GAMAN CONSULTANTS INC.
Barrie, Ont.
705-279-9156
ghendy.gaman@outlook.com

January 19, 2021

Miramichi Shores Land Development Limited
c/o Brad Pryde
10 Collard Way, Box 1725
Port Elgin, Ontario
N0H-2C0

Attention: Mr. Brad Pryde

Dear sirs:

Re: Miramichi Shores Phase 4
Hydrogeological Report Perforated Storm Sewer Evaluation
Town of Saugeen Shores
File 20007.00

Miramichi Shores Phase 4 is a proposed residential development located north of Concession 10 and east of Miramichi Bay Road as shown in Figure 1. The development is comprised of 14-lots and will be on partial services consisting of municipal water and onsite subsurface sewage (septic) systems as shown in Figure 2.

It is proposed to install a perforated storm sewer below the proposed subdivision road to lower the water table. The Saugeen Valley Conservation Authority has requested an evaluation of the effect of passive dewatering created by the perforated storm sewer (PSS) on potential receptors that depend on groundwater.

A: BACKGROUND

A hydrogeological report prepared by GAMAN Consultants Inc. dated January 2021 was prepared to support an application for a Permit To Take Water (PTTW). The study findings from that hydrogeological report are summarized below:

- The study area and site are located within the Huron Fringe physiographic region.
- The sand plains within this physiographic region are comprised of coarse textured glaciolacustrine sediments illustrated in Figure 3.
- The elevation of the tablelands east of the former Nipissing Bluff is above 194 masl. The ground surface at the toe of the bluff, east of the Site, is at an approximate elevation of 191 masl.
- Numerous groundwater seeps are present at the base of the embankment that support baseflow within unnamed tributaries in the study area including the tributary through this site.
- Four groundwater monitors designated BH20-01 to BH20-04 and drive point DP20-1 were installed at the site. Surficial soils are sandy and consistent with the physical setting of the study area.
- Groundwater was encountered below the proposed road at boreholes BH20-01 to BH20-03 and range from about 0.7 to 1.5 metres below ground level (mbgl). Groundwater levels at BH20-04 located adjacent to the water course were about 0.3 to 0.4 mbgl. Table 1 provides a summary of water levels.
- Surface water monitoring at DP20-01 shows surface water levels are higher than groundwater levels in the drive point and BH20-04. The water course loses water to the groundwater table in this area of the site.
- Rising head hydraulic conductivity (K) tests at the four boreholes provided a high K of 1.08×10^{-4} m/sec at BH20-01 and a geometric mean K of 5.6×10^{-5} m/sec (see Table 2).

B: GROUNDWATER SURFACE WATER INTERACTION

In a pre-consultation meeting between the Conservation Authority and WSP Canada Inc., we understand that the water course was assumed to support cold water fish habitat. This assumption may have been premised on the seeps located upgradient of the site noted in the WSP report and as shown on Figure 4.

Parts of the water course north of the proposed lots show the water course to be intermittent. Groundwater and surface water monitoring near BH20-04 show the water provides recharge to the water table as noted above. While the water course may support coldwater fish habitat upstream of BH20-04, the water course does not appear to be a groundwater discharge area along its entire length based on the water level elevations at DP20-01.

C: PROPOSED SERVICE DEPTH FOR PERFORATED STORM SEWER

We understand from discussions with Cobide Engineering that the PSS may range from 300-mm diameter to 525mm diameter at the cul-de-sac. The PSS will be located on the east/north side of the road. The invert of the PSS is expected to be installed at a depth of about 1.5 metres below proposed grade. Using the groundwater levels shown in Table 1, the PSS would be installed at depths below the groundwater table shown below:

- The PSS invert at BH20-01 may extend about 0.8 metres below the water table based on a proposed grade of 184.6 masl.
- The PSS invert at BH20-02 may extend about 1.2 metres below the water table based on a proposed grade of 184 masl.
- The PSS invert at BH20-03 appears to be above the water table based on a proposed grade of 183 masl.

The installation of perforated storm sewers has been standard practice in subdivisions in Saugeen Shores for more than 20 years. The use of PSS to control groundwater levels has been approved by the Town, MECP, and Saugeen Valley Conservation Authority. Perforated storm sewers are presently used nearby subdivisions such as:

- Miramichi Shores Phase 3
- Pegasus Trails
- Lakeside Woods
- The Woodlands

D: POTENTIAL RECEPTORS

The PSS will cause the groundwater table to decline and create a cone of depression in all directions from the drain. Figure 4 illustrates the locations of various receptors near the site as noted below:

- There are groundwater seeps located east of the site arising from the discharge of groundwater originating beneath the table lands.
- The water course created by these seeps is assumed to support cold water fish habitat especially where upwelling of groundwater below the water course arises.
- A portion of Wetland Unit 4 extends through Lots 12-14 and would be impacted by development.
- There are no private wells within the area of Figure 1.

E: WATER BUDGET

As precipitation falls to the ground in the form of rainfall or snow, it is subject to components of the hydrological cycle. Water will generally runoff, infiltrate, evaporate or be subject to transpiration from plant uptake. Evaporation and transpiration are commonly grouped together as evapotranspiration while runoff and infiltration are grouped together as water surplus. The water budget is represented in a simple form as follows:

Water In = water Out

P + EI = ET + IR + RO + EO

Where:

P = Precipitation

EI = External Inputs (Run-on, irrigation and vertical/lateral transfers)

ET = Evapotranspiration from plant uptake and evaporation.

IR = Infiltration Recharge

RO = Run-off

EO = External Outputs (water taking and vertical/lateral transfers)

Precipitation data is available from the Environment Canada website for climatic stations across the country. The Hanover Climatic Station provides climatic data temperature and precipitation for the period 1981 to 2010.

