PART A – FOUNDATION INVESTIGATION REPORT

for

HIGHWAY 400 UPGRADING MEDIAN SEWERS
NORTHERN PART APPROXIMATELY FROM MAPLEVIEW DRIVE TO ESSA ROAD
RETAINER ASSIGNMENT – TASK NO. 2013-E-0039-010
WP 2184-10-00
TOWN OF INNISFIL AND CITY OF BARRIE, SIMCOE COUNTY, ONTARIO

PREPARED FOR MINISTRY OF TRANSPORTATION OF ONTARIO

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Peto MacCallum Ltd.
CONSULTING ENGINEERS

PART A
FOUNDATION INVESTIGATION REPORT
For
Highway 400 Upgrading Median Sewers
Northern Part from Mapleview Drive to Essa Road
Retainer Assignment – Task No. 2013-E-0039-010, WP2184-10-00
Town of Innisfil and City of Barrie, Simcoe County, Ontario

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1. INTRODUCTION

Peto MacCallum Ltd. (PML) prepared this report for the Ministry of Transportation of Ontario (MTO) as the Retainer Assignment task No. 2013-E-0039-010.

This assignment includes the preparation of the following five separate reports.

PML REF. No.	FIR AND FIDR DESCRIPTION
15TF020-1	Highway 400 Upgrading Median Sewers Northern Part from Mapleview Drive to Essa Road
15TF020-2	Highway 400 Upgrading Lateral Sewers Northern Part from Mapleview Drive to Essa Road
15TF020-3	Highway 400 Upgrading Median Sewers Southern Part from Innisfil Beach Road to Mapleview Drive
15TF020-4	Highway 400 Upgrading Lateral Sewers Southern Part from Innisfil Beach Road to Mapleview Drive
15TF020-5	Highway 400 Culvert Headwalls for Culvert 96 and Inlet Headwall for Culvert 107

This report summarizes the results of a foundation investigation carried out along Highway 400 approximately from Mapleview Drive to Essa Road for the upgrading of the median sewer and including new lateral sewers.

The project involves the proposed installation of new lateral and longitudinal sewer pipes and replacement of existing sewer sections and inspection holes (manholes). This report provides details of the northern part of the assignment. The southern part from Innisfil Beach Road to Mapleview Drive is provided under separate cover.

The purpose of this investigation report is to summarize the subsurface stratigraphy and groundwater conditions encountered in the boreholes drilled along the Highway 400 within

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northern part of the project. The boreholes are applicable to both the longitudinal and lateral sewers.

It should be noted that the window for carrying out the field work for this investigation was limited. As a result, ten (10) boreholes were strategically located to obtain an approximate model of subsurface conditions along Highway 400 Sta. 26+297 to 28+905 (North Part). The Contractor shall be advised to carry out additional field investigation, such as additional boreholes and/or test pits to confirm the stratigraphy. Depth of the fill will be deeper than shown in the boreholes, especially in the areas near where there are existing storm sewer lines where boreholes were not drilled in the trenches.

2. SITE DESCRIPTION AND GEOLOGY

The project site is located in the Simcoe Lowlands Physiographic Region of Southern Ontario, the Simcoe lowland plain sloping gently toward the southwest and terminating against the Niagara Escarpment. Although the slope of the surface and the dip of the underlying Ordovician strata are both generally southwest-ward, the dip of the strata is steeper than the slope of the surface. The soil deposits are either deltaic or lacustrine in origin. The Simcoe lowlands consist of two lobes of sand plain which include shores of Kempenfelt Bay, the Nottawasaga River and Innisfil Creek.

The surficial soils of these sections of the Simcoe lowlands consist primarily of sand although silt, clay or peat may be found on low-lying areas.

The topography of the project area is generally flat to gently undulating, except for the highway embankments. The interchange of Highway 400 and Mapleview Drive is in a commercial and industrial area and was modified to the present condition by cutting approximately 6.0 m below the present grade of highway 400. The site is generally lined by farmland and heavily wooded area along Highway 400. Discontinuous sections contain commercial developments are also located from the Mapleview Drive interchange northerly and a residential community is located on the north side of the Essa Road interchange.

3. INVESTIGATION PROCEDURES

The borehole drilling for this study was carried out during the period from February 23 to 27, 2016. The investigation included ten (10) boreholes numbered 11 to 20 drilled to depths of 5.0 to 5.2 m and located as shown on the attached Drawings 17/25 to 25/25.

The borehole locations were cleared of underground services and then established in the field by portable GPS device and were strategically located to provide a minimum safe distance between the drilling equipment and the existing sewer pipe. The borehole locations and elevations were surveyed by PML in MTM NAD 83 northing and easting coordinates. All elevations in this report are expressed in metres.

All of the boreholes were advanced from the shoulder adjoining the median of the Highway 400 NBL, with the exception of Borehole 13 that was drilled on the S-E/W ramp at Mapleview Drive. Boreholes were advanced using continuous flight solid stem augers, powered by a track-mounted CME-75 drill rig. The drill rig used for drilling was owned and operated by Tri-Phase of Mississauga, Ontario. Tri-Phase is a specialist drilling contractor, was working under the full-time supervision of a member of PML's engineering staff.

Representative soil samples were recovered from the boreholes at regular 0.75 or 1.5 m depth intervals using a conventional split spoon sampler during drilling. Standard penetration tests were conducted simultaneously with the sampling operation to assess the strength characteristics of the substrata.

The groundwater conditions at the borehole locations were assessed during drilling by visual examination of the soil, the sampler and drill rods as the samples were retrieved and, when appropriate by measurement of the water level in the open borehole. Total of four (4) piezometer were installed at strategic borehole locations (Borehole 11, 15, 17 and 20) to record the water level in the long term.

Upon completion of drilling the boreholes were backfilled with bentonite/cement grout in accordance with the MTO guidelines and MOE Regulation 903 for borehole abandonment procedures. The piezometer were not decommissioned to provide update groundwater data at the time of construction.

Soils were identified in the field accordance with the MTO Soil Classification procedures. The recovered soil samples were returned to our laboratory for detailed visual examination, classification and routine moisture content determination in addition, the laboratory testing program included the following:

- Natural moisture content determinations (63)
- Grain size distribution analyses (17)
- Atterberg Limits Testing (4)

The results of the laboratory grain size distribution analyses and Atterberg Limits Testing are presented in Figures SR-GS-1 to SR-GS-3 and SR-PC-1, respectively. All of the test results are summarized on the Record of Borehole sheets.

4. SUMMARISED SUBSURFACE CONDITIONS

Reference is made to the appended Record of Borehole sheets for details of the subsurface conditions including soil classifications, inferred stratigraphy, boundary elevations, standard penetration test data and groundwater observations. The results of laboratory Atterberg limits testing, grain size distribution analyses and natural moisture content determinations are also shown on the Record of Borehole sheets.

A Key Plan of the project is provided in Drawing 400WM-A. The borehole locations and stratigraphic profile prepared from the borehole data are shown on Drawings 17/25 to 25/25. The boundaries between soil strata have been established at the borehole locations only. Between and beyond the boreholes, the boundaries are assumed and may vary.

The subsurface stratigraphy revealed in the boreholes drilled at the site generally comprised pavement structure over fill underlain by sand / silty sand and sand till deposits at depth. Cobbles and boulders were encountered in boreholes SR-BH 12 and SR-BH 15. It is noted that the level of the fill in the existing sewer trenches is deeper than shown on the borehole logs. In particular, Borehole SR-BH 13 was terminated at 5.2 m (El. 284.9) in native soils, whereas the nearby existing pipe was likely installed with a cut and cover technique and the depth of fill material could extend below the existing pipe to El. 284.5.

The groundwater level was at elevation 292.4 at borehole SR-BH 12. Four piezometers were installed in borehole SR-BH 11, SR-BH 15, SR-BH 17 and SR-BH 20. The water levels in the piezometers were recorded at depth of 3.25 to 3.72 m, elevation 294.1 to 267.2 m, except for borehole SR-BH-20 that remained dry.

The strata encountered are summarised below.

4.1 Pavement Structure

Asphalt layer ranging in thickness from 100 mm to 200 mm was encountered in all the boreholes. Pavement structure consists of compact to very dense sand with varying proportions of gravel. This granular base layer ranges in thickness from 300 mm to 670 mm and extends to a depth of 300 mm to 800 mm (El. 297.1 to El. 258.3). The moisture content of the granular base layer ranged from 2% to 8%.

4.2 Fill

The pavement structure is immediately followed by sand to silty sand fill layer in all of the boreholes located on the median, with the exception of SR-BH-16. This fill layer ranges in thickness from 400 mm to as high as 3.6 m and extends to a depth ranging from 900 mm to 4.1 m (El. 294. 7 to El. 256.1) below the asphalt surface. The SPT values in this fill layer varies widely and range from as low as 2 blows/300 mm to 31 blows/300 mm, indicating very loose to dense state of compaction.

The moisture content of this fill material varies from 1% to as high as 17%. The results of the grain size distribution analyses of four representative samples from this fill layer are shown on Figure SR-GS-1 in Appendix --. The test results reveal that the sand to silty sand fill consists of 1% to 5% gravel, 61% to 77% sand, 20% to 25% silt and 2% to 10% clay.

This fill layer was also found in Borehole SR-BH-13 that was located on the S-E/W ramp at Mapleview Drive. The thickness of fill in SR-BH-13 was about 3.2 m and extend to a maximum depth of 4.0 m (El. 286.1). The SPT values in this fill vary from 5 blows/300 mm to 31 blows/300 mm, indicating loose to dense state of compaction. The moisture content of the samples from this fill varies 2% to 18%. The high moisture content value of 18% corresponds to the sample with a blow count of 5/300 mm.

The results of grain size distribution analyses performed on 3 samples of the sand fill are presented in Figure SR-GS-1.

4.3 Sand to Silty Sand

The embankment fill in all of the boreholes, with the exception of SR-BH-13 and SR-BH-15, is underlain by sand to silty sand deposit at a depth ranging from 0.8 m to 4.1 m (El.256.1 to El. 294.7) below the asphalt surface. In SR-BH-13 and 15, the embankment fill is underlain by gravelly sand. This sandy deposit extends to the maximum depth of investigation of 5.2 m (El. 253.9). Occasional cobble layers were encountered in SR-BH-12 and SR-BH-15, which is reflected by the high SPT values. In general, SPT values in this deposit range from 14 blows/300 mm to as high as 56 blows/300 mm, indicating compact to very dense state of compaction.

Moisture content of this deposit, with the exception of Sample SS6 from SR-BH-11 (Silt) varies from 3% to 19%. The sand and silt contents of this deposit vary widely. The results of the sieve analysis test performed on ten representative samples from this deposit are provided on Figure SR-GS-2. The test results indicate that the sand to silty sand deposit consists of 0% to 12% gravel, 54% to 90% sand, 9% to 36% silt and 1% to 13% clay. However, the Sample SS6 from SR-BH-11 consisted of 9% sand, 83% silt and 8 % clay.

4.4 Gravelly Sand

The sandy fill in Boreholes SR-BH-13 and SR-BH-15 are immediately followed by gravelly sand layer, which extends to the maximum depth of investigation of 5.2 m (El. 283.0). The SPT values in this layer vary from 26 blows/300 mm to as high as 56 blows/300 mm, indicating compact to very dense state of compaction. .

The moisture content of the gravelly sand deposit varied from 2 to 8%. Grain size distribution analysis was performed on three representative samples from this layer and the results are provide on Figure SR-GS-3. The test results indicate that this layer consists of 245 to 33% gravel, 51% to 59% sand, 6% to 17% silt, and 2% to 6% clay.

4.5 Groundwater

In BH-12, groundwater was observed at a depth of 1.7 m (El. 293.1) while advancing the borehole. Upon completion of drilling, groundwater level was measured at a depth of 2.4 m (El. 292.4), which indicates the existence of a perched groundwater. Groundwater was not observed in any of the boreholes other than BH-12 during or upon completion of drilling.

The groundwater levels was monitored from February 24 to April 19, 2016. The groundwater levels measured in the piezometers installed in Boreholes BH-11, BH-15, BH-17 and BH-20 are provided in the Table 4.5.

Table 4.5 – Piezometer Water Level

Borehole No.	February 24 – 27, 2016		April 14, 2016	
	Depth (m)	Elevation (m)	Depth (m)	Elevation (m)
11	Dry	Dry	3.6	294.1
15	Dry	Dry	3.7	284.5
17	Dry	Dry	3.2	267.3
20	Dry	Dry	Dry	Dry

The groundwater levels at the site are subject to seasonal fluctuations and precipitation patterns.

5. CLOSURE

Mr. D. Woodcock and Mr. S. Aziz carried out the field investigation for this study under the supervision of Mr. M. Khorsand, BSc, EIT., and Mr. C. M. P. Nascimento, P. Eng., Project Manager. Tri-Phase Drilling Inc. supplied the drill rig for the subsurface exploration. The laboratory testing of the selected samples was carried out in the PML laboratory in Toronto.

This report was prepared by Mr. M. Khorsand, BSc, EIT. and reviewed by Mr. G. Degil, P.Eng. Senior Engineer, Geotechnical Services, Mr. C. M. P. Nascimento, P. Eng., MTO Designated Principal Contact, conducted an independent review of the report.

Yours very truly

Peto MacCallum Ltd.

