)	150 m east

Seasonal groundwater highs in the vicinity of the subject lands range from 255.2 masl to 255.7 masl. At BH16-30, the well is installed in a sand layer and groundwater is found at depths greater than 7 m and varies by 0.5 m. At BH-C, water was encountered during drilling below 6 m and groundwater levels are measured as high as 4.9 mbgs. At BH-A, the seasonal groundwater high is 4.2 mbgs.

Based on preliminary grading drawings available at this time, the groundwater should be well below any proposed building foundations (approximately 260 masl) meeting the minimum separation of 0.5 m between bottom of foundations and seasonal groundwater high.

2.2 Hydraulic Conductivity

In situ hydraulic conductivity testing was completed at wells in the vicinity of the subject lands (BH16-30 and BH-A) as part of previous studies. The geological setting indicates that the properties of these sediments are similar to those found on the subject lands. The results are provided in Appendix D and summarized below in Table 2.

Table 2: Estimated Hydraulic Conductivity from In Situ Well Tests

Well	Screened Formation	Depth of Screen (mbgl)	Hydraulic Conductivity (m/sec) In Situ Test
BH16-30	Sand	7.3 – 9.1	4.5×10^{-5}
BH-A	Sand	4.7 – 6.8	5.98×10^{-5}

*meters below ground level

The results of the in situ hydraulic conductivity testing indicate that hydraulic conductivity of the sand is in the range of 10^{-5} m/s.

2.3 Significant Groundwater Recharge Areas

The available LSRCA mapping indicates that the subject lands are located within a Significant Groundwater Recharge Area (SGRA). Boreholes in the vicinity of the subject lands (Appendix B) indicate that surficial sediments consist of sand and compact to dense sandy silt till. When combined with the water level information, these data suggest that groundwater recharge may be occurring in the area. Under the Lake Simcoe Protection Plan, post-development recharge is expected to match pre-development recharge for both water quantity and quality in an SGRA.

3.0 Groundwater Balance

Development of an area affects the natural water balance. The most significant difference between pre- and post-development conditions is the addition of impervious surfaces as a type of surface cover (i.e., roads, parking lots, driveways, and rooftops). Impervious surfaces prevent infiltration of water into the soils and the removal of the vegetation removes the evapotranspiration component of the natural water balance resulting in evaporation as the only remaining loss mechanism (beside runoff).

To minimize the potential impacts of development on the water balance, the use of Low Impact Development (LID) measures for stormwater management are generally recommended. A water balance and stormwater management plan was completed for the entirety of the subdivision as part of Draft Plan approval (Burnside, 2019). The plan included considerations for the subject lands and LID measures recommended during the previous study allowed for mitigation of recharge losses. The current proposed land use and impervious fractions are in keeping with the previous analysis and no changes to water balance or mitigation measures are anticipated. As a result, decreases in infiltration on the subject lands are expected to be mitigated by directing runoff to stormwater management pond SWM14.

4.0 Dewatering

The Ministry of the Environment, Conservation and Parks (MECP) has regulations that govern water taking for construction dewatering. Water takings above 50,000 L/day but below 400,000 L/day require registration under Environmental Activity Sector Registry (EASR). Takings above 400,000 L/day require a Category 3 Permit to Take Water (PTTW).

The groundwater table in the vicinity of the subject lands ranges between 4.2 m and 7.3 m below ground surface.

This is well below the expected depth of excavations associated with servicing connections and building foundations. Based on the anticipated depth of excavations for service installation and the depth to water table, the need for dewatering is not anticipated. Since construction dewatering and foundation drain dewatering is not proposed, there should be no impact to any private supply wells within 300 m of the subject lands.

R.J. Burnside & Associates Limited

Stephanie Charity, B.Sc., P.Geo.
Hydrogeologist

Dwight Smikle, M.Sc., P.Geo.
Senior Hydrogeologist

DS/SC:cl

Enclosure(s) Figures
Appendix A – Site Plan
Appendix B – Borehole Logs
Appendix C – Hydrographs
Appendix D – Hydraulic Conductivity Testing

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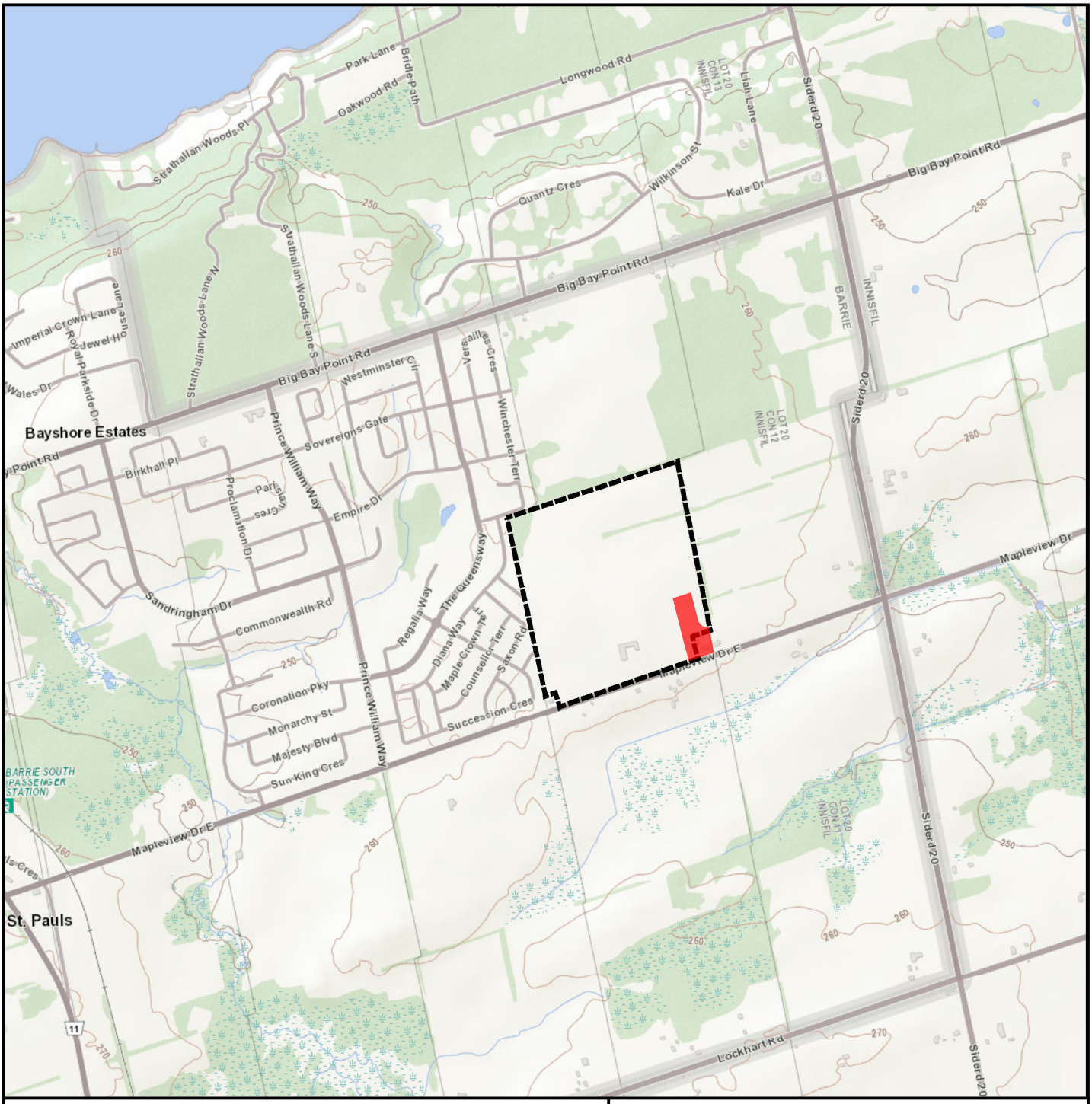
Figures



LEGEND

- SUBJECT LANDS (BLOCK 537)
- 970 MAPLEVIEW INC. LANDS

0 250 500 1,000 1,500
Metres

N

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Client / Report

970 MAPLEVIEW INC.
1004 MAPLEVIEW DRIVE
SITE PLAN APPLICATION
HYDROGEOLOGICAL BRIEF

Figure Title:

SITE LOCATION

Drawn	Checked	Date	Figure No.
SK	SC	May 2023	1
Scale		Project No.	
1:20,000		300043141.2000	

File Path:Nigel/Shared Work Areas/ A:\043141 970 Mapleview\06_GIS\Hydrogeological Brief\Report #1\043141 Site Location.mxd Print Date: 2023/05/11 Time: 09:19 AM

LEGEND

- SUBJECT LANDS (BLOCK 537)
- 970 MAPLEVIEW INC. LANDS
- MONITORING WELL (RJB, 2014)
- MONITORING WELL (GOLDER, 2016)
- MONITORING WELL (EXP, 2020)
- BOREHOLE (GOLDER, 2016)
- BOREHOLE (EXP, 2020)
- MECP WELL RECORD LOCATION
- A A' CROSS-SECTION LOCATION KEY