Thornthwaite (1948) developed a mathematical method for analyzing precipitation data and calculating evapotranspiration and water surplus. Average monthly temperature and precipitation data were analyzed using the method provided by Thornthwaite. The results are presented in Table 3 show the 30-year normal annual precipitation at 1,087 mm/yr. with a resultant water surplus of 505 mm/yr.

The MOECC Hydrogeological Technical Information Requirements For Land Development Applications (1995) included Table 2 derived from hydrologic analysis for assessing peak runoff for storm water management. The method considers topography, soil type and vegetation cover on the site as summarized in the table below.

Infiltration Factors	Range of Values	Assessment of Site	Selected Factor
Topography	0.1-0.3	Hilly	0.1
Soil Type	0.1-0.4	Open sandy loam	0.4
Cover	0.1-0.2	Woodland	0.2
Total Infiltration Factor			0.7

The rationale for selecting infiltration factors from this table is as follows:

- The infiltration factor for topography was estimated at 0.1 to reflects hilly topography.
- The soil infiltration factor was estimated at 0.4 to reflect the sandy texture.
- The cover factor of 0.2 reflects the woodlands.

The infiltration factor for this site is estimated at 0.70. The infiltration rate associated for the site is the product of the infiltration factor (0.70) and the water surplus (505 mm/yr.) and results in 354 mm/yr./ha.

F: PREDICTED ZONES OF INFLUENCE

The zone of influence (ZOI) created by the PSS was estimated using two analytical methods:

1. Sichardt's Formula (1927)
2. Solution to drawdown incorporating recharge (University of Washington).

Sichardt's formula is presented in Table 4a using the known hydraulic properties of the aquifer.

$Ro = 3000 * (H-h) * (k)^{0.5}$

The terms are defined in Table 4a and result in a ZOI of 27 metres beyond the ends of the PSS. The width of the ZOI parallel to the PSS is 50% of Ro or about 14 metres.

The University of Washington documented a formula for estimating a ZOI that incorporated groundwater recharge as shown in Table 4b. The recharge rate of 354 mm/yr. was converted to a daily rate and the average hydraulic conductivity is $5.6x10^{-5}$ m/sec. The recharge rate was estimated at 354 mm/yr. from Section E; however, Table 4b provides scenarios of estimating the ZOI for recharge rates between 200 and 350 mm/yr. to include a sensitivity analysis. This method provides a zone of influence ranging from 26 to 34 metres and is essentially the same as the ZOI calculated from Sichardt's formula. Figure 4 illustrates the zone of influence based on 30 metres from all edges of the PSS.

G: PERFORATED STORM SEWER (PSS) AT LAKESIDE WOODS

Lakeside Woods (Figure 1) is located about 750 metres south of this site and was serviced in 2018. A PSS similar to the one proposed for this site was installed at Lakeside Woods. Groundwater levels from March 2018 and January 7, 2021 are documented in Table 3c. The

change in ground water levels within 10 metres of the PSS were 0.24, 0.68 and 1.26 metres between these dates. The invert of the PSS near BH18-04 is 1.9 metres below grade and is expected to cause a locally broader zone of influence contributing to the 1.26 metres of change. The PSS is installed at shallower depths near the other boreholes.

The PSS at this proposed Miramichi Shores site was premised on a maximum depth of 1.2 metres below the water table. The March 2018 groundwater levels at Lakeside Woods likely reflect high groundwater table conditions and we expect the difference between the March 2018 and January 2021 groundwater levels to decrease as the spring freshet occurs. The change in groundwater levels near the PSS observed at Lakeside Woods reflect the potential effect of the PSS and the natural variation of the water table. The observed changes in groundwater levels at Lakeside Woods are small, within the expected natural variation of the water table at two boreholes and appear to support the theoretical zones of influence presented for this site.

H: EFFECTS TO RECEPTORS

Figure 4 shows the interpreted zone of influence from the analytical methods presented in Section E. A portion of Unit 4 located on Lots 12 to 14 appears to be the only receptor within this predicted zone of influence. The results of this report provide evidence to conclude that the use of a PSS installed to depths within 1.2 metres of the surface of the water table should have no adverse impacts (an acceptable effect) on the natural environment.

We trust that this is satisfactory.

Yours truly,
GAMAN Consultants Inc.

Gary R. Hendy, P.Eng.
Consulting Engineer
grh

I: LIMITATIONS AND USE

This report has been prepared for the exclusive use of Miramichi Shores Land Development Limited. for their exclusive use in the evaluation of the area for the proposed development. GAMAN Consultants Inc. accepts no responsibility for any damages incurred by any third party resulting from decisions made, or actions taken based upon the information contained within this report.

All background information used in the preparation of this report has been relied upon in good faith, and GAMAN does not accept any responsibility for any misstatements, inaccuracies, or deficiencies contained in those documents or records. The information contained in this report should be evaluated, interpreted and implemented only in the context of the assignment.

The findings and conclusions included in this report reflect our best judgement in light of the information available at the time of report preparation and site inspection and are valid only at the date of issuance. If additional information is provided in the future, such as the results of additional site-specific assessments or monitoring, GAMAN will be pleased to re-evaluate our conclusions contained within this report, and issue amendments, as required.