Mansoor Khorsand, BSc, EIT
Project Supervisor, Geotechnical Services

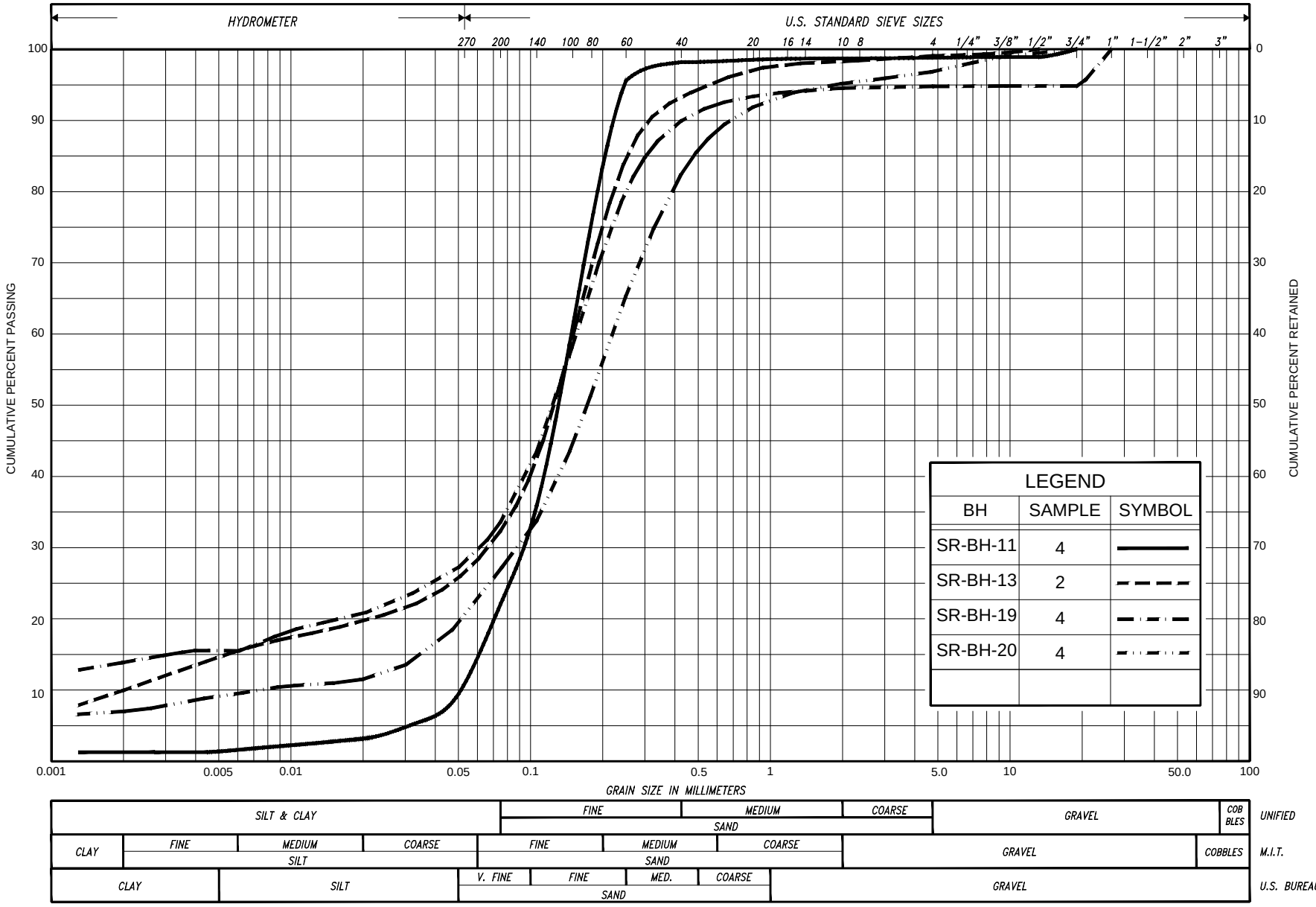
for Grigory O. Degil, PhD, P.Eng.
Senior Project Engineer

REGISTERED PROFESSIONAL ENGINEER
C M P Nascimento
May 16/2016
PROVINCE OF ONTARIO

Carlos M.P. Nascimento, P.Eng.
Project Manager and
MTO Designated Principal Contact

NOTE: .
Per Grigory Degil;
This report will be re-submitted when
Grigory Degil returns from overseas.

MKH/GD/CN:jk-mi

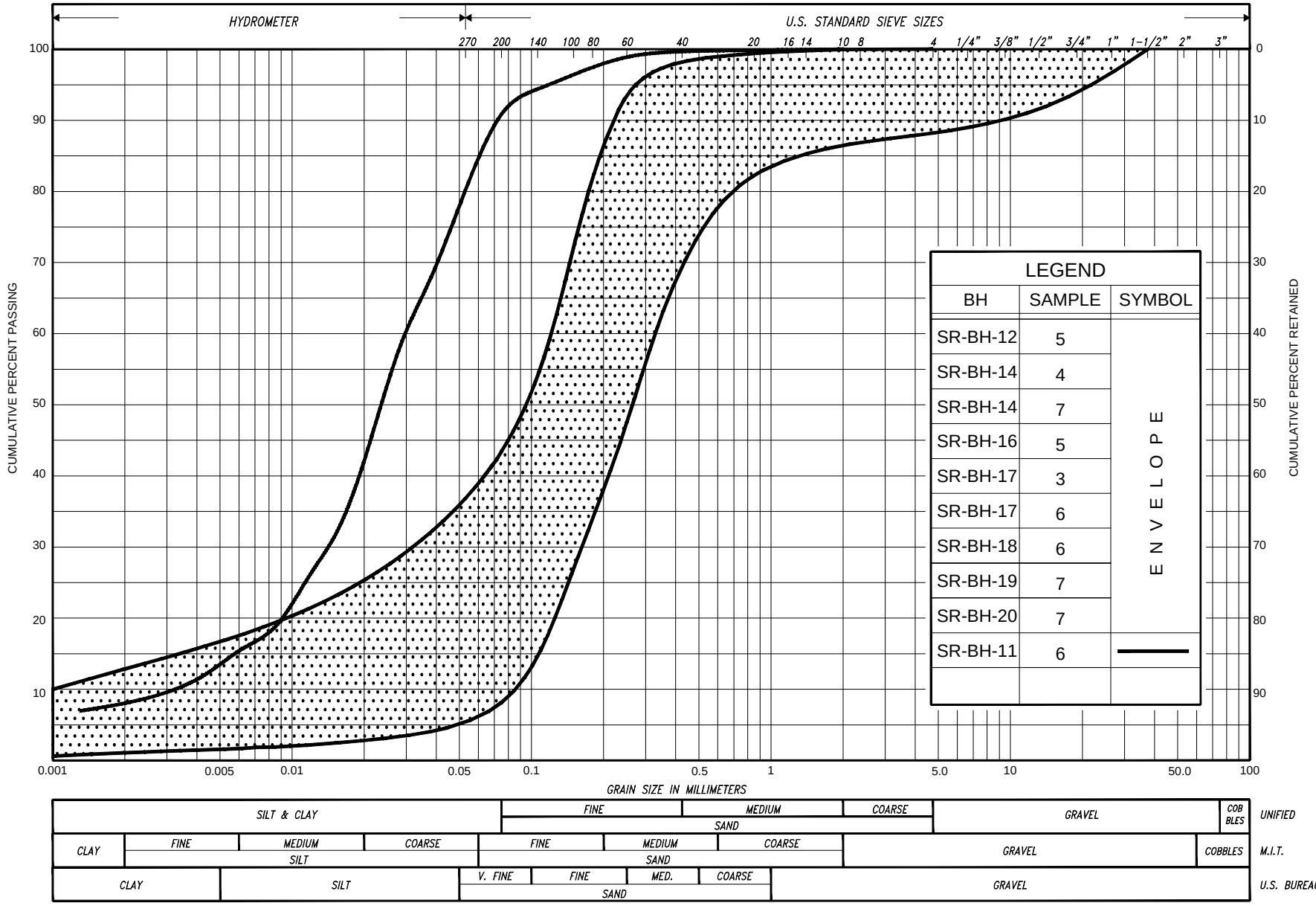


Ontario

GRAIN SIZE DISTRIBUTION

SAND to SILTY SAND, trace clay, trace to some gravel (FILL)

FIG No.	SR-GS-1
HWY:	400
Project No.	15TF020

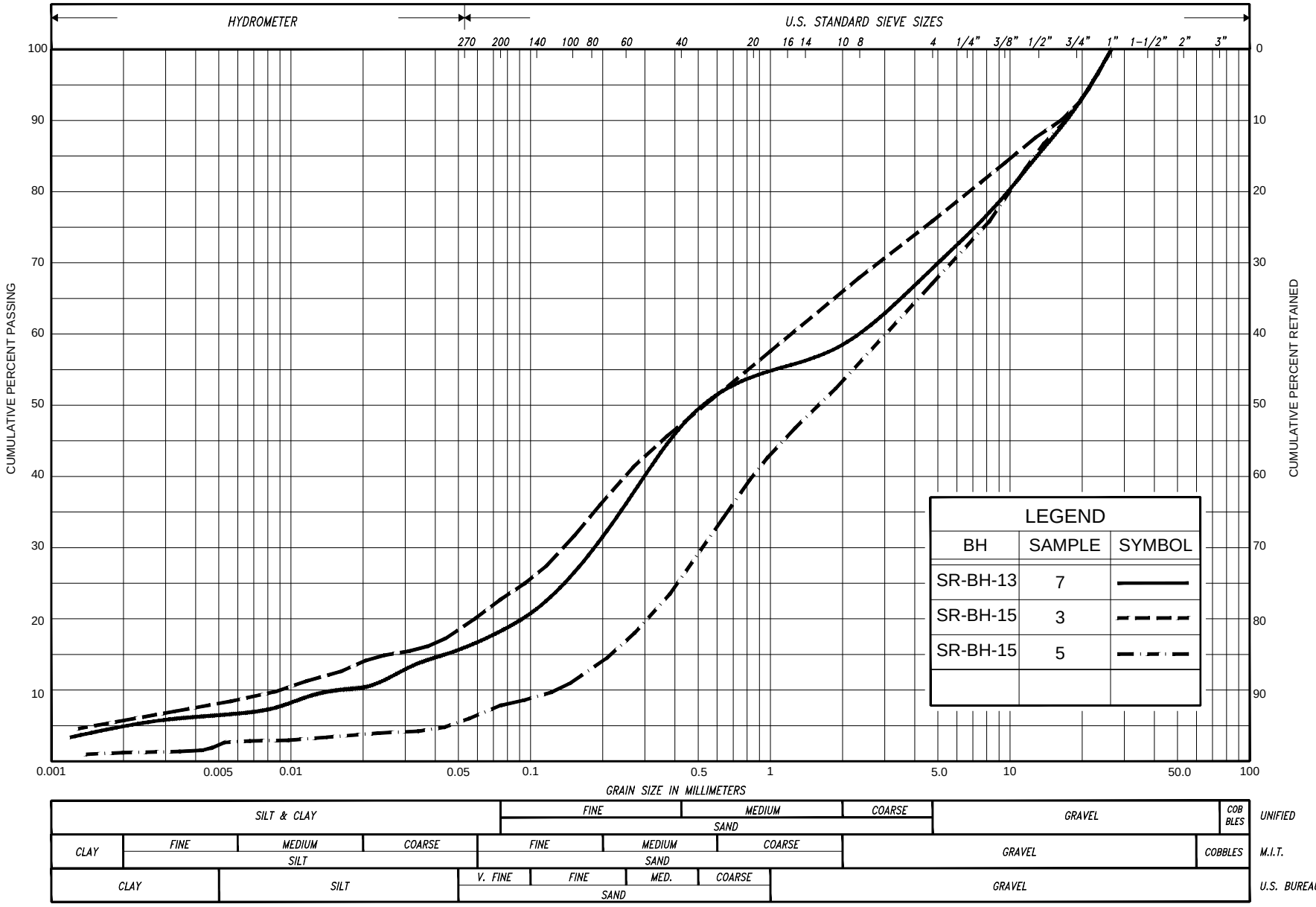


Ontario

GRAIN SIZE DISTRIBUTION

SAND to SILTY SAND to SANDY SILT, trace to some clay, trace gravel

FIG No.	SR-GS-2
HWY:	400
G.W.P. No.	15TF020



Ontario

GRAIN SIZE DISTRIBUTION

GRAVELLY SAND, trace to some silt, trace clay

FIG No.	SR-GS-3
HWY:	400
Project No.	15TF020

EXPLANATION OF TERMS USED IN REPORT

N VALUE: THE STANDARD PENETRATION TEST (SPT) N VALUE IS THE NUMBER OF BLOWS REQUIRED TO CAUSE A STANDARD 51mm O.D. SPLIT BARREL SAMPLER TO PENETRATE 0.3m INTO UNDISTURBED GROUND IN A BOREHOLE WHEN DRIVEN BY A HAMMER WITH A MASS OF 63.5kg, FALLING FREELY A DISTANCE OF 0.76m. FOR PENETRATIONS OF LESS THAN 0.3m N VALUES ARE INDICATED AS THE NUMBER OF BLOWS FOR THE PENETRATION ACHIEVED. AVERAGE N VALUE IS DENOTED THUS $\bar{N}$.

DYNAMIC CONE PENETRATION TEST: CONTINUOUS PENETRATION OF A CONICAL STEEL POINT (51mm O.D. 60° CONE ANGLE) DRIVEN BY 475 J IMPACT ENERGY ON 'A' SIZE DRILL RODS. THE RESISTANCE TO CONE PENETRATION IS MEASURED AS THE NUMBER OF BLOWS FOR EACH 0.3m ADVANCE OF THE CONICAL POINT INTO THE UNDISTURBED GROUND.

SOILS ARE DESCRIBED BY THEIR COMPOSITION AND CONSISTENCY OR DENSENESS.

COMPOSITION: SECONDARY SOIL COMPONENTS ARE DESCRIBED ON THE BASIS OF PERCENTAGE BY MASS OF THE WHOLE SAMPLE AS FOLLOWS:

PERCENT BY MASS	0 – 10	10 – 20	20 – 30	30 – 40	> 40
	TRACE	*SOME*	*WITH*	*ADJECTIVE (SILTY)*	*AND (AND SILT)*

CONSISTENCY: COHESIVE SOILS ARE DESCRIBED ON THE BASIS OF THEIR UNDRAINED SHEAR STRENGTH (c_u) AS FOLLOWS:

c_u (kPa)	0 - 12	12 - 25	25 - 50	50 - 100	100 - 200	>200
	VERY SOFT	*SOFT*	*FIRM*	*STIFF*	*VERY STIFF*	*HARD*

DENSENESS: COHESIONLESS SOILS ARE DESCRIBED ON THE BASIS OF DENSENESS AS INDICATED BY SPT N VALUES AS FOLLOWS:

N (BLOWS/0.3m)	0 - 5	5 - 10	10 - 30	30 - 50	>50
	VERY LOOSE	*LOOSE*	*COMPACT*	*DENSE*	*VERY DENSE*

ROCKS ARE DESCRIBED BY THEIR COMPOSITION AND STRUCTURAL FEATURES AND / OR STRENGTH.

RECOVERY: SUM OF ALL RECOVERED ROCK CORE PIECES FROM A CORING RUN EXPRESSED AS A PERCENT OF THE TOTAL LENGTH OF THE CORING RUN.