0 50 100 200 300 400
Metres

N

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Client / Report

970 MAPLEVIEW INC.
1004 MAPLEVIEW DRIVE

SITE PLAN APPLICATION
HYDROGEOLOGICAL BRIEF

Figure Title

BOREHOLE, WELL AND CROSS-SECTION PLAN

Drawn	Checked	Date	Figure No.
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Scale		Project No.	
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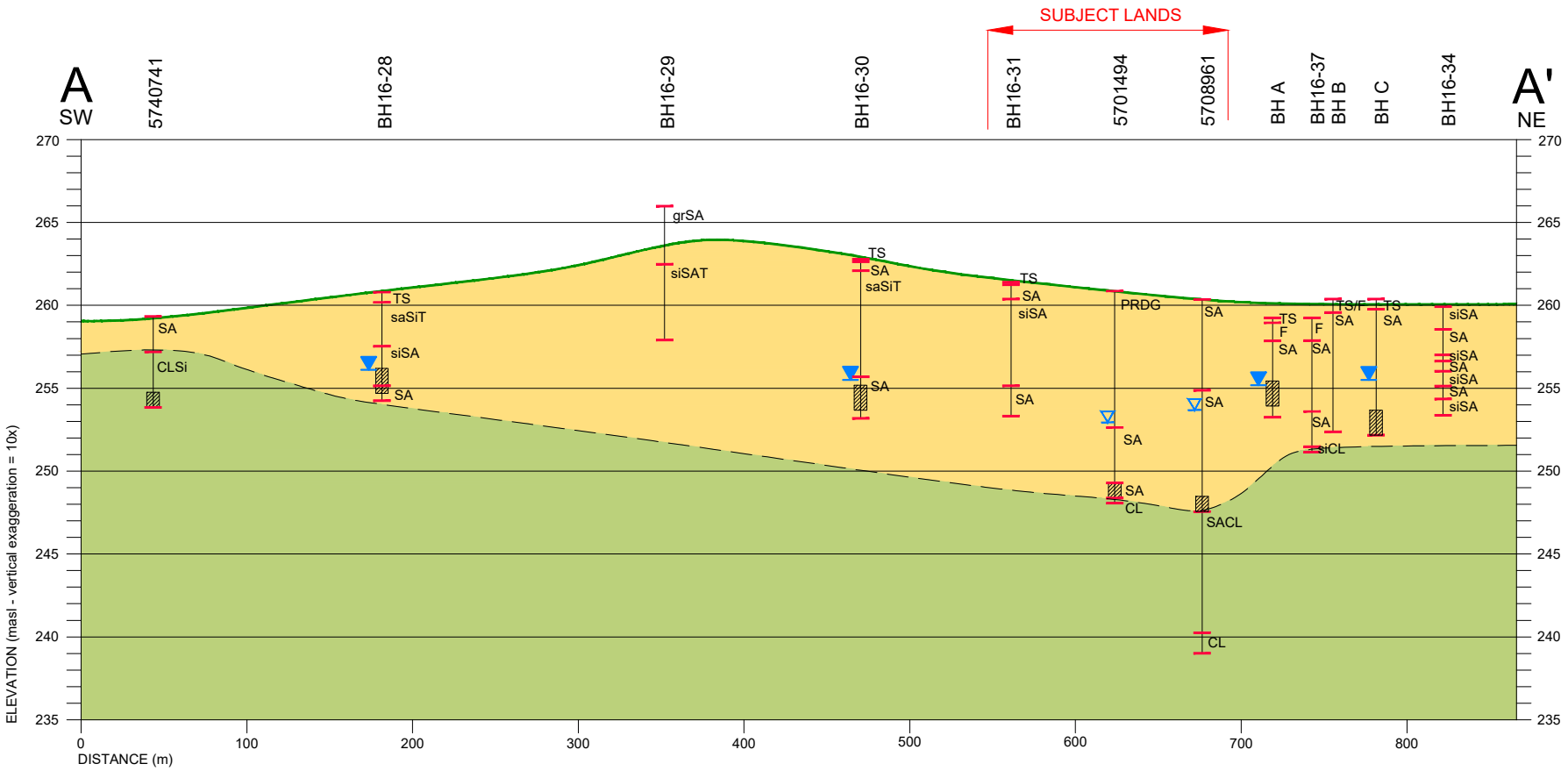

LEGEND

BH1 — WELL NUMBER / ID

EXISTING GROUND PROFILE

GEOLOGICAL CONTACT

STATIC WATER LEVEL (MECP WELL RECORD)

SEASONAL HIGH GROUNDWATER LEVEL

WELL SCREEN

si	SILTY
sa	SANDY
cl	CLAYEY
F	FILL
T	TILL
GR	GRAVEL
SA	SAND
Si	SILT
CL	CLAY

INTERPRETED STRATIGRAPHY

SAND / SILT / GRAVEL

SILT CLAY TILL

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1004 MAPLEVIEW DRIVE

SITE PLAN APPLICATION
HYDROGEOLOGICAL BRIEF

Figure Title

INTERPRETED GEOLOGICAL CROSS-SECTION A-A'

Drawn	Checked	Date	Figure No.
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Scale		Project No.	
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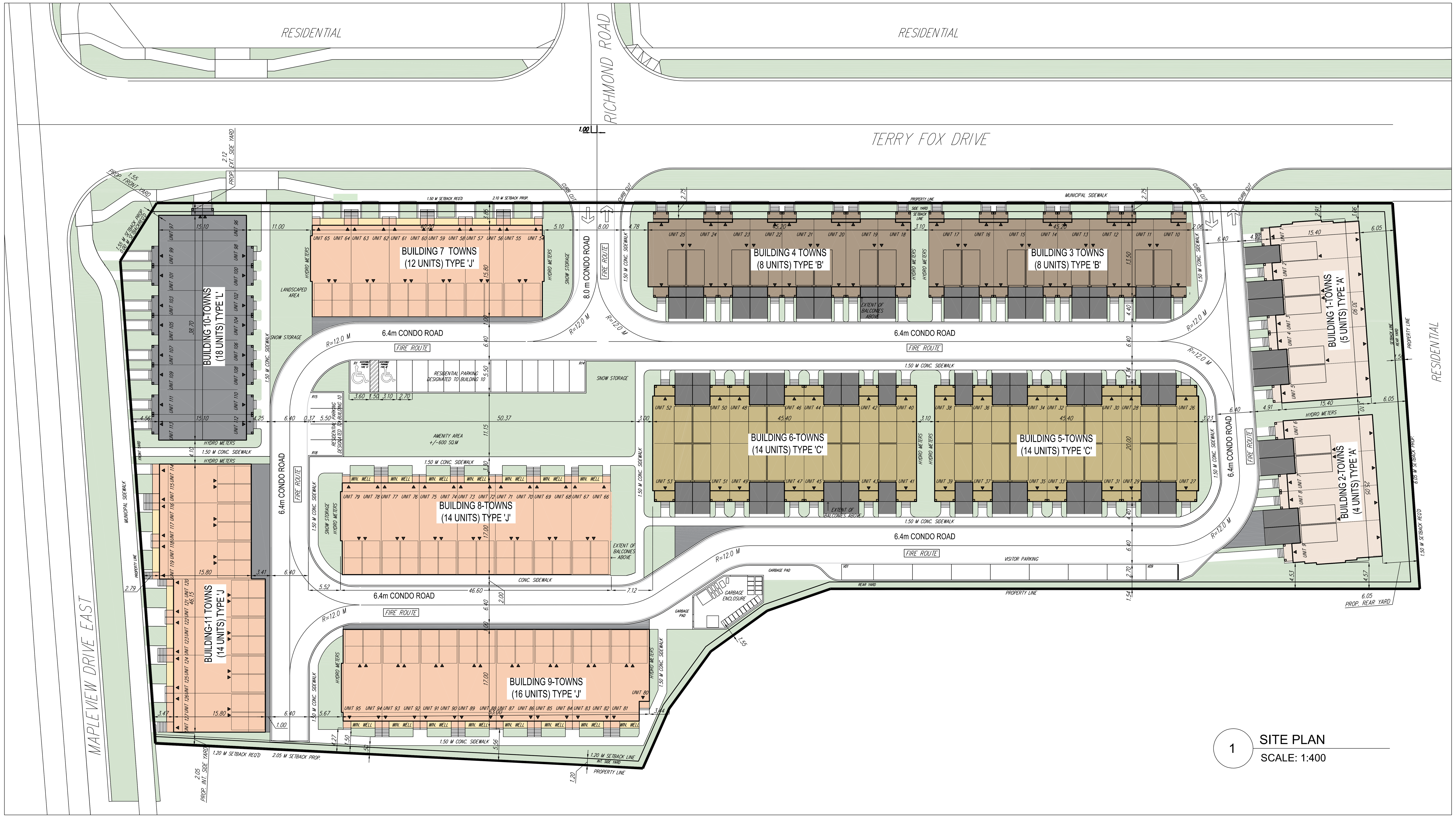
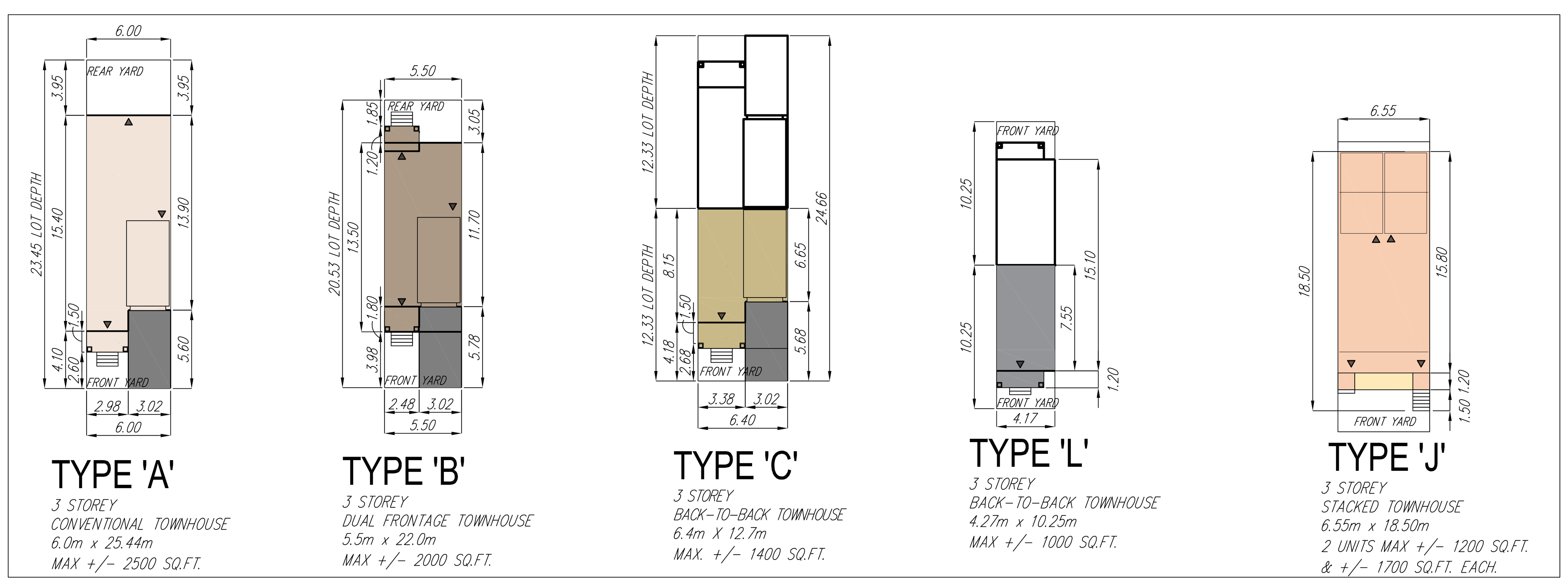
Appendix A