FIGURES

NOTES

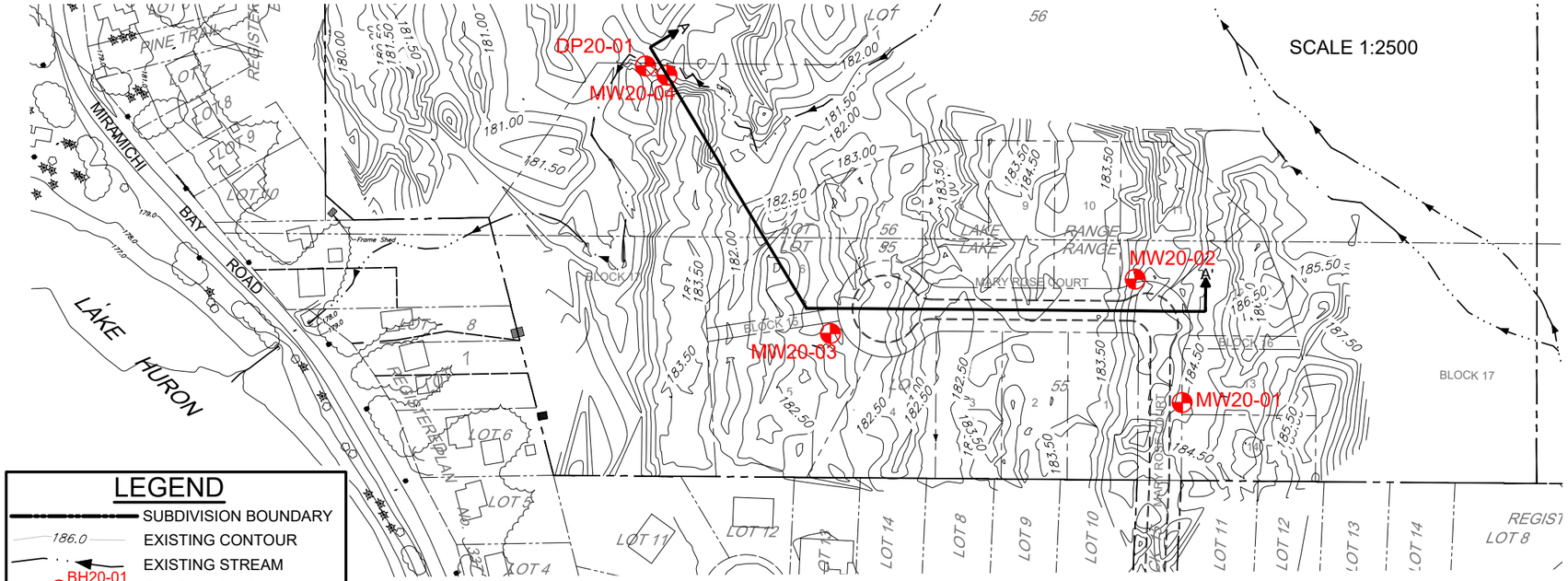
Site Location

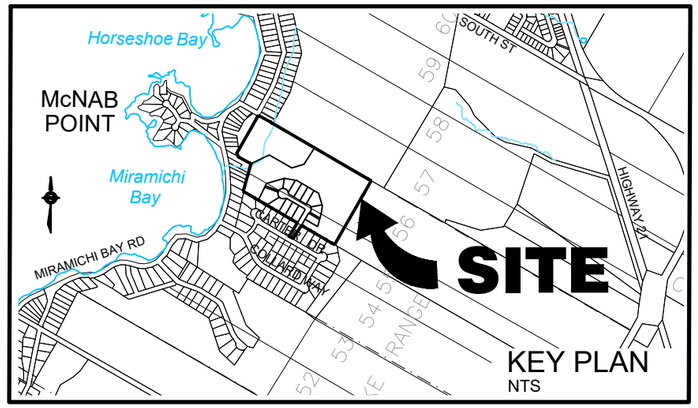
Miramichi Shores Phase 4 Hydrogeological Evaluation
Perforated Storm Sewer
For Miramichi Shores Land Development Limited

Date:	Jan-21	Scale:	~1:2000
Project:	20007.00	Ref No:	

GAMAN Consultants Inc.

Figure 1





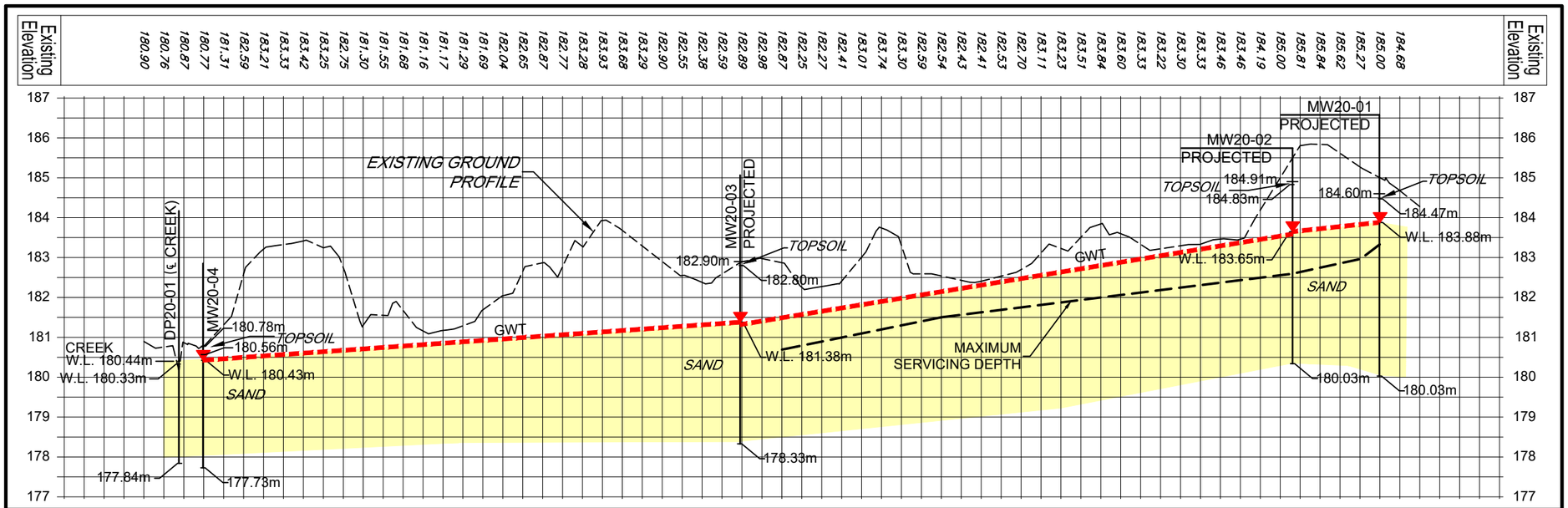
SCALE 1:2500 (11 x 17)