MODIFIED RECOVERY: SUM OF THOSE INTACT CORE PIECES, 100mm+ IN LENGTH EXPRESSED AS A PERCENT OF THE LENGTH OF THE CORING RUN. THE ROCK QUALITY DESIGNATION (R Q D), FOR MODIFIED RECOVERY, IS:

RQD (%)	0 - 25	25 - 50	50 - 75	75 - 90	90 - 100
	VERY POOR	*POOR*	*FAIR*	*GOOD*	*EXCELLENT*

JOINTING AND BEDDING:

SPACING	50mm	50 - 300mm	0.3m - 1m	1m - 3m	>3m
JOINTING	*VERY CLOSE*	*CLOSE*	*MOD. CLOSE*	*WIDE*	*VERY WIDE*
BEDDING	*VERY THIN*	*THIN*	*MEDIUM*	*THICK*	*VERY THICK*

ABBREVIATIONS AND SYMBOLS

FIELD SAMPLING

S S	SPLIT SPOON	T P	THINWALL PISTON
W S	WASH SAMPLE	O S	OSTERBERG SAMPLE
S T	SLOTTED TUBE SAMPLE	R C	ROCK CORE
B S	BLOCK SAMPLE	P H	T W ADVANCED HYDRAULICALLY
C S	CHUNK SAMPLE	P M	T W ADVANCED MANUALLY
T W	THINWALL OPEN	F S	FOIL SAMPLE
F V	FIELD VANE		

STRESS AND STRAIN

u_w	kPa	PORE WATER PRESSURE
r_u	1	PORE PRESSURE RATIO
σ	kPa	TOTAL NORMAL STRESS
σ'	kPa	EFFECTIVE NORMAL STRESS
τ	kPa	SHEAR STRESS
$\sigma_1, \sigma_2, \sigma_3$	kPa	PRINCIPAL STRESSES
ϵ	%	LINEAR STRAIN
$\epsilon_1, \epsilon_2, \epsilon_3$	%	PRINCIPAL STRAINS
E	kPa	MODULUS OF LINEAR DEFORMATION
G	kPa	MODULUS OF SHEAR DEFORMATION
μ	1	COEFFICIENT OF FRICTION

MECHANICAL PROPERTIES OF SOIL

m_v	kPa^{-1}	COEFFICIENT OF VOLUME CHANGE
C_c	1	COMPRESSION INDEX
C_s	1	SWELLING INDEX
C_α	1	RATE OF SECONDARY CONSOLIDATION
c_v	m^2/s	COEFFICIENT OF CONSOLIDATION
H	m	DRAINAGE PATH
T_v	1	TIME FACTOR
U	%	DEGREE OF CONSOLIDATION
σ'_{vo}	kPa	EFFECTIVE OVERBURDEN PRESSURE
σ'_p	kPa	PRECONSOLIDATION PRESSURE
τ_f	kPa	SHEAR STRENGTH
c'	kPa	EFFECTIVE COHESION INTERCEPT
ϕ'	-°	EFFECTIVE ANGLE OF INTERNAL FRICTION
c_u	kPa	APPARENT COHESION INTERCEPT
ϕ_u	-°	APPARENT ANGLE OF INTERNAL FRICTION
τ_R	kPa	RESIDUAL SHEAR STRENGTH
τ_r	kPa	REMOULDED SHEAR STRENGTH
S_t	1	SENSITIVITY = $\frac{c_u}{\tau_r}$

PHYSICAL PROPERTIES OF SOIL

ρ_s	kg/m^3	DENSITY OF SOLID PARTICLES
γ_s	kN/m^3	UNIT WEIGHT OF SOLID PARTICLES
ρ_w	kg/m^3	DENSITY OF WATER
γ_w	kN/m^3	UNIT WEIGHT OF WATER
ρ	kg/m^3	DENSITY OF SOIL
γ	kN/m^3	UNIT WEIGHT OF SOIL
ρ_d	kg/m^3	DENSITY OF DRY SOIL
γ_d	kN/m^3	UNIT WEIGHT OF DRY SOIL
ρ_{sat}	kg/m^3	DENSITY OF SATURATED SOIL
γ_{sat}	kN/m^3	UNIT WEIGHT OF SATURATED SOIL
ρ'	kg/m^3	DENSITY OF SUBMERGED SOIL
γ'	kN/m^3	UNIT WEIGHT OF SUBMERGED SOIL
e	1,%	VOID RATIO
n	1,%	POROSITY
w	1,%	WATER CONTENT
S_r	%	DEGREE OF SATURATION
w_L	%	LIQUID LIMIT
w_P	%	PLASTIC LIMIT
w_S	%	SHRINKAGE LIMIT
I_P	%	PLASTICITY INDEX = $w_L - w_P$
I_L	1	LIQUIDITY INDEX = $\frac{w - w_P}{I_P}$
I_C	1	CONSISTENCY INDEX = $\frac{w_L - w}{I_P}$
DTPL		DRIER THAN PLASTIC LIMIT
APL		ABOUT PLASTIC LIMIT
WTPL		WETTER THAN PLASTIC LIMIT
e_{max}	1,%	VOID RATIO IN LOOSEST STATE
e_{min}	1,%	VOID RATIO IN DENSEST STATE
I_D	1	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
D	mm	GRAIN DIAMETER
D_n	mm	n PERCENT - DIAMETER
C_U	1	UNIFORMITY COEFFICIENT
h	m	HYDRAULIC HEAD OR POTENTIAL
q	m^3/s	RATE OF DISCHARGE
v	m/s	DISCHARGE VELOCITY
i	1	HYDRAULIC GRADIENT
k	m/s	HYDRAULIC CONDUCTIVITY
j	kN/m^3	SEEPAGE FORCE

Ontario

Peto MacCallum Ltd. CONSULTING ENGINEERS

Foundation Design

RECORD OF BOREHOLE No SR-BH-11 1 of 1 METRIC

W.P. 2184-10-00 LOCATION Co-ords: 4 911 625.3 N; 289 892.1 E ORIGINATED BY S.A.

DIST Central HWY 400 BOREHOLE TYPE Continuous Flight Solid Stem Augers COMPILED BY M.Kh.

DATUM Geodetic DATE February 23 and 24, 2016 CHECKED BY C.N.

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
297.7	Ground Surface							20 40 60 80 100	20 40 60		
0.0	150mm asphalt over gravelly sand					*					
297.1	Dense		1	SS	33		297	○	○		
0.6	(PAVEMENT FILL)										
	Silty sand trace gravel, trace clay		2	SS	14			○	○		
	Compact Grey/brown Moist										
	(FILL)		3	SS	10		296	○	○		
			4	SS	10		295	○	○		1 77 20 2
294.7											
3.0	Sandy silt to silt trace clay		5	SS	32		294	○	○		
	Dense Brown/grey Moist to wet										
			6	SS	40		293	○	○		0 9 83 8
292.5											
5.2	End of borehole										

* Borehole dry

Water level measured in piezometer

Upon completion of augering, no cave-in

Piezometer Readings:

Date	Depth (m)	Elev.
Feb. 24/'16	Dry	-----
Apr. 19/'16	3.6	294.1

Piezometer Legend:

- Flush cover and concrete
- Bentonite seal
- Filter sand
- Screen
- Backfill

+ , × : Numbers refer to Sensitivity

15 10 5 (%) STRAIN AT FAILURE

Ontario

Peto MacCallum Ltd. CONSULTING ENGINEERS

Foundation Design

RECORD OF BOREHOLE No SR-BH-12 1 of 1 METRIC

W.P. 2184-10-00 LOCATION Co-ords: 4 911 801.9 N; 289 862.8 E ORIGINATED BY S.A.

DIST Central HWY 400 BOREHOLE TYPE Continuous Flight Solid Stem Augers COMPILED BY M.Kh.

DATUM Geodetic DATE February 23 and 24, 2016 CHECKED BY C.N.

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
294.8	Ground Surface										
0.0	180mm asphalt over gravelly sand										
294.3			1	SS	24				○		
0.5	Compact Grey/ brown Moist (PAVEMENT FILL)						294				
	Silty sand		2	SS	5				○		
	Very loose Brown Moist to compact (FILL)		3	SS	2	▽*	293		○		First water strike at 1.7m
	topsoil rootlets organics										
292.2			4	SS	15		292		○		
2.6	Silty sand to sandy silt trace clay, trace gravel										
	Compact to Brown/ very dense grey Wet		5	SS	28				○		7 55 27 11
	cobbles and boulders					▼*	291				
289.8			6	SS	96/28cm		290		○		Second water strike at 4.6m
5.0	End of borehole										

* 2016 02 23 and 24

▽ Water level observed during drilling

▼ Water level measured after drilling

Upon completion of augering, free water at 2.4m
cave-in at 4.1m

+7, ×5 : Numbers refer to Sensitivity

15 10 5 (%) STRAIN AT FAILURE

Ontario

Peto MacCallum Ltd. CONSULTING ENGINEERS

Foundation Design

RECORD OF BOREHOLE No SR-BH-13 1 of 1 METRIC

W.P. 2184-10-00 LOCATION Co-ords: 4 912 122.6 N; 289 841.7 E ORIGINATED BY D.W.

DIST Central HWY 400 BOREHOLE TYPE Continuous Flight Solid Stem Augers COMPILED BY M.Kh.

DATUM Geodetic DATE March 08, 2016 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						GR SA SI CL
290.1	Ground Surface					*					
0.0	200mm asphalt over sand, trace gravel						290				
	Compact Brown (PAVEMENT FILL)		1	SS	23				○		
289.3											
0.8	Sand, some to trace gravel		2	SS	15		289		○		1 66 23 10
	Compact Brown Moist to dense										
	(FILL)		3	SS	31				○		
							288				
			4	SS	29				○		
	Gravelly sand to sand						287				
	Loose Wet		5	SS	5				○		
286.1											
4.0	Gravelly sand, some silt, trace clay		6	SS	44		286		○		
	Dense to very dense Brown Wet										
			7	SS	56				○		31 51 13 5
284.9							285				
5.2	End of borehole										

* Borehole dry

Upon completion of augering, no cave-in

ON MTO_VER3 NEW LOGO_WP 15TF020-MEDIAN SEWERS NORTHERN PART.GPJ ON_MOT.GDT 17/05/2016 11:41:34 AM

+ , × : Numbers refer to Sensitivity

15 10 5 (%) STRAIN AT FAILURE

Ontario

Peto MacCallum Ltd. CONSULTING ENGINEERS

Foundation Design

RECORD OF BOREHOLE No SR-BH-14 1 of 1 METRIC

W.P. 2184-10-00 LOCATION Co-ords: 4 912 116.8 N; 289 809.3 E ORIGINATED BY D.W.

DIST Central HWY 400 BOREHOLE TYPE Continuous Flight Solid Stem Augers COMPILED BY M.Kh.

DATUM Geodetic DATE February 23, 2016 CHECKED BY C.N.

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
290.3	Ground Surface										
0.0	100mm asphalt over sand and gravel										
289.7	Compact Brown (PAVEMENT FILL)		1	SS	26		290		○		
0.6	Sand to silty sand										
289.2	Compact Brown Moist (FILL)		2	SS	21				○		
1.1	Sand to silty sand trace clay, trace gravel						289				
	Compact to dense Brown/ grey Moist to wet		3	SS	14				○		
			4	SS	29		288		○		0 61 36 3
			5	SS	35		287		○		
			6	SS	14				○		
							286				
285.1			7	SS	33				○		5 77 15 3
5.2	End of borehole										

* Borehole dry

Upon completion of augering, no cave-in

+ , × : Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

Ontario

Peto MacCallum Ltd. CONSULTING ENGINEERS

Foundation Design

RECORD OF BOREHOLE No SR-BH-15 1 of 1 METRIC

W.P. 2184-10-00 LOCATION Co-ords: 4 912 535.6 N; 289 728.7 E ORIGINATED BY S.A.

DIST Central HWY 400 BOREHOLE TYPE Continuous Flight Solid Stem Augers COMPILED BY M.Kh.

DATUM Geodetic DATE February 26 and 27, 2016 CHECKED BY C.N.

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
288.2	Ground Surface										
0.0 / 287.7	150mm asphalt over gravelly sand		1	SS	18		288		○		
0.5 / 287.3	Compact Grey/ brown (PAVEMENT FILL)										
0.9	Gravelly sand, some silt Compact Brown Moist (FILL)		2	SS	18		287		○		
	Gravelly sand, trace to some silt, trace clay		3	SS	44				○		24 53 17 6
	Compact to Brown/ very dense grey Moist		4	SS	45		286		○		
	cobbles		5	SS	55		285		○		33 59 6 2
283.0			6	SS	26		284		○		
5.2	End of borehole						283				

* Borehole dry

Water level measured in piezometer

Upon completion of augering, no cave-in

Piezometer Readings:

Date	Depth (m)	Elev.
Feb. 27/'16	Dry	-----
Apr. 19/'16	3.7	284.5

Piezometer Legend:

- Flush cover and concrete
- Bentonite seal
- Filter sand
- Screen
- Backfill

+ , × : Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

Ontario

Peto MacCallum Ltd. CONSULTING ENGINEERS

Foundation Design

RECORD OF BOREHOLE No SR-BH-16 1 of 1 METRIC

W.P. 2184-10-00 LOCATION Co-ords: 4 912 886.4 N; 289 591.2 E ORIGINATED BY S.A.

DIST Central HWY 400 BOREHOLE TYPE Continuous Flight Solid Stem Augers COMPILED BY M.Kh.

DATUM Geodetic DATE February 26 and 27, 2016 CHECKED BY C.N.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						GR SA SI CL
279.3	Ground Surface					*					
0.0	180mm asphalt over gravelly sand						279				
	Dense Grey/ brown (PAVEMENT FILL)		1	SS	33						
278.5											
0.8	Sand to silty sand trace clay, trace gravel		2	SS	23		278		○		
	Compact Brown/ Moist to dense grey		3	SS	22				○		
			4	SS	34		277		○		
			5	SS	34		276		○		0 88 9 3
							275				
274.1			6	SS	40				○		
5.2	End of borehole										

* Borehole dry.

Upon completion of augering, no cave-in

+ , × : Numbers refer to Sensitivity

15 10 5 (%) STRAIN AT FAILURE

Ontario

Peto MacCallum Ltd. CONSULTING ENGINEERS

Foundation Design

RECORD OF BOREHOLE No SR-BH-17 1 of 1 METRIC

W.P. 2184-10-00 LOCATION Co-ords: 4 913 134.3 N; 289 440.4 E ORIGINATED BY S.A.

DIST Central HWY 400 BOREHOLE TYPE Continuous Flight Solid Stem Augers COMPILED BY M.Kh.

DATUM Geodetic DATE February 26 and 27, 2016 CHECKED BY C.N.

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
270.5	Ground Surface										
0.0 / 270.1	150mm asphalt over gravelly sand										
0.4	Compact (PAVEMENT FILL)		1	SS	26		270		○		
269.5	Silty sand trace gravel, trace clay		2	SS	20				○		
1.0	Compact Grey/ Moist brown (FILL)		3	SS	32		269		○		2 90 7 1
	Sand to silty sand trace clay, trace gravel										
	Compact to dense Brown/ grey Moist		4	SS	33		268		○		
			5	SS	42		267		○		
							266				0 73 26 1
265.3			6	SS	44				○		
5.2	End of borehole										

* Borehole dry

Water level measured in piezometer

Upon completion of augering, no cave-in

Piezometer Readings:

Date	Depth (m)	Elev.
Feb. 27/'16	Dry	-------
Apr .19/'16	3.3	267.2

Piezometer Legend:

- Flush cover and concrete
- Bentonite seal
- Filter sand
- Screen
- Backfill

+ , × : Numbers refer to Sensitivity

15 10 5 (%) STRAIN AT FAILURE

Ontario

Peto MacCallum Ltd. CONSULTING ENGINEERS

Foundation Design

RECORD OF BOREHOLE No SR-BH-18 1 of 1 METRIC

W.P. 2184-10-00 LOCATION Co-ords: 4 913 206.3 N; 289 378.0E ORIGINATED BY D.W.

DIST Central HWY 400 BOREHOLE TYPE Continuous Flight Solid Stem Augers COMPILED BY M.Kh.

DATUM Geodetic DATE February 26, 2016 CHECKED BY C.N.

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
267.8	Ground Surface										
0.0	130mm asphalt over sand and gravel										
267.2 / 0.6	Compact Brown (PAVEMENT FILL)		1	SS	27				○		
	Sand to silty sand, some gravel organic inclusions		2	SS	12		267		○		
	Compact to Brown very loose Moist to wet		3	SS	3		266		○		
265.8 / 2.0	(FILL)										
	Sand to silty sand trace clay, some gravel		4	SS	15		265		○		
	Compact to dense Brown/grey Moist		5	SS	22		264		○		
262.6			6	SS	32		263		○		12 74 10 4
5.2	End of borehole										

* Borehole dry

Upon completion of augering, no cave-in

+ , × : Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

Ontario

Peto MacCallum Ltd. CONSULTING ENGINEERS

Foundation Design

RECORD OF BOREHOLE No SR-BH-19 1 of 1 METRIC

W.P. 2184-10-00 LOCATION Co-ords: 4 913 306.3 N; 289 295.9 E ORIGINATED BY D.W.