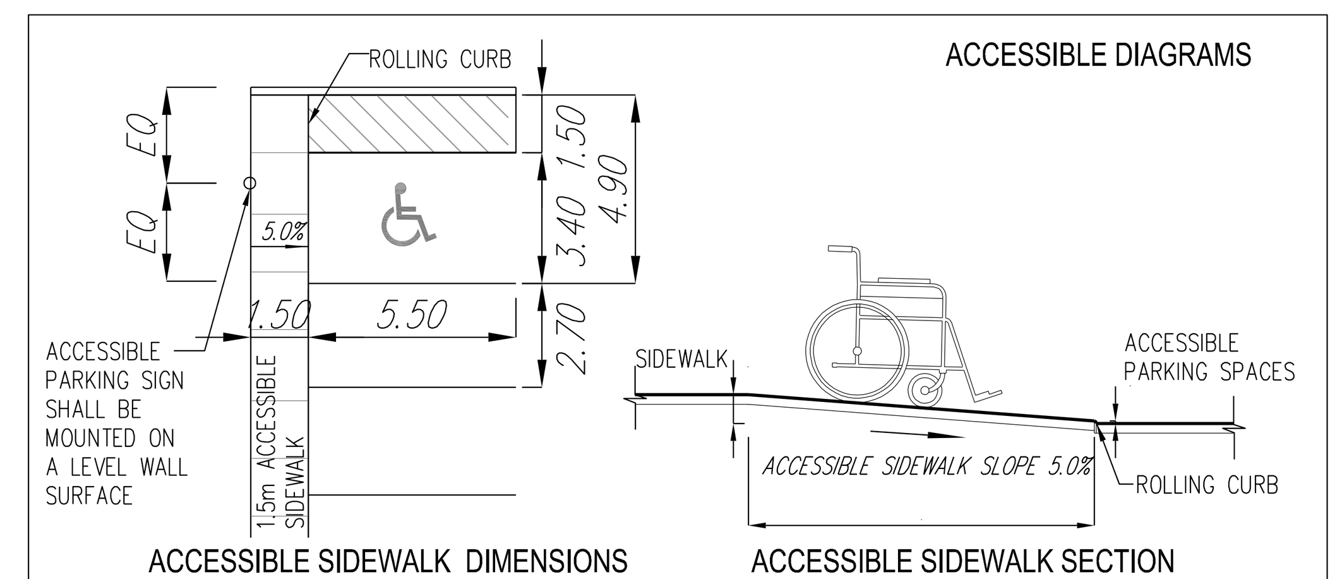
Site Plan

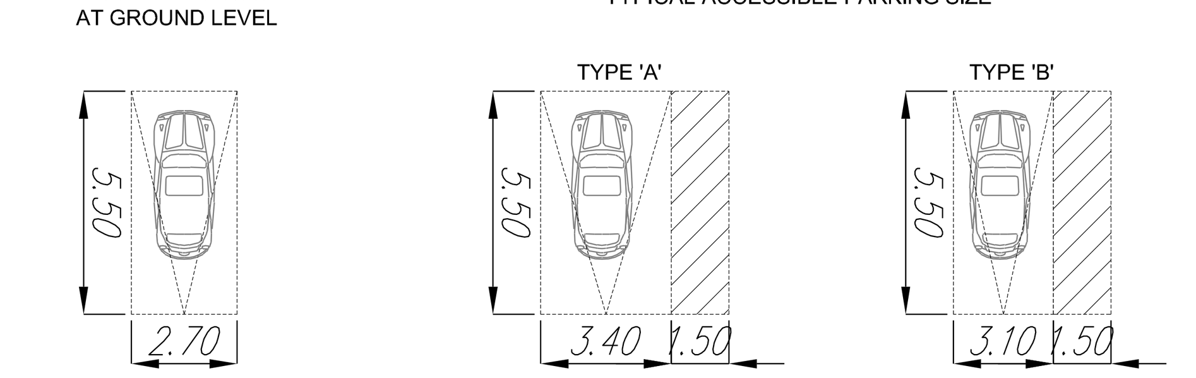


1 SITE PLAN
SCALE: 1:400



ACCESSIBLE DIAGRAMS





COMPLY TO CITY OF BARRIE PARKING STANDARDS BY-LAW 2009-141.

BY-LAW 2005-188

NOTES:
- SIGNS TO BE SET AT AN ANGLE OF NOT LESS THAN 30 DEGREES AND NOT MORE THAN 45 DEGREES, TO A LINE PARALLEL TO THE FLOW OF TRAFFIC AND SHOULD ALWAYS BE VISIBLE TO APPROACHING TRAFFIC
- SIGNS TO BE PLACED ON EITHER SITE (STAGGERED) OF THE FIRE ACCESS ROUTE AT INTERVALS OF NOT MORE THAN 30.0 METRES (100 FEET) APART.
- SIGNS SHALL NOT EXCEED 2.0 METRES (7 FEET) AND NOT LESS THAN 1.5 METRES (5 FEET) IN HEIGHT MEASURED FROM THE BOTTOM OF THE SIGN TO THE FINISHED PAVEMENT/GRADE.
- SIGNS SHALL BE INSTALLED AT MAXIMUM OF 3 METRES (10 FEET) AND A MINIMUM OF 1.0 METRE (3 FEET) MEASURED HORIZONTALLY FROM THE CURB.
- SIGNS SHALL BE INSTALLED SO THAT THERE ARE NO OBSTRUCTIONS WITHIN 6.0 METRES (20 FEET) OF THE SIGN AND BE VISIBLE TO APPROACHING TRAFFIC.
- SIGNS SHALL DISPLAY SINGLE HEADED ARROWS POINTING IN THE DIRECTION WHICH THE REGULATION IS IN EFFECT. AT INTERMEDIATE POINTS THROUGHOUT THE REGULATED AREA, DOUBLE-HEADED AREAS SHALL INDICATE THAT THE PROHIBITION OR RESTRICTION EXISTS IN EACH DIRECTION.
- ALL SIGNAGE AND INSTALLATION OF THE FIRE ACCESS ROUTE SIGN(S) MUST ALSO CONFORM TO THE REQUIREMENTS AS OUTLINED IN THE CITY OF BARRIE BY-LAW #2005-188 AS AMENDED (PARKING BY-LAW).

*** REFER TO CITY OF BARRIE FIRE ROUTE SIGNAGE AND INSTALLATION SPECIFICATIONS (CURRENT VERSION) FOR A COMPLETE LIST OF REQUIREMENTS ***

VAN ACCESSIBLE PARKING SIGN N.T.S.

NOTES:
SIGNS TO BE PLACED TO BE VISIBLE AND CLEARLY DIRECT USERS TO ACCESSIBLE PARKING AREAS (VAN ACCESSIBLE) THROUGHOUT THE SITE

ACCESSIBLE PARKING SIGN N.T.S.

NOTES:
SIGNS TO BE PLACED TO BE VISIBLE AND CLEARLY DIRECT USERS TO ACCESSIBLE PARKING AREAS THROUGHOUT THE SITE

SITE STATISTICS

STANDARDS REFLECT PARENT BYLAW REQUIREMENTS UNLESS DENOTED OTHERWISE. NUMBERS IN SQUARE BRACKETS INDICATES ZONING BYLAW ASSOCIATED WITH SPECIFIED STANDARD.

PARENT BYLAW: 2009-141
SITE SPECIFIC BYLAW:
PROPOSED ZONING DESIGNATION: MIXED USE (SECTION 14 -HEWITT & SALEM LANDS)

1.0 SITE STANDARDS

SITE AREA	17,309 sq.m (4.28 ac) [1.73 ha]		
PROPOSED DENSITY	127 units / 1.73 ha = 73.41 units per hectare (ha)		
PROPOSED FAR	+/-18,374 sq.m. / 17,309 sq.m. = +/-1.06		
GROSS	PROPOSED		
FLOOR AREA (GFA)	BUILDING 1	TYPE A X 5	+/-12,485 sq.ft.
	BUILDING 2	TYPE A X 4	+/-10,020 sq.ft.
	BUILDING 3	TYPE B X 8	+/-16,185 sq.ft.
	BUILDING 4	TYPE B X 8	+/-16,185 sq.ft.
	BUILDING 5	TYPE C X 14	+/-20,490 sq.ft.
	BUILDING 6	TYPE C X 14	+/-20,490 sq.ft.
	BUILDING 7	TYPE J X 6	+/-18,140 sq.ft.
	BUILDING 8	TYPE J X 7	+/-21,140 sq.ft.
	BUILDING 9	TYPE J X 8	+/-23,930 sq.ft.
	BUILDING 10	TYPE L X 18	+/-17,640 sq.ft.
	BUILDING 11	TYPE J X 7	+/-21,075 sq.ft.
	TOTAL	+/-197,780 sq.ft.	+/-18,374 sq.m.

2.0 LOT STANDARDS

ZONING STANDARD		REQUIRED (NUMBERS HAVE BEEN CONVERTED TO METRIC AS REQUIRED)	PROPOSED		
MAXIMUM NUMBER OF DWELLING UNITS			BUILDING 1	5 UNITS	TOTAL
			BUILDING 2	4 UNITS	
			BUILDING 3	8 UNITS	
			BUILDING 4	8 UNITS	
			BUILDING 5	14 UNITS	
			BUILDING 6	14 UNITS	
			BUILDING 7	12 UNITS	
			BUILDING 8	14 UNITS	
			BUILDING 9	14 UNITS	
			BUILDING 10	18 UNITS	
			BUILDING 11	14 UNITS	127 UNITS
LOT FRONTAGE			+/- 93.6 M		
MINIMUM FLOOR AREA					
MAXIMUM BUILDING HEIGHT		12 STOREYS	3 STOREYS		
MAXIMUM COVERAGE		N/A			
SETBACKS / TOWNHOUSES	FRONT YARD	0.00 m	1.55 m		
	EAST INTERIOR SIDE YARD	1.20 m	2.05 m		
	WEST EXTERIOR SIDE YARD	1.50 m	2.12 m		
	REAR YARD	1.50 m	6.05 m		
BUILDING COVERAGE			BUILDING 1	+/- 475 sq.m	TOTAL
			BUILDING 2	+/- 385 sq.m	
			BUILDING 3	+/- 655 sq.m	
			BUILDING 4	+/- 655 sq.m	
			BUILDING 5	+/- 925 sq.m	
			BUILDING 6	+/- 925 sq.m	
			BUILDING 7	+/- 690 sq.m	
			BUILDING 8	+/- 805 sq.m	
			BUILDING 9	+/- 920 sq.m	
			BUILDING 10	+/- 665 sq.m	
			BUILDING 11	+/- 805 sq.m	+/-7,905 sq.m
MINIMUM BUILDING SEPARATION			BLDG. 1 - BLDG. 2	BLDG. 3 - BLDG. 4	
			3.10 m	3.10 m	
MINIMUM LANDSCAPE STRIP @ WEST LOT LINE					
MINIMUM FRONT YARD LANDSCAPING					
MINIMUM LANDSCAPE OPEN SPACE					