50 0 25 50 100 METRES

100 0 50 150 250 500 FEET

LEGEND

- SUBDIVISION BOUNDARY
- 186.0 EXISTING CONTOUR
- EXISTING STREAM
- BH20-01 BOREHOLE LOCATION
- GWT GROUNDWATER TABLE
- W.L.275.9m WATER LEVEL ELEVATION



SECTION A - A'

SCALE

HORZ 1:1250

VERT 1:125

No.	DATE	DESCRIPTION	BY	APPD
1	JAN 11/21	PRELIMINARY SUBMISSION	TLB	SJC

REVISION / ISSUE

Title:
INTERPRETED HYDROSTRATIGRAPHY
SECTION A-A'
MIRAMICHI SHORES PHASE 4
PROPOSED SUBDIVISION
Town of Saugeen Shores, Ontario
HYDROGEOLOGICAL EVALUATION
PERFORATED DRAIN

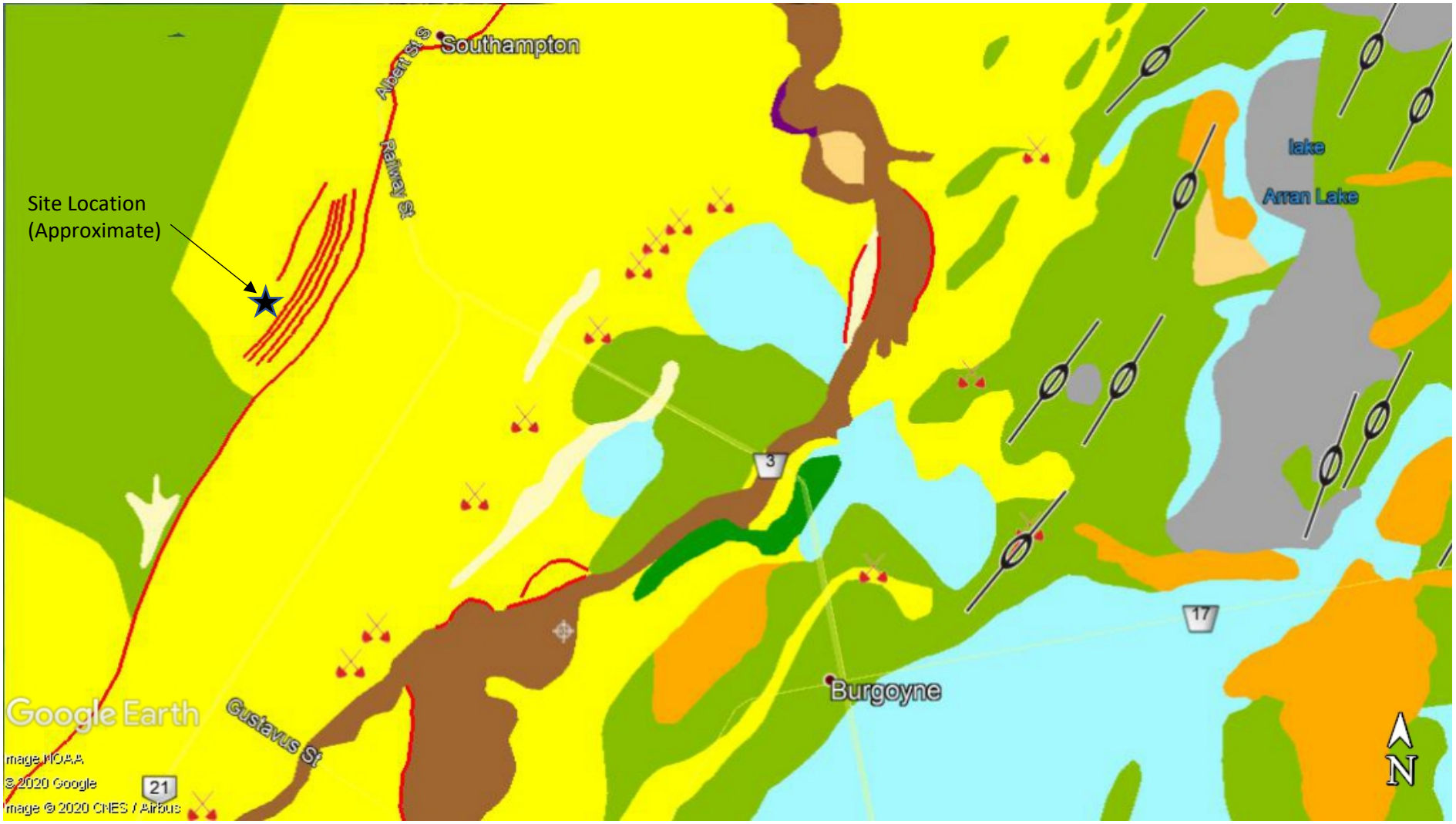
Client:
MIRAMICHI SHORES LAND DEVELOPMENT LTD.