DIST Central HWY 400 BOREHOLE TYPE Continuous Flight Solid Stem Augers COMPILED BY M.Kh.

DATUM Geodetic DATE February 26, 2016 CHECKED BY C.N.

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
264.0	Ground Surface										
0.0	200mm asphalt over sand and gravel										
263.5											
0.5	Very dense Brown (PAVEMENT FILL)		1	SS	55				○		
	Sand to silty sand trace clay, trace gravel		2	SS	20		263		○		
	Compact Brown Moist to loose		3	SS	25				○		
	(FILL)						262				
			4	SS	5				○		5 61 25 9
	silty sand layer		5	SS	6		261		○		
259.9			6	SS	14		260		○		
4.1	Silty sand trace clay, trace gravel										
	Compact Brown/ grey Moist		7	SS	24		259		○		8 70 18 4
258.8											
5.2	End of borehole										

* Borehole dry

Upon completion of augering, no cave-in

+ , × : Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

Ontario

Peto MacCallum Ltd. CONSULTING ENGINEERS

Foundation Design

RECORD OF BOREHOLE No SR-BH-20 1 of 1 METRIC

W.P. 2184-10-00 LOCATION Co-ords: 4 913 426.7 N; 289 194.8 E ORIGINATED BY D.W.

DIST Central HWY 400 BOREHOLE TYPE Continuous Flight Solid Stem Augers COMPILED BY M.Kh.

DATUM Geodetic DATE February 26, 2016 CHECKED BY C.N.

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa: ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
259.1	Ground Surface										
0.0	130mm asphalt over sand, some gravel to silty sand		1	SS	22	*	259	○	○		
258.3	Compact Brown										
0.8	(PAVEMENT FILL)		2	SS	22		258	○	○		
	Silty sand trace clay, trace gravel										
	Compact Brown Moist to dense		3	SS	31		257	○	○		
	(FILL)										
			4	SS	19		256	○	○		3 70 20 7
256.1											
3.0	Silty sand trace gravel, trace clay		5	SS	3			○	○		
	Very loose Wet to compact										
			6	SS	9		255	○	○		
	Brown/ grey Moist										
253.9			7	SS	22		254	○	○		2 54 31 13
5.2	End of borehole										

* Borehole dry

Upon completion of augering, no cave-in

Piezometer Readings:

Date	Depth (m)	Elev.
Feb. 26/'16	Dry	-------
Apr. 19/'16	Dry	-------

Piezometer Legend:

- Flush cover and concrete
- Bentonite seal
- Filter sand
- Screen
- Backfill

+ , × : Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

CONT No 2017-XXXX
WP No 2184-10-00

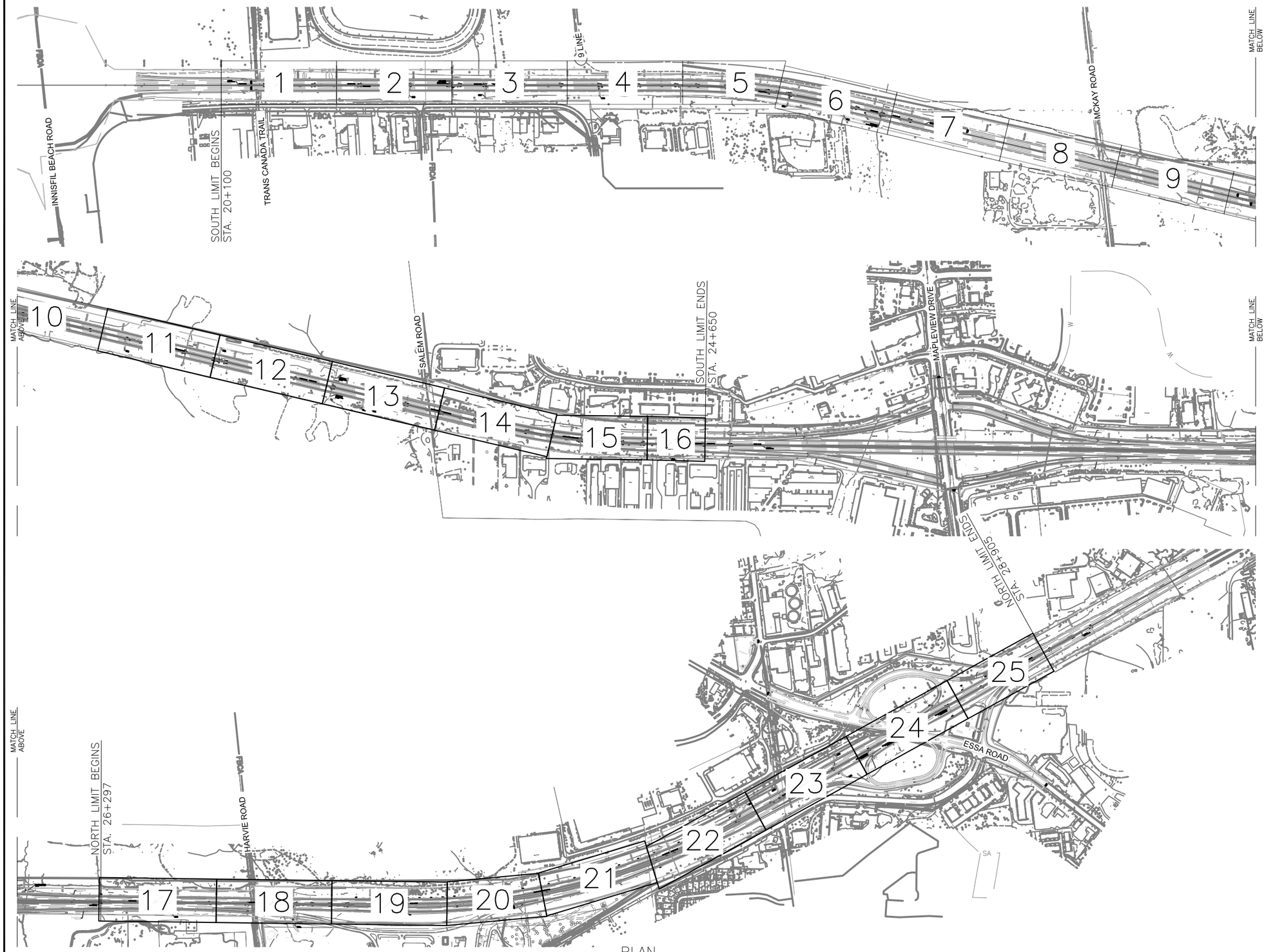
HIGHWAY 400 SEWER REPLACEMENT

KEY PLAN

SHEET

Peto MacCallum Ltd.
CONSULTING ENGINEERS

KEY PLAN
SCALE
5 0 5 10 15km



PLAN
SCALE
100 0 100 200m

LEGEND

25 Site Plan Sheet Number

BH No	BOREHOLE LOCATION PLAN
SR-BH-11	Refer to Sheet No. 400WM-17/25
SR-BH-12	Refer to Sheet No. 400WM-17/25
SR-BH-13	Refer to Sheet No. 400WM-18/25
SR-BH-14	Refer to Sheet No. 400WM-18/25
SR-BH-15	Refer to Sheet No. 400WM-20/25
SR-BH-16	Refer to Sheet No. 400WM-21/25
SR-BH-17	Refer to Sheet No. 400WM-22/25
SR-BH-18	Refer to Sheet No. 400WM-22/25
SR-BH-19	Refer to Sheet No. 400WM-23/25
SR-BH-20	Refer to Sheet No. 400WM-23/25

- NOTE -

The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.

REVISIONS

DATE	BY	DESCRIPTION

Geocres No. 31D-642

HWY No	400			DIST	CENTRAL
SUBM'D	NA	CHECKED	M.Kh	SITE	
DRAWN	NL	CHECKED	GD	DWG	400WM-A
		APPROVED	CN	DATE	MAY 16, 2016

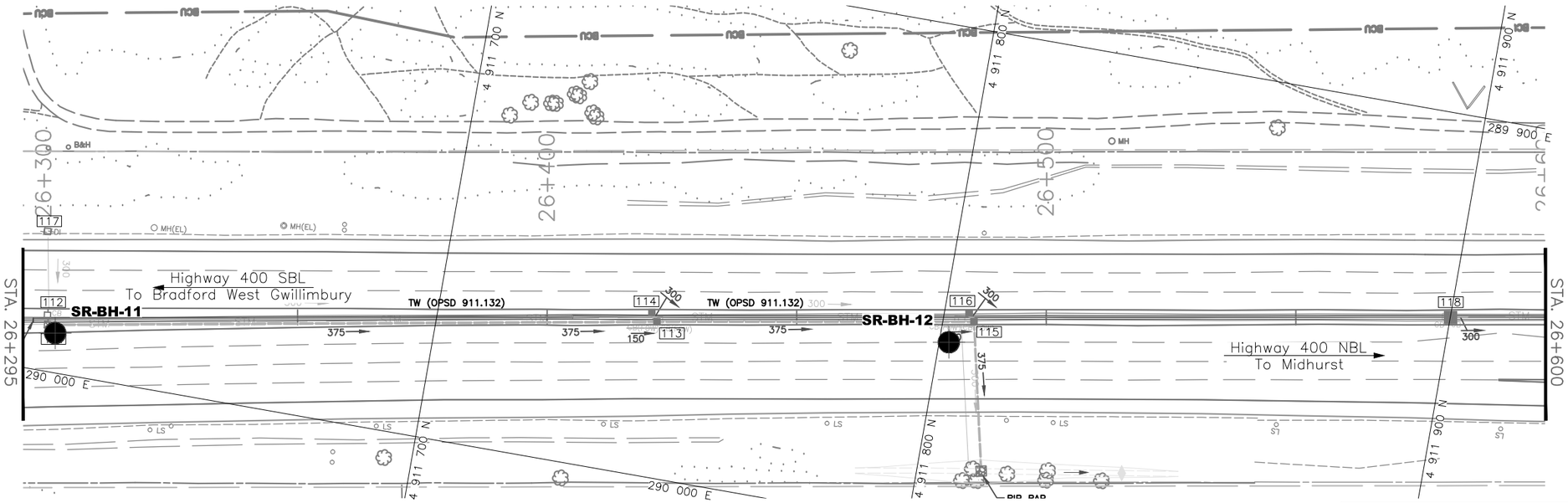
CONT No 2017-XXXX
WP No 2184-10-00

HIGHWAY 400 SEWER REPLACEMENT

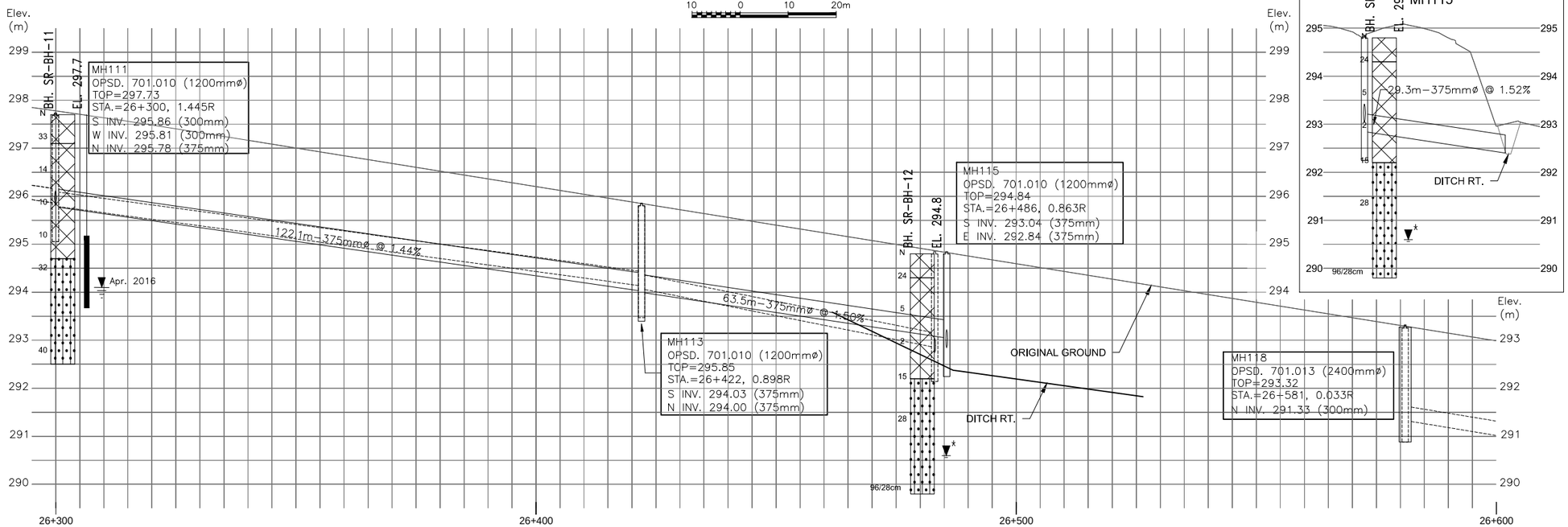
BOREHOLE LOCATIONS AND SOIL STRATA

SHEET

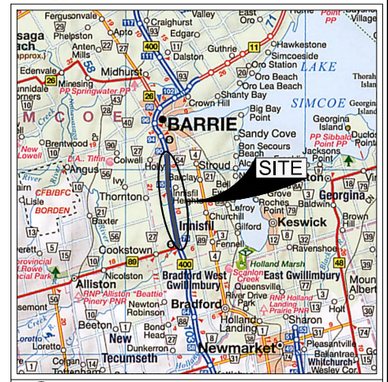
Peto MacCallum Ltd.
CONSULTING ENGINEERS



PLAN
SCALE
10 0 10 20m



℄ PROFILE
SCALE
HORIZONTAL
10 0 10 20m
VERTICAL
1 0 1 2m



KEY PLAN
SCALE
5 0 5 10 15km

LEGEND

- Borehole Location
- N Blows/0.3m (Std. Pen Test, 475 J / blow)
- Piezometer
- WL at time of investigation (March 2016)
- WL in Piezometer
- Existing Sewer
- Replacement/New Sewer
- FILL
- SAND TO SANDY SILT

BH No	ELEVATION	CO-ORDINATES NORTHINGS	CO-ORDINATES EASTINGS
SR-BH-11	297.7	4 911 625.3	289 892.1
SR-BH-12	294.8	4 911 801.9	289 862.8

REGISTERED PROFESSIONAL ENGINEER
C M P Nascimento
PROVINCE OF ONTARIO

PER GRIGORY DEGIL:
THIS REPORT WILL BE RE-SUBMITTED WHEN GRIGORY DEGIL RETURNS FROM OVERSEAS.

REF MTO Drawings; 09.NEWCONS-For FDN.dwg & 10.PROFILES.dwg; dated January 13, 2016 & January 12, 2016, respectively.