3.0 ADDITIONAL PROVISIONS

ZONING STANDARD	COMPLIANCE YES	NO

4.0 AMENITY AREAS

AMENITY AREAS (5.4.2.2) RESIDENTIAL USES	REQUIRED 12 SQ.M/ UNIT	PROPOSED	TOTAL
TYPE A = +/- 35 SQ.M PER UNIT		35 x 9 = +/- 315 SQ.M.	
TYPE B = +/- 12 SQ.M PER UNIT		12 x 16 = +/- 192 SQ.M.	
TYPE C = +/- 12 SQ.M PER UNIT		12 x 28 = +/- 336 SQ.M.	
TYPE J TOP+BOTTOM UNIT = +/-31 sq.m		31 x 28 = +/- 868 SQ.M.	
TYPE L = +/- 3 SQ.M PER UNIT		3 x 18 = +/- 54 SQ.M.	
AMENITY AREA		+/- 600 SQ.M.	
	1,524 SQ.M		+/-2,365 SQ.M COMPLIANCE

5.0 VEHICULAR PARKING REQUIREMENT

ZONING STANDARD	REQUIRED	PROPOSED AT GRADE	UNDERGROUND	TOTAL
VEHICULAR PARKING REQUIREMENTS				
RESIDENT PARKING	1 / UNIT 127	127	0	127 RESIDENT
VISITOR PARKING	0 / UNIT 0	9	0	9 VISITOR
				136
MINIMUM PARKING SPACE WIDTH	2.70 m	2.70 m		
MINIMUM PARKING SPACE LENGTH	5.50 m	5.50 m		
ACCESSIBLE PARKING				
MINIMUM NUMBER OF ACCESSIBLE PARKING SPACES	2 SPACES (1 TYPE A+ 1 TYPE B)	2	0	2 ACCESSIBLE
MIN. ACCESSIBLE PARKING	3.40m TYPE A	COMPLIANCE		
MIN. ACCESSIBLE PARKING	3.10m TYPE B	COMPLIANCE		
BICYCLE PARKING REQUIREMENTS				
RESIDENT PARKING RANGE	0 / UNIT 0			

6.0 SNOW STORAGE

AREA OF PARKING LOT	AS SHOWN
AREA OF SNOW STORAGE	AS SHOWN

SSHABANI \ Thursday, May 04, 2023 3:19 PM \ K:\PROJECTS\2020\220087.FERN\4.0 SITE DRAWINGS\4.5 CURRENT SITE PLAN\220087-EAST-BLOCK 211 51M-1221-1004 MAPLEVIEW DRIVE EAST.DWG

APPLICATION NUMBER:

APPLICATION NUMBER:

THIS DRAWING IS AN INSTRUMENT OF SERVICE, IS PROVIDED BY AND IS THE PROPERTY OF '4 ARCHITECTURE INC.'

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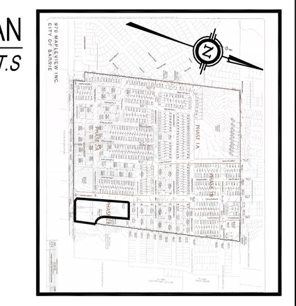
DRAWINGS ARE NOT TO BE SCALED.

OWNER INFORMATION
CLIENT NAME
ADDRESS 1
ADDRESS 2

KEY PLAN
N.T.S



LEGAL DESCRIPTION OF PROPERTY:
BLOCK 211 51M-1221-1004 MAPLEVIEW DRIVE.
TOWN OF BARRIE, ONTARIO

SITE LEGEND

- ENGINEERED FILL LOTS
- STREET TREE
- RETAINING WALL
- CATCH BASIN
- DOUBLE / SINGLE STM & SAN CONNECTION
- HYDRO TRANSFORMER
- PADMOUNTED MOTOR
- 190.10 EXISTING GRADES
- 190.10 PROPOSED GRADES
- 2.0% SWALE DIRECTION
- EMBANKMENT / BERM MAX 3:1 SLOPE
- BELL PEDESTAL
- CABLE PEDESTAL
- HYDRO POLE
- HYDRO POLE GUY
- STREET SIGN
- COMMUNITY MAILBOX
- WATER SERVICE
- HYDRO SERVICE
- SHEET DRAINAGE
- STREET LIGHT PEDESTAL
- STREET LIGHT (L.S.)
- BUILDING LIGHT (W.L.)
- TRAFFIC SIGNAL POWER PEDESTAL
- DOWNSPOUTS
- WINDOWS PERMITTED
- FIRE WALL (NO WINDOWS PERMITTED)
- EXTERIOR DOOR LOCATION
- EXTERIOR DOOR LOCATION IF GRADE PERMITS
- SANITARY LINE
- STORM WATER LINE
- WATERLINE
- HYDRO LINE
- GAS LINE
- CABLE LINE
- BELL
- HYDRO, GAS, BELL, CABLE LINE
- HYDRO METER LOCATION
- PROPOSED GAS METER LOCATION (TO BE CONFIRMED BY EMBRIDGE)
- DOWNSPOUTS
- SUMP PUMP (TO BE DISCHARGE AT GRADE)
- RAIN WATER LEADER -CONNECTED TO STORM SYSTEM (REFER TO SITE & SERVICING DRAWINGS)
- RAIN WATER LEADER -DISCHARGE AT GRADE (REFER TO SITE & SERVICING DRAWINGS)
- TACTILE SURFACE INDICATOR
- SANITARY MANHOLE
- STORM MANHOLE
- VALVE & CHAMBER
- VALVE & BOX
- FIRE HYDRANT
- SUMP PUMP AND SURFACE DISCHARGE LOCATION
- UPGRADE ELEVATION
- CHAIN LINK FENCE
- FENCE AND GATE
- PRIVACY FENCE (REFER TO LANDSCAPE DWGS)
- ACOUSTIC FENCE
- TF THIRD FLOOR
- SF SECOND FLOOR
- FF FINISHED FLOOR
- BF BASEMENT FLOOR
- AVG AVERAGE GRADE
- WOD WALKOUT DECK
- WOB WALKOUT BASEMENT
- WOB WALKOUT BASEMENT
- MOD MODIFIED
- REV REVERSED
- HIGHLIGHTED GRADE
- DIRECTIONAL TRAFFIC ARROW
- SITE SIGNAGE
- BARRIER FREE PARKING STALL
- TRANSFORMER
- REFUSE BIN
- CONDENSING UNIT (REFER TO MECHANICAL)
- SIAMESE CONNECTION
- PEDESTRIAN ACCESS
- MECHANICAL GRATE
- SPLASH PAD
- FIRE ROUTE SIGN
- FIRE EXIT ONLY
- FIRE ROUTE SIGN (NO PARKING)
- BOLLARD c/w LIGHT
- TRAVEL DISTANCE (METERS)
- FIRE ROUTE
- PROPERTY LINE
- 3m or 6m LANDSCAPE BUFFER
- SOFT LANDSCAPE
- SIDEWALK (MUNICIPAL)
- BUILDING FOOTPRINT
- S.P. SUNKEN PATIO (+/-1.5m BELOW GRADE)
- W.W. WINDOW WELL
- DENOTES EXTENT OF LAND DEEDED TO CITY
- DENOTES EXTENT OF LANDS TO BE ACQUIRED BY OWNER

REVISIONS

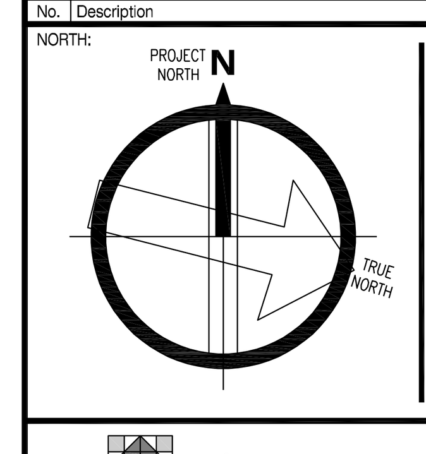
No.	Description	YYYY.MM.DD	By
10.	-	-	-
9.	-	-	-
8.	-	-	-
7.	-	-	-
6.	-	-	-
5.	-	-	-
4.	-	-	-
3.	-	-	-
2.	-	-	-
1.	REVISED AS PER -	-	-

SUBMITTALS

No.	Description	YYYY.MM.DD	By
10.	-	-	-
9.	-	-	-
8.	-	-	-
7.	-	-	-
6.	-	-	-
5.	-	-	-
4.	-	-	-
3.	-	-	-
2.	-	-	-
1.	ISSUED FOR --	-	-

WATERMARK

NORTH:



STAMP:

4 ARCHITECTURE INC.
WWW.4ARCHITECTURE.CA
8966 Woodbine Avenue, Suite 300, Markham, ON L3R 0J7
T. (905) 470 7212 // F. (905) 737 7326 email: mail@4architecture.ca

970 MAPLEVIEW INC.
220087

BARRIE, ONTARIO 1004 MAPLEVIEW DRIVE.