COBIDE ENGINEERING INC
517 10th St, Hanover, ON N4N 1R4
Telephone: (519) 506-5959
www.cobideeng.com

Design:	TLB	Scale:	AS SHOWN
Drawn:	JAF	Approved:	
Checked:	SJC		
Date:	DEC 2020		Design Engineer

DRAWING No. 00104-FIG2

C:\Users\scobean\Desktop\Submissions\2020-12-15 Hydrostratigraphy\00104 Hydrostratigraphy Plan Dec 15-20.dwg



NOTES

2	Bedrock Drift Complex
5a	silty sand - sand till
6	Ice-contact stratified deposits (sand & gravel)
7a	Glacialfluvial deposits (sandy)
8a	Fine Textured Glaciolacustrine Deposits (silt & clay)
9	Coarse Textured Glaciolacustrine Deposits
19	Modern Alluvial Deposits (gravel sand, silt, clay)
20	Organic Deposits (peat, muck marl)

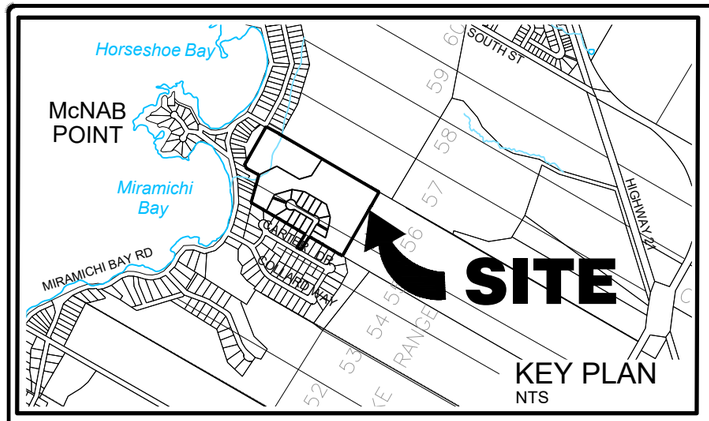
Surficial Geology

Miramichi Shores Phase 4 Hydrogeological Evaluation
Perforated Storm Sewer
For Miramichi Shores Land Development Inc.

Date:	Jan-21	Scale:	~1:2000
Project:	20007.00	Ref No:	

GAMAN Consultants Inc.

Figure 3



Legend

- PROPOSED SUBDIVISION BOUNDARY
- PROPOSED LOT LINE
- EXISTING PROPERTY/STREET LINE
- 182 — EXISTING CONTOUR
- EXISTING STREAM
- MW20-02 — BOREHOLE LOCATION
- ZONE OF INFLUENCE
- UN-MAPPED WETLAND (REF. 2021 EIS PREPARED BY WSP)

SCALE 1:2500 (11 x 17)

50 0 25 50 100 METRES

100 0 50 150 250 500 FEET

No.	DATE	DESCRIPTION	BY	APPD
1	JAN 11/21	PRELIMINARY SUBMISSION	TLB	SJC

REVISION / ISSUE

Title: PROPOSED SUBDIVISION
MIRAMICHI SHORES PHASE 4
GEOGRAPHIC TOWNSHIP OF SAUGEEN
TOWN OF SAUGEEN SHORES
ZONE OF INFLUENCE

Client: MIRAMICHI SHORES LAND DEVELOPMENT LTD.

COBIDE ENGINEERING INC
517 10th St, Hanover, ON N4N 1R4
Telephone: (519) 506-5959
www.cobideeng.com

Design:	TLB	Scale:	1:2500
Drawn:	JAF	Approved:	
Checked:	SJC		
Date:	JAN 2021		Design Engineer

DRAWING No. 00104-FIG4

H:\Pryde\00104 Miramichi Shores – Phase 4 Subdivision\Drawings\Submissions\2020-12-15 Hydrostratigraphy\00104 Fig 4 Zone of Influence Jan 11-21.dwg

TABLES

TABLE 1: MONITOR CONSTRUCTION DETAILS & WATER LEVELS

Miramichi Shores Phase 4 Hydrogeological Evaluation Perforated Storm Sewer (Project 20007.00)

TABLE 1A: Construction Details

MONITOR CONSTRUCTION DETAILS									
Monitor	Depth (mbgl)	BH Dia. (mm)	Monitor Dia. (mm)	Screen Length (m)	Sand Pack	Casing Elev. (masl)	casing stickup (magl)	ground Elev. (masl)	Creek Bed Elev (masl)
BH20-01	4.57	200	38	1.52	#3	185.62	1.03	184.59	
BH20-02	4.57	200	38	1.52	#3	185.95	0.97	184.98	
BH20-03	4.57	200	38	1.52	#3	183.97	1.03	182.94	
BH20-04	3.05	200	38	1.52	#3	181.82	0.98	180.84	
DP20-01	2.36*	38	38	0.9	none	181.44	1.24*		180.20

Note: monitor depth and casing stickup for DP20-01 are relative to creek bed

TABLE 1B: WATER LEVELS

Groundwater and Surface Water Levels										
Date	BH20-01		BH20-02		BH20-03		BH20-04		DP20-01	Creek
	Water Level		Water Level		Water Level		Water Level		Water Level	
	(mbtoc)	(masl)	(mbtoc)	(masl)	(mbtoc)	(masl)	(mbtoc)	(masl)	(masl)	(masl)
16-Nov-20	1.780	183.840	2.260	183.690	2.580	181.390	1.390	184.230	na	na
27-Nov-20	1.750	183.870	2.305	183.645	2.596	181.374	1.388	180.432	na	na
8-Dec-20	1.743	183.877	2.305	183.645	2.585	181.385	1.395	180.425	na	na
23-Dec-20	1.740	183.880	2.300	183.65	2.590	181.380	1.390	180.430	180.33	180.44