- NOTE -
The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.

REVISIONS	DATE	BY	DESCRIPTION

Geocres No. 31D-642

HWY No	400			DIST	CENTRAL
SUBM'D	NA	CHECKED M.Kh	DATE MAY 16, 2016	SITE	
DRAWN	NL	CHECKED GD	APPROVED CN	DWG	400WM-17/25

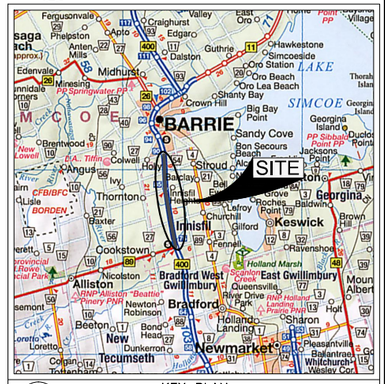
CONT No 2017-XXXX
WP No 2184-10-00

HIGHWAY 400 SEWER REPLACEMENT

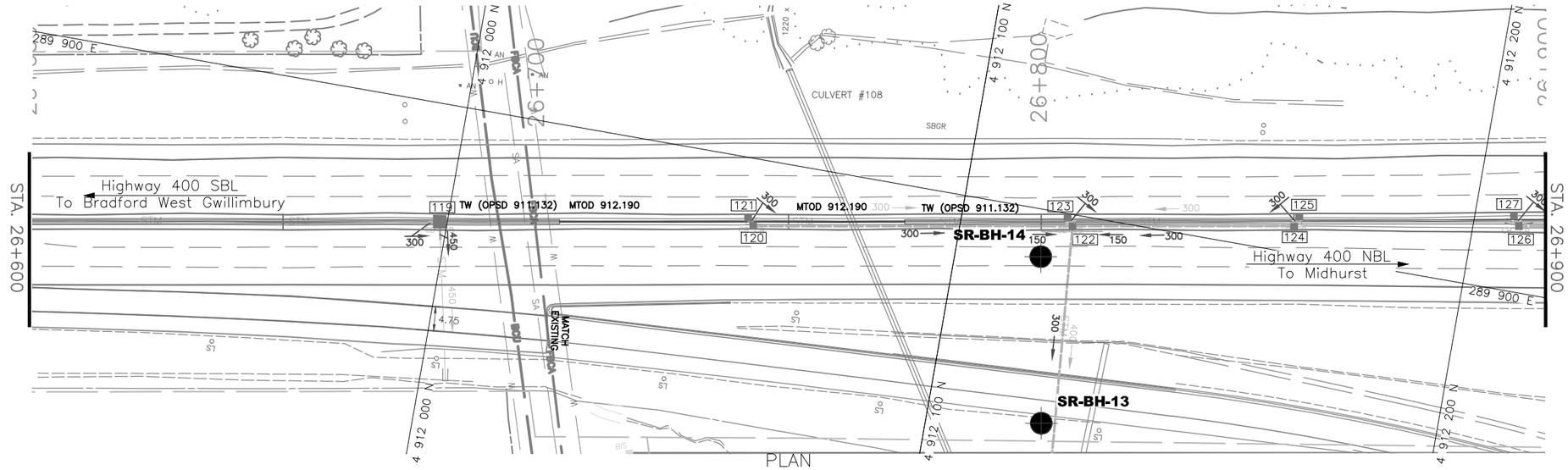
BOREHOLE LOCATIONS AND SOIL STRATA

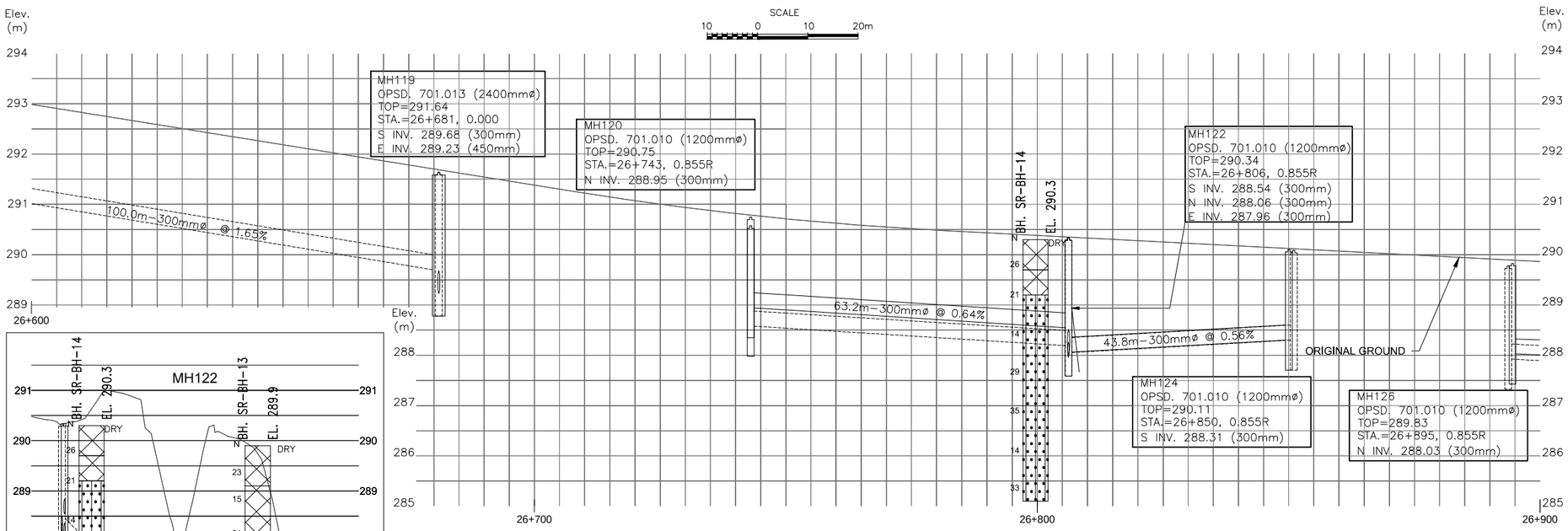
SHEET

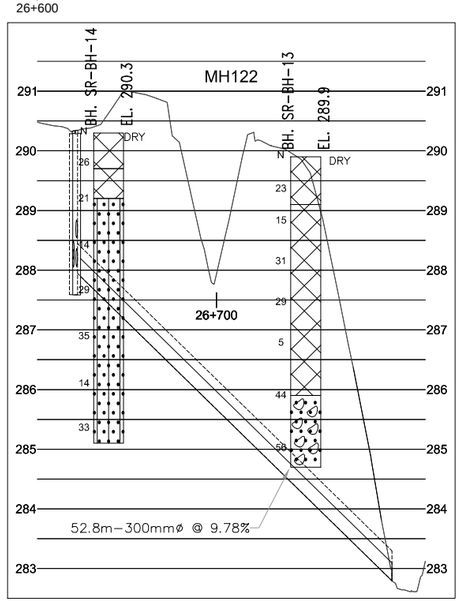
Peto MacCallum Ltd.
CONSULTING ENGINEERS



KEY PLAN
SCALE
5 0 5 10 15km







℄ PROFILE
SCALE
HORIZONTAL
10 0 10 20m
VERTICAL
1 0 1 2m

LEGEND

- Borehole Location
- N Blows/0.3m (Std. Pen Test, 475 J / blow)
- Piezometer
- WL at time of investigation (March 2016)
- WL in Piezometer
- Existing Sewer
- Replacement/New Sewer
- FILL
- GRAVELLY SAND
- SAND TO SILTY SAND

BH No	ELEVATION	CO-ORDINATES NORTHINGS	EASTINGS
SR-BH-13	290.1	4 912 122.6	289 841.7
SR-BH-14	290.3	4 912 116.8	289 809.3

REGISTERED PROFESSIONAL ENGINEER
C M P Nascimento
May 16, 2016
PROVINCE OF ONTARIO

PER GRIGORY DEGIL:
THIS REPORT WILL BE RE-SUBMITTED WHEN GRIGORY DEGIL RETURNS FROM OVERSEAS.

- NOTE -
The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.

REVISIONS

DATE	BY	DESCRIPTION

Geocres No. 31D-642

REF MTO Drawings; 09.NEWCONS-For FDN.dwg & 10.PROFILES.dwg; dated January 13, 2016 & January 12, 2016, respectively.

HWY No.	400			DIST	CENTRAL
SUBM'D	NA	CHECKED M.Kh	DATE MAY 16, 2016	SITE	
DRAWN	NL	CHECKED GD	APPROVED CN	DWG	400WM-18/25

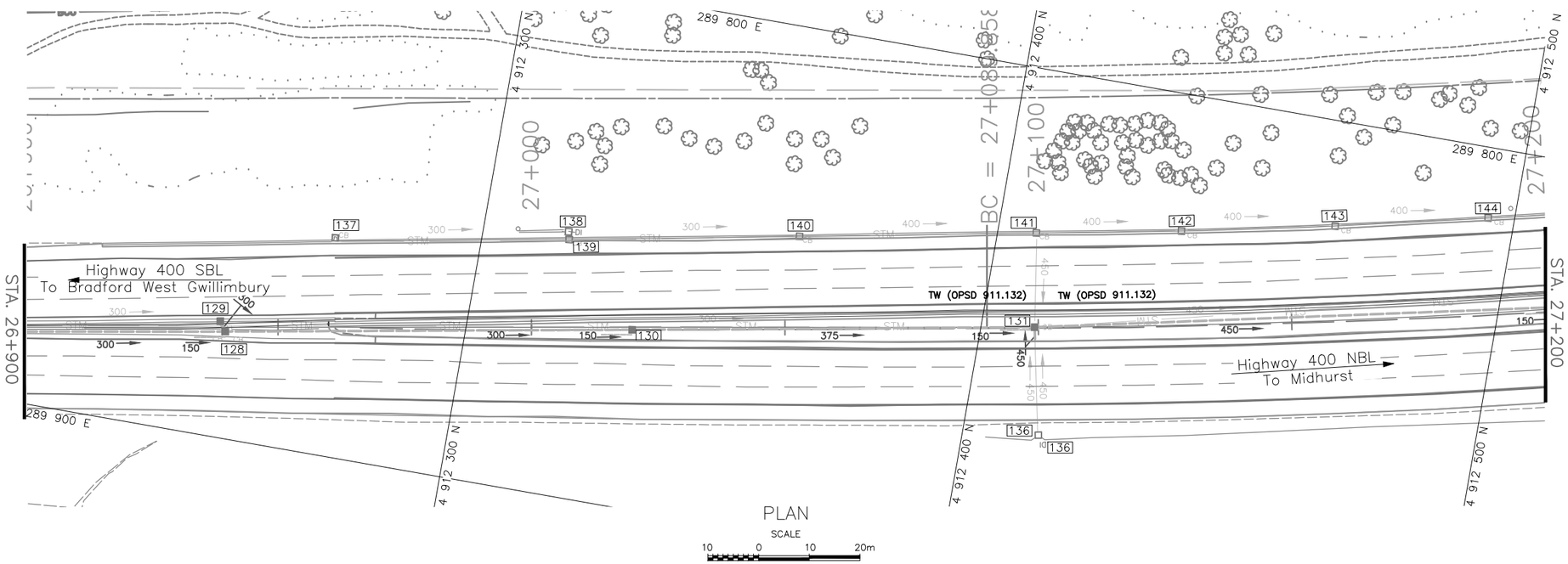
CONT No 2017-XXXX
WP No 2184-10-00

HIGHWAY 400 SEWER REPLACEMENT

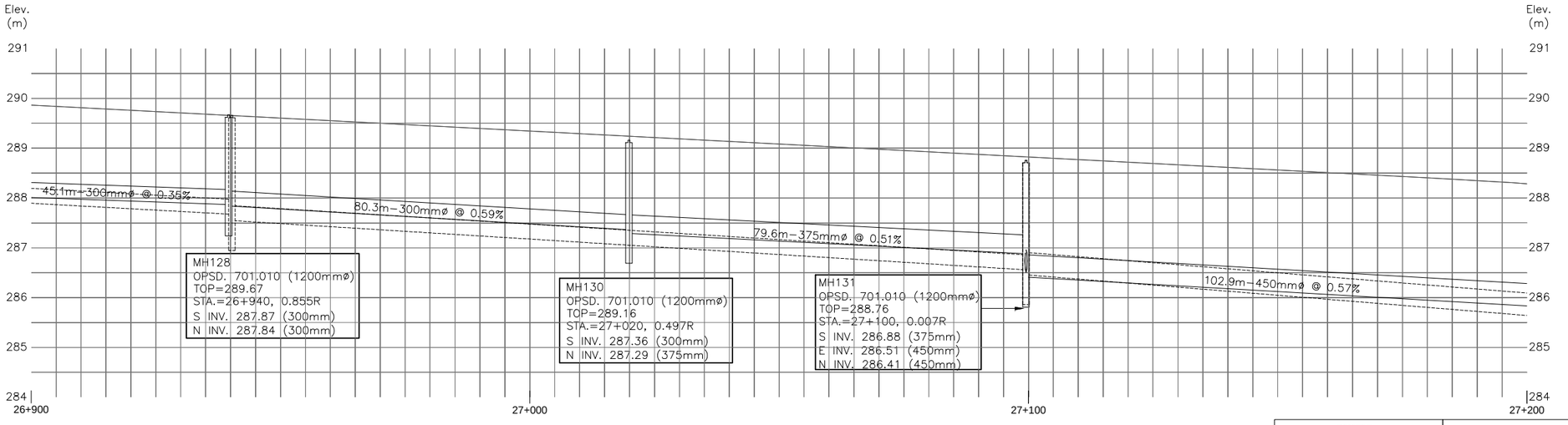
BOREHOLE LOCATIONS AND SOIL STRATA

SHEET

Peto MacCallum Ltd.
CONSULTING ENGINEERS



PLAN
SCALE
10 0 10 20m



℄ PROFILE
SCALE
HORIZONTAL
10 0 10 20m
VERTICAL
1 0 1 2m

KEY PLAN
SCALE
5 0 5 10 15km

LEGEND

Existing Sewer

Replacement/New Sewer

BH No	ELEVATION	CO-ORDINATES NORTHINGS	EASTINGS

REGISTERED PROFESSIONAL ENGINEER
C M P Nascimento
May 16, 2016
PROVINCE OF ONTARIO

PER GRIGORY DEGIL:
THIS REPORT WILL BE RE-SUBMITTED WHEN GRIGORY DEGIL RETURNS FROM OVERSEAS.