SITE PLAN

Scale	Drawn By	Checked By	
1:400	DS	SS	A001
File Number			
-			

BURNSIDE

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Appendix B

Borehole Logs

PROJECT: 1661309

LOCATION: N 4912310.49; E 611545.68

RECORD OF BOREHOLE: BH16-29

BORING DATE: October 5, 2016

SHEET 1 OF 1

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		265.95							
0	Truck Mount Power Auger / Solid Stem Auger	(SW) gravelly SAND, trace silt; brown, cobble fragments; non-cohesive, dry to moist, loose to dense		0.00	1	DO	9				
1					2	DO	3		○	M	
					3	DO	18		○		
2					4	DO	37		○		
3					5	DO	26		○		
				262.44							
4		(SM) SILTY SAND, some gravel; grey to brown, cobble fragments, (TILL); non-cohesive, dry to moist, compact to very dense		3.51	6	DO	12		○		
5											
6					7	DO	20		○		
7											
					8	DO	84		○		
8				257.87							
		End of Borehole		8.08							
9		NOTE: 1. Borehole dry upon completion of drilling October 5, 2016.									
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: DF

CHECKED: NL

GTA-BHS 001 S:\CLIENTS\LM_HOLDINGS\BARRIE\02_DATA\GINT\1661309-BG-0001.GPJ GAL-MIS.GDT 12-20-16 STB

PROJECT: 1661309

RECORD OF BOREHOLE: BH16-30

SHEET 1 OF 2

LOCATION: N 4912310.08; E 611672.23

BORING DATE: October 7, 2016

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		262.80							
0		TOPSOIL		0.00							
		(SW) SAND, trace silt; orange brown; non-cohesive, moist, very loose		0.15	1	DO	4				Concrete Casing
				262.11							
1	Truck Mount Power Auger 4 1/4" Hollow Stem Auger	(ML) sandy SILT, trace to some gravel; grey brown, (TILL); non-cohesive, moist, compact to very dense		0.69	2	DO	12		○		
					3	DO	32		○		
2					4	DO	50/ 102 mm		○		
3					5	DO	50/ 152 mm		○	M	
											Bentonite and Cuttings
4											
					6	DO	51		○		
5											
6					7	DO	80		○		
7				255.71							
		(SW) SAND, trace to some silt, trace to some gravel; light brown; non-cohesive, wet, dense to very dense		7.09							Bentonite
											#3 Silica Sand
					8	DO	54		○		
8											November 9, 2016
											10 Slot PVC Screen
9											
					9	DO	43		○		
				253.20							
		End of Borehole		9.60							
		NOTES:									
10		*CONTINUED NEXT PAGE*									

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: DF

CHECKED: NL

GTA-BHS 001 S:\CLIENTS\LM_HOLDINGS\BARRIE\02_DATA\GINT\1661309-BG-0001.GPJ GAL-MIS.GDT 12-20-16 STB

PROJECT: 1661309

RECORD OF BOREHOLE: BH16-30

SHEET 2 OF 2

LOCATION: N 4912310.08; E 611672.23

BORING DATE: October 7, 2016

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	SOIL PROFILE: STRATA PLOT	SOIL PROFILE: ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10		*--- CONTINUED FROM PREVIOUS PAGE ---*									
		1. Groundwater measured at a depth of 8.5 m below existing grade upon completion of drilling October 7, 2016. 2. Groundwater measured in monitoring well at a depth of 8.0 m below existing grade on November 9, 2016.									
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: DF

CHECKED: NL

GTA-BHS 001 S:\CLIENTS\LM_HOLDINGS\BARRIE\02_DATA\GINT\1661309-BG-0001.GPJ GAL-MIS.GDT 12-20-16 STB

PROJECT: 1661309

RECORD OF BOREHOLE: BH16-31

SHEET 1 OF 1

LOCATION: N 4912388.98; E 611739.40

BORING DATE: October 7, 2016

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		GROUND SURFACE		261.40							
	Truck Mount Power Auger / Solid Stem Auger	TOPSOIL		0.00							
		(SP) SAND, trace silt; light brown to orange brown, cobble fragments; non-cohesive, dry to moist, very loose		0.15	1	DO	4				
1				260.38	2A	DO	2				
		(SM) SILTY SAND; grey to light brown; non-cohesive, moist, compact to very dense		1.02	2B						
					3	DO	12				
2					4	DO	38				
3					5	DO	53				
4					6	DO	60				
5		laminated in Sample 6									
6				255.15	7A						
		(SP) SAND, trace to some silt; light brown, laminated; non-cohesive, moist to wet, dense to very dense		6.25	7B	DO	51				
7											
8				253.32	8	DO	46				
		End of Borehole		8.08							
		NOTE:									
		1. Groundwater measured at a depth of 6.8 m below existing grade upon completion of drilling October 7, 2016.									
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: DF

CHECKED: NL

GTA-BHS 001 S:\CLIENTS\LM_HOLDINGS\BARRIE\02_DATA\GINT\1661309-BG-0001.GPJ GAL-MIS.GDT 12-20-16 STB

PROJECT: 1661309

RECORD OF BOREHOLE: BH16-36

SHEET 1 OF 1

LOCATION: N 4912297.98; E 611773.63

BORING DATE: October 4, 2016

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		261.26							
0	Truck Mount Power Auger / Solid Stem Auger	FILL-(SW) gravelly SAND, some silt; dark brown to brown; non-cohesive, dry to moist, compact		0.00	1	DO	26				
				260.65							
		(SP) SAND, trace to some silt, trace to some gravel; light brown to brown, laminated; non-cohesive, moist to wet, loose to dense		0.61							
1					2	DO	11		○		
					3	DO	9		○		
2					4	DO	29		○		
3					5	DO	25		○		
4					6	DO	33		○		
5											
6					7	DO	29		○		
7											
					8	DO	41		○		
8				253.18							
		End of Borehole		8.08							
9		NOTE: 1. Groundwater measured at a depth of 6.7 m below existing grade upon completion of drilling October 4, 2016.									
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: DF

CHECKED: NL

GTA-BHS 001 S:\CLIENTS\LM_HOLDINGS\BARRIE\02_DATA\GINT\1661309-BG-0001.GPJ GAL-MIS.GDT 12-20-16 STB

PROJECT: 1661309

LOCATION: N 4912357.00; E 611947.16

RECORD OF BOREHOLE: BH16-37

BORING DATE: October 4, 2016

SHEET 1 OF 1

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		259.32							
0	Truck Mount Power Auger / Solid Stem Auger	FILL-SAND and GRAVEL		0.00	1A						
		FILL-(SW) SAND, some gravel, some silt; brown; non-cohesive, moist, loose		0.15	1B	DO	6				
1					2	DO	4		○		
				257.95							
		(SW) SAND, trace silt, trace gravel to gravelly, medium to coarse grained; light brown, laminated; non-cohesive, moist, loose to compact		1.37	3	DO	9		○		
2					4	DO	14		○		
3					5	DO	22		○		
4											
					6	DO	25		○		
5				253.68							
		(SP) SAND, trace silt; light brown, laminated; non-cohesive, wet, compact		5.64							
6					7	DO	13		○		
7											
				251.55	8A						
		(CL) SILTY CLAY; grey; cohesive, w~PL, stiff		7.77	8B	DO	15		○—○—○	MH	
8				251.24							
		End of Borehole		8.08							
9		NOTE: 1. Groundwater measured at a depth of 5.3 m below existing grade upon completion of drilling October 4, 2016.									
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: DF

CHECKED: NL

GTA-BHS 001 S:\CLIENTS\LM_HOLDINGS\BARRIE\02_DATA\GINT\1661309-BG-0001.GPJ GAL-MIS.GDT 12-20-16 STB

Log of Borehole A

Project No. BAR-00609046-B0 | Figure No. 6

Project: Proposed SWMF 14 Outlet Pipe | Sheet No. 1 of 1

City/ Municipality: 970 Mapleview Drive East, Barrie, ON

Location: 17T 4912352 611911

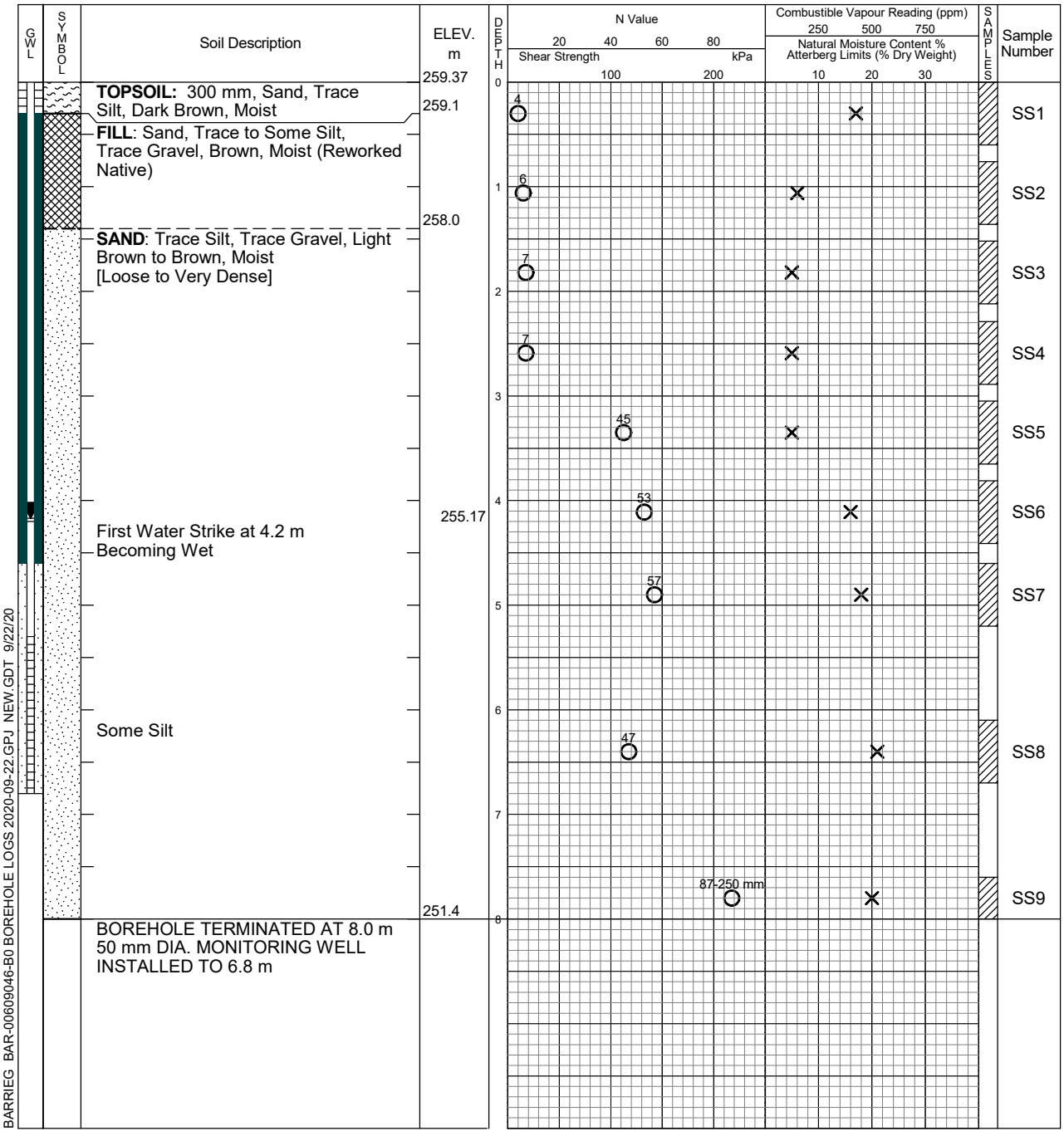
Date Drilled: September 15, 2020

Drill Type: Track-Mount, Solid Stem Augers

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



BARRIEG BAR-00609046-B0 BOREHOLE LOGS 2020-09-22.GPJ NEW.GDT 9/22/20

EXP Services Inc.
14 Cedar Pointe Drive
Barrie, ON L4N 5R7
t: +1.705.719.1100
f: +1.705.719.1109

Borehole data requires interpretation assistance from EXP before use by others.