Table 2: Summary of Hydraulic Conductivity Tests

Miramichi Shores Phase 4 Hydrogeological Evaluation Perforated Storm Sewer (Project 20007.00)

Borehole	Test #	K m/sec
BH20-01	1	1.01E-04
BH20-01	2	1.07E-04
BH20-01	3	1.08E-04
BH20-02	1	6.22E-05
BH20-02	2	5.65E-05
BH20-02	3	3.46E-05
BH20-03	1	6.28E-05
BH20-03	2	4.45E-05
BH20-03	3	5.33E-05
BH20-04	1	3.59E-05
BH20-04	2	2.94E-05
BH20-04	3	3.69E-05
Geo mean		5.6E-05

TABLE 3
CLIMATIC WATER BUDGET: CLIMATE NORMAL 1981-2010 (Hanover)
Potential Evapotranspiration
Miramachi Shores Phase 4 Hydrogeological Evaluation Perforated Storm Sewer (20007.00)

	Thornthwaite (1948)							
Month	**Mean Temperature (°C)**	**Heat Index**	**Potential Evapo-transpiration (mm)**	**Daylight Correction Value**	**Adjusted Potential Evapo-transpiration (mm)**	**Total Precipitation (mm)**	**Surplus (mm)**	**Deficit (mm)**
January	-6.8	0.0	0.0	0.81	0.0	109.6	109.6	0.0
February	-5.9	0.0	0.0	0.81	0.0	81.3	81.3	0.0
March	-1.7	0.0	0.0	1.02	0.0	72.0	72.0	0.0
April	5.8	1.3	27.9	1.12	31.3	73.1	41.8	0.0
May	11.9	3.7	58.8	1.27	74.7	84.6	9.9	0.0
June	17.2	6.5	86.2	1.29	111.2	78.3	0.0	32.9
July	19.6	7.9	98.7	1.30	128.4	83.1	0.0	45.3
August	18.6	7.3	93.5	1.20	112.2	95.0	0.0	17.2
September	14.6	5.1	72.7	1.04	75.7	109.1	33.4	0.0
October	8.4	2.2	41.0	0.95	39.0	89.7	50.7	0.0
November	2.6	0.4	12.2	0.80	9.7	103.0	93.3	0.0
December	-3.3	0.0	0.0	0.74	0.0	108.4	108.4	0.0
TOTALS	**6.8**	**34.3**			**582.2**	**1087.2**	**600.5**	**95.4**

TOTAL WATER SURPLUS **505.0** **mm**

NOTES:

1) Water budget adjusted for latitude and daylight.

2) (°C) - Represents calculated mean of daily temperatures for the month.

3) Precipitation and Temperature data from the Hanover Climatic Station latitude 44°06'59.058" N, longitude 80°00'21.042" W, elevation 270 masl

4) Total Water Surplus (Thornthwaite, 1948) is calculated as total precipitation minus adjusted potential evapotranspiration.

Table 4: Predicted Zones of Influence

Miramichi Shores Phase 4 Hydrogeological Evaluation Perforated Storm Sewer (Project 20007.00)

Table 4A: Sichdart Equation Zone of Influence

$Ro = 3000 * (H - h) * (K)^{1/2}$		
H	4	Original height of water level above datum (metres)
h	2.8	Water level from invert of drain to base of aquifer (metres)
K	5.56E-05	Hydraulic Conductivity (m/sec)
Ro	27	Zone of Influence (metres)

Table 4b: Zone of Influence with Recharge

Ro = b * (k/(2*n))^0.5				
Recharge (n)		Hydraulic Conductivity (k)	Aquifer Thickness (b)	Zone of Influence (Ro)
mm/yr	mm/sec	m/sec	metres	metres
350	6.66E-07	5.56E-05	4	26
300	5.71E-07	5.56E-05	4	28
250	4.76E-07	5.56E-05	4	31
200	3.81E-07	5.56E-05	4	34

Table 5: Lakeside Woods Observed Groundwater Levels

Miramichi Shores Phase 4 Perforated Storm Sewer (Project 20007.00)

	BH18-01		BH18-02		BH18-04	
Distance from Sewer to Monitor (m)	9		5		7	
Sewer Invert Elevation	179.71		178.64		180.5	
Groundwater Elevations	Date	WL Elev	Date	WL Elev	Date	WL Elev
	2018-03-15	180.33	2018-03-15	179.44	2018-03-15	182.40
	2021-01-07	180.09	2021-01-07	178.76	2021-01-07	181.19
Change in Water Level		0.24		0.68		1.21

BOREHOLE LOGS

CMT Engineering Inc.
1011 Industrial Crescent,
St. Clements, ON, N0B 2M0
Telephone: 519-699-5775

BOREHOLE NUMBER BH20-01

PROJECT: Miramichi Shores - Phase 4 Subdivision
PROJECT ADDRESS:
PROJECT NUMBER: 20-626
PROJECT LOCATION: Saugeen Shores, Ontario
DRILLING DATE: 20-11-16
GROUND ELEVATION: 184.60 m
DRILLING CONTRACTOR: CMT Drilling Inc.
LOGGED BY: SW
DRILLING EQUIPMENT: Geoprobe 7822DT
SAMPLING METHOD: SPT