C M P Nascimento

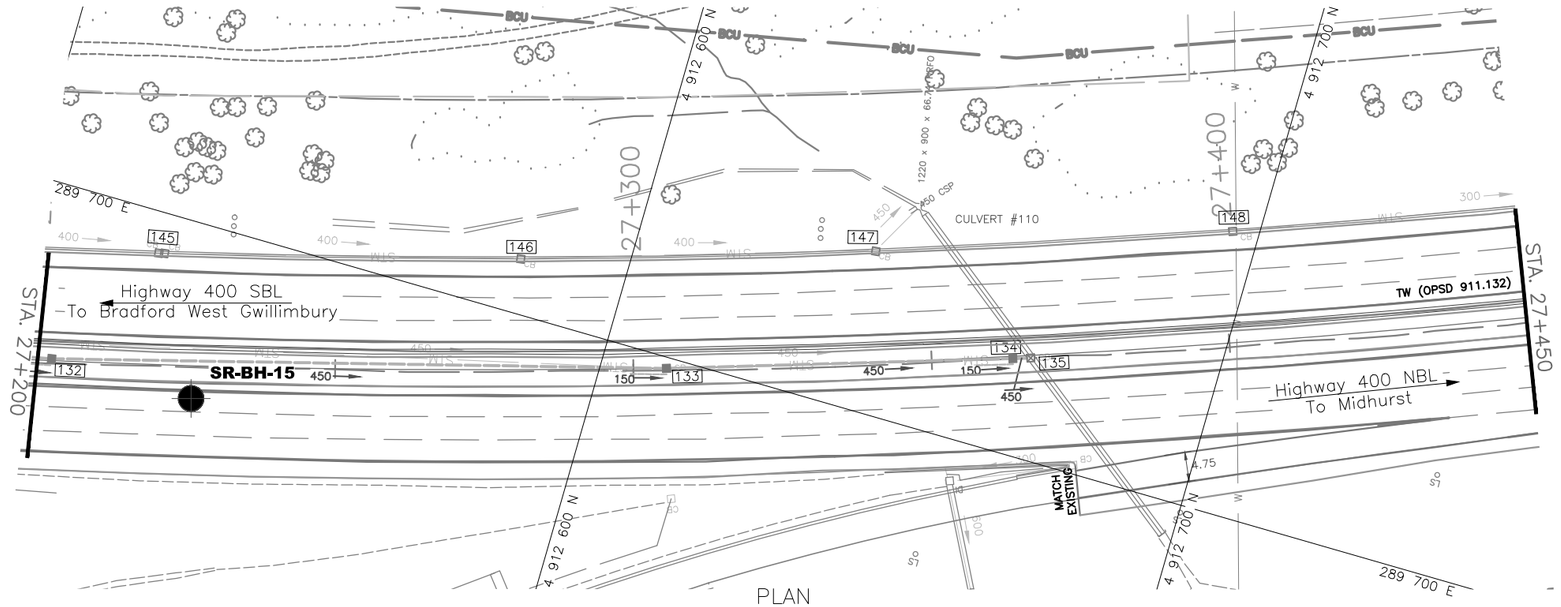
REF MTO Drawings; 09.NEWCONS-For FDN.dwg & 10.PROFILES.dwg; dated January 13, 2016 & January 12, 2016, respectively.

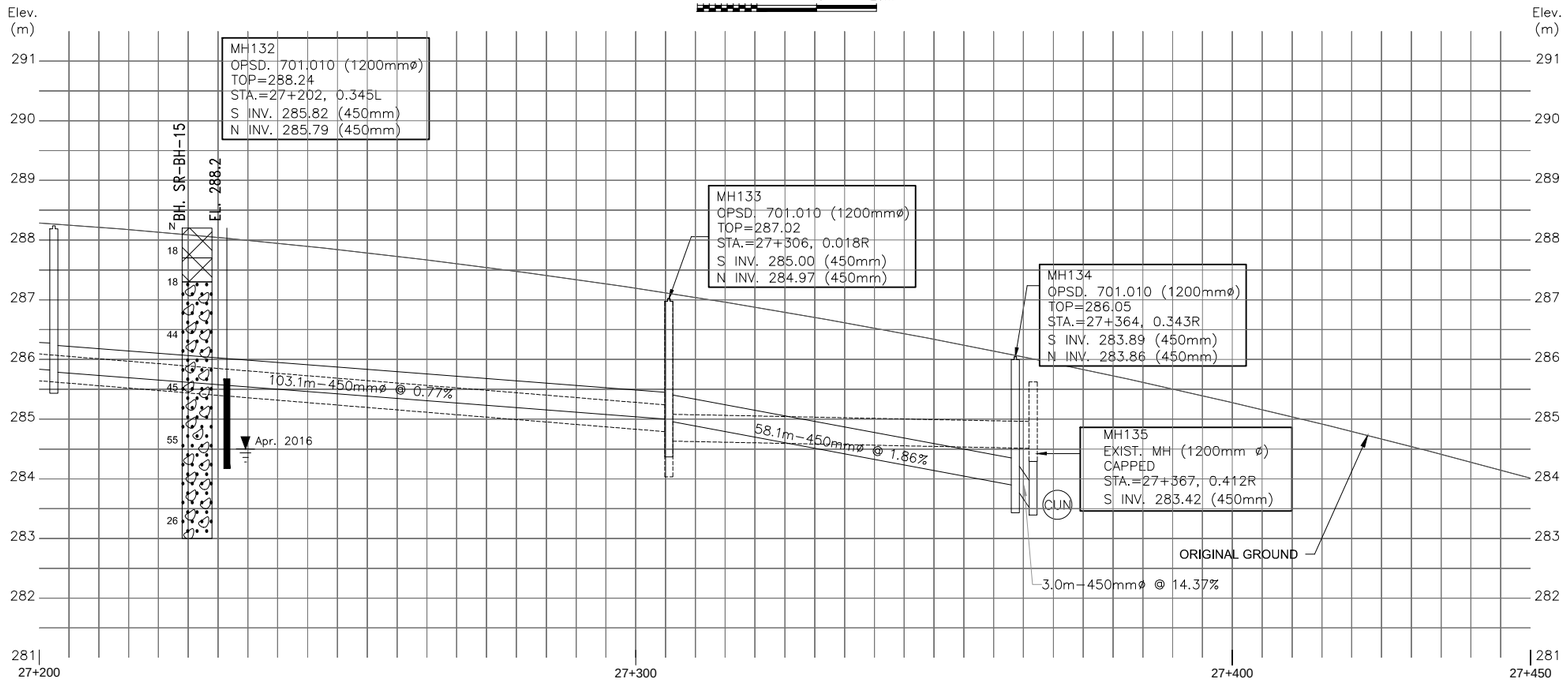
- NOTE -
The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.

REVISIONS			
DATE	BY	DESCRIPTION	

Geocres No. 31D-642

HWY No	400			DIST	CENTRAL
SUBM'D	NA	CHECKED	M.Kh	DATE	MAY 16, 2016
DRAWN	NL	CHECKED	GD	APPROVED	CN
SITE				DWG	400WM-19/25





℄ PROFILE

SCALE

HORIZONTAL

10 0 10 20m

VERTICAL

1 0 1 2m

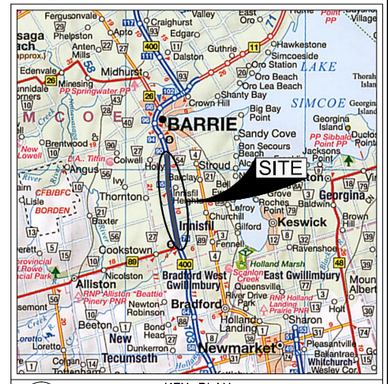
CONT No 2017-XXXX
WP No 2184-10-00

HIGHWAY 400 SEWER REPLACEMENT

BOREHOLE LOCATIONS AND SOIL STRATA

SHEET

Peto MacCallum Ltd.
CONSULTING ENGINEERS



KEY PLAN
SCALE
5 0 5 10 15km

LEGEND

- Borehole Location
- N Blows/0.3m (Std. Pen Test, 475 J / blow)
- Piezometer
- WL in Piezometer
- Existing Sewer
- Replacement/New Sewer
- FILL
- GRAVELLY SAND

BH No	ELEVATION	CO-ORDINATES NORTHINGS	CO-ORDINATES EASTINGS
SR-BH-15	288.2	4 912 535.6	289 728.7

REGISTERED PROFESSIONAL ENGINEER
C M P Nascimento
May 16, 2016
PROVINCE OF ONTARIO

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- NOTE -

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REVISIONS	DATE	BY	DESCRIPTION

Geocres No. 31D-642

REF MTO Drawings; 09.NEWCONS-For FDN.dwg & 10.PROFILES.dwg; dated January 13, 2016 & January 12, 2016, respectively.

HWY No. 400				DIST CENTRAL
SUBM'D NA	CHECKED M.Kh	DATE MAY 16, 2016	SITE	
DRAWN NL	CHECKED GD	APPROVED CN	DWG 400WM-20/25	

CONT No 2017-XXXX
WP No 2184-10-00

HIGHWAY 400 SEWER REPLACEMENT

BOREHOLE LOCATIONS AND SOIL STRATA

SHEET

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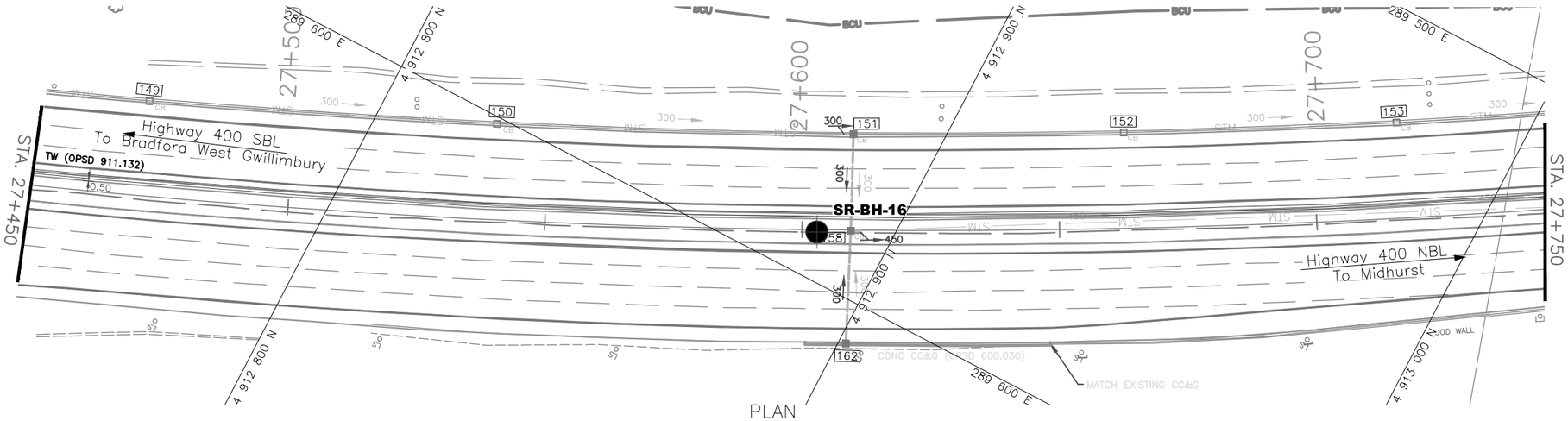
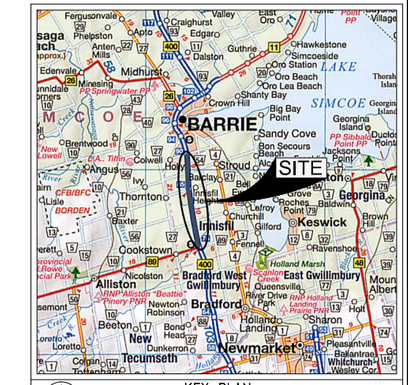


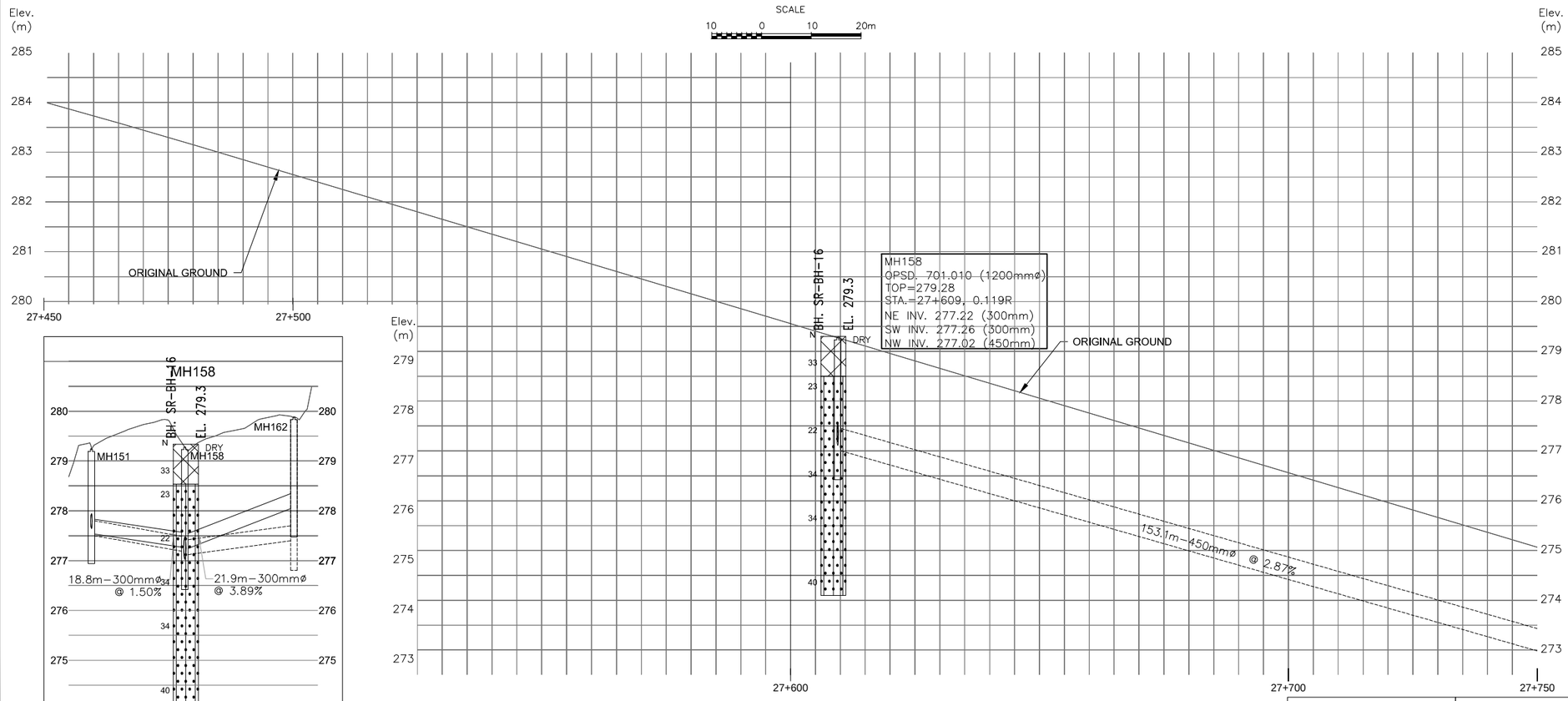


KEY PLAN
SCALE
5 0 5 10 15km

LEGEND

- Borehole Location
- N Blows/0.3m (Std. Pen Test, 475 J / blow)
- Existing Sewer
- Replacement/New Sewer
- FILL
- SAND TO SILTY SAND