See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	6.7 / 252.7	Install
Sept. 22, 2020	4.20 / 255.17	

Log of Borehole B

Project No. BAR-00609046-B0 | Figure No. 7

Project: Proposed SWMF 14 Outlet Pipe | Sheet No. 1 of 1

City/ Municipality: 970 Mapleview Drive East, Barrie, ON

Location: 17T 4912424 611938

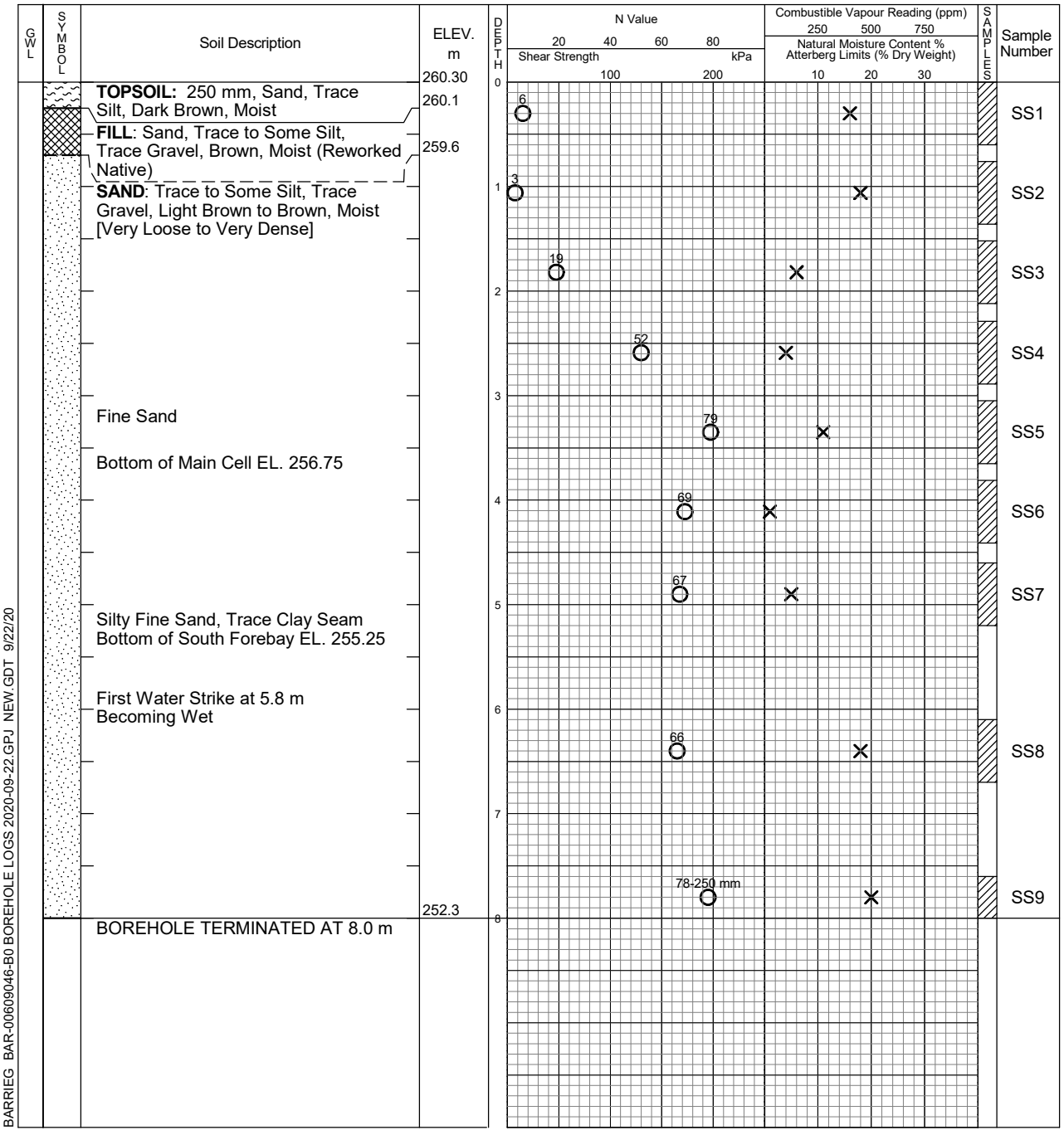
Date Drilled: September 15, 2020

Drill Type: Track-Mount, Solid Stem Augers

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



BARRIEG BAR-00609046-B0 BOREHOLE LOGS 2020-09-22.GPJ NEW.GDT 9/22/20

EXP Services Inc.
14 Cedar Pointe Drive
Barrie, ON L4N 5R7
t: +1.705.719.1100
f: +1.705.719.1109

Borehole data requires interpretation assistance from EXP before use by others.

See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	5.8 / 254.5	5.8

Log of Borehole C

Project No. BAR-00609046-B0 | Figure No. 8

Project: Proposed SWMF 14 Outlet Pipe | Sheet No. 1 of 1

City/ Municipality: 970 Mapleview Drive East, Barrie, ON

Location: 17T 4912510 611899

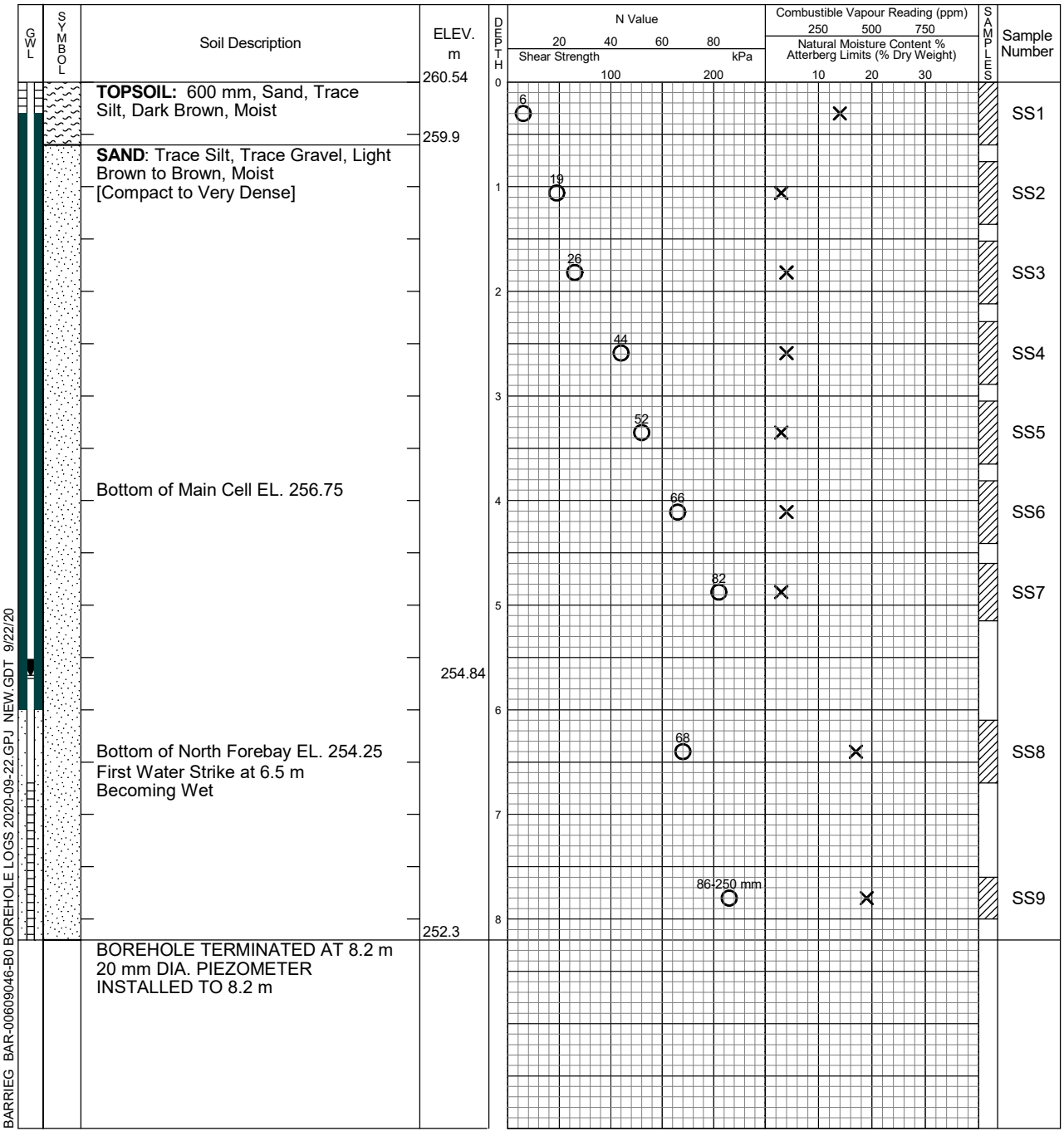
Date Drilled: September 15, 2020

Drill Type: Track-Mount, Solid Stem Augers

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Combustible Vapour Reading
Natural Moisture
Plastic and Liquid Limit
Undrained Triaxial at % Strain at Failure
Penetrometer



BARRIEG BAR-00609046-B0 BOREHOLE LOGS 2020-09-22.GPJ NEW.GDT 9/22/20

EXP Services Inc.
14 Cedar Pointe Drive
Barrie, ON L4N 5R7
t: +1.705.719.1100
f: +1.705.719.1109

Borehole data requires interpretation assistance from EXP before use by others.

See Figures 1A and 1B for Notes on Sample Descriptions.