DEPTH (m)	MATERIAL DESCRIPTION	Depth, Elevation (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)
	TOPSOIL Very loose, black, sandy topsoil, moist (130 mm)	0.00, 184.60			
	DISTURBED SAND Very loose, dark brown reworked/disturbed sand, trace silt and clay, some organics, moist	0.13, 184.47	SPT 1	20	0-1-1-1 (2)
1	**SAND** Loose, brown sand, trace silt and clay, saturated	0.76, 183.84	SPT 2	44	1-2-2-2 (4)
	Becoming grey, compact	1.52, 183.08	SPT 3	100	4-6-5-5 (11)
2			SPT 4	100	4-7-9 (16)
3	Compact, saturated sand, trace clay and silt (Based on visual inspection. Not confirmed by SPT sampling)	3.05, 181.55			
4					

SPT N VALUE: 10 20 30 40
POCKET PEN. (kPa): 90 180 270 360
MOISTURE CONTENT (%): 12 24 36 48

SPT N VALUE: 2, 4, 11, 16
MOISTURE CONTENT (%): 19.9, 27, 24.8, 22.8

WELL DIAGRAM: Bentonite Seal; Water Level: 183.877 m on Dec 8/2020; 38 mm Riser; #3 Sand Pack; 38 mm Screen

Bottom of borehole at 4.57 m, Elevation 180.03 m.

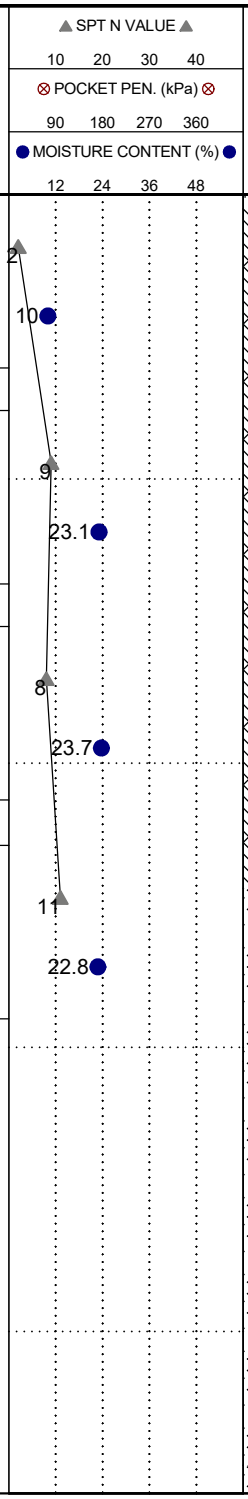
CMT Engineering Inc.
1011 Industrial Crescent,
St. Clements, ON, N0B 2M0
Telephone: 519-699-5775

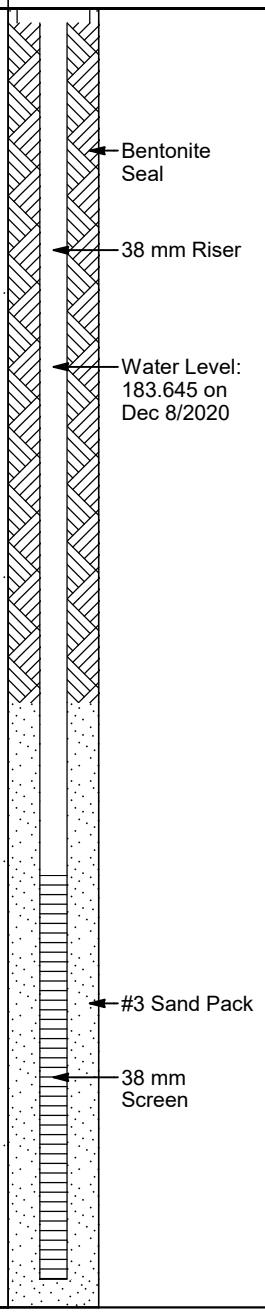
BOREHOLE NUMBER BH20-02

PROJECT: Miramichi Shores - Phase 4 Subdivision
PROJECT ADDRESS:
PROJECT NUMBER: 20-626
PROJECT LOCATION: Saugeen Shores, Ontario
DRILLING DATE: 20-11-16
GROUND ELEVATION: 184.91 m
DRILLING CONTRACTOR: CMT Drilling Inc.
LOGGED BY: SW
DRILLING EQUIPMENT: Geoprobe 7822DT
SAMPLING METHOD: SPT

DEPTH (m)	MATERIAL DESCRIPTION	Depth, Elevation (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)
0	**TOPSOIL** Very loose, black, sandy topsoil, moist (80 mm)	0.00, 184.91			
		0.08, 184.83			
	DISTURBED SAND Very loose, grey reworked/disturbed sand, trace silt and clay, trace organics and roots, moist (200 mm)	0.28, 184.63	SPT 1	66	0-1-1-1 (2)
	Becoming red				
1	**SAND** Loose, grey sand, trace silt and clay, wet	1.04, 183.87	SPT 2	70	3-4-5-4 (9)
	Becoming saturated	1.52, 183.39	SPT 3	61	4-4-4-4 (8)
2	Becoming compact	2.29, 182.62	SPT 4	100	5-5-6 (11)
3	Compact, saturated sand, trace clay and silt (Based on visual inspection. Not confirmed by SPT sampling)	3.05, 181.86			
4					

Bottom of borehole at 4.57 m, Elevation 180.34 m.