BH No	ELEVATION	CO-ORDINATES NORTHINGS	EASTINGS
SR-BH-16	279.3	4 912 886.4	289 591.2



REGISTERED PROFESSIONAL ENGINEER
C M P Nascimento
May 16, 2016
PROVINCE OF ONTARIO

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Nascimento

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REVISIONS

DATE	BY	DESCRIPTION

Geocres No. 31D-642

HWY No	400			DIST	CENTRAL
SUBM'D	NA	CHECKED M.Kh	DATE MAY 16, 2016	SITE	
DRAWN	NL	CHECKED GD	APPROVED CN	DWG	400WM-21/25

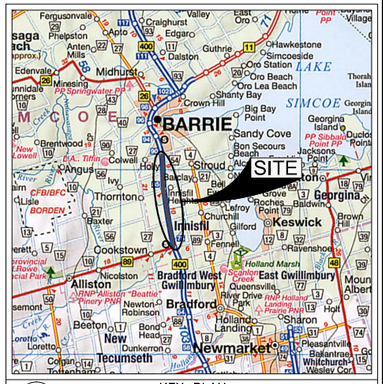
CONT No 2017-XXXX
WP No 2184-10-00

HIGHWAY 400 SEWER REPLACEMENT

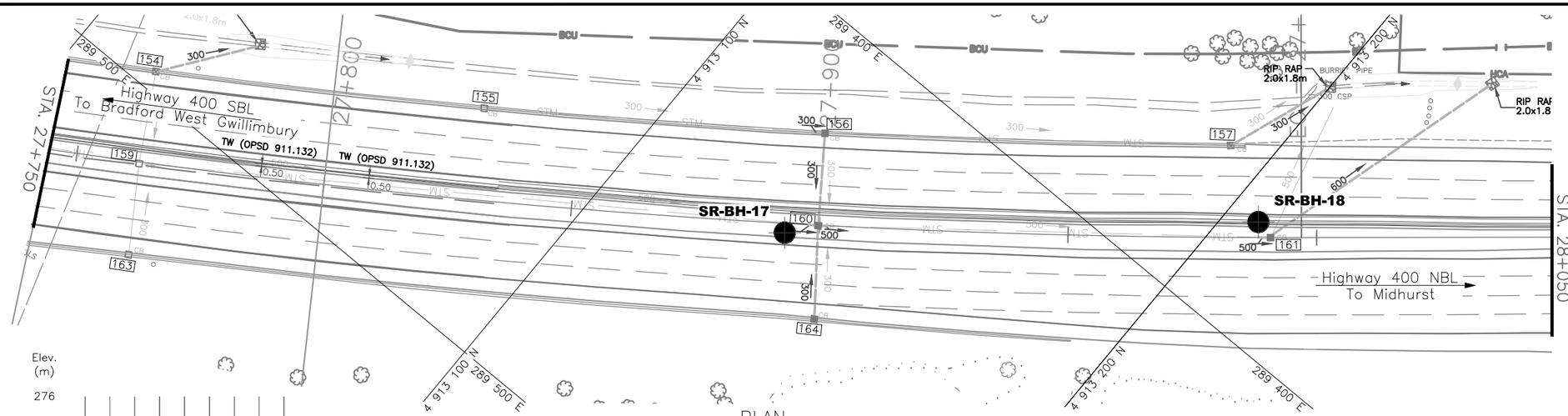
BOREHOLE LOCATIONS AND SOIL STRATA

SHEET

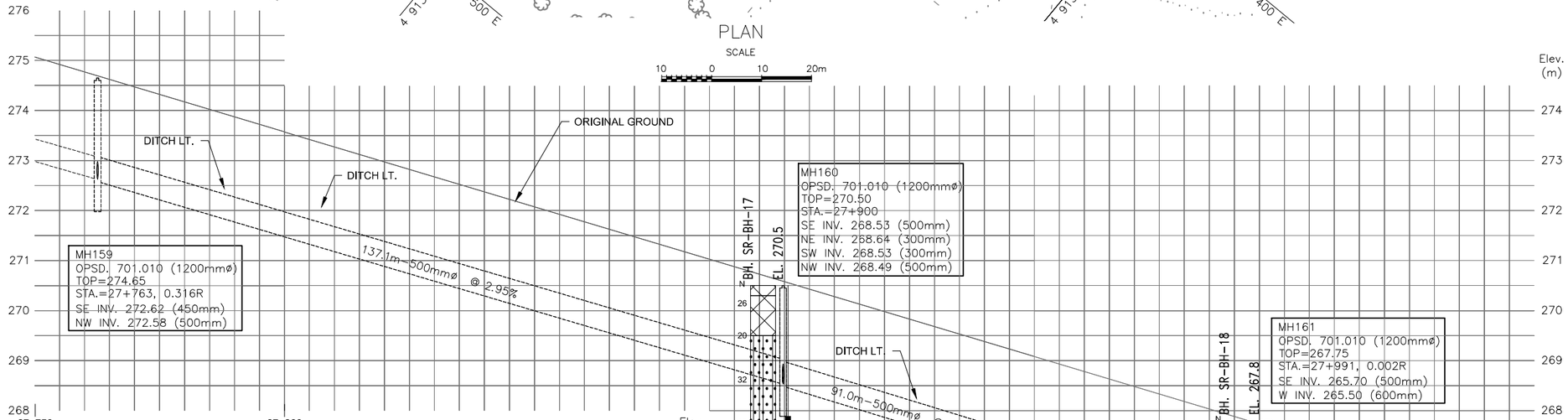
Peto MacCallum Ltd.
CONSULTING ENGINEERS

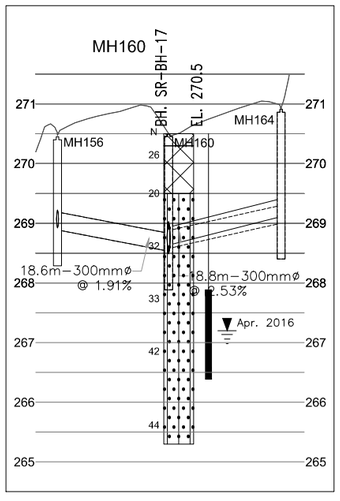


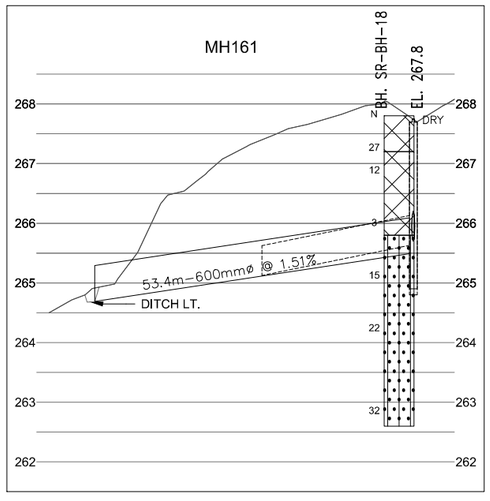
KEY PLAN
SCALE
5 0 5 10 15km



PLAN
SCALE
10 0 10 20m







℄ PROFILE
SCALE
HORIZONTAL
10 0 10 20m
VERTICAL
1 0 1 2m

LEGEND

- Borehole Location
- N Blows/0.3m (Std. Pen Test, 475 J / blow)
- Piezometer
- WL in Piezometer
- Existing Sewer
- Replacement/New Sewer
- FILL
- SAND TO SILTY SAND

BH No	ELEVATION	CO-ORDINATES NORTHINGS	CO-ORDINATES EASTINGS
SR-BH-17	270.5	4 913 134.3	289 440.4
SR-BH-18	267.8	4 913 206.3	289 378.0

REGISTERED PROFESSIONAL ENGINEER
C M P Nascimento
May 16, 2016
PROVINCE OF ONTARIO

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C M P Nascimento

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REVISIONS

DATE	BY	DESCRIPTION

Geocres No. 31D-642

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HWY No.	400			DIST	CENTRAL
SUBM'D	NA	CHECKED M.Kh	DATE MAY 16, 2016	SITE	
DRAWN	NL	CHECKED GD	APPROVED CN	DWG	400WM-22/25

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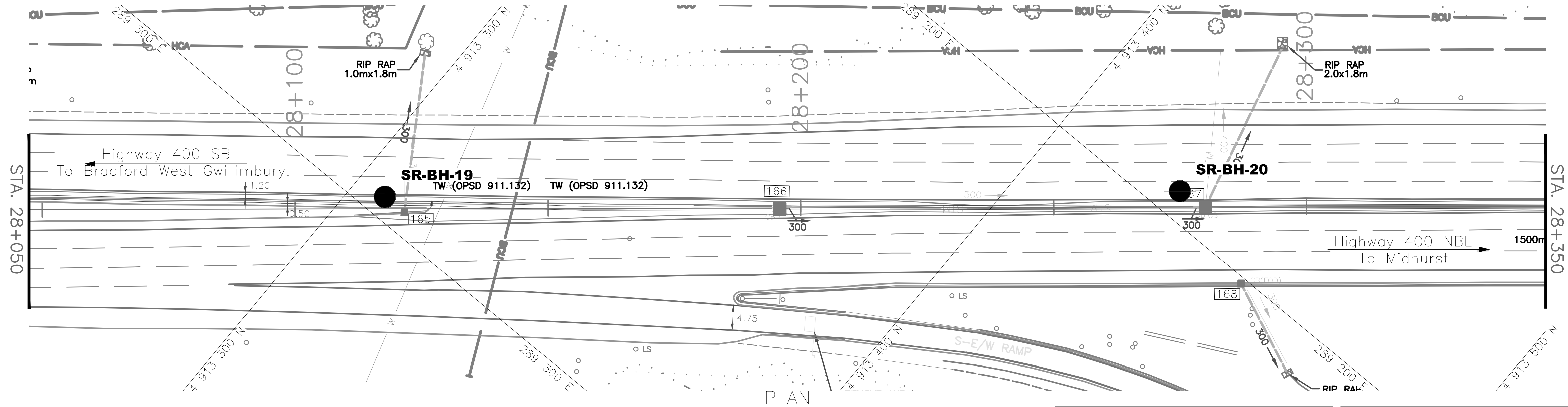
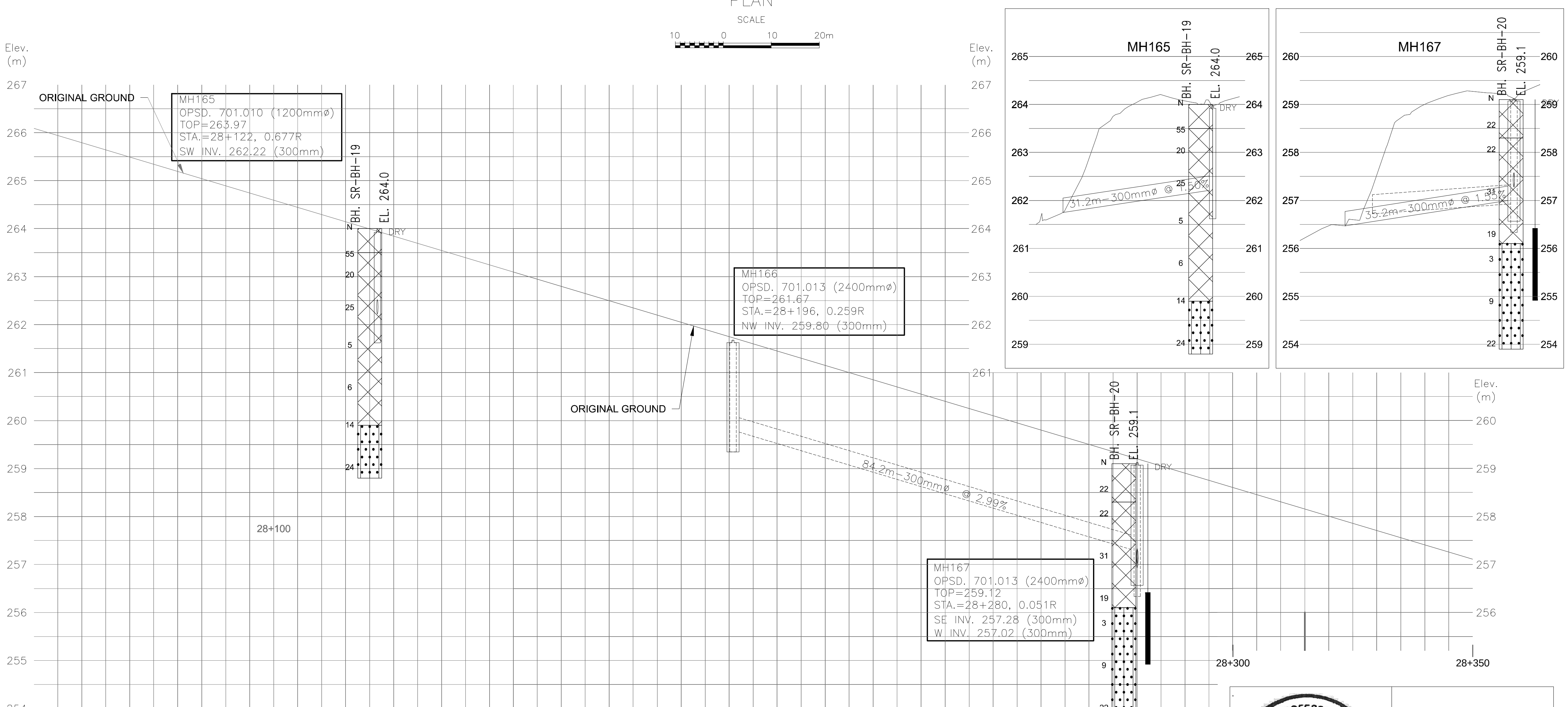
SHEET

HIGHWAY 400 SEWER REPLACEMENT
BOREHOLE LOCATIONS AND SOIL STRATA

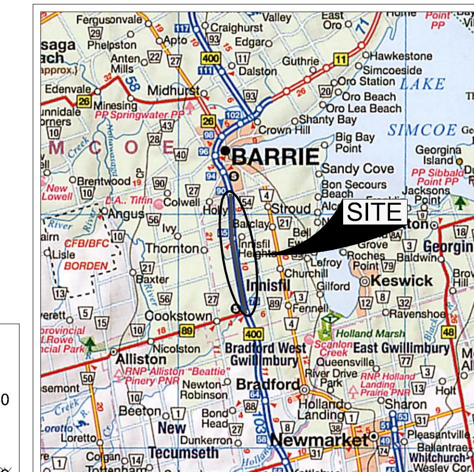
Peto MacCallum Ltd.
CONSULTING ENGINEERS



PLAN
SCALE



℄ PROFILE
SCALE
HORIZONTAL
VERTICAL



KEY PLAN
SCALE

LEGEND

- Borehole Location
- N — Blows/0.3m (Std. Pen Test, 475 J / blow)
- Piezometer
- Existing Sewer
- Replacement/New Sewer
- FILL
- SILTY SAND

BH No	ELEVATION	CO-ORDINATES NORTHINGS	CO-ORDINATES EASTINGS
SR-BH-19	264.0	4 913 306.3	289 295.9
SR-BH-20	259.1	4 913 426.7	289 194.8

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REGISTERED PROFESSIONAL ENGINEER
C M P Nascimento
PROVINCE OF ONTARIO

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REVISIONS DATE	BY	DESCRIPTION

Geocres No. 31D–642

HWY No 400			DIST CENTRAL
SUBM'D NA	CHECKED M.Kh	DATE MAY 16, 2016	SITE
DRAWN NL	CHECKED GD	APPROVED CN	DWG 400WM–23/25

REF MTO Drawings; 09.NEWCONS–For FDN.dwg & 10.PROFILES.dwg; dated January 13, 2016 & January 12, 2016, respectively.