Time	Water Level (m)	Depth to Cave (m)
Upon Completion	7.6 / 252.9	Install
Sept. 22, 2020	5.70 / 254.84	

BURNSIDE

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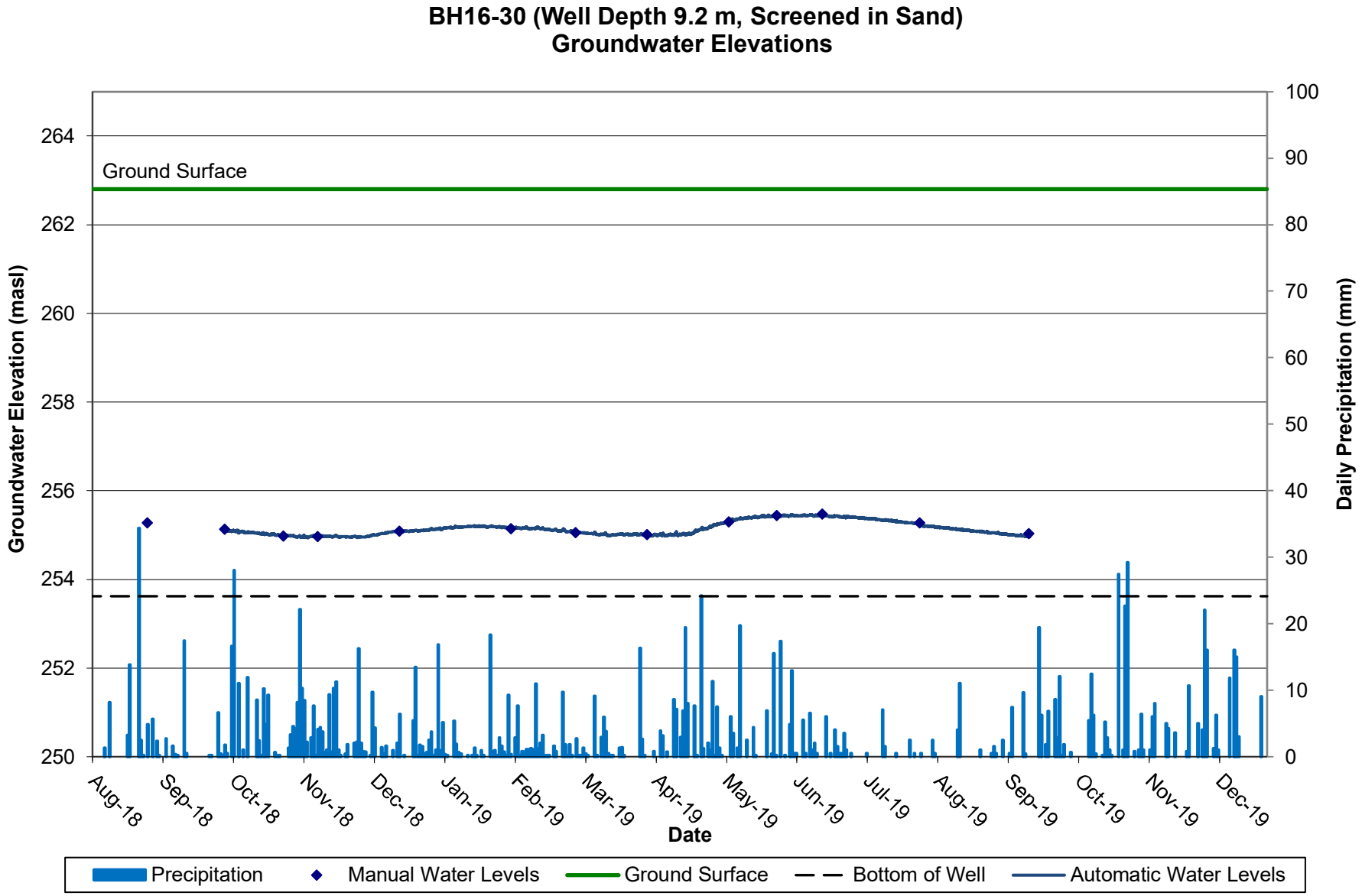
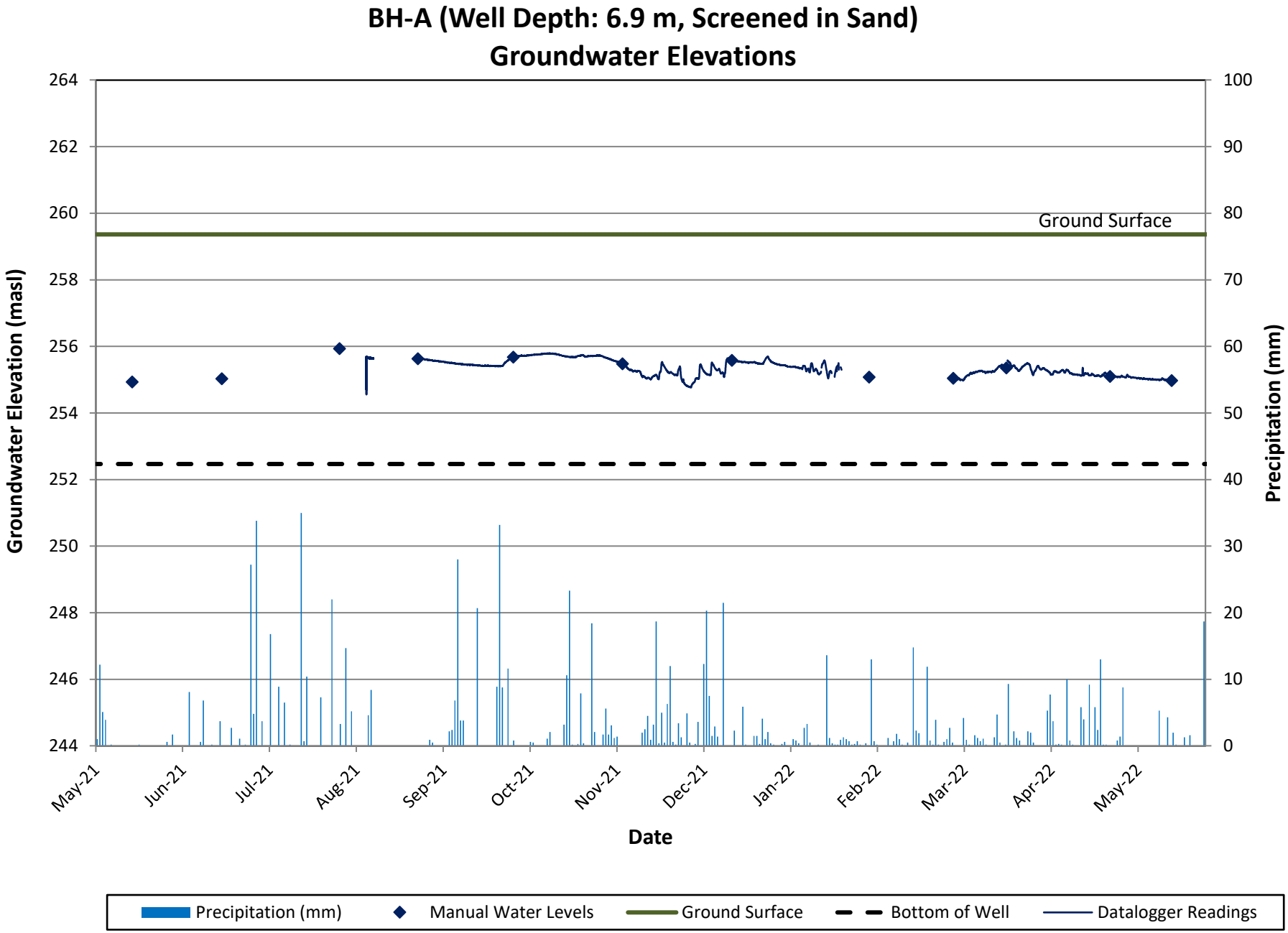
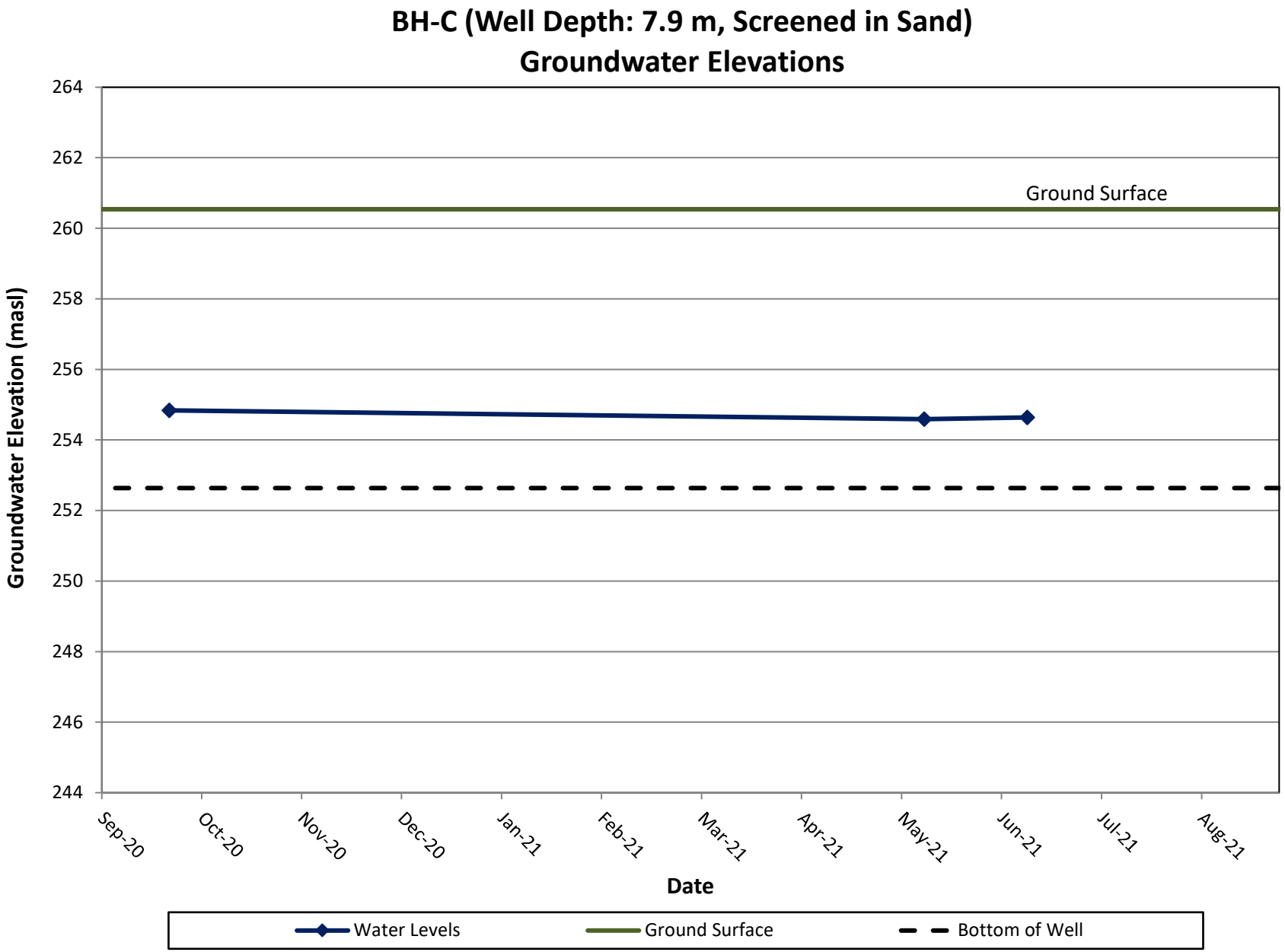
Appendix C