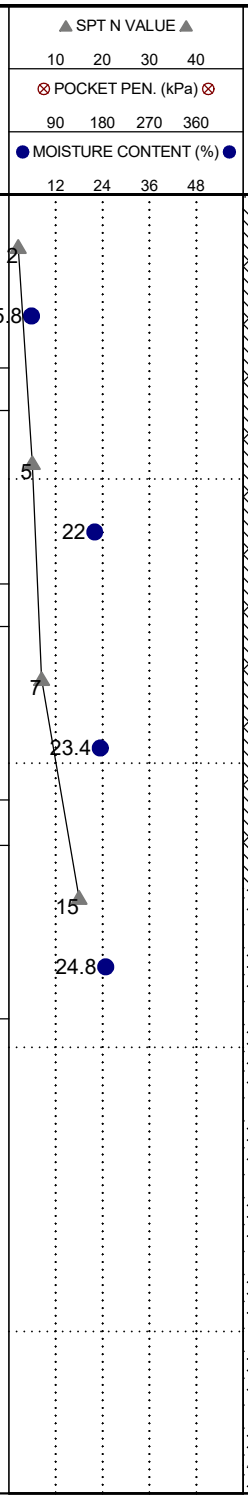
CMT Engineering Inc.
1011 Industrial Crescent,
St. Clements, ON, N0B 2M0
Telephone: 519-699-5775

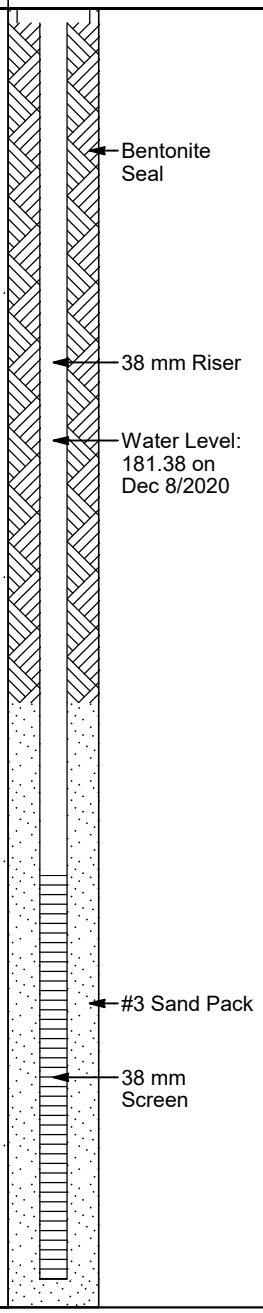
BOREHOLE NUMBER BH20-03

PROJECT: Miramichi Shores - Phase 4 Subdivision
PROJECT ADDRESS:
PROJECT NUMBER: 20-626
PROJECT LOCATION: Saugeen Shores, Ontario
DRILLING DATE: 20-11-16
GROUND ELEVATION: 182.90 m
DRILLING CONTRACTOR: CMT Drilling Inc.
LOGGED BY: SW
DRILLING EQUIPMENT: Geoprobe 7822DT
SAMPLING METHOD: SPT

DEPTH (m)	MATERIAL DESCRIPTION	Depth, Elevation (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)
	TOPSOIL Very loose, black, sandy topsoil, moist (100 mm)	0.00, 182.90			
		0.10, 182.80			
	DISTURBED SAND Very loose, brown reworked/disturbed sand, trace silt and clay, some organics, moist (100 mm)	0.20, 182.70	SPT 1	61	0-1-1-1 (2)
	SAND Very loose, light brown sand, trace silt and clay, moist				
	Becoming loose, grey, wet	0.76, 182.14	SPT 2	20	3-2-3-3 (5)
1					
			SPT 3	61	2-2-5-5 (7)
2					
	Becoming compact, saturated	2.29, 180.61	SPT 4	100	2-6-9-9 (15)
3					
	Compact, saturated sand, trace clay and silt (Based on visual inspection. Not confirmed by SPT sampling)	3.05, 179.85			
4					

Bottom of borehole at 4.57 m, Elevation 178.33 m.





CMT Engineering Inc.
1011 Industrial Crescent,
St. Clements, ON, N0B 2M0
Telephone: 519-699-5775

BOREHOLE NUMBER BH20-04

PROJECT: Miramichi Shores - Phase 4 Subdivision
PROJECT ADDRESS:
PROJECT NUMBER: 20-626
PROJECT LOCATION: Saugeen Shores, Ontario
DRILLING DATE: 20-11-16
GROUND ELEVATION: 180.78 m
DRILLING CONTRACTOR: CMT Drilling Inc.
LOGGED BY: SW
DRILLING EQUIPMENT: Geoprobe 7822DT
SAMPLING METHOD: SPT

DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	Depth, Elevation (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	SPT N VALUE / POCKET PEN. (kPa) / MOISTURE CONTENT (%)	WELL DIAGRAM
		TOPSOIL Very loose, black, sandy topsoil, wet (220 mm)	0.00, 180.78					
		DISTURBED SAND Very loose, grey reworked/disturbed sand, trace gravel, silt and clay, some organics, trace wood, saturated	0.22, 180.56	SPT 1	0	0-0-1-1 (1)	>>	Water Level: 180.425 m on Dec 8/2020
1		**BURIED TOPSOIL** Very loose, black, silty organic burried topsoil layer, saturated (100mm)	0.86, 179.92 0.96, 179.82	SPT 2	100	0-1-0-1 (1)	55.4	38 mm Riser Bentonite Seal
2		**DISTURBED SAND** Very loose, grey reworked/disturbed sand, trace gravel, silt and clay, trace organics, trace wood, saturated		SPT 3	80	0-0-2-2 (2)	2 39.3	#3 Sand Pack
3		**SAND** Compact to dense, grey sand, trace silt, clay and gravel, saturated	2.29, 178.49	SPT 4	100	4-9-17-20 (26)	26 21.8	38 mm Screen

Bottom of borehole at 3.05 m, Elevation 177.73 m.