CONT No 2017-XXXX
WP No 2184-10-00

HIGHWAY 400 SEWER REPLACEMENT

BOREHOLE LOCATIONS AND SOIL STRATA

SHEET

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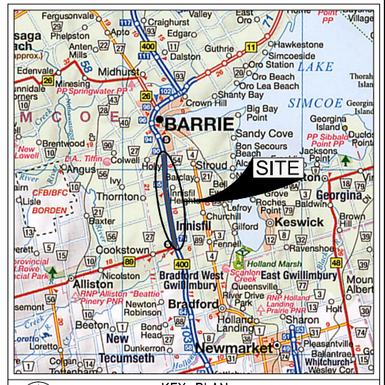
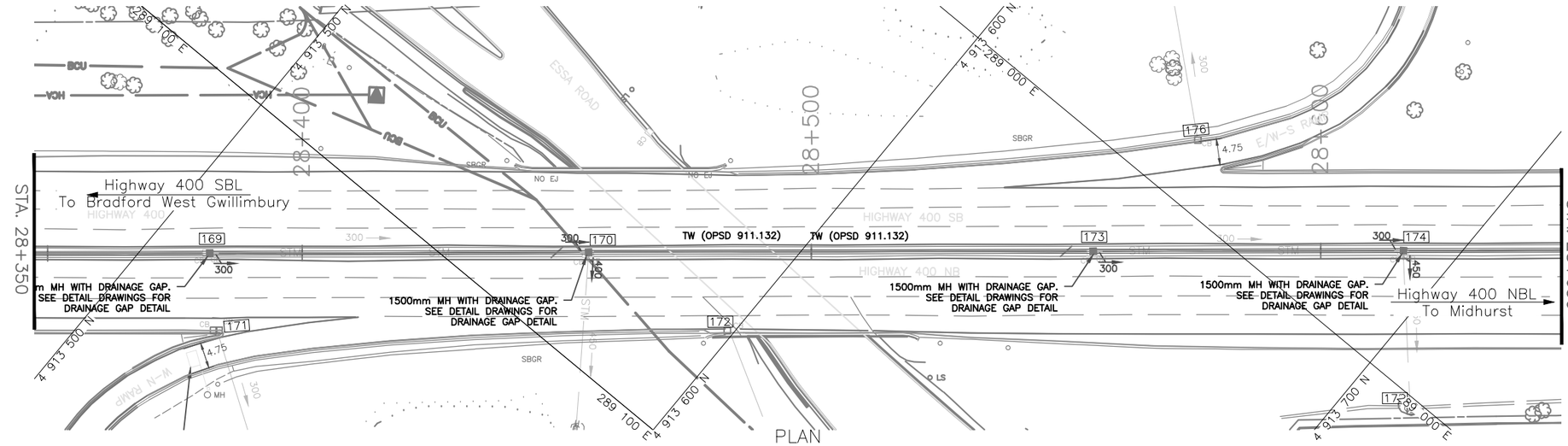
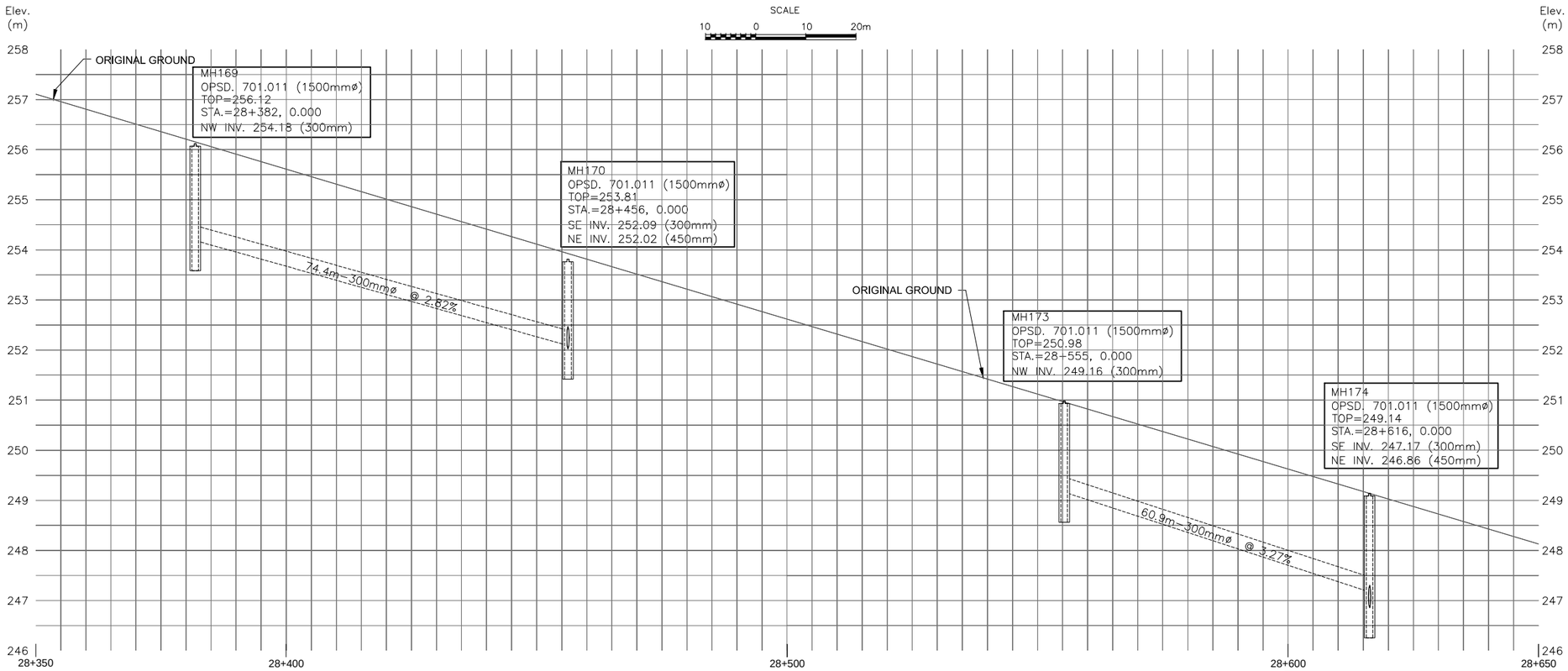


KEY PLAN
SCALE
5 0 5 10 15km



PLAN
SCALE
10 0 10 20m



℄ PROFILE
SCALE
HORIZONTAL
10 0 10 20m
VERTICAL
1 0 1 2m

LEGEND
Existing Sewer
Replacement/New Sewer

BH No	ELEVATION	CO-ORDINATES NORTHINGS	EASTINGS

REGISTERED PROFESSIONAL ENGINEER
C M P Nascimento
May 16, 2016
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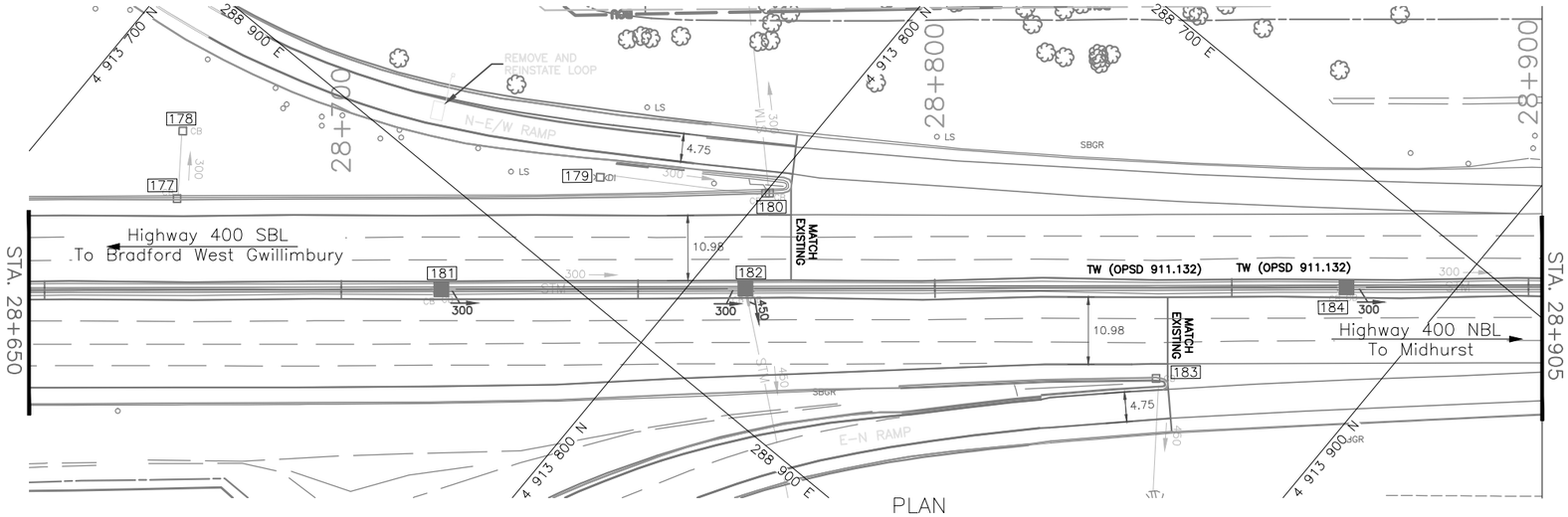
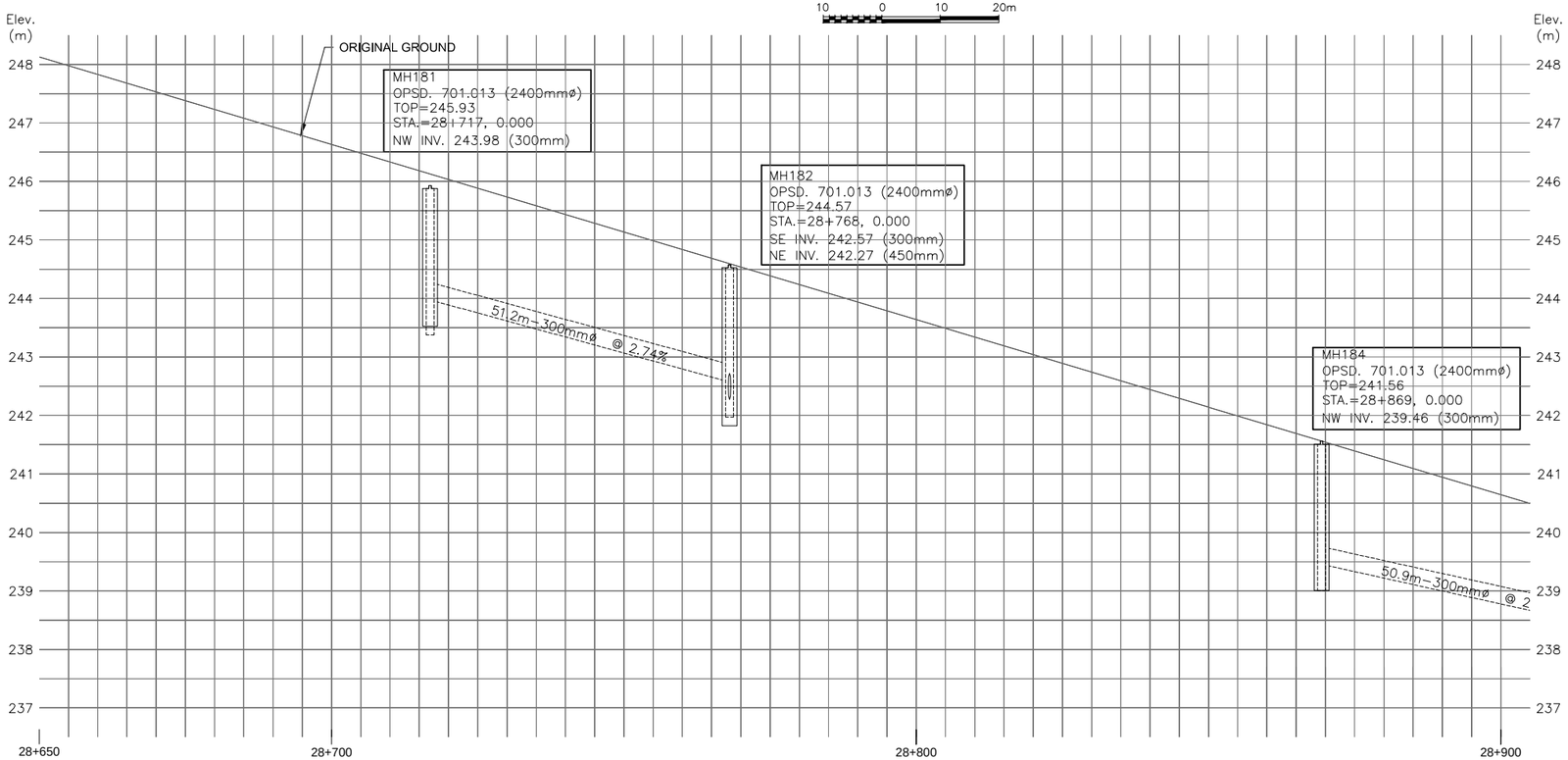
HWY No 400				DIST CENTRAL
SUBM'D NA	CHECKED M.Kh	DATE MAY 16, 2016		SITE
DRAWN NL	CHECKED GD	APPROVED CN		DWG 400WM-24/25



PLAN

SCALE

10 0 10 20m



℄ PROFILE

SCALE

HORIZONTAL

10 0 10 20m

VERTICAL

1 0 1 2m

CONT No 2017-XXXX
WP No 2184-10-00

HIGHWAY 400 SEWER REPLACEMENT

BOREHOLE LOCATIONS AND SOIL STRATA

SHEET

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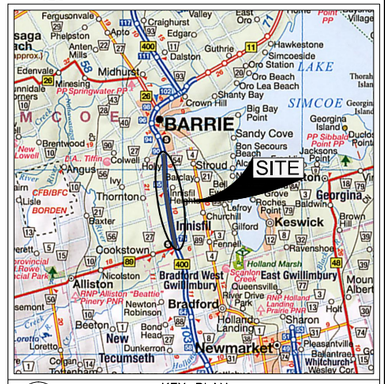


KEY PLAN

SCALE

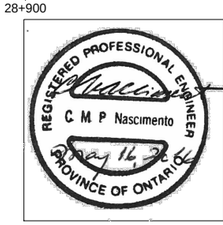
5 0 5 10 15km

LEGEND

Existing Sewer

Replacement/New Sewer

BH No	ELEVATION	CO-ORDINATES NORTHINGS	EASTINGS



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REVISIONS		
DATE	BY	DESCRIPTION

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HWY No 400				DIST CENTRAL
SUBM'D NA	CHECKED M.Kh	DATE MAY 16, 2016		SITE
DRAWN NL	CHECKED GD	APPROVED CN		DWG 400WM-25/25