Hydrographs


BH16-30 (Well Depth 9.2 m, Screened in Sand)
Groundwater Elevations
Ground Surface
Groundwater Elevation (masl)
Daily Precipitation (mm)
264
262
260
258
256
254
252
250
100
90
80
70
60
50
40
30
20
10
0
Aug-18
Sep-18
Oct-18
Nov-18
Dec-18
Jan-19
Feb-19
Mar-19
Apr-19
May-19
Jun-19
Jul-19
Aug-19
Sep-19
Oct-19
Nov-19
Dec-19
Date
Precipitation
Manual Water Levels
Ground Surface
Bottom of Well
Automatic Water Levels


BH-A (Well Depth: 6.9 m, Screened in Sand)
Groundwater Elevations
Groundwater Elevation (masl)
Precipitation (mm)
Ground Surface
264
262
260
258
256
254
252
250
248
246
244
100
90
80
70
60
50
40
30
20
10
0
May-21
Jun-21
Jul-21
Aug-21
Sep-21
Oct-21
Nov-21
Dec-21
Jan-22
Feb-22
Mar-22
Apr-22
May-22
Date
Precipitation (mm)
Manual Water Levels
Ground Surface
Bottom of Well
Datalogger Readings


BH-C (Well Depth: 7.9 m, Screened in Sand)
Groundwater Elevations
Groundwater Elevation (masl)
264
262
260
258
256
254
252
250
248
246
244
Ground Surface
Sep-20
Oct-20
Nov-20
Dec-20
Jan-21
Feb-21
Mar-21
Apr-21
May-21
Jun-21
Jul-21
Aug-21
Date
Water Levels
Ground Surface
Bottom of Well

BURNSIDE

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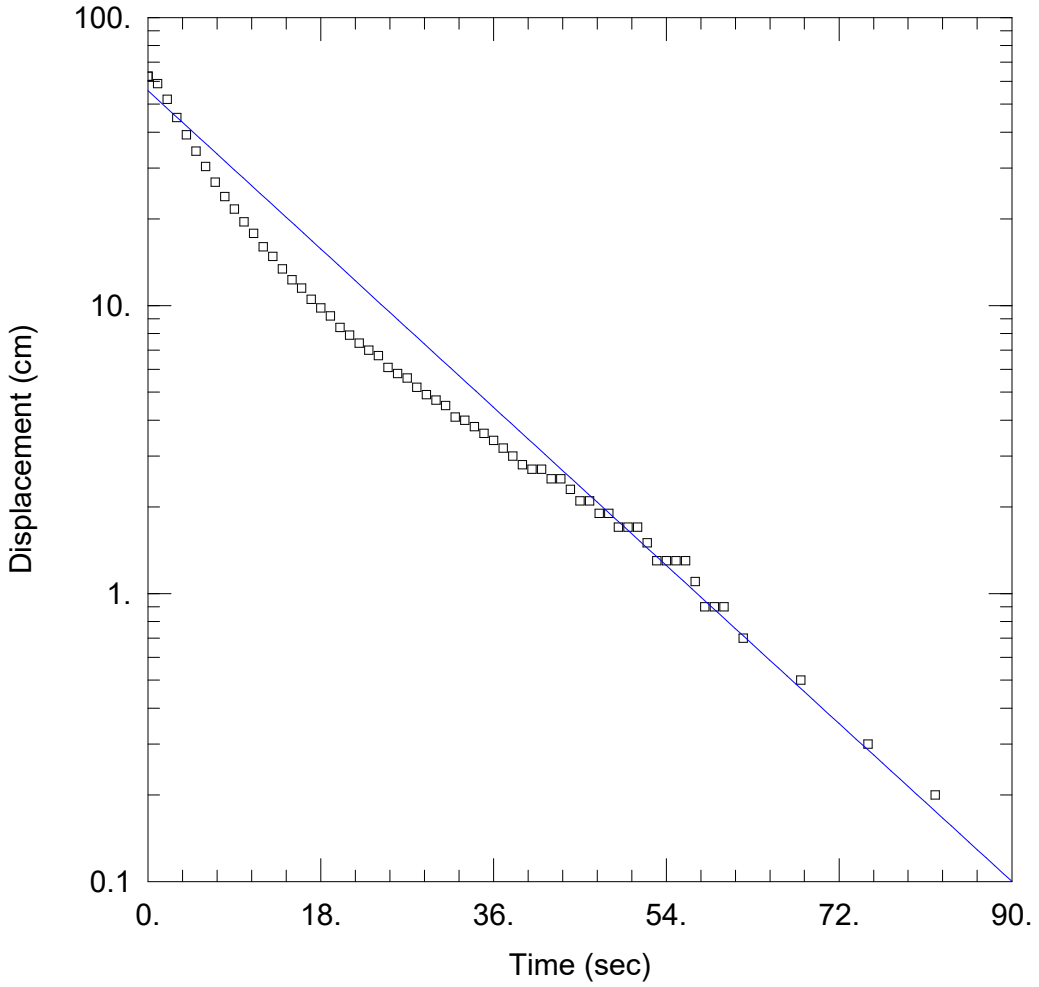
Appendix D

Hydraulic Conductivity Testing



HYDRAULIC CONDUCTIVITY TEST AT BH16-30

PROJECT INFORMATION

Company: R.J Burnside & Associates Limi
Project: 300043141
Location: Barrie
Test Well: BH16-30
Test Date: June 18, 2019

AQUIFER DATA

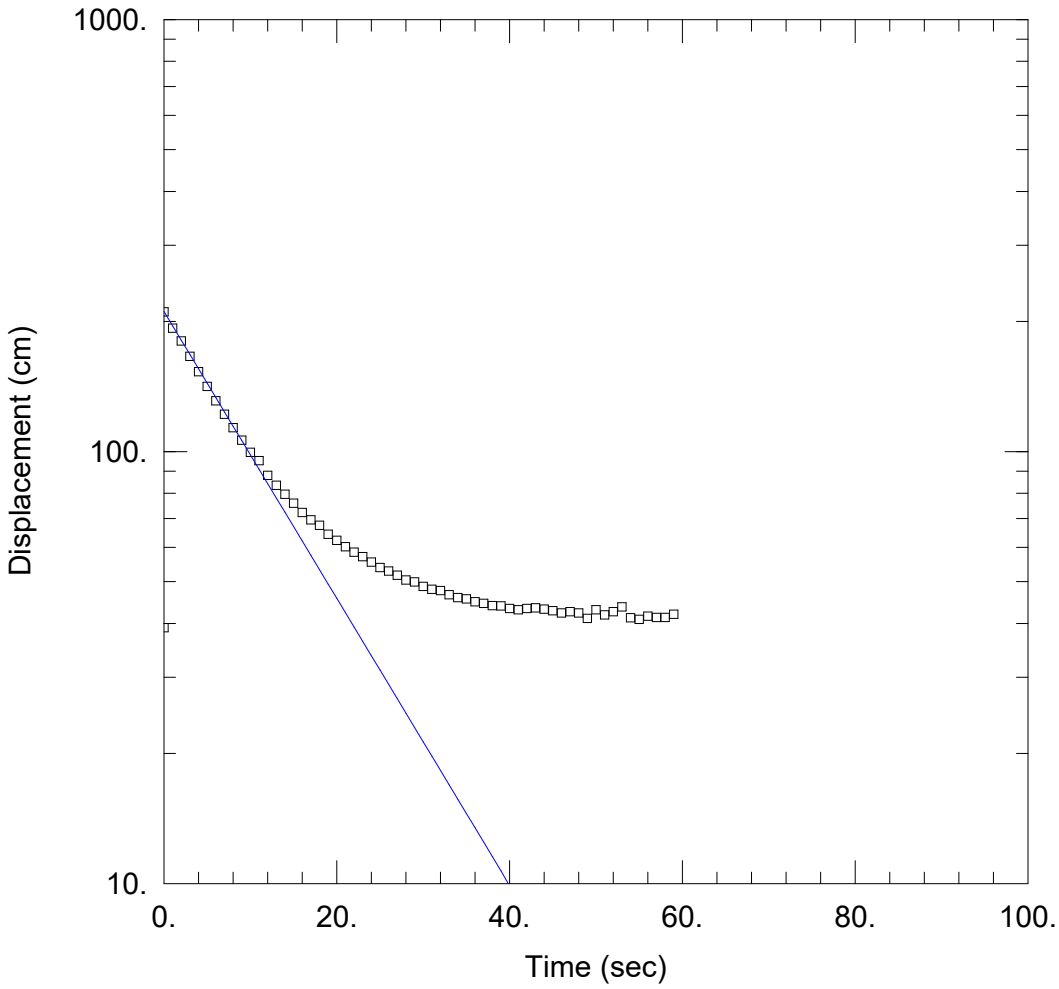
Saturated Thickness: 185. cm
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH16-30)

Initial Displacement: 62.6 cm
Total Well Penetration Depth: 152. cm
Casing Radius: 2.54 cm
Static Water Column Height: 185. cm
Screen Length: 152. cm
Well Radius: 7.62 cm

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 0.004466 cm/sec
y0 = 55.67 cm



HYDRAULIC CONDUCTIVITY TEST (FH) IN BH-A - SCREENED IN SAND

PROJECT INFORMATION

Company: R.J. Burnside & Associates
Client: BSHF Big Bay Point
Project: 300053160
Location: Barrie, ON
Test Well: BH-A
Test Date: Sep 27, 2021

AQUIFER DATA

Saturated Thickness: 321. cm
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH-A)

Initial Displacement: 39.1 cm
Total Well Penetration Depth: 321. cm
Casing Radius: 2.54 cm
Static Water Column Height: 321. cm
Screen Length: 152. cm
Well Radius: 7.62 cm

SOLUTION

Aquifer Model: Unconfined
K = 0.005981 cm/sec
Solution Method: Hvorslev
y0 = 210.9 cm